

SPECIFICATION

Title of Invention

SLEEPING APPARATUS

5

Technical Field

[0001]

The present invention relates to a sleeping apparatus.

Priority is claimed on Japanese Patent Application No. 2015-198765, filed on

10 October 6, 2015, the content of which is incorporated herein by reference.

Related Art

[0002]

For example, Patent Document 1 discloses an electric bed including a

15 lifting/lowering device for lifting and lowering a bed frame and a switch for operating the

lifting/lowering device. In addition, Patent Document 2 discloses an electric bed

capable of lifting and lowering a bed frame in stages. Furthermore, Patent Document 3

discloses an electric bed in which lifting/lowering speed of a bed frame is variable. In

these sleeping apparatuses, height of a bed can be adjusted by operating a switch so as to

20 lift and lower the bed frame.

Prior Art Document

Patent Document

[0003]

25 [Patent Document 1] Japanese Unexamined Patent Application, First

Publication No. 2004-159807

[Patent Document 2] Japanese Unexamined Patent Application, First

Publication No. 2014-076214

[Patent Document 3] Japanese Patent No. 5690033

5

Disclosure of the Invention

Problems to be Solved by the Invention

[0004]

In the electric beds, while a user of the electric bed or a caregiver of the user
10 (hereinafter, the user or the caregiver will be referred to as an operator) visibly checks
height of a sleeping base from a floor, which is supported by the bed frame, an operator
performs an operation for lifting and lowering the sleeping base. At this time, in many
cases, the operator views the sleeping base from the above, and thus, there is a case in
which the operator feels difficulty in visibly checking the height of the sleeping base.
15 In particular, for example, in a dark room, it is difficult for the operator to visibly check
the height of the sleeping base. In a case where the height of the sleeping base cannot
be recognized, there is a possibility that an article (for example, a nursing care product)
placed around the electric bed may be interposed between the sleeping base and the floor.

[0005]

20 The present invention has been made in view of the above-mentioned
circumstances, and an object thereof is to provide a sleeping apparatus whose operator
can easily recognize a change in height of a sleeping base.

Means for Solving the Problem

25

[0006]

In order to achieve the above-described object, the present invention adopts the following aspects.

(1) According to a first aspect of the present invention, there is provided a sleeping apparatus including a sleeping base; a drive mechanism that lifts and lowers the sleeping base; a control unit that controls the drive mechanism; and a notification unit that notifies a notification information, based on an instruction transmitted from the control unit. The control unit causes the notification unit to notify the notification information having patterns which are different depending on a height of the sleeping base from a floor.

10 [0007]

According to the aspect described above in (1), the notification unit notifies the notification information having patterns which are different depending on the height of the sleeping base from the floor. This allows an operator to recognize the notification information. In this manner, the operator understands the height of the sleeping base without visibly checking the height of the sleeping base. Therefore, the operator easily recognizes a change in the height of the sleeping base.

15

[0008]

(2) In the aspect described above in (1), a configuration may be adopted as follows. When the sleeping base is lowered, if the height of the sleeping base from the floor reaches a temporary stop height which is predefined, the control unit causes the drive mechanism to temporarily stop lowering the sleeping base.

20

[0009]

In a case of (2) described above, the drive mechanism stops a lowering operation if the height of the sleeping base from the floor reaches the temporary stop height. In this manner, lowering of the sleeping base is temporarily stopped at the temporary stop

25

height. Therefore, after recognizing that lowering the sleeping base is stopped, the operator can check whether any obstacle is present or absent between the sleeping base and the floor.

[0010]

- 5 (3) In the aspect described above in (2), a configuration may be adopted as follows. Only in a case where the height of the sleeping base from the floor is equal to or lower than the temporary stop height, the control unit causes the notification unit to notify the notification information.

[0011]

- 10 In a case of (3) described above, only when the height of the sleeping base from the floor is equal to or lower than the temporary stop height, the notification unit notifies the notification information. This allows the operator to recognize the notification information. In this manner, without visibly checking the height of the sleeping base, the operator can recognize that the height of the sleeping base from the floor is equal to
15 or lower than the temporary stop height.

[0012]

- (4) In the sleeping apparatus according to any one of the aspects described above in (1) to (3), a configuration may be adopted as follows. The notification unit includes a speaker. The control unit causes the speaker to produce a notification information
20 sound having patterns which are different depending on the height of the sleeping base from the floor, as the notification information.

[0013]

- In a case of (4) described above, the speaker produces the notification information sound having patterns which are different depending on the height of the
25 sleeping base from the floor. This allows the operator to recognize the pattern of the

notification information sound. In this manner, without visibly checking the height of the sleeping base, the operator can recognize a change in the height of the sleeping base from the floor.

[0014]

- 5 (5) In a case of (4) described above, a configuration may be adopted as follows. The notification information sound has a pattern in which a sound producing period representing a sounding period or a continuous sounding period and a sound eliminating period representing a soundless period are alternately repeated. At least any one of the sound producing period and the sound eliminating period is set to be shortened as the
- 10 height of the sleeping base from the floor becomes lower.

[0015]

- In a case of (5) described above, as the height of the sleeping base from the floor is lowered, at least any one of the sound producing period and the sound eliminating period of the notification information sound is set to be shortened. This enables the
- 15 operator to intuitively recognize the pattern of the notification information sound. Therefore, without visibly checking the height of the sleeping base, the operator can recognize a change in the height of the sleeping base from the floor.

[0016]

- (6) In a case of (4) described above, the notification information sound may be
- 20 set so that at least one of a sound pressure and a frequency varies depending on the height of the sleeping base from the floor.

[0017]

- In a case of (6) described above, the operator can intuitively recognize the pattern of the notification information sound. Therefore, without visibly checking the
- 25 height of the sleeping base, the operator can recognize a change in the height of the

sleeping base from the floor.

[0018]

(7) In a case described above in any one of (4) to (6), a configuration may be adopted as follows. When lowering of the sleeping base is stopped, the control unit
5 causes the speaker to produce a stop sound which is a sound notifying that lowering of the sleeping base is stopped.

[0019]

In a case of (7) described above, when lowering of the sleeping base is stopped, a stop sound is produced by the speaker. In this manner, without visibly checking the
10 height of the sleeping base, the operator can recognize that lowering of the sleeping base is stopped.

[0020]

(8) In a case described above in any one of (4) to (7), a configuration may be adopted as follows. The sleeping apparatus further includes a detection unit that detects
15 an environmental change around the sleeping base. Based on an input from the detection unit, the control unit changes at least any one of the sound pressure of the notification information sound and the frequency of the notification information sound.

[0021]

In a case of (8) described above, the speaker produces the notification
20 information sound having the sound pressure or the frequency depending on the environmental change around the sleeping apparatus. Therefore, it is possible to prevent the surrounding environment from being undesirably affected by the notification information sound.

[0022]

25 (9) In a case described above in any one of (1) to (8), a configuration may be

adopted as follows. The sleeping apparatus further includes an operation unit to which an instruction to lift and lower the sleeping base is input. The notification unit includes a vibration generator that vibrates the operation unit. The control unit causes the vibration generator to generate a vibration having patterns which are different depending
 5 on the height of the sleeping base from the floor.

