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(54) ADJUSTABLE SPRING CORE UNIT

(57) A pocket spring core unit includes a plurality of adjustable pocketed spring elements (20). The adjustable pocketed spring elements (20) each include a first coil spring (22), a second coil spring (23), and a pocket (21) enclosing the first coil spring (22) and the second coil (23) spring to pre-tension the first coil spring (22) and the second coil spring (23) against each other. Further, the pocket spring core unit includes an adjustment mechanism (25) for adjusting, for each of the adjustable pocket spring elements (20), a degree of pre-tensioning of the first coil spring (22) relative to a degree of pre-tensioning of the second coil spring (23).

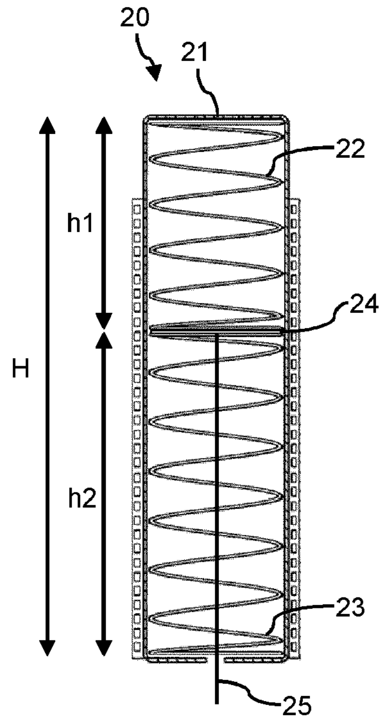

FIG. 2A

EP 4 042 905 A1

Description

FIELD OF THE INVENTION

[0001] The invention relates to an adjustable spring core unit, a bedding or seating product comprising an adjustable spring core unit, and method of adjusting a spring core unit.

BACKGROUND

[0002] Spring cores are widely used in seating or bedding products. Such spring cores may be made from a matrix of multiple springs joined together directly as by helical lacing wires, or indirectly as by fabric within which each individual spring is contained. Pocket spring cores in which springs are respectively contained in a pocket of fabric are popular, due to the comfort and luxury feel provided by pocket spring cores.

[0003] In view of user comfort, it is known to provide spring cores with springs having different characteristics. For example, varying degrees of hardness may be achieved selecting the gauge of the wire from which the individual springs are manufactured. By forming a spring core of springs with different degrees of hardness, a desired hardness profile of the resulting seating or bedding product can be achieved. For example, a mattress could be designed to provide different zones, and a zone for supporting a user's shoulders could be provided with a lower hardness than a zone for supporting a user's head. As a result, the user's overall comfort may be improved.

[0004] However, the individual user preferences concerning the hardness profile may vary. For example, in certain the user may prefer a harder support in the shoulder region, while in other situations the user may prefer a softer support in the shoulder region. This may for example depend on whether the user is sleeping or just lying while reading a book, or may depend on whether the user is lying on the back or sideways. Further, the user preferences may also differ from one user to the other. It is known to address such issues, by providing adjustability of the degree of hardness. For example, WO 2014/117995 A1 describes a mattress arrangement with adjustable firmness. In this case, the adjustability is achieved by supporting at least a part of the mattress on flexible straps. The firmness of the mattress can then be adjusted by controlling slack of the straps. Another class of adjustable mattresses is based on controlling pressure of air bladders in the mattress, e.g., as explained in US 2020/029704 A1.

[0005] However, with the existing mechanisms for adjusting hardness of a mattress it may happen that adjustment of the hardness level comes together with changes in height of the mattress. This may be undesirable from the perspective of the user's comfort and also from an aesthetic perspective. Further, existing mechanisms may have an excessive degree of complexity and thus be difficult to integrate in a mattress or other type of bedding or seating product. Still further, as compared to spring core systems, air-bladder based adjustment systems may suffer from poor permeability of the resulting product.

[0006] Accordingly, there is a need for spring core arrangements which allow for efficiently adjusting the hardness of a bedding or seating product with a spring core, while maintaining height and other characteristics of the product and maintaining a low complexity.

SUMMARY

[0007] The present disclosure provides a spring core unit according to claim 1, a bedding or seating product according to claim 14, and a method according to claim 15. The dependent claims define further embodiments.

[0008] According to an embodiment, a pocket spring core unit is provided, e.g., for incorporation into a bedding product, such as a mattress, or for incorporation into a seating product, such as a sofa cushion or chair cushion. The spring core unit comprises a plurality of adjustable pocketed spring elements. In typical scenarios, the spring core may additionally comprise non-adjustable pocketed spring elements. It is however also conceivable that all pocketed spring elements of the spring core are adjustable.

[0009] The adjustable pocketed spring elements each comprise a first coil spring, a second coil spring, and a pocket. The pocket encloses the first coil spring and the second coil spring to pre-tension the first coil spring and the second coil spring against each other. In some scenarios, the first coil spring and the second coil spring may be separate components. It is however also conceivable that the first coil spring and the second coil spring are portions of the same coil spring.

[0010] Further, the spring core comprises an adjustment mechanism for adjusting, for each of the adjustable pocket spring elements, a degree of pre-tensioning of the first coil spring relative to a degree of pre-tensioning of the second coil spring. In this way, the hardness level provided by the pocketed spring element can be varied in an efficient manner, without affecting other characteristics of the spring core unit, such as its height at the respective position of the adjustable pocketed spring element. By way of example, the degree of pre-tensioning of the first coil spring could be increased relative to the second coil spring, thereby increasing the hardness level of the spring core as perceived on a side of the first coil spring. Further, the degree of pre-tensioning of the first coil spring could be decreased relative to the second coil spring, thereby reducing the hardness level of the spring core as perceived on a side of the first coil spring.

[0011] In typical scenarios, the adjustable pocketed spring elements may be arranged in multiple rows. The rows may extend along a width direction of the spring core unit, and the multiple rows may be distributed over a length direction of the spring core unit. For example, the spring core unit may be based on an arrangement of pocketed spring elements in multiple parallel rows, with at least some of the rows including multiple adjustable pocketed spring elements, and optionally also non-adjustable pocketed spring elements. Further, the arrangement of pocketed spring elements could also include rows of non-adjustable pocketed spring elements. The adjustable pocketed spring elements may be grouped together to provide adjustable zones of the spring core unit. Accordingly, a hardness level of different portions of the spring core unit can be individually adjusted.

