The invention relates to a bed base (7) with at least one motorized slat module (3), comprising at least one slat row (32) for carrying a mattress, and an electrical motor (31) and mechanical transmission means for moving the slat row (32) in a height direction of the bed base, and an electrical control circuit and a control means (5) for controlling the motor (31).

The invention also relates to a motorized slat module (3) and a bed (1).
PRIOR ART

Fig 1A

Fig 1B

Fig 1C

Fig 1D
MOTORIZED BED BASE, SLAT MODULE AND BED

DOMAIN OF THE INVENTION

[0001] The invention relates to a bed base with a motorized slat module.

[0002] The invention also relates to a motorized slat module, and to a bed comprising such bed base.

BACKGROUND ART

[0003] Beds are generally known. A standard bed usually consists of a bed base (also called mattress support) and a mattress which is placed on the bed base, wherein the bed base functions as supporting structure for supporting the mattress at a predefined height above the ground. Frequently used bed bases in the year 2010 are: a slat base, a box spring, a spiral base or a plate base.

[0004] A disadvantage of the known beds/bed bases is however that the bed base cannot be easily adapted to the needs of the person lying upon it.

DISCLOSURE OF THE INVENTION

[0005] It is an aim of the present invention to provide a bed base that can be adapted in a user-friendly way to the specific characteristics (such as e.g. the sleep position, length, body weight) of the user.

[0006] This goal is achieved by a bed base with the features of the first claim.

[0007] Thereto the bed base according to the present invention comprises at least one motorized slat module, wherein the motorized slat module comprises at least one slat row for carrying a mattress, and an electrical motor and mechanical transmission means for moving the slat row in height direction of the bed base, and wherein the bed base comprises an electrical control circuit and a control means (e.g. a remote control) for controlling the motor.

[0008] By using a motorized slat module, it is possible to adjust the height of one or more slat row in an easy and user-friendly way with minimal effort, even when the mattress is placed on the bed base and even when the user is lying on the mattress. This is not possible with the known systems where a person first needs to get out of the bed, then has to lift or shift the mattress, and then adjust the setting (if present at all), where after he can place the mattress again, lie down upon it and only then can feeling whether the setting is better or worse. With the bed base of the invention choosing an optimal setting is very easy, fast, and requires little effort. Moreover it is very easy to determine whether small adjustments of the position are better or worse. In this way e.g. the optimal position in which the body can come to complete rest, or the optimal position wherein the pressure on a wound is minimal, can be easily found.

[0009] By moving the slat row in a direction substantially transverse to the bed base, i.e. in the height direction of the bed base or the bed, minimal shear or friction forces are exerted on a mattress placed on the bed base, so that it is subjected to minimal wear. Also, the mattress and the person are only moved in the height direction, so that their position relative to the head and foot part of the bed base remains substantially unchanged, and the mattress is not pushed down the bed base.

[0010] It should be noted that the advantages applicable to a bed base are of course also valid for a bed comprising such a bed base.

[0011] By making use of the control means, the user can lie in any position (e.g. on his left side or his right side, or his back) and set the height of the motorized slat row. Such a control means is much more user friendly than e.g. a series of buttons at the head end or at a side of the bed, since the user is not required to take a special position to be able to operate the buttons, e.g. by stretching his arms. Since this is not the same position as the sleeping position, such buttons do not allow the optimal setting.

[0012] Thanks to the control means the user is thus able, without help from others, and while using the bed base (thus while he/she is lying on the bed) to adjust the height of the slat rows himself according to his/her preference (body length, weight, sleeping profile, etc.). This is not possible with known systems. The bed according to the present invention thus clearly provides much larger ease of use.

[0013] Preferably the slat row comprises two slat holders for holding a slat, wherein each slat holder is connected to a slide which is moveable in height direction in a guide connected to a side board of the bed base, and wherein the slide is connected to a rotatable shaft driven by the motor via an eccentric mechanical transmission, such that a rotational motion of the shaft is converted into a linear motion of the slat.

[0014] In this way, a rotating shaft motion is converted into a linear motion in an elegant, compact and robust manner. Preferably, the eccentric connections are located on the shaft as far apart as possible, so that a very stable position of the slats is obtained, and so that deflection of the slats (e.g. under the weight of a person) is not impeded. Thanks to the eccentric mechanical transmission connected to the rotatable shaft, the slat row will perform an up and down movement (e.g. substantially sinusoidal) when the motor is running at a constant speed. This allows the control of such movements to be greatly simplified, since the motor e.g. need not run forward and backward alternately. Moreover, a motor running at a constant speed creates less noise than a motor which is repeatedly stopped. This is particularly advantageous while sleeping, resting or relaxing.

[0015] Preferably, the bed base comprises a memory for storing at least one set position of the motor in the memory upon a first (e.g. “store”) command of the control means, and for retrieving a stored position from the memory and for returning to that position upon a second command (e.g. “got”) of the control means. In this way the user can in an easy way (e.g. literally “by a push on the button”) make the bed base return to a previously set position.

[0016] Preferably, the bed base is provided for easy storage of and returning to one or more preferred positions, e.g. one tuned position for lying on the back, one tuned position for lying on the left side, and one tuned position for lying on the right side. In this way, the bed base is even more user friendly because in this way the user can very easily and quickly change the ideal position of the bed base depending on the lying position he wants to take. This is not possible or not practical with known bed bases, where in practice only one fixed position can be set mechanically.

[0017] In a preferred embodiment the slat module comprises two neighbouring slat rows, namely a first and a second slat row, and two motors, namely a first and a second motor.
second slat row is driven by the second motor for adjusting the height of the second slat row. In other words, each slat row is driven by its own motor. Depending on the configuration of the electrical control circuit and/or the control means, the two motors may be driven independently, or simultaneously.

[0018] By using two motors, smaller motors may be used, and the bed base has more degrees of freedom for the height settings, so that a fine-tuning is possible. Depending on the embodiment these two motors may be driven e.g., separately, in one or two rotation directions, at the same speed or at different speeds. In an embodiment, the control means has two push-buttons per motor for this purpose: “forward” and “backward”. To reduce the complexity, in an embodiment the motors can rotate in only one direction, and one button per motor suffices on the control means. To further reduce complexity, the motors may also be driven simultaneously, e.g., both forward or both backward, of the one forward and the other backward. In this embodiment, one button for two motors is sufficient.

[0019] In another embodiment of the bed base, the height of first ends of the first and the second slat row is adjusted by the first motor, and second ends of the first and the second slat row are adjusted by the second motor. With such a slat module it is possible to place the slats under an angle with respect to the horizontal, which may e.g. be useful for displacing the pressure on the body.

[0020] When the two motors are furthermore driven continuously and substantially in opposite phase, the slat rows are tilted to create a rocking effect, which works very soothing.

[0021] In an embodiment, the slat module comprises two neighboring slat rows and only one motor for simultaneously adjusting the two neighboring slat rows.