[0023]

In a case of (9) described above, the vibration generator generates the vibration having patterns which are different depending on the height of the sleeping base from the floor. This allows the operator who operates the operation unit to recognize the
 10 vibration pattern without visibly checking the height of the sleeping base. In this manner, the operator can recognize a change in the height of the sleeping base from the floor.

[0024]

(10) In the aspect described above in any one of (1) to (9), a configuration may
 15 be adopted as follows. The notification unit includes a display unit that displays the notification information. The control unit causes the display unit to display a warning having patterns which are different depending on the height of the sleeping base from the floor, as the notification information.

[0025]

20 In a case of (10) described above, the display unit displays the warning having patterns which are different depending on the height of the sleeping base from the floor. This allows the operator to recognize the display of the display unit. Therefore, the operator can recognize a change in the height of the sleeping base from the floor.

[0026]

According to the above-described respective aspects of the present invention, the control unit causes the notification unit to notify the notification information having patterns which are different depending on the height of the sleeping base from the floor.

- 5 Accordingly, the operator recognizes the notification information, and can recognize the height of the sleeping base from the floor without directly viewing the height of the sleeping base. Therefore, the operator easily recognizes a change in the height of the sleeping base.

10 Brief Description of the Drawings

[0027]

FIG. 1 is a side view of a sleeping apparatus according to a first embodiment of the present invention.

- FIG. 2 is a functional block diagram of a drive mechanism, a control mechanism,
15 and an operation unit of the sleeping apparatus.

FIG. 3 is a front view of the operation unit of the sleeping apparatus.

FIG. 4 is a flowchart schematically illustrating an operation for lowering a sleeping base of the sleeping apparatus.

- FIG. 5 is a flowchart illustrating details of the operation for lowering the
20 sleeping base of the sleeping apparatus.

FIG. 6 illustrates an example of a pattern of a buzzer sound produced by the speaker of the sleeping apparatus.

FIG. 7 is a functional block diagram of a modification example of the drive mechanism, the control mechanism, and the operation unit of the sleeping apparatus.

- 25 FIG. 8 is a plan view of a sleeping apparatus according to a second embodiment

of the present invention.

FIG. 9 is a side view of the sleeping apparatus.

FIG. 10 is an exploded perspective view of a support frame configuring the sleeping apparatus.

5 FIG. 11 is a plan view of the support frame.

FIG. 12 is a side view of the support frame.

FIG. 13 is a side view of the support frame, and is a view illustrating state where a main frame is lifted by a lifting/lowering mechanism.

FIG. 14 is a front view of an operation unit applicable to the sleeping apparatus
10 according to the embodiment.

Embodiments of the Invention

[0028]

[First Embodiment]

15 Hereinafter, a first embodiment of a sleeping apparatus according to the present invention will be described with reference to FIGS. 1 to 5. FIG. 1 is a side view of a sleeping apparatus A according to the present embodiment. An H-direction in FIG. 1 represents a direction in which a head portion of a user (not illustrated) is present on the sleeping apparatus A, and an F-direction represents a direction in which a leg of the user
20 is present on the sleeping apparatus A. In the following description, the H-direction (head side) will be referred to as a forward direction, and the F-direction (foot side) will be referred to as a rearward direction. The right side when the user lies on his or her back on a sleeping base 200 (to be described later) will be referred to as rightward, and the left side will be referred to as leftward. The sleeping apparatus A has a support
25 frame 100, the sleeping base 200, a drive mechanism 300, a control mechanism 400, and

an operation unit 500.

[0029]

The support frame 100 includes a base frame 110, a main frame 111, a lifting/lowering mechanism 120, and a board 130. The base frame 110 is a rectangular member installed on a floor (floor surface, installation surface) FL. The base frame 110 includes a leg member 100a in each end portion in contact with the floor FL. The leg members 100a are rubber cover members installed in order to prevent the floor FL from being damaged due to load concentration on the floor FL.

[0030]

The main frame 111 is a rectangular frame member in a plan view, and directly supports the sleeping base 200. In addition, the main frame 111 includes an option attachment portion 110a. A pair of right and left option attachment portions 110a is disposed across the main frame 111 therebetween, and a pair of option attachment portions 110a is further disposed at an interval in a forward/rearward direction. The option attachment portions 110a are members for fixing fences (not illustrated) to prevent falling-down.

[0031]

The lifting/lowering mechanism 120 has a first link 120a, a second link 120b, and a connecting pin 120c. The first link 120a is a rod-shaped member for connecting the base frame 110 and the main frame 111. The first link 120a is fixed to the base frame 110, and is fixed to the main frame 111 so as to be slidable along the forward/rearward direction. Similarly to the first link 120a, the second link 120b is a rod-shaped member for connecting the base frame 110 and the main frame 111, and is installed so as to intersect the first link 120a. The second link 120b is fixed to the main frame 111, and is fixed to the base frame 110 so as to be slidable along the

forward/rearward direction.

[0032]

The connecting pin 120c connects the first link 120a and the second link 120b so that both members are rotatable around an intersecting position between the first link
5 120a and the second link 120b. A pair of lifting/lowering mechanisms 120 is provided on the right and left side in a forward direction. These lifting/lowering mechanisms 120 are members for supporting the main frame 111 so that the main frame 111 can be lifted and lowered by the first link 120a and the second link 120b.

[0033]

10 The board 130 is fixed to the main frame 111, and is raised upward from a bed surface 200. A pair of boards 130 is disposed on the front and rear side of the main frame 111, and is raised from both side end portions in the forward/rearward direction of a second longitudinal member 33.

[0034]

15 The support frame 100 having this configuration supports the sleeping base 200 in such a way that the main frame 111 for directly supporting the sleeping base 200 and the base frame 110 directly installed on the floor FL are connected to each other by the lifting/lowering mechanisms 120. In addition, the support frame 100 can cause the lifting/lowering mechanisms 120 to lift and lower the sleeping base 200 supported by the
20 main frame 111. The sleeping base 200 is a flat plate-shaped member, and is disposed on the support frame 100 as illustrated in FIG. 1. A mattress (not illustrated) is installed on this sleeping base 200.

[0035]

FIG. 2 is a functional block diagram of the drive mechanism 300, the control
25 mechanism 400, and the operation unit 500. The drive mechanism 300 is connected to

the first link 120a by a connecting portion (not illustrated) so that an operation of the drive mechanism 300 is transmitted to the first link 120a, and is installed inside the main frame 111. As illustrated in FIG. 2, the drive mechanism 300 includes a motor 330 and a position information detection unit 331. The motor 330 has a rotary shaft (not illustrated), and produces power for lifting and lowering the sleeping base 200. The position information detection unit 331 detects a rotation amount of the motor 330, as information relating to a height h of the sleeping base 200 from the floor FL (installation surface of the base frame 110), and inputs the information to a first control unit 440 (to be described later). This drive mechanism 300 is connected to a power source (not illustrated), and rotates the first link 120a clockwise or counterclockwise in accordance with an instruction of the first control unit 440, thereby lifting and lowering the sleeping base 200.

[0036]

The control mechanism 400 is fixed to the support frame 100, and is connected to a power source (not illustrated). The control mechanism 400 has the first control unit 440, a storage unit 441, and an environment detection unit 442. The first control unit 440 controls the motor 330, based on data acquired from the position information detection unit 331. In addition, the first control unit 440 determines brightness in a room, based on a signal input from the environment detection unit 442, and transmits an instruction regarding a sound volume (sound pressure) of a speaker 552 to the second control unit 550. That is, the first control unit 440 changes the sound pressure of a buzzer sound (notification information sound), based on the input from the environment detection unit 442.