[0012] With respect to the arrangement of the adjustable pocketed spring elements in multiple rows, the adjustment mechanism may be is configured to provide adjustments of the degree of pre-tensioning the first coil spring relative to the degree of pre-tensioning of the second coil spring which differ between at least some of the rows where the respective pocketed spring elements are arranged. In some scenarios, adjustment mechanism could also be configured to provide adjustments of the degree of pre-tensioning the first coil spring relative to the degree of pre-tensioning of the second coil spring which differ between at least some of the adjustable pocketed spring elements of the same row, e.g., between a pocketed spring element arranged in a central region of the row and a pocketed spring element arranged closer to an end of the row. Accordingly, different hardness level profiles can be defined, with adjustable variations of the hardness level along the length direction of the spring core unit and/or along the width direction of the spring core unit.

[0013] The adjustment mechanism may comprises at least one motor unit per row of the adjustable pocketed spring elements. These motor units then can be used to drive adjustment of the pocketed spring elements individually for each row. By providing two or more motor units per row, it is possible to drive adjustment of the pocketed spring elements individually for different pocketed spring elements or groups of pocketed spring elements within the same row.

[0014] In some scenarios, the adjustment mechanism comprises, within the adjustable pocketed spring elements, a support member which is arranged between the first coil spring and the second coil spring and is movable along a tensioning direction of the first coil spring and the second coil spring. The support member could for example be a plate, with one end of the first coil spring element abutting on one side of the plate, and one end of the second coil spring element abutting on the other side of the plate.

[0015] The adjustment mechanism may then further comprise, within at least some of the adjustable pocket spring elements, a pulling member for pulling the support member in a direction to cause increase of pre-tensioning of the second coil spring relative to the first coil spring. The pulling member may be an elongate pulling member, such as a wire, a thread, a cable, a webbing etc.

[0016] Further, the adjustment mechanism may comprises a reel for winding the pulling member. Here the pulling member enables that the support member is further displaced in the pulling direction when a load is placed on the adjustable pocketed spring element, which contributes to overall flexibility of the spring core unit. If the adjustable pocketed spring elements are arranged in multiple rows, multiple reels corresponding to different adjustable pocketed spring elements of the same row can be driven by a common drive axle extending along the row. In this way, a mechanism for driving the adjustment of the adjustable pocketed spring elements can be implemented in a compact manner. Alternatively or in addition, the adjustment mechanism may comprises, within at least some of the adjustable pocketed spring elements, a spindle shaft for moving the support member to change the pre-tensioning of the second coil spring relative to the first coil spring. If the adjustable pocketed spring elements are arranged in multiple rows, the spindle shafts of different adjustable pocketed spring elements of the same row can be driven by a common drive axle extending along the row. Also in this case, a mechanism for driving the adjustment of the adjustable pocketed spring elements can be implemented in a compact manner. In some scenarios, adjustable pocketed spring elements based on the pulling member for pulling the support member and adjustable pocketed spring elements based on the spindle shaft for moving the support member, could be combined in the spring core unit.

[0017] The adjustment mechanism may be is remote controllable by a user control device. For example, a hardness profile of the spring core unit can be adjustable by modifying at least one profile curve on a touch screen of the user control device. Accordingly, the characteristics of the spring core unit can be adjusted in a comfortable and intuitive manner. In some scenarios, the adjustment mechanism may be configured to be remote controllable based on wireless signals. For example, the user control device could be a smartphone or tablet computer and could use wireless communication to control the adjustment mechanism. The wireless communication could be based on wireless signals transmitted directly between the user control device and the adjustment mechanism, e.g., wireless signals based on a short-range wireless communication technology like Bluetooth. Alternatively, the wireless communication could be based on a wireless home network, e.g., using a WLAN (Wireless Local Area Network) technology. In some scenarios, the wireless communication between the user control device and the adjustment mechanism could also be based on a smart home platform.

[0018] According to a further embodiment, a bedding or seating product is provided. The bedding or seating product may for example correspond to a mattress, a bed, a sofa, a seat, or a cushion for a sofa or a seat. The bedding or seating product comprises a spring core unit according to the above embodiment. In some scenarios, the bedding or seating product may also comprise the user control device.

[0019] According to a further embodiment, a method of adjusting a pocket spring core unit is provided. The method may for example be used for adjusting a spring core unit according to the above embodiment. The method involves obtaining user input. For example, the user input could be obtained based on a touch screen user interface. Such touch screen user interface can be configured to obtain the user input based on the user modifying at least one profile curve on a touch screen of the user control device. Based on the user input, settings of adjustable pocketed spring elements of the spring core are determined. As mentioned above, the adjustable pocketed spring elements each comprising a first coil spring, a second coil spring, and a pocket enclosing the first coil spring and the second coil spring to pre-tension the first coil spring and the second coil spring against each other. The settings are then applied to adjust, for each of the adjustable pocket spring elements, a degree of pre-tensioning of the first coil spring relative to a degree of pre-tensioning of the second coil spring. Applying the settings may involve providing control signals to motor units driving the adjustment of the pre-tensioning. In some scenarios, the control signals may also be based on feedback signals from the motor units. For example, such feedback signals could indicate a current status of the motor unit and the pre-tensioning adjustment by the motor unit.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] Embodiments of the invention will be described with reference to the accompanying drawings.

FIG. 1 is a perspective view, partially broken away, of a mattress including a pocket spring core unit according to an embodiment.

FIGS. 2A and 2B illustrates an adjustable pocketed spring element according to an embodiment.

FIG. 3 illustrates an example of arranging different pocketed spring elements according to an embodiment.

FIG. 4 illustrates an adjustment mechanism according to an embodiment.

FIG. 5 illustrates a further example of an adjustable pocketed spring element according to an embodiment.

FIG. 6 shows a flowchart for illustrating a method for adjusting a spring core unit according to an embodiment.