[0022] By using one motor instead of two motors cost savings can be achieved (the price of the motor is a substantial component of the total price of the slat module). In addition also the control thereof can be simplified, in relation to control electronics as well as to its control. Furthermore, the risk of failure is hereby also reduced. By a clever choice of the mechanical transmission, there are sufficient degrees of freedom for the user to obtain a desired ergonomic height setting, or rather a desired combination of the height settings of the two neighboring slat rows.

[0023] In an embodiment, the bed base is furthermore provided for controlling the two neighboring slat rows in such a way that during operation of the motors the slat rows move in substantially opposite directions, this means one upwards and the other downwards. This corresponds to a phase shift of the shafts of substantially 180°.

[0024] In another embodiment, the slat module is furthermore provided for controlling the two neighboring slat rows in such a way that during functioning of the motor the slat rows move in substantially the same direction, this means both upwards or both downwards. This corresponds to a phase shift of the shafts of substantially 0°.

[0025] In an embodiment, the bed base has at least two slat modules, and the electrical control circuit and/or the control means is adapted for driving the at least two slat modules simultaneously.

[0026] Preferably, the electrical control circuit thereby comprises a dynamic operation mode in which the at least two slat modules are controlled for creating a wave movement.

[0027] Tests have surprisingly shown that by jointly controlling at least two motorized slat modules a wave is provided which creates a very relaxed feeling to the person lying on the bed with this bed base.

[0028] An embodiment of the bed base according to the invention has three motorized slat modules, positioned substantially near to the head or neck zone, the lumbar zone, and the thigh zone of the bed base.

[0029] Another embodiment of the bed base according to the invention has three motorized slat modules, positioned substantially near the head or neck zone, the lumbar zone, and the knee zone of the bed base. Tests have shown that locating the motorized slat modules near the other zones (see Fig. 21) has a less calming effect on the person, therefore a bed base with three or four motorized slat modules is an optimal compromise between low cost (the less motors, the cheaper) and optimal calming effect due to the ergonomic setting (the more motors, the more degrees of freedom).

[0030] Another embodiment of the bed base according to the invention has four motorized slat modules positioned substantially near the head or neck zone, the lumbar zone, the thigh zone and the knee zone of the bed base. This embodiment has one more degree of freedom, and is experienced in tests as highly enjoyable. This embodiment combines the advantages of the preceding embodiments, namely a higher flexibility especially in the lower body part, albeit at a somewhat higher cost.

[0031] Optionally the bed base has one or more position sensors, coupled with the electrical control circuit, for measuring the position of the slat rows, or for measuring an angular position of the motorized shaft.

[0032] Optionally, the bed base has one or more pressure sensors, coupled with the electrical control circuit, for measuring a pressure exerted on the slats.

[0033] Preferably, the electrical control circuit comprises a processor for controlling the motor(s) around a working point, such that the motors perform a predetermined angular displacement around the working point, e.g. with a predetermined amplitude, e.g. less than 60°, preferably less than 45°, more preferably less than 30°. In this way small variations around a given working point, e.g. around one of the preferred positions retrieved from the memory, may be obtained. This may e.g. be useful for preventing bedsores by slightly displacing the pressure, without deviating too much from the preferred position.

[0034] Preferably, the processor is also provided with an algorithm for retrieving from the memory the preferred position which deviates the least from the current position, choosing the retrieved position as working point, and performing a number of predetermined angular displacements around that working point, or during a certain period.

[0035] It is also an aim of the invention to provide a motorized slat module for such bed base.

[0036] Preferably, the set position of the at least one slat row is visually readable. This allows the user to set the bed base back to a known position afterwards in a simple and quick way. This also allows to set another similar bed (e.g. in a hotel or in another room) to exactly the same position.

[0037] It is also an aim of the invention to provide a bed with such bed base.

BRIEF DESCRIPTION OF THE DRAWINGS

[0038] The invention is further elucidated by the description below and the accompanying figures of preferred
embodiments. Note that the figures are not necessarily drawn to scale. The figures are intended to explain the principles of the invention. Some elements are as far as possible given the same reference over the different drawings. The person skilled in the art may combine different features from the different drawings.

[0039] FIG. 1A-1D show bed bases known in the art.

[0040] FIG. 1A shows a flat bed base which is not adjustable in height.

[0041] FIGS. 1B and 1C show a bed base with an adjustable head end and an adjustable foot end.

[0042] FIG. 1D shows a bed base like that of FIG. 1C, which is further adjustable in height in its entirety.

[0043] FIG. 2A shows the principle of a bed base according to the present invention, with a person (the mattress is omitted for illustrative purposes).

[0044] FIG. 2B shows the principle of the bed of FIG. 2A with an indication of some zones of the human body.

[0045] FIG. 3A shows an embodiment of a slat base according to the invention with three motorized slat modules, with two motors each, in side view.

[0046] FIGS. 3B-3I show detailed drawings of several possible positions of the motorized slat modules of FIG. 3A, in side view, wherein the shafts have a fixed angular difference of 180° relative to each.

[0047] FIG. 4 shows in perspective view a first preferred embodiment of a motorized slat module according to the invention, in exploded view.

[0048] FIG. 5A shows a top view of the module of FIG. 4.

[0049] FIG. 5B and FIG. 5C show the module of FIG. 5A in side view.

[0050] FIGS. 6A-6E show a second preferred embodiment of a motorized slat module according to the invention with a single motor and external gears, in left side view, top view, front view, bottom view and right side view respectively.

[0051] FIG. 7 shows a perspective view of a motorized slat module of the slat base of FIGS. 6A-6E, in exploded view.

[0052] FIG. 8A shows an embodiment of a slat base according to the invention, with four motorized slat modules according to FIG. 6A.

[0053] FIGS. 8B-8I show detailed drawings of several possible positions of the motorized slat modules of FIG. 8A, in side view.

[0054] FIG. 9A shows a perspective view of another preferred embodiment of a motorized slat module according to the invention, in exploded view.

[0055] FIGS. 9B-9D show the motorized slat module of FIG. 9A, respectively, in top view, front view and side view.

[0056] FIG. 10 shows a preferred embodiment of the motor of the motorized slat module of FIG. 9A, in exploded view.

[0057] FIG. 11A shows an embodiment of a slat base according to the invention, with four single-motor modules according to FIG. 9A.

[0058] FIGS. 11B-11K show detailed drawings of several possible positions of the motorized slat modules of FIG. 9A, in side view.

[0059] FIGS. 12A and 12B show a slat base according to the invention, with position indicators, respectively in side view and perspective view.

[0060] FIG. 13A shows a preferred embodiment of a remote control with six buttons for controlling a slat base with three modules each containing two motors.

[0061] FIG. 13B shows a preferred embodiment of a remote control with four buttons for controlling a slat base with three modules each containing only one motor.