[0037]

The storage unit 441 is a memory for transmitting and receiving data to and

from the first control unit 440 in response to a request from the first control unit 440. In addition, the storage unit 441 stores in advance a maximum floor height representing the height at which the height h of the sleeping base 200 from the floor FL is the highest, a temporary stop height, a minimum floor height representing a lower limit height at which the sleeping base 200 can be lowered, patterns of the buzzer sound, and a program to be executed by the first control unit 440. The temporary stop height represents the height from the floor FL when lowering of the sleeping base 200 is temporarily stopped, and is determined in advance when the sleeping apparatus A is manufactured. In the present embodiment, as an example, the temporary stop height is set to 29 cm (290 mm). The environment detection unit 442 (detection unit) is an illumination sensor for detecting brightness in a room having the sleeping apparatus A installed therein. The environment detection unit 442 outputs a signal of the detected illuminance to the first control unit 440.

[0038]

FIG. 3 is a front view of the operation unit 500. The operation unit 500 is connected to the control mechanism 400 via a cable (not illustrated). As illustrated in FIG. 2, the operation unit 500 includes a second control unit 550, an input unit 551, a speaker 552, and a display unit 553. The second control unit 550 controls the speaker 552 and the display unit 553, based on an instruction of the first control unit 440 and the signal input from the input unit 551. In addition, the first control unit 440 and the second control unit 550 cooperate with each other, thereby functioning as a control unit according to the present invention.

[0039]

As illustrated in FIG. 3, the input unit 551 has a lowering switch 551a, a lifting switch 551b, and a sound volume control button (not illustrated). The lowering switch

551a is operated by an operator in order to lower the sleeping base 200. The lifting switch 551b is operated by the operator in order to lift the sleeping base 200. The lowering switch 551a and the lifting switch 551b are turned on only while these are continuously pressed down by the operator. The sound volume control button is used in order for the operator to adjust a sound volume of the speaker 552. In addition, the operator can set the buzzer sound so that no sound is produced by operating the sound volume control button.

[0040]

The speaker 552 produces the buzzer sound, based on an instruction of the second control unit 550. The speaker 552 corresponds to a notification unit according to the present invention. The display unit 553 is a monitor which displays information on the height h of the sleeping base 200, and etc., based on an instruction by the second control unit 550.

[0041]

This sleeping apparatus A is an electric bed in which the height h of the sleeping base 200 from the floor FL can be adjusted by a user or a caregiver of the user. An operation for lifting and lowering the sleeping base 200 which is performed by the operator is input through the operation unit 500 located on the hand side of the operator. The sleeping apparatus A performs the operation for lifting and lowering the sleeping base 200, based on this input. FIG. 4 is a flowchart schematically illustrating an operation for lowering the sleeping base 200. As illustrated in FIG. 4, if the lowering switch 551a is pressed down, lowering of the sleeping base 200 starts (Step S1). If the height h of the sleeping base 200 from the floor FL reaches the temporary stop height, the buzzer sound (temporary stop sound) is produced by the speaker 552, and the operation for lowering the sleeping base 200 is stopped (Step S2). Furthermore, if the lowering

switch 551a is pressed down again, the sleeping base 200 is lowered again in a state where the buzzer sound (lowering sound) is produced (Step S3). If the height h of the sleeping base 200 from the floor FL reaches the lowest floor height, the buzzer sound (final stop sound) is produced by the speaker 552, and lowering of the sleeping base 200 is stopped (Step S4).

[0042]

Subsequently, the operation for lowering the sleeping base 200 in the sleeping apparatus A will be described in detail with reference to FIGS. 5 and 6. FIG. 5 is a flowchart illustrating details of the operation for lowering the sleeping base 200.

[0043]

First, it is determined whether or not the lowering switch 551a is turned on (Step S11). Here, the second control unit 550 determines whether or not the lowering switch 551a is turned on. In a case where it is determined that the lowering switch 551a is not turned on, the operation for lowering the sleeping base 200 is brought into a stopped state (Step S12). In a case where it is determined that the lowering switch is turned on, it is determined whether or not the height h of the sleeping base 200 is higher than the temporary stop height (Step S13). Here, the first control unit 440 compares the height h of the sleeping base 200 from the floor FL which is acquired from the position information detection unit 331 with the temporary stop height (29 cm) stored in the storage unit 441.

[0044]

In a case where it is determined that the height h of the sleeping base 200 from the floor FL is higher than the temporary stop height, that is, in a case where it is determined as YES in Step S13, the first control unit 440 rotates the motor 330, and lowers the sleeping base 200 (Step S14). Next, it is determined whether or not the

height h of the sleeping base 200 from the floor FL reaches the temporary stop height (Step S15). Here, the first control unit 440 compares the height h of the sleeping base 200 from the floor FL which is acquired from the position information detection unit 331 with the temporary stop height stored in the storage unit 441. In a case where the height
 5 h of the sleeping base 200 from the floor FL is higher than the temporary stop height, that is, in a case where it is determined as NO in Step S15, the process returns to Step S11 again.

[0045]

If the height h of the sleeping base 200 from the floor FL is equal to the
 10 temporary stop height, that is, if it is determined as YES in Step S15, the first control unit 440 stops the operation of the motor 330, and brings the operation for lowering the sleeping base 200 into a temporarily stopped state (Step S16). Furthermore, the first control unit 440 causes the speaker 552 to produce the buzzer sound (alarm sound) indicating that the sleeping base 200 reaches the temporary stop height (Step S17). The
 15 operations in Step S16 and Step S17 are in no particular order, and Step S17 may be performed first, and Step S16 may be performed later.

[0046]

Subsequently, it is determined whether the lowering switch is turned on even after the buzzer sound is produced (Step S18). Here, the first control unit 440
 20 determines whether the lowering switch 551a is turned on. In a case where the lowering switch 551a is turned on, that is, in a case where it is determined as YES in Step S18, the first control unit 440 stops the operation for lowering the sleeping base 200 (Step S19), and the process returns to Step S18 again. In a case where the sleeping base 200 is lowered from a position higher than the temporary stop height, even if the user
 25 continuously presses down the lowering switch 551a, the sleeping base 200 remains

stopped at the temporary stop height. That is, even if the operator continuously presses down the lowering switch 551a, the sleeping base 200 is not lowered in Step S19.

[0047]

On the other hand, in a case where the lowering switch 551a is not turned on,
 5 that is, in a case where it is determined as NO in Step S18, the process returns to Step S11 again. In this way, in order to cause the height h of the sleeping base 200 to be lower than the temporary stop height, the operator needs to release the lowering switch 551a once, and the operator needs to press down the lowering switch 551a again. If the operator presses down the lowering switch 551a again and a signal is input to the second
 10 control unit 550, it is determined as YES in Step S11, and the process proceeds to Step S13.

[0048]

In Step S13, in a case where the height h of the sleeping base 200 from the floor FL is equal to or lower than the temporary stop height, that is, in a case where it is
 15 determined as NO, in accordance with a unit interval period t3 in Table 1, the buzzer sound is produced using the buzzer sound pattern depending on the height h of the sleeping base 200 from the floor FL (Step S20). At this time, the first control unit 440 changes the sound pressure of the buzzer sound, based on an input from the environment detection unit 442.