DETAILED DESCRIPTION OF EMBODIMENTS

[0021] Exemplary embodiments of the invention will be described with reference to the drawings. While some embodiments will be described in the context of specific fields of application, such as in the context mattresses, the embodiments are not limited to this field of application. The features of the various embodiments may be combined with each other unless specifically stated otherwise. Throughout the following description, same or like reference numerals refer to same or like components or mechanisms.

[0022] FIG. 1 shows a cushion in the form of a single-sided mattress 1 incorporating an adjustable pocket spring core 2 according to an embodiment. This cushion or mattress 1 comprises the pocket spring core 2 over the top of which there is a foam pad 4 covered by a fiber pad 5. This complete assembly is mounted upon a base 7 and is completely enclosed within an upholstered covering material 6.

[0023] In the illustrated example, adjustment of the spring core 2 is controlled by a user control device 100. The user control device 100 may for example correspond to a smartphone or a tablet computer. Functionalities related to controlling the adjustment of the spring core 2 may then be implemented by a software application installed and executed on the user control device 100. In other scenarios, the user control device 100 could be a dedicated remote control marketed together with the mattress 1. As schematically illustrated in FIG. 1, the user control device 100 may provide adjustment of the spring core 2 based on a touch-based graphical user interface. In the example of FIG. 1, a touch screen 110 of the user control device 100 displays one or more hardness profile curves 111, 112. For example, one hardness profile curve 111 could correspond to a hardness profile along a length L of the mattress 1, and another hardness profile curve 112 could correspond to a hardness profile along a width L of the mattress 1. In other examples, the hardness profile curves 111, 112 could correspond to different zones of the mattress 1. By touch interaction with the touch screen, the user can modify the displayed hardness profile curves 111, 112. Corresponding settings can then be applied to adjust the spring core 2.

[0024] The pocket spring core 2 is formed of multiple rows 3 of pocketed spring elements. At least in part, the rows 3 may correspond to strings of pocketed spring elements. Such strings may respectively be formed by providing a fabric layer, inserting one or more springs into the fabric layer, folding the fabric layer so as to cover the spring either before or after insertion of the spring, and applying longitudinal and transverse seams, e.g. by welding. Each string 3 may extend across the full width of the product 1. The strings 3 may be connected in side-by-side relationship as, for example, by gluing the sides of the strings 3 together in an assembly machine, so as to create an assembly or matrix of springs having multiple rows and columns of pocketed springs bound together, such as by gluing, welding or any other conventional assembly process commonly used to create pocket spring cores. As a result, the pocket spring core 2 forms a unitary structure having a width W and length L. The pocket spring core 2 may be fabricated using various kinds of conventional pocket spring manufacturing machine and by any conventional spring pocketing process, which allow for not only using coil springs formed of a metal wire, but also foam springs formed of a foam material. The fabric from which the pockets are formed may be semi-impermeable. The fabric may be configured such that it has a greater resistance to air flow directed from an exterior to an interior of the pocket than to air flow directed from an interior to an exterior of the pocket. The seams which delimit the respective pockets may be straight or linear, or they may be sinusoidal welded seams, e.g., formed by ultrasonic welding.

[0025] In the illustrated examples, it assumed that the spring core 2 includes at least two different types of pocketed spring elements: adjustable pocketed spring elements and non-adjustable pocketed spring elements. However, it would also conceivable that all pocketed spring elements of the spring core 2 are adjustable. The non-adjustable pocketed spring elements may be formed in a conventional manner, by inserting a spring into a packet of the fabric material. FIGS. 2A and 2B illustrate an example of implementing the adjustable pocketed spring elements.

[0026] As illustrated in FIGS. 2A and 2B, the adjustable pocketed spring elements 20 are based on providing a first coil spring 22 and a second coil spring 23 in the same pocket 21. In the following description, these coil springs 22, 23 are also referred to as upper spring 22 and lower spring 23, to reflect that in the illustrated example the lower spring 23 is arranged on a bottom side of the spring core 2, i.e., a side of the base 7, and the upper spring 22 is arranged on a top side of the spring core 2, i.e., a side foam pad 4 and fiber pad 5. In more generic terms, the top side is the side where a user will impart load when utilizing the mattress 1, while the bottom side is a side where the mattress 1 will be supported, e.g., on a bed frame or slats of a bed frame. The pocket 21 encloses the upper spring 22 and the lower spring 23 to pre-tension the upper spring 22 and the lower spring 23 against each other. The pocket 21 determines an overall height H of the adjustable pocketed spring element 20 in an unloaded state. The hardness level provided by the adjustable pocketed spring element can be adjusted by setting a degree of pre-tensioning of the upper spring 22 relative to a degree of pre-tensioning of the lower spring 23. As illustrated, this can be achieved by shifting a support plate 24, arranged between the upper spring 22 and the lower spring 23, along the height direction. Due to the shifting of the support plate 24, the individual compressed heights h1, h2 of the upper spring 22 and the lower spring 23 can be changed, without changing the overall height H of the pocketed spring element 20. For this purpose, the uncompressed heights of the upper spring 22 and the lower spring 23 may be selected in appropriate manner, so that both springs 22, 23 remain pre-tensioned over the entire range of possible positions of the support plate 24. For example, this could be achieved by choosing the upper spring 22 with an uncompressed height which is higher than the overall height H of the pocket, minus a height of the support plate 24.

[0027] FIG. 2A illustrates a first state of the pocketed spring element 20, in which the degree of pre-tensioning of the upper spring 22 is increased relative to the lower spring 23, thereby increasing the hardness level of the spring core 2 as perceived by a user resting on the mattress 1. FIG. 2B illustrates a second state of the pocketed spring element 20, in which the degree of pre-tensioning of the upper spring could be decreased relative to the lower spring, thereby reducing the hardness level of the spring core 2 as perceived by a user resting on the mattress 1.

