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Spring module and spring cushion for furniture

Abstract

The present disclosure provides a spring module for a spring cushion of furniture and a spring cushion having the same, the spring module may comprise a spring and a spring bracket for accommodating the spring, and the spring bracket may comprise a base, an end cover and a flexible connecting part connected therebetween, the spring may be fixed in the spring bracket with a predetermined initial pressure. The present disclosure further relates to a spring cushion having the spring modules.

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Background/Summary

FIELD

(1) The present disclosure relates to a field of furniture, in particular to a spring module and a spring cushion for furniture.

BACKGROUND

(2) Large furniture, such as beds, is an essential part of people's life. Most existing large furniture is not easy to disassemble, or is not easy to reassemble after disassembly. However, with the development of the modern life, furniture like beds, in particular, needs to be disassembled and assembled more and more frequently in order to meet the needs of people's migration and outdoor recreation. During the process of migration, it is very difficult to disassemble and assemble beds, thereby the still useable beds are sometimes discarded for reducing the burden of migration.

(3) A bed is usually composed of a bedstead, a spring cushion and an outer cover. Existing spring cushions are usually integrated, non-disassemble cushions formed by springs and a plurality of superimposed layers. The integral cushions are large in size, thus not easy to disassemble and store.

(4) Existing independent bagged spring bed mattresses are designed to avoid mutual interference between two or more people lying in bed at the same time (for example, in the case of relatively large weight difference between individuals, one of them will inevitably affect other ones when turning over or moving). In such type of bed mattress, each spring is individually packaged in a bag or a sleeve made of non-woven fabrics or other materials. The bags are arranged in a pattern, and then an outer side of the arranged bag set is covered by a whole piece of foam rubber through adhesion, bonding, etc., so as to form a furniture cushion or a desired spring cushion in the form of a furniture cushion. However, the independent bagged spring bed mattress is still an integral product, which is non-disassemble and not easy to transport. In addition, in the independent bagged spring bed mattress, non-woven fabrics used for covering the bagged springs are adhered to each other, so when the bed mattress is squeezed, a plurality of bagged springs cannot move up and down completely independently, thus affecting the comfort of the bed mattress.

(5) In addition, existing bed mattresses also have the disadvantage of being difficult to clean. For a typical bed mattress, generally only the bed cover can be removed, while the sponge part cannot be removed, thus not easy to clean. Even though latex may have a certain anti-mite effect, the sponge part which is difficult to clean will bring great health risks since a bed mattress may usually be used for several years.

(6) Therefore, there is a need for an improved spring cushion, which can be readily disassembled, moved and reassembled, as well as stored in a compact space, and is easy to clean with better comfort.

SUMMARY

(7) In view of the foregoing problems in the prior art, the present disclosure provides a spring module for a spring cushion of furniture, and a spring cushion with the same. The spring module of the present disclosure has at least following advantages: simple structure, easy to assemble and form a spring cushion together with a sponge pad, etc., the spring cushion thus formed is easy to disassemble, and the disassembled spring modules are able to be compressed or stacked and nested one another, which may greatly save storage and transportation space; since the spring module has a flexible connecting part positioned outside a spring, the spring in the spring module is not easy to be wound together with springs or other components in adjacent spring modules, no matter in the state of being assembled into spring cushions or in the state of being stacked and nested one another. Compared with a single spring, since the spring module may have a base, its stress area is larger and more stable, thereby the spring cushion is more stable in use; an initial pressure of the spring in the spring module can be predetermined as desired, so that the spring module has a desired stiffness, furthermore, spring modules with different stiffness can be arranged at different positions of the spring cushion as desired; the spring modules in the spring cushion can realize compressing and releasing motions that are truly independent of each other, enabling the spring

cushion of the present disclosure to have a better comfort compared with the existing bagged spring bed mattresses; the sponge part (sponge block and/or sponge pad) in the spring cushion is detachable, which is easy to clean. The spring cushion of the present disclosure can be used for furniture having spring cushions, such as, including but not limited to bed mattresses, sofas, soft pack benches, etc.

(8) In one aspect, the present disclosure provides a spring module for making a spring cushion of furniture, the spring module comprising one or more conical springs, and a spring bracket configured to hold and fix the one or more conical springs, and the spring bracket comprises: a base comprising one or more spring mounting seats, each spring mounting seat having a spring fixing part for fixing an end of the conical spring: one or more end covers, each end cover being arranged opposite to one corresponding spring mounting seat and cooperating with each other so as to hold one of the one or more conical springs, wherein the end cover abuts against the other end of the conical spring opposite to the one end fixed in the spring mounting seat; and one or more groups of flexible straps, each group of flexible straps comprising a plurality of flexible straps spaced apart from each other and evenly arranged between a corresponding pair of the spring mounting seat and the end cover, and the flexible straps are positioned outside the conical spring when the conical spring is held between the corresponding pair of the spring mounting seat and the end cover.

(9) According to a preferred embodiment of the present disclosure, the base further comprises a module mounting part for detachably mounting the spring module onto a mounting rack of the spring cushion. The beneficial technical effect of the preferred embodiment is at least that, the spring module can be mounted onto the mounting rack of the spring cushion.