20 [0049]

FIG. 6 illustrates an example of patterns of the buzzer sound (warning sound pattern) produced by the speaker 552. The reference numeral t1 in FIG. 6 indicates a sound producing period (100 ms) representing a period during which the buzzer sound is continuously produced from the speaker 552, and the reference numeral t2 indicates a
 25 sound eliminating period (50 ms) representing a period during which no sound is

produced from the speaker 552. That is, in a line chart illustrated in FIG. 6, the lateral direction on the right side of the page indicates a time traveling direction, and the upward/downward direction of the page indicates the presence or absence of the buzzer sound. The line chart means as follows. When the solid line is located on the upper side of the page at a predetermined time, the sound is produced from the speaker 552. When the solid line is located on the lower side of the page, no sound is produced from the speaker 552. The reference numeral t3 indicates a unit interval period (variable).

[0050]

The buzzer sound calls the attention of the operator in such a way that the sound producing period t1 + the sound eliminating period t2 + the sound producing period t1 are defined as one unit, and in such a way that the sound is produced multiple times during a unit U (refer to FIG. 6) thereof while the unit interval period t3 is left therebetween. The unit interval period t3 of the buzzer sound is set in accordance with Table 1 illustrated below. The unit interval period t3 of the buzzer sound is set so that the unit interval period t3 is shortened as the height h of the sleeping base 200 from the floor FL is lowered. As described above, in the present embodiment, the unit interval period t3 representing the period during which no sound is produced is set so as to be shortened as the height h of the sleeping base 200 from the floor FL is lowered, thereby functioning as the sound eliminating period described in the present invention.

Therefore, when the sleeping base 200 is lowered, while a period ($2 \times t1 + t2$) of one unit U functioning as the sound producing period is maintained constant, the unit interval period t3 functioning as the sound eliminating period is gradually shortened.

As described above, the pattern of the buzzer sound is changed depending on the height h of the sleeping base 200 from the floor FL. An output value of the height h of the sleeping base 200 from the floor FL which is detected by the position information

detection unit 331 is in units of centimeters (cm) after the decimal point is truncated.

[0051]

[Table 1]

Height h	Unit Interval Period t3 [ms]
Temporary Stop Height to 28 cm	470
27 to 26 cm	440
25 to 24 cm	410
23 to 22 cm	380
21 to 20 cm	350
19 to 18 cm	320
17 to 16 cm	290
15 cm	260

5 [0052]

Referring back to FIG. 5, subsequently to Step S20, the first control unit 440 controls the motor 330 so as to start to perform the operation for lowering the sleeping base 200 (Step S21). Next, the first control unit 440 determines whether or not the height h of the sleeping base 200 from the floor FL reaches the lowest floor height serving as the lower limit of the height at which the sleeping base 200 can be lowered (Step S22). In a case where the height h of the sleeping base 200 from the floor FL is higher than the lowest floor height, that is, in a case where it is determined as NO in Step S22, the process returns to Step S11. In a case where the height h of the sleeping base 200 from the floor FL reaches the lowest floor height, that is, in a case where it is

determined as YES in Step S22, the first control unit 440 stops the operation for lowering the sleeping base 200 (Step S23). At this time, the operation for lowering the sleeping base 200 may be stopped, and a stop buzzer sound (stop sound) having a long tone may be produced.

5 [0053]

As the control unit, the sleeping apparatus A according to the present embodiment as described above includes the first control unit 440 and the second control unit 550 which cause the speaker 552 to produce the buzzer sound having patterns which are different depending on the height h of the sleeping base 200 from the floor FL. This
10 enables the operator to check a change in the height h of the sleeping base 200 from the floor FL without visibly checking the height h of the sleeping base 200.

[0054]

In addition, the sleeping apparatus A according to the present embodiment includes the storage unit 441 for storing the temporary stop height. In this manner, if
15 the height h of the sleeping base 200 from the floor FL reaches the temporary stop height, even if the operator continuously presses down the lowering switch 551a, the first control unit 440 stops the operation for lowering the sleeping base 200 once. Therefore, after recognizing that the operation for lowering the sleeping base 200 is stopped, the operator can check whether any obstacle is present or absent between the sleeping base 200 and
20 the floor FL.

[0055]

In addition, the sleeping apparatus A according to the present embodiment includes the environment detection unit 442. In this manner, depending on the brightness of the room having the sleeping apparatus A installed therein, the first control
25 unit 440 can set the sound pressure of the buzzer sound produced by the speaker 552.

Therefore, the buzzer sound whose magnitude satisfies the surrounding environment or a situation of the user of the sleeping apparatus A is produced during the night time. That is, it is possible to prevent the surrounding environment from being obstructed by the buzzer sound.

5 [0056]

[Second Embodiment]

Hereinafter, as a second embodiment, a modification example of the support frame, the sleeping base, and the drive mechanism of the sleeping apparatus according to the present invention will be described with reference to FIGS. 8 to 14. In a sleeping
10 apparatus B according to the present embodiment, the same reference numerals will be given to elements common to those according to the first embodiment, and repeated description will be omitted.

[0057]

As illustrated in FIGS. 8 to 14, the sleeping apparatus B includes a sleeping base
15 11, a support frame 12, a drive mechanism 13, a board 14, a control unit 15, and an operation unit 501. The sleeping apparatus B is a so-called electric bed in which electric power is used as a power source.

The sleeping base 11 is longer in the forward/rearward direction than the rightward/leftward direction in a plan view. The sleeping base 11 includes a back
20 bottom 16, a waist bottom 17, and a leg bottom 18. The back bottom 16, the waist bottom 17, and the leg bottom 18 are arranged side by side in this order from a head side H toward a foot side F. The leg bottom 18 includes a knee bottom 19 and a foot bottom 20. The knee bottom 19 and the foot bottom 20 are arranged side by side in this order from the head side H toward the foot side F.

25 [0058]

The upper surface of the back bottom 16, the upper surface of the waist bottom 17, and the upper surface of the leg bottom 18 (the knee bottom 19 and the foot bottom 20) respectively form a part of a sleeping base surface 21. The back bottom 16 corresponds to a portion for supporting the back of the user on the sleeping base surface 21. The waist bottom 17 corresponds to a portion for supporting the waist of the user on the sleeping base surface 21. The leg bottom 18 corresponds to a portion for supporting the leg of the user on the sleeping base surface 21. The knee bottom 19 corresponds to a portion for supporting from the knee to the waist of the user on the sleeping base surface 21. The foot bottom 20 corresponds to a portion for supporting from the knee to the toe of the user on the sleeping base surface 21. The waist bottom 17 is formed so as to be expandable in the forward/rearward direction. The knee bottom 19 and the foot bottom 20 are connected to each other so as to be pivotable around a bending shaft 22 extending in the rightward/leftward direction.

[0059]

The sleeping base surface 21 has an orthogonal plane orthogonal in the upward/downward direction in a standard state before the sleeping base 11 is subjected to deformation such as back raising or knee raising (for example, pivoting motion including rising) by the drive mechanism 13. The sleeping base surface 21 is formed in a rectangular shape which is longer in the forward/rearward direction than in the rightward/leftward direction in a plan view. The longitudinal direction of the sleeping base surface 21 (sleeping base 11) is set to the forward/rearward direction, and the short side direction of the sleeping base surface 21 is set to the rightward/leftward direction. A mattress (not illustrated) is disposed on the sleeping base surface 21.