[0028] In the example of FIGS. 2A and 2B, the position of the support plate 24 within the pocket 21 can be controlled by a pulling member 25 attached to the support plate 24 and pulling the support plate 24 downwards, i.e., in a direction to further compress the lower spring 23. In the embodiment shown in FIGS. 2A and 2B, the pulling member is a wire 25. The wire 25 is guided through a hole in the bottom part of the pocket 21. When increasing the tension on the wire 25, the support member 24 moves downward, further compressing the lower spring 23 while allowing the upper spring to relax. When releasing tension on the wire 25, the support member 24 moves upward, pushed by the lower spring 23, at the same time further compressing the upper spring 22.

[0029] It is noted that a similar effect as explained in connection with FIGS. 2A and 2B could also be achieved by forming the upper spring 22 and the lower spring 23 as parts of a single spring and replacing the support plate with an attachment on a turn within this single spring, thus functionally dividing the single spring into the upper spring 22 and the lower spring 23. However, providing the upper spring 22 and the lower spring 23 as separate springs may offer some additional flexibility in designing the characteristics of the adjustable pocketed spring element 20. For example, the lower spring 23 could be provided with a harder characteristic than the upper spring 22, which may help to achieve a wider range of adjustability.

[0030] FIG. 3 shows an example of how the adjustable pocketed spring elements 20 could be arranged in the spring core 2. In particular, FIG. 3 shows a plane defined by the width direction Wand the length direction L of the spring core 2. As can be seen, the pocketed spring elements are arranged in rows extending along the width direction W, and along the length direction L, the rows are joined parallel to each other. At least some of the rows include the adjustable pocketed spring elements 20. By way of example,

[0031] FIG. 3 highlights a exemplary rows 11, 12, 13, 14, 15, 16 which include the adjustable pocketed spring elements 20. The adjustment of the adjustable pocketed spring elements 20 may be implemented on a per row level, so that the settings of the hardness level may differ between two or more of the rows 11, 12, 13, 14, 15, 16.

In this way, a hardness profile of the spring core along the length direction L can be varied. As can be seen, such variations may be based on setting hardness levels which differ between neighboring rows, thereby enabling smooth variations of the hardness profile. Further, such variations may be based on setting hardness levels which differ between zones of the spring core 2, e.g., between a first zone with the rows 11, 12, 13 and a second zone with the rows 14, 15, 16. Accordingly, it is also possible to provide one or more adjustment zones of the spring core 2.

[0032] FIG. 4 further illustrates implementation of an adjustment mechanism for the adjustable pocketed spring elements 20. More specifically, FIG. 4 illustrates implementation of the adjustment mechanism on the level of an individual row, e.g., one of the rows 11, 12, 13, 14, 15, 16. More specifically, FIG. 4 shows a multiple adjustable pocketed spring elements 20 of a row, and components of the adjustment mechanism to adjust these adjustable pocketed spring elements 20.

[0033] As illustrated, the adjustment mechanism includes a motor unit 50. The motor unit 50 is provided with an electric motor 51. As further illustrated, the motor unit may also be provided with a sensor 52 which senses the position of the motor 51. For example, the motor 51 could be a stepper motor. The sensor 52 could be based on a potentiometer. In this way, the adjustment of the adjustable pocketed spring elements 20 can be driven in a precise manner, and adjusted positions can be verifier, e.g., after powering down of the adjustment mechanism.

[0034] The motor 51 drives rotation of a drive axle 60 which extends along the row of the adjustable pocketed spring elements 20. The drive axle 60 is supported on a rail 70. The rail 70 may also act as a support for the bottoms of the adjustable pocketed spring elements 20. At the location of each adjustable pocketed spring element 20, a reel 65 is provided on the drive axle 65. The wire 25 of the corresponding adjustable pocketed spring element 20 is wound onto the reel. Accordingly, by rotating the drive axle 60 in one direction, the wires 25 can be tensioned to pull the support plates 24 of the adjustable pocketed spring elements 20 downwards, thereby increasing pre-tensioning of the lower springs 23 and relaxing the upper springs 22 in the adjustable pocketed spring elements 20. The hardness level provided at the location of these adjustable pocketed spring elements 20 is thus reduced. By rotating the drive axle 60 in the opposite direction, the wires 25 are released, allowing the lower springs 23 to push upwards the support plates 24, thereby increasing pre-tensioning of the upper springs 22. In this case, the hardness level provided at the location of these adjustable pocketed spring elements 20 is increased.

[0035] As illustrated, the motor unit 50 for driving the adjustment of the adjustable pocketed spring elements 20 may be arranged at one end of the row of adjustable pocketed spring elements 20. In this way, access to the motor unit 50 can thus be facilitated, and it becomes possible to accommodate the motor unit 50 in side region of the spring core 2. Here, it is to be noted that the motor unit 50 may in fact be arranged within the spring core 2 or at least within the mattress 1. For example, the motor unit 50 could be embedded within a region 30 of foam padding or of non-adjustable pocketed spring elements provided at the lateral edge of the spring core 2.

[0036] It is noted that in some scenarios, the same row of pocketed spring elements of the spring core 2 could also include multiple assemblies of the type as illustrated in FIG. 4. For example, two motor units 50 could be provided on opposing ends of the row and be connected to respective drive axles 60. In this way, two groups of adjustable pocketed spring elements 20 within the same row could be adjusted in an individual manner. The two groups could for example correspond to a first group in the center of the spring core 2 and a second group arranged outside the first group. Other arrangements of the adjustable pocketed spring elements 20 of the groups are possible as well, e.g., an interleaved arrangement in which adjustable pocketed spring elements 20 of the two groups alternate within the same row. Depending on the desired position granularity of adjustment, further motor units 50 and drive axles 60 per row could be added.

[0037] As further illustrated, the adjustment mechanism is provided with a controller 80 which controls the operation of the motor 51, optionally taking into account the feedback provided by the sensor 52. Further, the controller 80 may interact with the above-mentioned user control device 100 to accomplish the adjustment of the adjustable pocketed spring elements 20 based on user input. In some scenarios, a single controller 80 may control all motor units 50 of the spring core 2. Alternatively, the spring core 80 could be provided with multiple controllers 80, e.g., each assigned to an individual row, an individual adjustment zone, or to an individual group of adjustable pocketed spring elements 20.