[0062] FIG. 13C shows a preferred embodiment of a remote control as shown in FIG. 13B, where the set position can be stored, or can be retrieved.

[0063] FIGS. 14A-14C show a perspective view of a slat base according to the present invention, with four single-motor modules, where the two shafts show an angular difference of 180°, and one shaft shows an angle of 0° to the Z axis.

[0064] FIGS. 15A-15C show in perspective view the slat base of the FIGS. 14A-14C, where the one shaft shows an angle of 45° to the Z axis.

[0065] FIGS. 16A-16C show in perspective view the slat base of the FIGS. 14A-14C, where the one shaft shows an angle of 90° to the Z axis.

[0066] FIGS. 17A-17C show in perspective view the slat base of the FIGS. 14A-14C, where the one shaft shows an angle of 135° to the Z axis.

[0067] FIGS. 18A-18C show in perspective view the slat base of the FIGS. 14A-14C, where the one shaft shows an angle of 180° to the Z axis.

[0068] FIGS. 19A-19D show in more detail an embodiment of a slat row with plates of the motorized module of FIGS. 14A-18, in top view, front view, side view and in cross section respectively.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

Reference Numbers

[0069] 1 bed
[0070] 11 head or neck zone
[0071] 12 shoulder zone
[0072] 13 lower back, lumbar zone
[0073] 14 thigh or pelvis zone
[0074] 16 knee zone
[0075] 16 calf zone
[0076] 17 foot or heel zone
[0077] 2 slat base
[0078] 21 side board
[0079] 22 connection
[0080] 24 slat holder
[0081] 26 slat
[0082] 28 plate base
[0083] 27 centre of the slat
[0084] 3 motorised slat module
[0085] 31 electrical motor
[0086] 32 slat row
[0087] 33 shaft
[0088] 34 bracket
[0089] 35 position indicator
[0090] 36 eccentric
[0091] 37 gear (of worm gear)
[0092] 38 guide
[0093] 39 slide
[0094] 4 eccentric
[0095] 5 control means
[0096] 51 button
[0097] 6 person, body
[0098] 7 bed base
[0099] 8 plate
[0100] 101 motor
[0101] 102 worm gear
The invention relates to a bed 1, more in particular a bed 1 with a motorized slat base 2 or a motorized plate base 26. The present invention is thus applicable to a slat base 2 as well as to a plate base, but for simplicity usually only a slat base 2 is mentioned in the description. Unless specifically mentioned otherwise, everything that is described for a slat base 2 is also applicable to a plate base 26, and vice versa. Sometimes the word “bed base” 7 is used, which means both a slat base 2 and a plate base 26.

A slat base 2 is, just like a mattress, a body supporting part of a bed 1. A good slat base 2 distributes the weight of the person 6 evenly, so that the person sleeps comfortably in a bed 1 with such a bed base 7.

There are different types of slat bases 2. There are e.g. flat slat bases in which slats 25 have a fixed position (FIG. 1A), and usually are located in a single plane. There are also slat bases 2 with several segments, wherein the head and foot end may be adjusted manually or by means of a motor. This motor may e.g. be operated by a third person, e.g. nursing staff (FIGS. 13-1D).

A typical slat base 2 usually comprises the following components: 1) a frame or base structure with two side boards 21, usually made of wood, which are mutually connected to a head- and a footboard, 2) cross-connections (or lateral supports) to keep the side boards 21 at a distance from each other, usually connected between the side boards 21 by means of known connection means such as e.g. screws, 3) a plurality of slat holders 24 (also called “spring cap”), for holding slats 25, wherein the slat holders 24 may be e.g. springy plastic elements attached to the side boards 21 by means of plastic screws or pins, 4) rigid or resilient straight or slightly curved slats 25 (also called “battens”), placed in the slat holders 24, usually made of wood or synthetic material, for carrying a mattress (not shown). The rigid slats 25 are typically used for the plate base 26, wherein typically a number of plates 8 are placed on the slat 25, whereas for a slat base 2 typically slightly curved and flexible slats 25 are used. Slat bases typically have a plurality (e.g. 15 or 20 or more) of slat rows 32, which means the combination of a slat 25 (e.g. slat or batten of wood or plastic) and the related slat holders 24 (e.g. springy element), which are connected to the side boards 21 of the bed base 7 for holding the ends of the slats 25. The slat holders 24 can have several known shapes. The slat row 32 may contain one slab (mono-slat), or two slats (duo-slat) or three slats (tri-slat), or more than three.

An ideal bed 1 provides substantially equal support to all body parts (e.g. head, shoulders, . . . ) of a person 6, regardless of his or her length, shape and weight. Different body parts however need a different orthopedic support. Moreover, an adult human body can vary greatly in shape and weight from person to person. Even for a single person this can vary greatly during the life time, for example due to pregnancy, obesity or illness. When replacing a (worn) mattress, the bed base 7 should in fact be adjusted. In order to improve the user’s comfort, and especially the orthopedic support, systems have already been developed in which height differences in the slat rows 32 have been applied, but as far as known to the inventor, these systems allow a once-only setting. Once the bed 1 is at the customer premises, the setting is fixed and cannot be adjusted anymore.

When sleeping in a healthy way, the spine of a sleeping person 6 should be able to recover during the night. For this, the spine must be well positioned. A bed 1 or a bed base 7 must thus give in certain places, support in other places and in some places even fulfill both functions, depending on the length and body shape, the weight and the favourite sleeping position.

Too hard a sleep system 1 or bed base 7 does not adjust sufficiently to the body 6. This may cause blood circulation problems and high pressure. The arms may e.g. become numb.

Too soft a sleep system 1 or bed base 7 disturbs the natural sleep movements, the required turn arounds during the night. If this requires too much effort, one cannot sleep relaxed.

Lying well means that the spine has the same natural S-shape when lying as when standing. Tests show that most people sleep on their sides at least 60% of the time. In side position, the spine should preferably be a straight line. The body needs to be carried by the bed base 7 and by the mattress. In this way, the intervertebral discs, which during the day are under heavy pressure, can sufficiently recover.

With a good bed 1 or bed base 7, the balance between ‘too hard’ and ‘too soft’ can be adjusted according to length, weight and body shape of each individual.

As far as known to the inventor so far only slat bases 2 or mattress supporting bed systems are available with a height control system by manually adjusting springy slat holders 24 (caps) to hard or soft, and/or hardening or softening resilient slat rows 32 suspended in resilient slat holders 24 (caps) e.g. by shifting plastic connectors between two slat rows 32 to the centre, or by adjusting the height of slat rows 32 through a manual intervention (e.g. mechanical suspension) to a height adjustment system.

As FIG. 2A shows the principle of a bed base 7 of the present invention, wherein the height of one or more slat rows 32 can be adjusted depending on the person 6. In practice, the person lies on a mattress placed on the bed base 7, but the mattress is omitted in this drawing for illustrative purposes. As further described, it is not absolutely necessary to make all slat rows 32 adjustable in height, but only the most important.