[0060]

The support frame 12 supports the sleeping base 11, and receives each load of

the sleeping base 11 and the user lying on the sleeping base 11. In the present embodiment, the support frame 12 supports the back bottom 16 and the leg bottom 18 (movable bottom) so as to pivotable around pivotal shafts 23 and 24 extending in the rightward/leftward direction, thereby allowing the sleeping apparatus B to function as a so-called Gatch bed. The support frame 12 includes a base frame 25, a main frame 26, and a lifting/lowering mechanism 27.

[0061]

The base frame 25 is installed on the floor FL, and has a rectangular shape in a plan view. As illustrated in FIG. 10, the base frame 25 includes first longitudinal members 28 extending in the forward/rearward direction and first lateral members 29 extending in the rightward/leftward direction.

A pair of the first longitudinal members 28 is disposed at an interval in the rightward/leftward direction.

The first lateral members 29 are installed between the pair of right and left first longitudinal members 28, and connect both the first longitudinal members 28 to each other in the rightward/leftward direction. A pair of the first lateral members 29 is disposed at an interval in the forward/rearward direction. The first lateral members 29 are immovably fixed to the first longitudinal members 28.

[0062]

End portions in the forward/rearward direction of the first longitudinal members 28 protrude outward in the forward/rearward direction further than the first lateral members 29. A leg member 30 for installation is mounted on each of the end portions. In the illustrated example, a rubber cover is employed as the leg members 30. However, a caster may be employed instead of the rubber cover.

[0063]

The main frame 26 directly supports the sleeping base 11. The main frame 26 includes a frame portion 31 for supporting the sleeping base 11 from the below, and option attachment portions 32 which protrude in the rightward/leftward direction from the frame portion 31 and which are disposed below the sleeping base 11.

5 The frame portion 31 has a rectangular shape in a plan view. The frame portion 31 includes second longitudinal members 33 (longitudinal member) extending in the forward/rearward direction, and second lateral members 34 (receiving member) extending in the rightward/leftward direction.

[0064]

10 A pair of the second longitudinal members 33 is disposed at an interval in the rightward/leftward direction.

The second lateral members 34 are installed between the pair of right and left second members 33, and connect both the second longitudinal members 33 to each other in the rightward/leftward direction. A plurality of (five in the illustrated example)

15 second lateral members 34 are disposed at intervals in the forward/rearward direction.

The second lateral members 34 are immovably fixed to the second longitudinal members 33. End portions in the forward/rearward direction of the second longitudinal members 33 further protrude in the forward/rearward direction than the second lateral members 34 located at the outermost side along the forward/direction among the plurality of second

20 lateral members 34.

[0065]

A pair of the right and left option attachment portions 32 is disposed while the frame portion 31 is interposed therebetween. Furthermore, the pair of right and left option attachment portions 32 is disposed at an interval in the forward/rearward direction.

25 Each of the option attachment portions 32 includes a pair of front and rear protruding

members 35 extending in the rightward/leftward direction from the second longitudinal member 33, and option receivers 36 respectively mounted on both the protruding members 35 so as to be slidable in the rightward/leftward direction. The option receivers 36 protrude from the sleeping base 11 in the rightward/leftward direction.

- 5 Fences (not illustrated) to prevent falling-down are attached to and detached from the option receivers 36.

[0066]

- The main frame 26 is divided into two of a head side frame 37 and a foot side frame 38 along the forward/rearward direction. In the present embodiment, each of the
- 10 pair of second longitudinal members 33 is divided into two of a head side member 33a and a foot side member 33b along the forward/rearward direction. Then, the pair of right and left head side members 33a is connected to the two second lateral members 34 located on the head side H in the plurality of second lateral members 34, thereby forming the head side frame 37. In addition, the pair of right and left foot side members 33b is
- 15 connected to the three second lateral members 34 located on the foot side F in the plurality of second lateral members 34, thereby forming the foot side frame 38. The pair of right and left option attachment portions 32 is disposed one by one in each of the head side frame 37 and the foot side frame 38.

[0067]

- 20 The head side frame 37 has a retractable frame 39 to which the back bottom 16 is fixed, and a first pivot member 43 which causes the retractable frame 39 (back bottom 16) to pivot around a first pivotal shaft 23. Both the retractable frame 39 and the first pivot member 43 are formed in an inverted U-shape which opens toward the head side H in a plan view.

- 25 The retractable frame 39 includes a pair of bottom support portions 40 disposed

apart from each other in the rightward/leftward direction, and a connecting shaft 41 which connects end portions on the foot side F in the forward/rearward direction in the bottom support portions 40. End portions in the rightward/leftward direction of the connecting shaft 41 protrude from the bottom support portions 40 in the

5 rightward/leftward direction.

[0068]

As illustrated in FIGS. 10 and 11, the retractable frame 39 is connected to the main frame 26 via retracting links 42. A pair of the retracting links 42 is disposed across the retractable frame 39 in the rightward/leftward direction. End portions in the

10 rightward/leftward direction of the connecting shaft 41 are pivotably connected to an end portion on the foot side F of each of the retracting links 42. End portions on the head side H in each of the retracting links 42 are pivotably connected to the main frame 26 via the first pivotal shaft 23. The first pivotal shaft 23 connects the retracting link 42 to the main frame 26 so as to be pivotable.

15 [0069]

As illustrated in FIGS. 9 to 11, the first pivot member 43 includes a pair of right and left first arm upward pressing portions 43a extending in the forward/rearward direction along the lower surface of the back bottom 16, and a first connecting portion 43b (receiving member) which connects the pair of right and left first arm upward

20 pressing portions 43a to each other in the rightward/leftward direction. The first connecting portion 43b connects the end portions on the foot side F of the first arm upward pressing portions 43a. The end portions in the rightward/leftward direction of the first connecting portion 43b protrude from the first arm upward pressing portions 43a in the rightward/leftward direction, and are pivotably connected to the second

25 longitudinal members 33. The end portions on the head side H of the first arm upward

pressing portions 43a come into slidable contact with the lower surface of the bottom support portion 40.

[0070]

In the head side frame 37, the first pivot member 43 pivots upward. In this manner, the end portions on the head side H of the first arm upward pressing portions 43a slide on the lower surface of the bottom support portion 40, and the first pivot member 43 presses up the retractable frame 39. Then, the retracting links 42 pivot around the first pivotal shafts 23, and the retractable frame 39 pivots around the first pivotal shafts 23, and the retractable frame 39 pivots around the connecting shaft 41. In this manner, as illustrated in FIG. 9, while the back bottom 16 entirely moves to the head side H, the back bottom 16 pivots and rises around the first pivotal shaft 23, thereby bringing the back bottom 16 into a so-called a back raised state in which the back bottom 16 is inclined with respect to the horizontal plane.

[0071]

The retractable frame 39 brought into the back raised state is supported by retracting stays 44 extending in the forward/rearward direction. The retracting stays 44 are disposed between the retractable frame 39 and the second lateral member 34 located closest to the head side H in the plurality of second lateral members 34. The end portions on the foot side F of the retracting stays 44 are pivotably connected to the retractable frame 39, and the end portions on the head side H of the retracting stays 44 are pivotably connected to the second lateral member 34. The retracting stays 44 support the retractable frame 39 brought into the back raised state, from obliquely below on the head side H.