[0038] Communication between the one or more controller(s) 80 and the user control device 100 may be based on wireless signals, e.g., Bluetooth signals or WLAN signals. However, utilization of wire-based communication is possible as well, e.g., based on a USB (Universal Serial Bus) interface or a dedicated wire-based control interface. In some scenarios, the wireless communication between the user control device and the controller(s) could also be based on a smart home platform.

[0039] FIG. 5 shows a modified implementation of an adjustable pocketed spring element 20'. The adjustable pocketed spring element 20' can be used as a replacement for or in combination with the adjustable pocketed spring element 20. As illustrated in FIG. 5, the adjustable pocketed spring element 20' differs from the adjustable pocketed spring element 20 in providing a spindle shaft 26 instead of the wire 25. The spindle shaft 26 is thus used for moving the support plate 24 for adjusting the relative pre-tensioning of the upper spring 22 and the lower spring 23. In some cases, a spindle gear for translating rotation of the spindle shaft 26 to displacement of the support plate 24 can be formed between the support plate 24 and the spindle shaft 26. In other cases, a spindle gear for translating rotation of the spindle shaft 26 to displacement of the support plate 24 could be formed between the drive axle 60 and the spindle shaft 26.

[0040] The above-described adjustment mechanisms operate in a self-locking manner, i.e., even when the motor units 50 are powered off, the adjustment is maintained. Accordingly, implementation complexity can be reduced and fault tolerance improved. Still further, since active operation is only needed when changing settings, high energy efficiency can be achieved.

[0041] Fig. 6 shows a flowchart for illustrating a method for adjusting a spring core in accordance with the illustrated concepts. In particular, the method may be used for adjusting the above-described adjustable spring core 2. The method may be performed by one or more control devices associated with the adjustable spring core, e.g., the user control device 100, one or more of the controllers 80, or a combination of such control devices.

[0042] At step 610, user input is obtained. For example, the user input could be obtained based on a touch screen user interface, e.g., using the above-mentioned touch screen 110 of the user control device 100. Such touch screen user interface can be configured to obtain the user input based on the user modifying at least one profile curve on a touch screen of the user control device, e.g., as explained above for the hardness profile curves 111, 112.

[0043] At step 620, the user input is used as a basis to determine settings of adjustable pocketed spring elements of the spring core. The adjustable pocketed spring elements may for example correspond to the above-mentioned pocketed spring elements 20 or 20'. Accordingly, the adjustable pocketed spring elements each include a first coil spring, a second coil spring, and a pocket enclosing the first coil spring and the second coil spring to pre-tension the first coil spring and the second coil spring against each other.

[0044] At step 630, the settings are then applied to adjust, for each of the adjustable pocket spring elements, a degree of pre-tensioning of the first coil spring relative to a degree of pre-tensioning of the second coil spring. Applying the settings may involve providing control signals to motor units driving the adjustment of the pre-tensioning, e.g., the above-mentioned motor units 50. In some scenarios, the control signals may also be based on feedback signals from the motor units. For example, such feedback signals could indicate a current status of the motor unit and the pre-tensioning adjustment by the motor unit.

[0045] It is noted that in some scenarios, steps of the above method may be distributed among multiple cooperating control devices. For example, in some cases functionalities corresponding to step 610 could be implemented by the user control device 100, while functionalities corresponding to steps 620 and 630 could be implemented by the controller 80. In other cases, functionalities corresponding to steps 610 and 620 could be implemented by the user control device 100, while functionalities corresponding to step 630 could be implemented by the controller 80. In still further cases, functionalities corresponding to steps 610, 620, and 630 could be implemented by the user control device 100, with the controller 80 merely receiving and converting the control signals provided by the user control device.

[0046] Functionalities corresponding to the steps 610, 620, 630 may also implemented by computer program code to be executed by a processor of a control device, e.g., of the user control device 100 and/or the controller 80. Such computer program code may be provided on a non-transitory storage medium, e.g., an optical disk like a DVD (Digital Versatile Disk) or a CD-ROM (Compact Disk Read-Only-Memory), a magnetic storage like a floppy disk, or a flash-memory based storage, such as a USB-memory stick.

[0047] Further, such program code could also be provided from a network source, e.g., as a download or stream.

[0048] It is noted that the embodiments and examples described above are susceptible to various modifications. For example, the adjustable pocketed spring element according to the example of FIGS. 2A and 2B and the adjustable pocketed spring core element according to the example of FIG. 5 could be combined in the same spring core, either with or without non-adjustable pocketed spring elements Further, a wide variety of coil springs or may be used, without limitation to the illustrated spring types. For example, the adjustable pocketed spring elements may be based on cylindrical coil springs, barrel-shaped coil springs, hourglass-shaped coil springs, or combinations thereof. Still further, the dimensions and other characteristics of the springs may be selected in various ways. For example, the springs may have the same height when uncompressed, or they may have different heights. In addition, the springs may have the same spring rate, or they may have different spring rates. The thickness of the wire of each spring may be the same or may be different. Still further, it is noted that the adjustable pocketed spring elements could be include various numbers of coil springs, including the case of only a single coil spring which is functionally divided into a first portion corresponding to the upper spring and a second portion corresponding to the lower spring.

[0049] Further, while the above examples explained the adjustable spring core as being part of a mattress, it is noted that the same or similar adjustable spring core could also be used in various other kinds of bedding or seating products, such as in sofas or seats, e.g., as part of a sofa cushion or seat cushion.

Claims

1. A spring core unit (2), comprising:

a plurality of adjustable pocketed spring elements (20; 20’), the adjustable pocketed spring elements (20; 20’) each comprising a first coil spring (22), a second coil spring (23), and a pocket (21) enclosing the first coil spring (22) and the second coil (23) spring to pre-tension the first coil spring (22) and the second coil spring (23) against each other; and
an adjustment mechanism (25; 26; 50, 60, 65, 70) for adjusting, for each of the adjustable pocket spring elements (20; 20’), a degree of pre-tensioning of the first coil spring (22) relative to a degree of pre-tensioning of the second coil spring (23).