To meet the individual needs of each person w.r.t. sleeping position, length, body weight and body proportions,
a bed 1 or a bed base 7 (also called “mattress carrier”) should be able to be individualized in a simple and user friendly manner.

[0140] Preferably, the bed base 7 is divided into several zones 11-17, arranged with each time a different rigidity (stiffness) and function. An example of such an arrangement is shown in FIG. 2B. The layout of the bed base 7 is preferably adapted to support these functions, especially when using foam or latex mattresses. Examples of such functions are the soft sinking of the shoulder when in side position, or supporting the spine in the dorsal position.

[0141] Besides this orthopedic function, the bed base 2 of the present invention is also ideally suited for creating a wellness-feeling. The inventor has surprisingly found that the motorized slat base 2 of the present invention does not only provide a very pleasant feeling statically (at an optimal setting), but also dynamically (i.e. when the motor 31 is running) creates a very pleasant and soothing effect. To this end, according to the invention, two adjacent slats 25a, 25b are moved in height direction simultaneously. These two slats 25 may move simultaneously up or down, in opposite directions, or completely independent of each other, depending on the construction of the module 3 and the control thereof. The inventor has surprisingly found that when the motion of two adjacent slats 25 occurs out of phase (i.e. for example when one slab 25a goes up while the adjacent slab 25b goes down) a kind of wave movement is created, which in turn creates a very calming and soothing feeling with the person 6 lying on the bed 1. This feeling is even enhanced when multiple modules simultaneously perform such a wave movement. It should be noted that the mattress in often not mentioned in this text, or shown in the figures, because it is not the focus of the invention, but it is certainly possible and desirable that a mattress is placed on the bed base 2 of the invention. The inventor has also found that there are certain preferred positions in the bed base 7, in which this effect is very pronounced.

[0142] FIG. 2B shows some preferred locations (zone 11, 13 and 14 or 15) in the slat base 2 for positioning one or more motorized slat rows 32, the height position of which can be adjusted. Zone 11 is a preferred position because the motion of a single or double slat row 32 in a slat base 2 as the carrier of a mattress in a bed 1 near the head or neck zone 11 of the body gives a soothing and calming feeling, a wellness-feeling. Zone 13 is a preferred position for movements near the lumbar zone 13 of the backbone of the person. This gives a pleasant supportive, soothing and calming feeling, it can function as a massage function and getting the breathing cycle under control and for lowering the breathing frequency. Zone 15 is a preferred position because: the motion of a single or double slat row 32 in a slatted base 2 as the carrier of a mattress in a bed 1 near the thigh and knee area 15 of the body 6 gives a soothing and calming feeling — the wellness-feeling.

[0143] A preferred embodiment of the slat base 2 according to the invention comprises three (or more) motorized slat modules, located on the above mentioned zones 11, 13 and 15. These zones are strategically chosen for obtaining an optimal soothing or calming effect with a minimal number of motors 31, thus at a minimum cost, in another preferred embodiment, the slat base 2 according to the invention comprises four (or more) motorized slat modules.

[0144] The inventor has found that there is an optimal speed of the vertical displacement of the slats 25, especially when dynamically changing the height, i.e. during rotation of the motor(s), for obtaining the soothing and calming effect, and suspects that this is related to the respiratory rate of man: With rapid breathing is meant a respiratory rate of 10 or even more than 20 times per minute. While less than 8 times per minute is a peaceful and healthy respiratory rate, also during sleep. Tests have shown that (for an adult) an optimal displacement distance (from an upper to a lower position, i.e. the amplitude) is 15-50 mm, preferably 20-40 mm, more preferably substantially 30 mm. The inventor has also found that an optimal maximum displacement speed is 3-20 mm per second, preferably 5-15 mm per second, most preferably around 10 mm per second. Thanks to a mechanical transmission system, the rotation of the shaft 33 is converted into an upward and downward movement of the slats 25. The time required to obtain one complete rotation of 360 degrees of the shaft 33, and thus, by using an eccentric mechanical transmission, to obtain an upward and downward movement of substantially 30 mm of the slat 25, is preferably a period of 3-15 seconds, more preferably a period of 4-12 seconds, for example, substantially 6.5 seconds or 8 seconds. The speed of rotation of the shaft 33 with a rotation of 360 degrees is preferably set at substantially 6.5 seconds. In another embodiment, this period is adjustable, for example using a frequency motor. This allows for example the respiratory cycle to be influenced for calming down.

[0145] Optionally, the moving and/or fixed battens 25 (slats) may also be fitted with electrically vibrating pads, which can vibrate at a frequency of e.g. 20-100 Hz, but other frequencies may also be used.

[0146] Lying well is a very personal matter. Every person has a unique sleeping position, body length, -weight and -shape. Adjusting the bed with a certain type of mattress to the ideal ergonomic sleeping profile of a person 6, can be sensed and set by a user himself with the bed base 7 according to the invention. Each type of mattress, e.g. foam-latex or spring mattress additionally reacts differently with each unique body on a bed base 7 or sleep system. The bed base 7 of the invention can be adapted very specifically to these details, like a tailored suit. Well aligned and healthy lying with the ideal symbiosis of the mattress, the bed base 7 and the body 6 has been difficult to obtain in the past by a user in a bed. Because bed bases 7 were rather complicated to manipulate in certain zones until now, to increase pressure to the mattress by manually adjusting slat rows 32 in height, or by hardening or softening springy caps 24 (slat holders) with battens 25, or hardening or softening springy battens 25 themselves.

[0147] With a bed 1 comprising a slat base 2 according to the present invention, and a specific mattress (material, height, thickness and type) the desired height can be very easily set or adjusted, while the person lies on the bed and is thus supported by the bed 1. This allows the user to feel the most comfortable position himself, and compression of the mattress, and bending of the slats is also taken into account. To this end, the bed 1 according to the invention preferably also includes a remote control 5, wireless or with a cable, for controlling the motor(s) 31 under the slat rows 32, and the user can for himself fine-tune a unique individual sleep profile (static position) following his own feeling.

[0148] In a preferred embodiment of the slat base 7 of the invention, the position of each height of the slats 25 of the motorized slat modules 3 can be easily read on the side of the bed 1 via position indicators 35. This may e.g. be height indicators. In case of a rotatable shaft 33 with an eccentric transmission as described above, this position may e.g. also
be indicated by showing the position of the shaft itself, e.g. as an angle. An example of this is shown in FIGS. 12A and 12B, where openings (e.g. round holes) are provided in the side board 21 of the bed base 7 which decorative disks are provided which are connected to the corresponding shafts 33 of the motorized slat modules 3. Possibly a scale is applied around the indicator 35, on the side board 21 of the bed base 7. Reading the set position is e.g. useful when a person has tuned to a preferred position, and wants to set the same position again later, fast, and without having to fine-tune it again, for example after a dynamic operation of the bed, as described above, for obtaining the calming effect due to the wave movement. Moreover, this indicator 35 may also contribute to the aesthetic aspect of the bed base 7, in FIG. 12A-12B the inventor has chosen for a symbolic representation of the eccentric mounting of the shafts 33 as indication of the angular position of the shaft 33.