[0072]

As illustrated in FIGS. 10 and 11, the foot side frame 38 has fixing members 45

to which the leg bottom 18 is fixed via second pivotal shafts 24, and a second pivot member 46 which causes the leg bottom 18 to pivot around the second pivotal shafts 24.

The fixing members 45 are disposed in the second lateral member 34 located closest to the head side H in the plurality of second lateral members 34 configuring the foot side frame 38. The fixing members 45 protrude from the second lateral member 34 toward the foot side F. The end portion on the head side H of the leg bottom 18 is pivotably fixed to the fixing members 45 via the second pivotal shafts 24.

[0073]

The second pivot member 46 is connected to the second longitudinal members 33 so as to be pivotable around an upward pressing shaft 47. A pair of upward pressing shafts 47 is disposed across the second pivot member 46 in the rightward/leftward direction. Both the upward pressing shafts 47 are arranged so as to be coaxial with each other.

[0074]

The second pivot member 46 is formed in an inverted U-shape which opens to the foot side F in a plan view. The second pivot member 46 includes a pair of right and left second arm upward pressing portions 48 extending in the forward/rearward direction along the lower surface of the leg bottom 18, and a second connecting portion 49 (receiving member) which connects the pair of right and left second arm upward pressing portions 48 to each other in the rightward/leftward direction. The second connecting portion 49 connects the end portions on the head side H in the pair of right and left second arm upward pressing portions 48. The end portions on the head side H of the second arm upward pressing portions 48 are connected to the second longitudinal members 33 via the upward pressing shafts 47. The end portions on the foot side F of the second arm upward pressing portions 48 come into slidable contact with the lower

surface of the knee bottom 19.

[0075]

In the foot side frame 38, the second pivot member 46 pivots upward. In this manner, while the end portion on the foot side F of the second arm upward pressing
5 portion 48 slides on the lower surface of the knee bottom 19, the second pivot member 46 presses up the knee bottom 19. Then, as illustrated in FIG. 9, the knee bottom 19 pivots around the first pivotal shaft 23, and the end portion on the foot side F in the knee bottom 19 rises. On the other hand, the foot bottom 20 relatively pivots around the bending shaft 22, thereby bringing the sleeping base surface 21 into a so-called leg raised state
10 where a portion corresponding to the knee on the sleeping base surface 21 is bent so as to protrude upward.

[0076]

The foot bottom 20 has a toe raising stay 50. The toe raising stay 50 holds the leg bottom 18 in a toe raised state. After the leg bottom 18 is brought into the raised
15 state, the leg bottom 18 brought into the toe raised state causes the foot bottom 20 to pivot upward around the bending shaft 22. The toe raising stay 50 extends in the forward/rearward direction along the lower surface of the foot bottom 20. The end portion on the foot side F in the toe raising stay 50 is pivotably connected to the foot bottom 20. The end portion on the head side H in the toe raising stay 50 is set as a free
20 end.

In the toe raising stay 50, when the leg bottom 18 is brought into the toe raised state, the toe raising stay 50 entirely pivots downward, and extends obliquely downward from the foot bottom 20 to the head side H. The end portion on the head side H in the toe raising stay 50 is locked to the second longitudinal member 33.

25 [0077]

Here, the end portion on the head side H in the waist bottom 17 is fixed to the retractable frame 39, and the end portion on the foot side F in the waist bottom 17 is fixed to the fixing member 45. When the back bottom 16 pivots to rise, the end portion on the head side H in the waist bottom 17 rises together with the back bottom 16.

- 5 While being stretched in the forward/rearward direction, the waist bottom 17 is entirely bent so as to protrude downward.

[0078]

- In the support frame 12, the first pivot member 43 and the second pivot member 46 cause the back bottom 16 and the leg bottom 18 to pivot in the above-described standard state. In this manner, the sleeping base 11 is brought into a typical use state of back raising and leg raising (knee raising) as illustrated by a two-dot chain line in FIG. 9. When the sleeping base 11 is changed from the standard state to the use state, by performing the leg raising earlier than the back raising, it is possible to effectively prevent the user from being misaligned with the sleeping apparatus B.

- 15 [0079]

As illustrated in FIGS. 10, 12, and 13, the lifting/lowering mechanism 27 lifts and lowers the main frame 26 relative to the base frame 25. The lifting/lowering mechanism 27 employs a so-called X-link structure. The lifting/lowering mechanism 27 includes first links 51, second links 52, and a connecting rod 53 (receiving member).

- 20 Each of a pair of the first links 51 and the second links 52 is disposed at an interval in the rightward/leftward direction. Both the first links 51 and the second links 52 extend in the forward/rearward direction, and the center portions in the forward/rearward direction in each of the first links 51 and the second links 52 are pivotably connected to each other via a connecting pin 54.

- 25 [0080]

Four connecting rods 53 are provided. Each of the connecting rods 53 connects both end portions in the forward/rearward direction in each of the pair of right and left first links 51 and both end portions in the forward/rearward direction in each of the pair of right and left pair of second links 52 to each other.

5 Among the four connecting rods 53, the connecting rod 53 which connects the end portions on the head side H of the first links 51 is pivotably connected to the first longitudinal member 28, and the connecting rod 53 which connects the end portions on the head side H of the second links 52 is pivotably connected to the second longitudinal member 33. In the four connecting rods 53, the connecting rod 53 which connects the
10 end portions on the foot side F of the first link 51 is mounted on an upper guide portion 55 disposed in the second longitudinal member 33, and the connecting rod 53 which connects the end portions on the foot side F of the second links 52 is mounted on a lower guide portion 56 disposed in the first longitudinal member 28. The upper guide portion 55 and the lower guide portion 56 respectively support the connecting rods 53 so as to be
15 slidable along the forward/rearward direction.

[0081]

In the lifting/lowering mechanism 27, when the first links 51 pivot upward, the second links 52 pivot upward in conjunction therewith. At this time, while the end portions on the foot side F in the first links 51 and the end portions on the foot side F in
20 the second links 52 are respectively guided to the head side H by the upper guide portion 55 or the lower guide portion 56, the first links 51 and the second links 52 pivot, and the main frame 26 rises from the base frame 25.

[0082]

As illustrated in FIGS. 10 and 11, the drive mechanism 13 is attached to the
25 support frame 12, and moves the movable unit 57 serving as at least a portion of the

sleeping base 11 and the support frame 12. The drive mechanism 13 is a direct acting actuator which expands and contracts in the forward/rearward direction, and moves the movable unit 57 by expanding and contracting in the forward/rearward direction. The drive mechanism 13 includes a bottom drive mechanism 58 which causes the back

5 bottom 16 or the leg bottom 18 (movable bottom) serving as the movable unit 57 to pivot, and a link drive mechanism 59 which causes the first link 51 or the second link 52 (link) serving as the movable unit 57 to pivot.

[0083]

The bottom drive mechanism 58 includes a first drive mechanism 58a which
10 causes the back bottom 16 to pivot and a second drive mechanism 58b which causes the leg bottom 18 to pivot.