2. The spring core unit (2) according to claim 1,
wherein the adjustable pocketed spring elements (20; 20’) are arranged in multiple rows (3) and the adjustment mechanism (24; 25; 26; 50, 60, 65, 70) is configured to provide adjustments of the degree of pre-tensioning the first coil spring (22) relative to the degree of pre-tensioning of the second coil spring (23) which differ between at least some of the rows.

3. The spring core unit (2) according to claim 1 or claim 2,
wherein the adjustable pocketed spring elements (20; 20’) are arranged in multiple rows (3) and the adjustment mechanism (24; 25; 26; 50, 60, 65, 70) is configured to provide adjustments of the degree of pre-tensioning the first coil spring (22) relative to the degree of pre-tensioning of the second coil spring (23) which differ between at least some of the adjustable pocketed spring elements (20: 20’) of the same row (3).

4. The pocket spring core unit (2) according to any one of the preceding claims,
wherein the adjustable pocketed spring elements (20; 20’) are arranged in multiple rows (3) and the adjustment mechanism (24; 25; 26; 50, 60, 65, 70) comprises at least one motor unit (50) per row of the adjustable pocketed spring elements (20; 20’).

5. The pocket spring core unit (2) according to any one of the preceding claims,
wherein the adjustment mechanism (24; 25; 26; 50, 60, 65, 70) comprises, within the adjustable pocket spring elements (20; 20’), a support member (24) which is arranged between the first coil spring (22) and the second coil spring (23) and is movable along a tensioning direction of the first coil spring (22) and the second coil spring (23).

6. The pocket spring core unit (2) according to claim 5, wherein the adjustment mechanism (24; 25; 26; 50, 60, 65, 70) comprises, within at least some of the adjustable pocket spring elements (20; 20’), a pulling member (25) for pulling the support member (24) in a direction to cause increase of pre-tensioning of the second coil spring (23) relative to the first coil spring (22).

7. The pocket spring core unit (2) according to claim 6, wherein the adjustment mechanism (24; 25; 26; 50, 60, 65, 70) comprises a reel (65) for winding the pulling member (25).

8. The pocket spring core unit (2) according to claim 7, wherein the adjustable pocketed spring elements (20; 20’) are arranged in multiple rows (3) and multiple reels (65) corresponding to different adjustable pocketed spring elements (20) of the same row (3) are driven by a common drive axle (60) extending along the row (3).

9. The pocket spring core unit (2) according to any one of claims 5-8,
wherein the adjustment mechanism (24; 25; 26; 50, 60, 65, 70) comprises, within at least some of the adjustable pocket spring element (20; 20’), a spindle shaft (25) for moving the support member (24) to change the pre-tensioning of the second coil spring (23) relative to the first coil spring (22).

10. The pocket spring core unit (2) according to claim 9, wherein the adjustable pocketed spring elements (20; 20’) are arranged in multiple rows (3) and the spindle shafts (26) of different adjustable pocketed spring elements (20’) of the same row (3) are driven by a common drive axle (60) extending along the row (3).

11. The pocket spring core unit (2) according to any one of the preceding claims,
wherein the adjustment mechanism (25; 26; 50, 60, 70) is remote controllable by a user control device (100).

12. The pocket spring core unit (2) according to claim 11, wherein a hardness profile of the spring core unit (2) is adjustable by modifying at least one profile curve (111, 112) on a touch screen (110) of the user control device (100).

13. The pocket spring core unit (2) according to claim 11 or 12,
wherein the adjustment mechanism (25; 26; 50, 60, 65, 70) is configured to be remote controllable based on wireless signals.

14. A bedding or seating product (1),
wherein the bedding or seating product (1) comprises a spring core unit (2) according to any one of the preceding claims.

15. A method of adjusting a pocket spring core unit (2), the method comprising:

- obtaining user input;
- based on the user input, determining settings of adjustable pocketed spring elements (20; 20') of the spring core (2), the adjustable pocketed spring elements (20; 20') each comprising a first coil spring (22), a second coil spring (23), and a pocket (21) enclosing the first coil spring (22) and the second coil (23) spring to pre-tension the first coil spring (22) and the second coil spring (23) against each other; and
- apply the settings to adjust, for each of the adjustable pocket spring elements (20; 20'), a degree of pre-tensioning of the first coil spring (22) relative to a degree of pre-tensioning of the second coil spring (23).