[0149] Optionally the bed 1 may be equipped with an electronic control including a memory, and one or more tuned positions can be stored in the memory, e.g. by means of a button 51 (e.g. “Set”, “store”, FIG. 13C) on the remote control 5. In case of multiple motors, e.g. the position of all the motors is stored. As a parameter, e.g. the angular position of the shaft concerned w.r.t. the vertical axis may be stored, or e.g. the difference between the actual height of the slat row 32 as compared to a reference height. Via another button (e.g. “Get”, “retrieval”, FIG. 13C), the bed base 7 can be automatically returned to that position afterwards, e.g. after a dynamic operation of a certain duration (e.g. 1 minute or 5 minutes or 15 minutes or any other time).

[0150] Another possibility for bringing the motorized slat modules back to their original position after a dynamic movement is that the electrical control and/or remote control 5 are further provided (e.g. with a dedicated button 51 on the control means 5) for rotating the motors 31 over an integer number of full revolutions (e.g. 5 or 10 or 20 or another integer number), such that the bed returns back to the original position every period of e.g. 6.5 seconds.

[0151] Above a bed 1 is described with a bed base 2 that is easily adjustable for optimum ergonomics. The bed 1 can be set by the user himself while he/she is lying on the bed, so as to obtain a perfect lying position, and is suitable for various types of mattresses.

[0152] FIG. 23 shows the principle of a bed 1, with the position of some zones (shown in alternating white and gray).

[0153] FIG. 3A shows an embodiment of a slat base 2 according to the invention with three motorized slat modules 3, each having two motors 31 and two slats 25. In total, this slat base 2 comprises fifteen slats 25, but that number may also be higher or lower than fifteen, depending on the dimensions of the slat 25. Also, the number of motorized slat modules 3 may be higher or lower than three. As described above, these modules 3 are preferably located at strategic locations, e.g. in this case module 3c is located near the head/neck zone 11, module 3b near the lower back 13 (lumbar zone), and module 3a near the knee zone 15.

[0154] FIGS. 3B-3J show detailed drawings of several possible positions of the motorized slat modules 3 of FIG. 3A, in side view. According to these figures, the two motors 31a, 31b are controlled such that the two shafts 33 are always at an angle of 180° offset from each other. This is advantageous for obtaining a wave effect, but is not strictly necessary for the invention. Also, the angle offsets between the shafts may also be used, e.g. 160°, 140°, 120°, 100°, 80°, 60°, 40°, 20°, 0°, or any other angle. The angle of 180° is the only angle where the two adjacent slats 25a, 25b move in opposite directions, wherein the body is supported, as it were, alternately by the one or the other slat. When an angle of 0° is used, the slats 25a, 25b are moved simultaneously up or down, which does not create the same effect. In an alternative embodiment (not shown), the motors 31a, 31b may also be driven independently of each other, and the shafts 33 may thus assume any arbitrary angle relative to each other. In FIGS. 3B-3J the module 3 is only shown in positions that are multiples of 45°, but in reality the module also moves through all intermediate angles. Thus, with a continuously running motor 31, in each period the positions shown in the FIGS. 3B-3J are passed. The motor is preferably a DC motor, preferably driven at 24 volts, but other known motors 31 deemed suitable by the skilled person may also be used. The motor 31 preferably comprises a gear system or reduction system, internal or external to the motor 31, preferably with a locking system or a worm system, so that the tuned position is maintained without feeding power to the motor 31, even when a 6 person is lying on the bed.

[0155] Another embodiment of the bed base according to the invention comprises at least five motorized slat modules 3 positioned substantially near the head or neck area 11, the shoulder area 12, the lumbar area 13, the thigh area 14 and the knee area 15 of the bed base.

[0156] FIG. 4 shows a perspective view of a first preferred embodiment of a motorized slat module 3 according to the invention, in exploded view. This module 3 comprises two motors 31a, 31b for driving two slats 25a, 25b, wherein the motors 31 may be driven together (simultaneously), or individually. The slat holders 24 are not directly mounted to the side boards 21 of the bed base 7, but to a slider 402 which is movable in the height direction in a guide 401 fixed to the side boards 21. By moving the slider 402 in the guide 401, the height of the slats 25 can be changed. Through a mechanical transmission based on an eccentric connection 4, 22 between the shafts 415 and the slider 402, a rotational movement of the shaft 415 is converted into a linear movement of the slat 25. This is an advantage compared to known systems where e.g. a square shaft is rotated and which directly supports the mattress, wherein the mattress experiences mechanical stresses when the shaft rotates, causing it to tear or at least the show wear due to friction. By the transmission system of the present invention, the mattress is only lifted in height direction, and such wear due to friction is negligible. The motor with the shafts 415 is suspended from a motor mount 408, which is fixedly connected to the side boards 21 of the bed base 7.

[0157] FIG. 5A shows a top view of the module of FIG. 4.

[0158] FIG. 5B and FIG. 5C show the module of FIG. 5A in side view. In FIG. 5C it is clearly visible that the position of the two connections 506a, 506b are offset by 180° relative to each other. Note in FIG. 5A that the motors 31a and 31b are in this case preferably not placed in one line, but are shifted slightly outward for not obstructing adjacent motorized slat modules 3 on the bed base 2.

[0159] FIGS. 6A-6F show a second preferred embodiment of a motorized slat module 3 of the invention with only one motor 31 per module, in left side view, top view, front view, bottom view and right side view respectively. By using gears 37 two neighbouring shafts 33 can be driven simultaneously by a single motor 31. During the production of this module 3, the angle between the shafts 33a, 33b can be mechanically
fixed at an angle of 180°, or a different angle. When an angular difference of 180° is used, the height of the two slats 25, when they are located at a same height, is a middle position, i.e. at equal height as the neighbouring not-motorized slats 25. When the angular difference is 0°, the two slats 25 will be at the same height for each rotational position of the shaft 33, which may be higher or lower than the neighbouring slats 25. When the angular difference is e.g. 90°, there are two motor positions in which the two slats are at equal height, in one case both slats are lower than the adjacent fixed slats 25, in the other case higher than the adjacent slats 25. The skilled person can find the most optimal angular difference by performing routine tests.

[0160] FIG. 7 shows the module 3 of FIGS. 6A-6E, in exploded view. The motor 31 drives via a first gear 743 a first dayshaft 742, and via a second gear 750 a second drive shaft 748. Again the slat holders 24 are connected to a slider 702 which is movable in the height direction in a guide 701 fixed to the side boards 21 of the bed base. By moving the slider 702 in the guide 701, the height of the slats 25 can be adjusted. Through a mechanical transmission based on an eccentric connection 4, 22 between the shafts 742, 748 and the sliders 702, a rotational movement of the shafts is converted into a linear movement of the slats 25. The figure also shows a motor support 708, a shaft support 744, and a bearing 749. How the parts work together will be further clarified in the discussion of FIGS. 14A-18.