The first drive mechanism 58a is disposed in a portion located on the head side H along the forward/rearward direction in the support frame 12. The first drive mechanism 58a expands and contracts in the forward/rearward direction, thereby causing
15 the first pivot member 43 to pivot upward. The first drive mechanism 58a is disposed between the second lateral member 34 located closest to the head side H in the plurality of second lateral members 34 and the first connecting portion 43b. The first drive mechanism 58a is connected to the second lateral member 34 and the first connecting portion 43b via attachment members 60 respectively protruding from the second lateral
20 member 34 and the first connecting portion 43b. The first drive mechanism 58a is pivotably connected to the attachment member 60.

[0084]

The second drive mechanism 58b is disposed at a central portion in the forward/rearward direction in the support frame 12. The second drive mechanism 58b
25 causes the second pivot member 46 to pivot upward, by expanding and contracting in the

forward/rearward direction. The second drive mechanism 58b is disposed between the second lateral member 34 located closest to the head side H in the plurality of second lateral members 34 disposed in the foot side frame 38 and the second connecting portion 49 of the second pivot member 46. The second drive mechanism 58b is connected to the second lateral member 34 and the second connecting portion 49 via the attachment members 60 respectively protruding from the second lateral member 34 and the second connecting portion 49. The second drive mechanism 58b is pivotably connected to the attachment member 60.

[0085]

The link drive mechanism 59 is disposed on the foot side F along the forward/rearward direction in the support frame 12. The link drive mechanism 59 causes the first link 51 to pivot upward, by expanding and contracting in the forward/rearward direction. The link drive mechanism 59 is disposed between the first links 51 and the connecting rod 53 which connects the end portions on the foot side F of the first links 51 in the plurality of connecting rods 53. The link drive mechanism 59 is connected to the connecting rod 53 via the attachment member 60 protruding from the connecting rod 53. The link drive mechanism 59 is connected to the first links 51 via a conversion mechanism 61. The conversion mechanism 61 converts expansion and contraction movements of the link drive mechanism 59 into pivot movements of the first links 51. The link drive mechanism 59 is pivotably connected to the attachment member 60 and the conversion mechanism 61.

[0086]

As illustrated in FIGS. 8 to 13, the boards 14 are fixed to the support frame 12, and rise above the sleeping base surface 21. A pair of front and rear boards 14 is provided, and rises from both side end portions in the forward/rearward direction of the

second longitudinal member 33.

The control unit 15 controls the drive mechanism 13. The control unit 15 is electrically connected to the drive mechanism 13. A power cord C and the operation unit 501 (to be described later) are electrically connected to the control unit 15. The control unit 15 receives power supply from the outside via the power cord C, and an instruction from the outside is input to the control unit 15 via the operation unit 501. That is, the control unit 15 controls the drive mechanism 13, based on the instruction from the operation unit 501 illustrated in FIG. 14.

[0087]

FIG. 14 is a front view of the operation unit 501 applicable to the sleeping apparatus B. Similarly to the first embodiment, the operation unit 501 includes a second control unit 550, an input unit 551, a speaker 552, and a display unit 553. As illustrated in FIG. 14, in addition to the lowering switch 551a and the lifting switch 551b, the input unit 551 includes a leg lowering switch 551c, a leg raising switch 551d, a back lowering switch 551e, a back raising switch 551f, an interlocking (back/leg lowering) switch 551g, and an interlocking (back/leg raising) switch 551h.

[0088]

The leg lowering switch 551c moves the knee bottom 19 and the foot bottom 20 from a leg raised state in a direction horizontal to the floor FL. The leg raising switch 551d is operated when the knee bottom 19 and the foot bottom 20 are moved to the leg raised state. The back lowering switch 551e is operated when the back bottom 16 is moved from a back raised state in the direction horizontal to the floor FL. The back raising switch 551f is operated when the back bottom 16 is moved to the back raised state. The back/leg lowering switch 551g is operated when the back bottom 16 and the knee bottom 19 are moved in conjunction with each other from the back raised state and the

leg raised state to a state horizontal to the floor FL. The back/leg raising switch 551h is operated when the back bottom 16 and the knee bottom 19 are moved in conjunction with each other to the back raised state and the leg raised state.

[0089]

5 The present invention is not limited to only the above-described embodiments. For example, the following modification examples are conceivable.

(1) In each of the above embodiments, the speaker 552 produces the buzzer sound having the pattern as illustrated in FIG. 6. However, the present invention is not limited thereto. The speaker 552 may perform information notification using voice. If
10 the information notification using the voice is performed, an operator is more likely to recognize the height h of the sleeping base 200 from the floor FL.

[0090]

(2) The first control unit 440 may cause the display unit 553 to display the notification information having patterns which are different depending on the height h of
15 the sleeping base 200 from the floor FL. In addition, the display unit 553 may have an LED light, and may emit light by using patterns (blinking intervals, colors, or combinations thereof) different depending on the height h of the sleeping base 200 from the floor FL. In this case, the display unit 553 can function as the notification unit according to the present invention.

20 [0091]

(3) FIG. 7 is a functional block diagram of a modification example of the drive mechanism 300, the control mechanism 400, and the operation unit 500. As illustrated in FIG. 7, the operation unit 500 may further include a vibration generator 554. The first control unit 440 and the second control unit 550 may cause the vibration generator
25 554 to generate vibrations by using patterns which are different depending on the height

h of the sleeping base 200 from the floor FL. If the operation unit 500 includes the vibration generator 554, an operator can recognize a change in the height h of the sleeping base 200 from the floor FL by checking the vibration pattern of the operation unit 500 located on the hand of the operator. In this case, the vibration generator 554
5 can function as the notification unit according to the present invention.

Furthermore, as the notification unit, it is also possible to adopt a configuration including at least one of the speaker 552, the display unit 553, and the vibration generator 554.

[0092]

10 (4) In each of the above-described embodiments, in the lowering operation of the sleeping base 200, the buzzer sound is produced, only when the height h of the sleeping base 200 from the floor FL is equal to or lower than the temporary stop height. However, the present invention is not limited thereto. In a case where the operation for lowering the sleeping base 200 is performed, the buzzer sound may be always produced.
15 In addition, even in a case where an operation for lifting the sleeping base 200 is performed, the buzzer sound may be produced.

[0093]

(5) In each of the above-described embodiments, the environment detection unit 442 is the illumination sensor, and the first control unit 440 changes the sound pressure
20 of the buzzer sound, based on the input from the environment detection unit 442. However, the present invention is not limited thereto. The environment detection unit 442 may be a sound sensor such as a microphone. The environment detection unit 442 can appropriately employ a detection unit for detecting a change in the surrounding environment. For example, a timepiece may be employed as the environment detection
25 unit 442, and based on the time, the sound pressure of the buzzer sound may be lowered

at night, for example. In this manner, it is possible to change a volume pattern of the buzzer sound in accordance with the time.

In addition, the first control unit 440 may change a frequency of the buzzer sound, based on a signal output from the environment detection unit 442. In this case,
5 for example, the frequency of the buzzer sound may be set so that the frequency can be switched between 2.7 kHz and 1.2 kHz.

[0094]

(6) In addition, the environment detection unit 442 is included in the control mechanism 400. However, the present invention is not limited thereto. The
10 environment detection unit 442 may be included in the operation unit 500. In addition, the environment detection unit 442 may be included in the support frame 100.