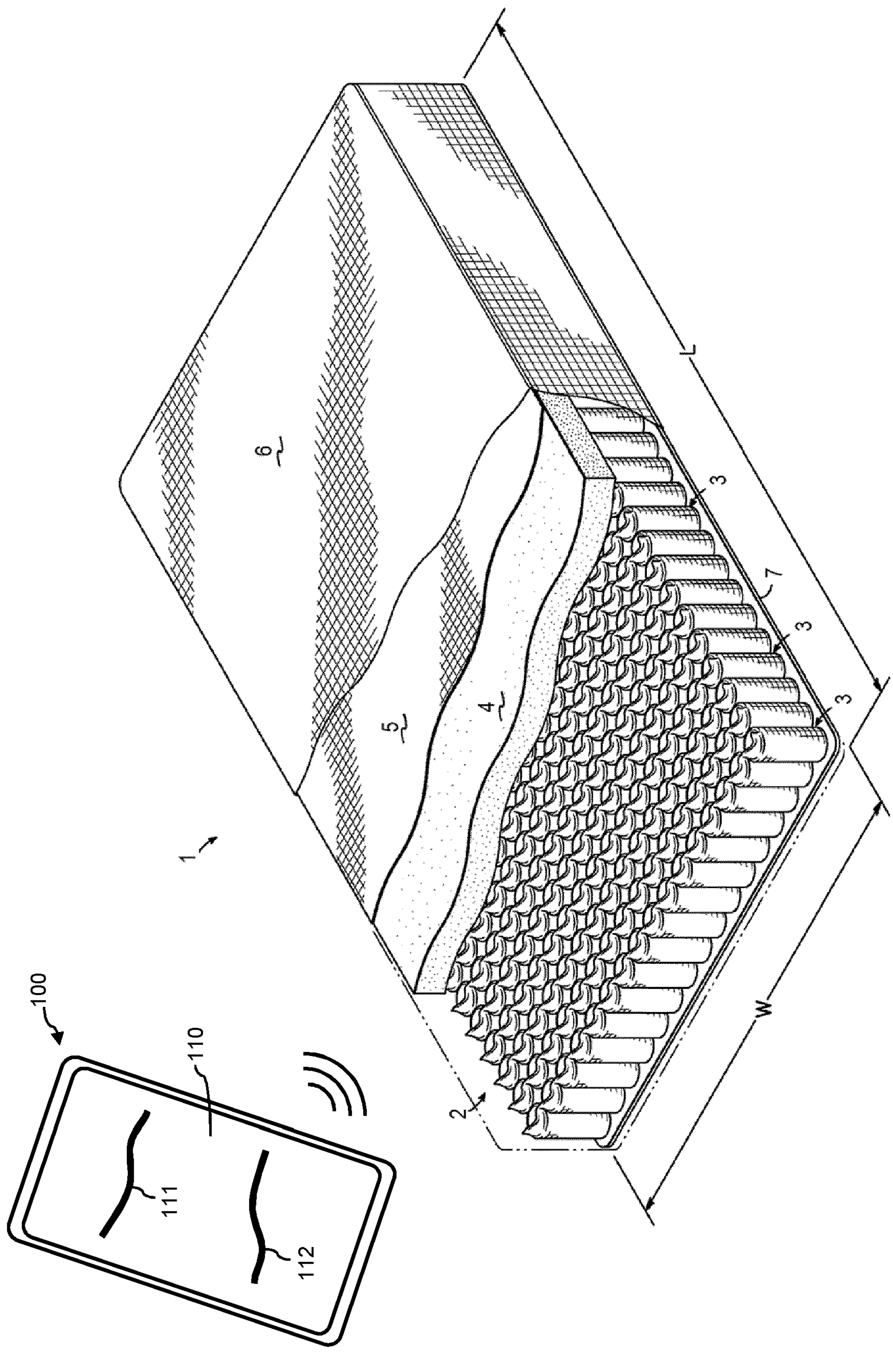

FIG. 1

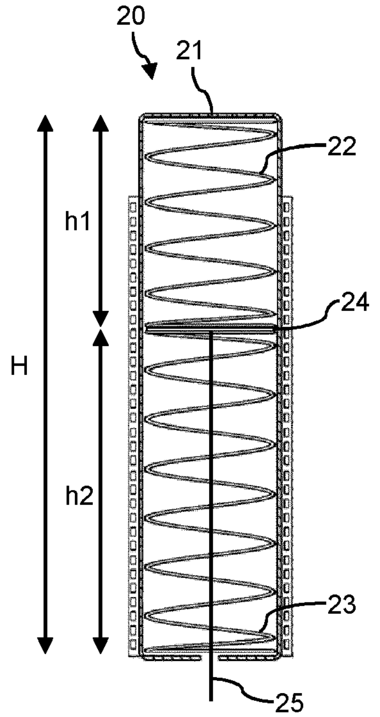

FIG. 2A

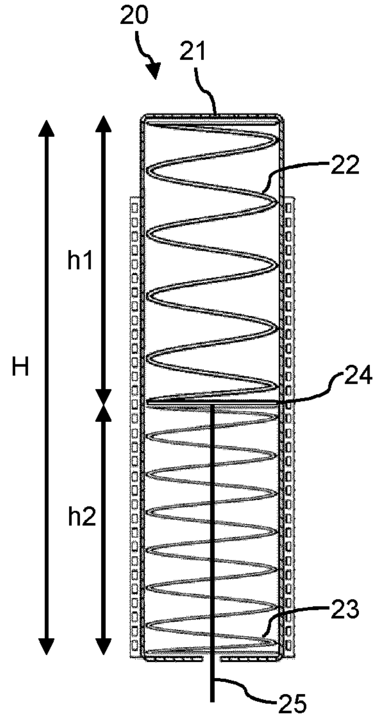

FIG. 2B

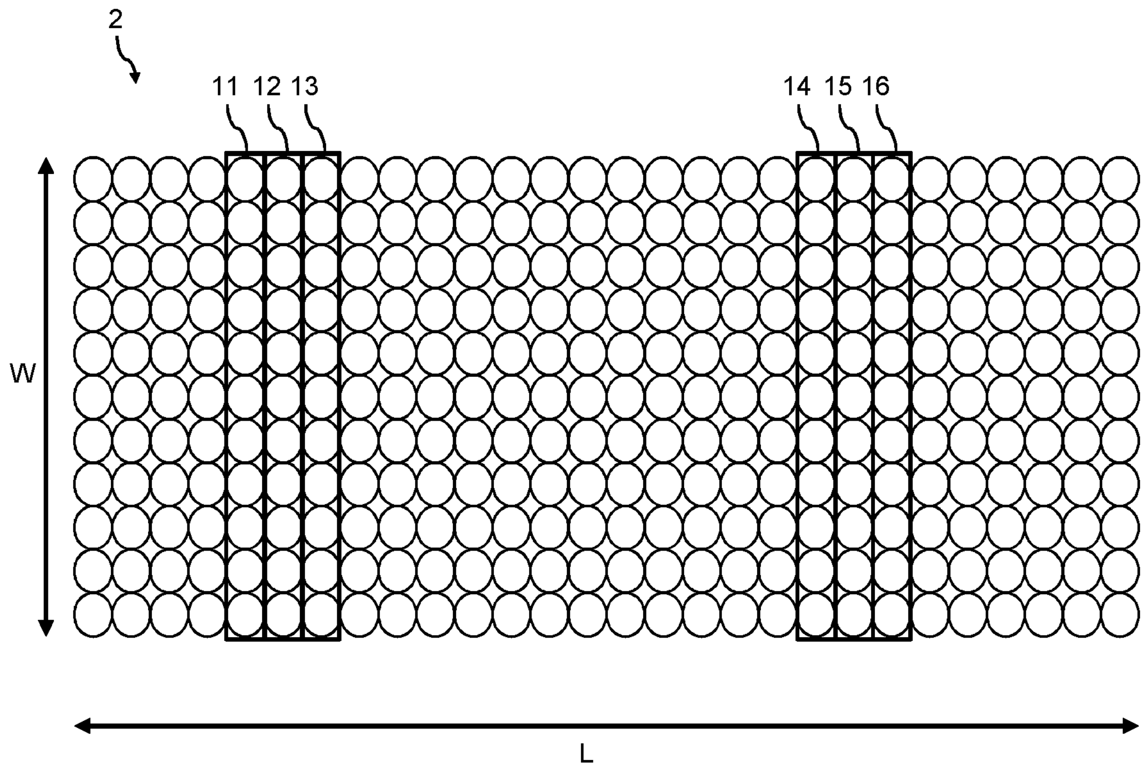

FIG. 3

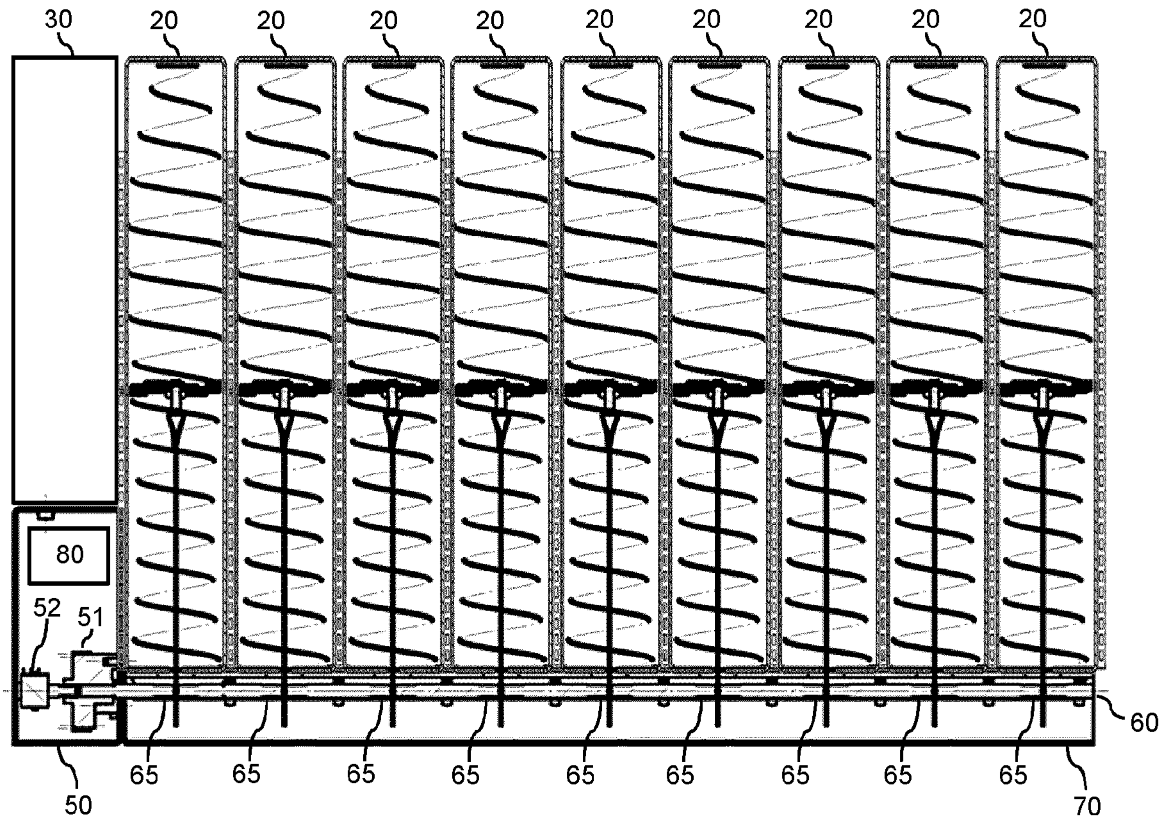
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FIG. 4

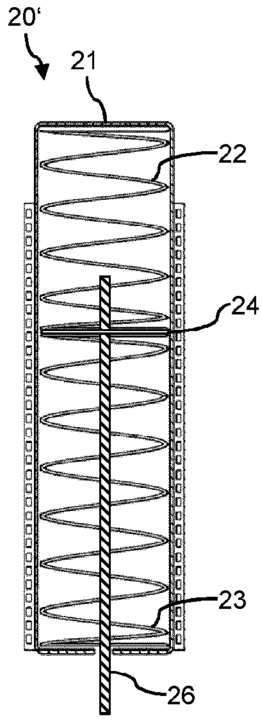
20'
21
22
24
23
26

FIG. 5

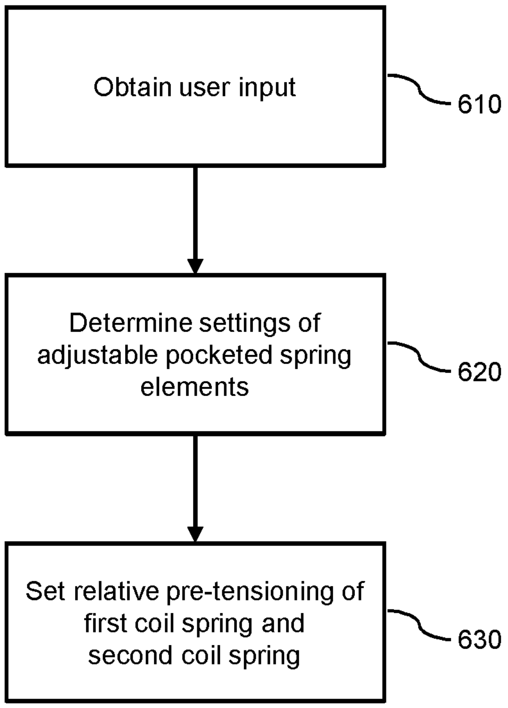
Obtain user input
610
Determine settings of adjustable pocketed spring elements
620
Set relative pre-tensioning of first coil spring and second coil spring
630

FIG. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 21 15 6533

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A47C

The present search report has been drawn up for all claims

2

Place of search	Date of completion of the search	Examiner
The Hague	23 July 2021	Kus, Slawomir

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