[0161] FIG. 8A shows an embodiment of a slot base 2 according to the invention, with four modules according to FIG. 6A-7. The number of motorized slat modules 3a, 3d may however also be less than four, e.g. two or three or more than four, e.g. five or six or another number. Also in this example, a slot base 2 is shown with fifteen slats 25, but a different number may also be used, depending on the width B of the slats 25 and the distance (aperture) between them. Preferably, slats 25 with a width B of 6-14 cm are used, more preferably slats with a width of 8-12 cm, most preferably substantially 10 cm. The slats 25 may but need not all have the same width B.

[0162] FIGS. 8B-8J show detailed drawings of some positions of the motorized slat modules 3 of FIG. 6A-7, in side view, wherein again the shafts 33 are at a 180° angular offset. Only a few positions are shown that are multiples of 45°, showing that now the one than the other slot 25a, 25b is located higher, but the intermediate positions are also assumed when the shafts 33a, 33b rotate over a complete revolution. Assuming that the motor 31 starts from the position shown in FIG. 8B, and then, all positions from FIG. 8B to FIG. 8J are assumed, and the pattern repeats itself again from FIG. 8B to FIG. 8J as long as the motor 31 is running. Because the two slats 25a, 25b are alternately higher and lower than the other, a wave effect is obtained. Optionally, the control of the different motors 31 of the different modules 3a, 3d are also tuned to each other, to stretch out this wave effect over an even larger area.

[0163] FIG. 9A shows a third embodiment of a motorized slat module 3 according to the invention, in exploded view. The principle of the suspension is the same as described above, but the gears (or worm wheels) of the motor 31 are now internal to the motor housing, which enhances the safety, and reduces the risk of blocking the motor. Again the slat holders 24 are mounted to a slider 902 which is movable in the vertical direction in a guide 901 which is connected to the side boards 21 of the bed base. By moving the slider 902 in the guide 901, the height of the slats 25 can be set. Through a mechanical transmission based on an eccentric connection 4, 22 between the drive shafts 955 and the slides 902, a rotational movement of the shafts is converted into a linear movement of the slats 25.

[0164] FIGS. 9B-9D show the motorized slat module of FIG. 9A, in top view, front view and side view respectively.

[0165] FIG. 10 shows a preferred embodiment of the motor of the motorized slat module 3 of FIG. 9A, in exploded view. Shown is a motor 101, with a drive shaft 104, driving two worm gears 102 and two worm wheels 105 and 106 through a gear 109 which is held in a gear support 110. The worm gear 105 is in a bearing 107. The whole is closed with a lid 103. Note that with this motor 31 the gears 37 as shown in FIG. 7 can be avoided.

[0166] FIG. 11A shows an example of a bed base 2 having four motorized slat modules 3 according to FIG. 10 and a total of fifteen slats 25. A variant of this example may comprise more or less than four motorized slat modules 3, and/or more or less than fifteen slats 25. In this example, the shafts 33a, 33b of the modules are again 180° out of phase to each other, but other phase angles are also possible, as discussed above. FIGS. 11B to 11K show once again the wave movement due to the positions which the slats 25a, 25b successively take, as described above.

[0167] FIGS. 12A and 12B show a slot base 2 according to the invention, with position indicators 35, in side view and in perspective view respectively. These position indicators 35 indicate the positions of the shafts 33a, 33b of each motorized slat module 3, regardless whether it has one or two motors 31 (see above). In case the module 3 only contains a single motor, there is no need to show the positions of both shafts 33, since they take a fixed position relative to each other anyway. Of course, the indicator 35 may also assume another form, e.g. a disk with a hand pointing to a scale (not shown) which may be applied to the side board 21. As indicated above this may be useful to be able to be able to reconstruct an earlier setting of the motorized slat modules 3 again later, even though this is not required when the bed is equipped with a memory. But it is handy for example if the user wants to set another bed (e.g. in an hotel) in the same way.

[0168] FIG. 13A shows an example of a control means 5 or a remote control 5 having six buttons 51 for controlling the motor modules 3a, 3b, 3c of the slot base 2 of FIG. 3A. The shown controller 5 has six buttons 51, one for controlling each motor, wherein M1a represents the first motor of module 3a, M1b the second motor of module 3a, M2a the first motor of module 3b, etc. Alternatively, the controllers may also have three buttons M1, M2, M3, wherein M1 controls both motors of the first module 3a simultaneously. This control means 5 may e.g. be connected to the control electronics of the bed base 2 via a cable, or via a wireless connection, e.g. Bluetooth, but other connection techniques deemed appropriate by the skilled person may also be used.

[0169] FIG. 13B shows an example of a remote control 5 with four buttons 51 for operating the slot base 2 of FIG. 8A. Since in this case, only one motor 31 is present per module 3, there is only one control button 51 required per module 3.

[0170] FIG. 13C shows a variant of the remote control 5 of FIG. 13B, wherein an additional button “Set” is provided for storing the tuned position in a memory (not shown, but this may e.g. be present in the control electronics), and an additional button “Get” for retrieving the stored position from
memory, and for automatically moving the motorized slat modules 3 to that position. If required, the necessary position-determining means are thereby provided on the shaft 33 and in the control electronics. With position is meant the position of all motorized slat modules 3 of the bed base 2. Optionally, multiple positions may be stored, for example, one for each position or lying on a side, and one tuned position for lying on the back.

Optionally the control means 5 of FIGS. 13A-13C further comprise a button (or switch or the like) for starting or stopping the continuous wave movement, supported by the necessary control electronics. Possibly the control electronics comprises a timer, such that one push on the start-wave-motion-button (not shown) operates the motors 31 for a predetermined period (e.g. 5 minutes, or another period).

The principle of the motorized slat base 2 according to the invention may also be applied to other bed bases 7, such as e.g. a plate base 26. This is illustrated in the FIGS. 14A-19C, which will also be used to explain the working of the eccentric connection.

FIGS. 14A-14C show in perspective view an embodiment of a plate base 28 according to the present invention, with a single motor 31 (not shown), wherein the two shafts 33a, 33 show an angle of 180°, and wherein one shift 33b assumes an angle of 0° w.r.t. the Z-axis (as shown in FIG. 14A). The figures for a slat base 2 would look almost identical, except that no plate would be mounted on the slats 25. This also applies to the FIGS. 15A-18.