[0095]

(7) In the above-described embodiments, the buzzer sound having the different patterns is produced from the speaker 552 by changing the unit interval period t_3
15 depending on the height h of the sleeping base 200 from the floor FL. However, the present invention is not limited thereto. For example, the buzzer sound having the different patterns may be produced from the speaker 552 by changing at least one of the sound pressure of the buzzer sound and the frequency of the buzzer sound depending on the height h of the sleeping base 200 from the floor FL. Even in this case, the operator
20 can intuitively recognize the pattern of the notification information sound. Accordingly, the operator can recognize a change in the height h of the sleeping base 200 from the floor FL without visibly checking the height h of the sleeping base 200.

[0096]

(8) In addition, in the above-described embodiment, the buzzer sound is
25 produced concurrently with the operation for lowering the sleeping base 200. However,

the present invention is not limited thereto. The buzzer sound may be produced earlier than the operation for lowering the sleeping base 200. If the buzzer sound is produced earlier than the lowering operation, the buzzer sound is pronounced earlier than the motion of the sleeping base 200. Accordingly, the operator can safely operate the sleeping base 200 while predicting the motion of the sleeping base 200. Furthermore, in addition to the operation for lowering the sleeping base 200, a configuration may be adopted in which the buzzer sound is produced even during the lifting operation.

[0097]

(9) In addition, if the rotation speed of the motor 330 is variable, the first control unit 440 can decrease the rotation speed of the motor 330 when the height h of the sleeping base 200 from the floor FL is equal to or lower than the temporary stop height. In this manner, it is also possible to decrease the lowering speed of the sleeping base 200.

[0098]

(10) In addition, in each of the above-described embodiments, the unit interval period t_3 is shortened as the height h of the sleeping base 200 from the floor FL becomes lower. However, the present invention is not limited thereto. For example, although the unit interval period t_3 is constant, as the height h of the sleeping base 200 from the floor FL is lowered, the period $(2 \times t_1 + t_2)$ of one unit U may be shortened. Furthermore, without using the unit interval period t_3 , a pattern may be employed in which the sound producing period t_1 and the sound eliminating period t_2 are alternately repeated. And, as the height h of the sleeping base 200 from the floor FL is lowered, at least one of the sound producing period t_1 and the sound eliminating period t_2 is shortened. In a case of this configuration, the sound producing period t_1 functions as the sound producing period according to the present invention, and the sound eliminating period t_2 functions as the sound eliminating period according to the present invention.

Industrial Applicability

[0099]

According to a sleeping apparatus according to one aspect of the present
 5 invention, a control unit causes a notification unit to notify notification information
 having patterns which are different depending on the height of a sleeping base from a
 floor FL. Therefore, an operator recognizes the notification information, thereby
 enabling the operator to check the height of the sleeping base from the floor FL without
 viewing the sleeping base. Therefore, the operator is likely to recognize a change in the
 10 height of the sleeping base.

Brief Description of the Reference Symbols

[0100]

A BED APPARATUS
 15 B BED APPARATUS
 FL FLOOR
 h HEIGHT
 U SOUND PRODUCING PERIOD
 t3 SOUND ELIMINATING PERIOD
 20 11 SLEEPING BASE
 12 SUPPORT FRAME
 13 DRIVE MECHANISM
 16 BACK BOTTOM (MOVABLE BOTTOM)
 18 LEG BOTTOM (MOVABLE BOTTOM)
 25 23, 24 PIVOTAL SHAFT

- 26 MAIN FRAME
- 33 SECOND LONGITUDINAL MEMBER (LONGITUDINAL MEMBER)
- 34 SECOND LATERAL MEMBER (RECEIVING MEMBER)
- 34a SIDE SURFACE
- 5 34b LOWER SURFACE
- 43b FIRST CONNECTING PORTION (RECEIVING MEMBER)
- 49 SECOND CONNECTING PORTION (RECEIVING MEMBER)
- 53 CONNECTING ROD (RECEIVING MEMBER)
- 57 MOVABLE UNIT
- 10 120 LIFTING/LOWERING MECHANISM
- 200 SLEEPING BASE
- 300 DRIVE MECHANISM
- 400 CONTROL MECHANISM
- 440 FIRST CONTROL UNIT
- 15 441 STORAGE UNIT
- 442 ENVIRONMENT DETECTION UNIT (DETECTION UNIT)
- 500 OPERATION UNIT
- 550 SECOND CONTROL UNIT
- 551 INPUT UNIT
- 20 551a LOWERING SWITCH
- 551b LIFTING SWITCH
- 552 SPEAKER
- 553 DISPLAY UNIT
- 554 VIBRATION GENERATOR

Claims

1. An electric bed comprising:
 - a plurality of bottoms including a back bottom, a waist bottom, and a leg bottom;
 - a plurality of first frames that support the plurality of bottoms;
 - a second frame that supports the plurality of first frames;
 - a drive unit that is capable of moving the plurality of bottoms;
 - a control unit that is connectable to the drive unit; and
 - a notification unit that is connectable to the control unit,

wherein when the plurality of bottoms are lowered, the notification unit produces a buzzer sound having patterns which are different based on a height of the plurality of bottoms from a floor,

wherein the notification unit produces a buzzer including a first sound producing period if the height of the plurality of bottoms from the floor is a first height which is predefined, the notification unit produces a buzzer including a second sound producing period if the height of the plurality of bottoms from the floor is a second height, the first height is higher than the second height, a second sound producing period is shorter than a first sound producing period,

wherein the second frame includes a first member extending in a first direction of the second frame, a part of the first member is curved, the second frame includes two second members extending in a second direction intersecting the first direction and a leg member provided on the second member, the second frame include a third member extending in the first direction, the third member connects two first links extending in the second direction, the first member connects two second links extending in the second direction, each of the first link connects each of the second link by fixing members, the first member is provided on a head side of the electric bed relative to the third member, the minimum height of the electric bed from floor is less than 20 cm.
2. The electric bed according to claim 1,

wherein the patterns of the buzzer sound include a first pattern including the first sound producing period and a second pattern different from the first pattern, the second pattern including the second sound producing period.
3. The electric bed according to claim 2,

wherein the first pattern includes the first sound producing period during which a sound is produced, a first sound eliminating period after the first sound producing period, during which

no sound is produced, and a third sound producing period after the first sound eliminating period, during which a sound is produced.

4. The electric bed according to claim 2 or 3,
wherein when the plurality of bottoms are lowered, if the height of the plurality of bottoms from the floor reaches the first height which is predefined, lowering of the plurality of bottoms is temporarily stopped, and the notification unit produces the buzzer sound having the first pattern, and

wherein when the plurality of bottoms are lowered again, the notification unit continues to produce the buzzer sound having the second pattern.

5. The electric bed according to claim 4, further comprising an operation unit that is connectable to the control unit,

wherein the operation unit includes a lowering switch that lowers the plurality of bottoms, and a lifting switch that lifts the plurality of bottoms.

6. The electric bed according to claim 5,
wherein while the lowering switch is pressed down, if the height of the plurality of bottoms from the floor is higher than the first height, the plurality of bottoms are lowered.

7. The electric bed according to claim 5 or 6,
wherein the operation unit further includes a back raising switch, a back lowering switch, a leg lowering switch, and a leg raising switch.

8. The electric bed according to claim 2,
wherein the notification unit includes a speaker, and
wherein the speaker produces a sound having patterns which are different depending on the height of the plurality of bottoms from the floor.

9. The electric bed according to claim 1, 2, 3, 5, 6, or 8,
wherein the minimum height of the electric bed from floor is 15 cm.