A good understanding of how the system works, can be obtained by comparing the FIGS. 14A, 15A, 16A, 17A and 18 with each other, taking particular note of the positions of the eccentrics 36 of both shafts, and the positions of the slates 39 in the respective guides 38. FIGS. 15A-15C, 16A-16C and 17A-17C show the same as FIGS. 14A-14C, except that the shafts are rotated over an angle of 45°, 90° and 135° respectively. FIG. 18 shows the position of the motorized slat module of FIG. 14, after the shafts are rotated over 180°.

FIGS. 19A-19D show in more detail a top portion of the slat row 32 with plates 8 of the motorized slat module 3 shown in the FIGS. 14A-18, in plan view, in front view, in side view and in cross section respectively. The components of the movement mechanism are not shown in these FIGS. 19A-19D. Whereas the slat 25 of a slat base 2 is preferably flexible and curved (e.g. FIG. 5B), the slat 25 of a plate base 26 is preferably rigid and straight. The plates 8 may be mounted to the slat 25 in known ways. By moving the slat 25 in height direction in the same manner as previously explained for a slat base 2, according to the invention the plates 8 can therefore still be adjusted in height.

In an alternative embodiment (not shown) of a motorized slat module 3 according to the invention, the motorized slat module comprises two motors 31 for driving a first and a second height of a single slat 25, which heights may be different from each other. Preferably the respective suspension points are chosen near the first and second end of the slat 25. Through transfer means the motors 31 cause the slat 25 to tilt relative to an axis Y (FIG. 12B) located in the length direction of the bed base 7. Preferably both slat rows 32a, 32b of the same module are thereby tilted simultaneously, but the principle will be explained for one slat 25 of the slat module 3. Each motor may e.g. drive a half shaft that can change the height at one end of the slat 25. When the two motors 31 of a single slat 25 are thereby driven in opposite phase (i.e. 180° shifted), the slat 25 shows a tilting movement about the Y-axis, wherein the centre 27 of the slat 25 remains substantially at the same height w.r.t. the bed base 7. When the motors 31 are thereby driven with another constant phase angle relative to each other, e.g. a phase angle of 30° or 45° or 60° or another angle, the tilting movement about the axis Y is combined with an up and down movement of the slat 25. Such tilting movement of the slat 25, whether or not combined with an up and down movement, also acts as a massage function. In an embodiment, the motor 3 and the transmission means are chosen such that the tilt period is about 2-30 seconds, preferably 4-8 seconds, more preferably substantially 6 seconds. This gives a rocking effect which is very calming. Optionally the motors 3 may be controlled such that the phase angle between the motors is not constant, but varies over time.

In a further embodiment of the above described motorized slat modules 3 or motorized bed bases 7, a displacement and/or tilting period is chosen of at least 5 minutes, preferably at least 10 minutes, more preferably at least 20 minutes. Thereby the motor 3 may, for example, periodically be operated for a short time, e.g. every 1 or 2 or 5 or 10 minutes for 0.25 or 0.50 or 1.0 or 2.0 seconds, while performing only a fraction of a complete rotation of the shaft 33, e.g. 5° or 10° or 15° or 30° or 45° rotation of the half-shaft, but other values deemed appropriate by the skilled person may also be used. Such slow displacement and/or tilt movements provide particular benefit to bedridden people or sleeping persons because while sleeping the support points of the body 6 are slowly changed that way. This may provide to old or sick people the advantage of preventing bedsores or at least reducing them.

Optionally, each of the aforementioned motorized slat modules 3 or motorized bed bases 7 (thus those with a single or two motors per slat row 25, as well as those with a single motor per two slat rows) be equipped for sensors, for example, position sensors able to determine the height of the slats 25, or in case the slats 25 are tiltable, two heights. These sensors may be connected to the control circuit as described above, or may optionally pass positions via communications means to an electronic device, preferably a portable electronic device such as a PDA (personal digital assistant), a smartphone, iPad etc. Optionally this electronic device has an application for displaying the measured sensor values on a display. Preferably, the electronic device also has an application to pass the desired position of the slat rows to the control circuit, which in turn can drive the motors to the desired position. This control may optionally happen in an interactive way with the user, e.g. by using the buttons of the electronic device. In this way the electronic device thus serves as the control means 5.

In an embodiment, each of the aforementioned motorized slat modules 3 (or motorized bed bases 7) may be equipped with pressure sensors, measuring the pressure exerted on the support points of the slats 25 or on the plates 8, so that a pressure distribution of the persons 6 on the mattress and on the bed base 7 can be determined, and hence also a pressure distribution on the body of the person 6. It is believed that prolonged pressure on one place leads to bedsores.

The sensor information may be transmitted, for example, via wires or wirelessly to the control circuit and/or to the electronic device, e.g. via WiFi, Bluetooth, Zigbee or other known techniques. The sensor information may optionally also be displayed on a display (not shown), e.g. in the form of a 3-dimensional (3D) graph, or a 2-dimensional (2D) graph with a color code. The display may thereby
be mounted separately next to the bed base or be rigidly attached to the bed base, or may optionally be incorporated into the remote control.

In an embodiment of the bed base, the electrical control circuit is provided with a processor that performs an algorithm which reads the sensors (periodically or continuously) and that uses the sensor information for determining an adaptive setting of the motor control such that the pressure on the person is optimally distributed over time and/or over different positions of the body, in order to thereby increase the comfort of the user and/or to reduce the risk of bed sores. This adaptive control could take into account the sleeping position of the person at a given time, e.g. a position on the back, position on the left side, position on the right side, position on the belly, etc. Alternatively, the algorithm instead of on the control circuit, may also be performed by a processor of the portable electronic device, wherein commands for the motor control are preferably wirelessly transmitted to the control circuit.

In an example of such an application the motors do not perform a continuous rotation of the shaft (or half-shafts, but a number of predetermined angular displacements (e.g. a rotation angle from −60° to +60°, i.e. an amplitude of 60°), or from −45° to +45° or from −30° to +30° or other angular displacements) around a given operating point, a sort of rocking motion. This rocking motion may e.g. be started and/or stopped by a dedicated button (not shown) on the control means 5. The operating point may (and usually will) be different for each motor. The operating point may also be derived from the sensor information and may e.g. differ for each lying position of the person, detected by the pressure sensors. In an implementation of the control algorithm a number of predetermined preferred positions are pre-programmed, and the most likely preferred position is chosen based on the sensor information, (e.g. position on the back, position on the left side, position on the right side, position on the belly). For each preferred position and for each motor a corresponding displacement around that operating point may be chosen, and stored in a memory.

In an embodiment, the processor is provided with an algorithm to determine, from any manually set position of the bed base, which of the preferred positions deviates the least from the current position, to retrieve that position, and to consider it as operating point, and to perform around that operating point a number of predetermined angular displacement (e.g. rocking movements), with an amplitude of e.g. 30° of the shaft. As a criterion for determining the nearest preferred position, for example for each of the stored positions the sum of the squares of the differences of the heights of the slat rows may be calculated, i.e. the difference between the actual position as measured by position sensors and the position in the reference position as stored, and that position for which the sum of the squares is minimal is selected. Other criteria may also be chosen, e.g. the minimal sum of squares of the differences of the angular positions of the shafts, or the sum of the absolute values of the differences between the actually measured and stored angles, or another suitable criterion known to the skilled person.

In an embodiment of the algorithm, the position of a bedsore or other sore on the body can be entered by the user, and the algorithm tries to control the slats 25 such that the pressure on these positions is as low as possible, or is maximally spread by tilting the slat row, so that the wounds can heal faster.

A bed base 7 according to the invention may of course comprise multiple slat rows 25 with two motors each. And of course several slat modules 3 may be combined in a single bed base 7.

Although the present invention is described with reference to specific preferred embodiments, it will be understood that various modifications can be made to these embodiments without departing from the scope of the invention as set forth in the claims. Accordingly, the description and drawings are to be considered in an illustrative sense rather than a restrictive sense.

1.32. (canceled)

33. A bed base comprising at least one motorized slat module, the motorized slat module comprising at least one slat row for carrying a mattress, an electrical motor and a mechanical transmission means for moving the slat row in height direction of the bed base, and the bed base comprising an electrical control circuit and a control means for controlling the motor, and the slat row comprising two slat holders for holding a slat, each slat holder being connected to a slide which is moveable in height direction in a guide connected to a side board of the bed base; wherein the bed base comprises pressure sensors, connected to the electrical control circuit, for measuring a pressure exerted upon the slats and a processor for receiving the pressure measured by the pressure sensors, and for controlling the motors of the slat modules for minimizing the pressure.

34. The bed base according to claim 33, wherein the bed base is a slat base.

35. The bed base according to claim 33, wherein the bed base is a plate base.

36. The bed base according to claim 33, wherein the control means is connected to the electrical control circuit by means of an electrical cable.

37. The bed base according to claim 33, wherein the control means is connected to the electrical control circuit by means of a wireless connection.

38. The bed base according to claim 33, wherein the bed base comprises a memory for storing at least one tuned position of the motor in the memory, upon a first command of the control means, and for retrieving a stored position from the memory and for returning to that position upon a second command of the control means.

39. The bed base according to claim 33, wherein the motorized slat module comprises two neighbouring slat rows, namely a first slat row and a second slat row, and two motors, namely a first motor and a second motor.

40. The bed base according to claim 39, wherein the first slat row is driven by the first motor for adjusting the height of the first slat row, and the second slat row is driven by the second motor for adjusting the height of the second slat row.

41. The bed base according to claim 39, wherein the height of first ends of the first and of the second slat row are driven by the first motor, and wherein second ends of the first and of the second slat row are driven by the second motor.

42. The bed base according to claim 41, wherein the two motors are driven substantially to opposite phase for tilting the slat rows, for creating a rocking effect.

43. The bed base according to claim 42, wherein the tilting period of the slat rows is a period of 2-10 seconds.

44. The bed base according to claim 39, wherein the electrical control circuit and/or the control means are provided for driving the two motors independently.
45. The bed base according to claim 39, wherein the electrical control circuit and/or the control means are provided for driving the two motors simultaneously.

46. The bed base according to claim 33, wherein the motorized slat module comprises two neighbouring slat rows and a single motor for adjusting the heights of the two neighbouring slat rows simultaneously.

47. The bed base according to claim 46, wherein the motorized slat module is provided for driving the two neighbouring slat rows in such a way that during rotation of the motor the slat rows move substantially in opposite directions.

48. The bed base according to claim 46, wherein the motorized slat module is provided for driving the two neighbouring slat rows in such a way that during rotation of the motor the slat rows move substantially in the same direction.

49. The bed base according to claim 33, comprising at least two slat modules, wherein the electrical control circuit and/or the control means are provided for simultaneously operating the at least two slat modules.

50. The bed base according to claim 49, wherein the electrical control circuit has a dynamic operation mode in which the at least two motorized slat modules (3a, 3b) are controlled such as to create a wave movement.

51. The bed base according to claim 50, wherein the period of one full rotation of the shaft (33) in the dynamic operation mode is a period of 3-15 seconds.

52. The bed base according to claim 50, wherein the amplitude of the displacement in height direction is 15-50 mm.

53. The bed base according to claim 50, wherein the maximum speed of displacement is 3-20 mm per second.

54. The bed base according to claim 33, comprising at least three motorized slat modules positioned substantially near the head or neck zone, the lumbar zone, and the thigh zone of the bed base.

55. The bed base according to claim 33, comprising at least three motorized slat modules positioned substantially near the head, or neck zone, the lumbar zone, and the knee zone of the bed base.

56. The bed base according to claim 33, comprising at least four motorized slat modules positioned substantially near the head or neck zone, the lumbar zone, the thigh zone and the knee zone of the bed base.

57. The bed base according to claim 33, comprising at least four motorized slat modules positioned substantially near the head or neck zone, the shoulder zone, the lumbar zone, the thigh zone and the knee zone of the bed base.

58. The bed base according to claim 33, further comprising position sensors, connected to the electrical control circuit, for measuring a position of the slat rows.

59. The bed base according to claim 33, wherein the electrical control circuit comprises a processor for operating each motor around a working point, such that each motor performs a predefined angular displacement around the working point, with a predefined amplitude.

60. The bed base according to claim 59, wherein multiple positions of the motorized slat modules are stored in the memory, and wherein the processor is provided with an algorithm for retrieving the position which deviates the least from the current position, and for choosing that position as working point, and for performing a predefined angular movement around that working point.

61. A motorized slat module comprising at least one slat row for carrying a mattress, an electrical motor and mechanical transmission means for moving the slat row in height direction of slat module, and the slat module comprising an electrical control circuit and a control means for controlling the motor, and the slat row comprising two slat holders for holding a slat, each slat holder being connected to a slide which is moveable in height direction in a guide for connection to a side board of a bed base, wherein the slat module comprises pressure sensors, connected to the electrical control circuit, for measuring a pressure exerted upon the slats and a processor for receiving the pressure measured by the pressure sensors, and for controlling the motors of the slat modules for minimizing the pressure.

62. The motorized slat module according to claim 61, wherein the position of the at least one slat row is visibly readable.

63. A bed with a bed base comprising at least one motorized slat module, each motorized slat module comprising at least one slat row for carrying a mattress, an electrical motor and mechanical transmission means for moving the slat row in height direction of bed base, and the slat module comprising an electrical control circuit and a control means for controlling the motor, and the slat row comprising two slat holders for holding a slat, each slat holder being connected to a slide which is moveable in height direction in a guide connected to a side board of the bed base, wherein the bed base comprises pressure sensors, connected to the electrical control circuit, for measuring a pressure exerted upon the slats and a processor for receiving the pressure measured by the pressure sensors, and for controlling the motors of the slat modules for minimizing the pressure.

64. The bed according to claim 63, wherein the position of the at least one slat row is visibly readable from the side of the bed.

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