(10) According to a preferred embodiment of the present disclosure, the conical spring is installed into the spring bracket with a predetermined initial compression force. The beneficial technical effect of the preferred embodiment is at least that, the spring module may be provided with an ideal initial stiffness.

(11) According to a preferred embodiment of the present disclosure, four flexible straps spaced apart from each other are evenly arranged around a periphery of the end cover. The beneficial technical effect of the preferred embodiment is at least that, winding between the spring modules may be avoided via using a small number of flexible straps.

(12) According to a preferred embodiment of the present disclosure, an opening is formed at a center of the end cover. The beneficial technical effect of the preferred embodiment is at least that, it is beneficial for saving materials and costs, and when a plurality of spring modules are nested together, a space between the end cover and the end cover may communicate with an outer space, which is beneficial for the nesting and disassembly.

(13) According to a preferred embodiment of the present disclosure, the corresponding pair of the spring mounting seat and the end cover form a substantially frustoconical shape, wherein the end cover forms a small end of the frustoconical shape, the spring mounting seat forms a large end of the frustoconical shape, and an opening is formed at a center of the spring mounting seat, such that the end cover and most of or all of the flexible straps of another spring module are able to enter an inner side of the spring module via the opening, thus forming nesting. The beneficial technical effect of the preferred embodiment is at least that, the spring module is capable of maintaining a posture more stably and the nesting of multiple modules may be facilitated.

(14) According to a preferred embodiment of the present disclosure, the spring bracket is integrally formed. The beneficial technical effect of the preferred embodiment is at least that, the spring bracket has low manufacturing costs, and is strong and durable.

(15) According to a preferred embodiment of the present disclosure, the spring bracket is assembled by a first half and a second half which can be detachably coupled to each other, and the first half comprises a first half of the base, a first half of the end cover and at least one flexible strap, the second half comprises a second half of the base, a second half of the end cover and at least one flexible strap, and the first half as well as the second half of the spring bracket are all

integrally formed. The beneficial technical effect of the preferred embodiment is at least that, the assembly of the conical spring into the spring bracket may be facilitated.

(16) According to a preferred embodiment of the present disclosure, the base and the end cover of one of the first half and the second half of the spring bracket are respectively provided with at least one socket, and the base and the end cover of the other one are respectively provided with at least one plug adapted to the socket. The beneficial technical effect of the preferred embodiment is at least that, both two halves of the spring bracket may be integrally formed, and the assembly of the spring bracket is simple.

(17) According to a preferred embodiment of the present disclosure, the module mounting part is configured as slideways provided on a bottom surface of the base, enabling the base to be slidably assembled onto the mounting rack in the spring cushion via the slideways. The beneficial technical effect of the preferred embodiment is at least that, it is beneficial for the assembly and disassembly of the spring module and the mounting rack.

(18) According to a preferred embodiment of the present disclosure, the slideways are discontinuous adjacent to an opening, thus forming segmented slideways. The beneficial technical effect of the preferred embodiment is at least that, the nesting of multiple spring modules may be facilitated.

(19) According to a preferred embodiment of the present disclosure, the base of the spring bracket comprises: a first part and a second part arranged opposite to each other; a third part and a fourth part respectively adjacent to the first part and the second part and arranged opposite to each other, wherein, at least one flexible strap is fixedly connected to a top surface of each of the above four parts, and the above four parts are able to be detachably coupled to each other via a locking device, thereby forming the base. The beneficial technical effect of the preferred embodiment is at least that, the assembly of the conical spring in to the spring bracket may be facilitated.

(20) According to a preferred embodiment of the present disclosure, inner peripheries of the first part, the second part, the third part and the fourth part together form an opening at the center of the base.

(21) According to a preferred embodiment of the present disclosure, wherein the module mounting part comprises first slideways formed at outer sides of the third part and the fourth part of the base, enabling the base to be slidably assembled to the mounting rack in the spring cushion via the first slideways. The beneficial technical effect of the preferred embodiment is at least that, the nesting of multiple spring modules may be facilitated.

(22) According to a preferred embodiment of the present disclosure, a top surface of the end cover is provided with second slideways extending in a direction consistent with the first slideways on the base, enabling the end cover to be slidably assembled to the mounting rack in the spring cushion via the second slideways. The beneficial technical effect of the preferred embodiment is at least that, it is beneficial for the assembly and disassembly of the spring module and the mounting rack, and the spring module may be assembled to the mounting rack with the end cover of which facing downwards.

(23) According to a preferred embodiment of the present disclosure, the spring bracket further comprises: four flexible connecting belts respectively arranged on sides of the third part and the fourth part of the base and positioned on both sides of ends of the first slideways, and an end of the flexible connecting belt is provided with a through hole; four projections respectively provided on the top surface of the end cover and positioned laterally outside two second slideways, wherein, when two or more spring modules are assembled on the mounting rack and one of the spring modules is assembled on the mounting rack via the end cover, the flexible connecting belts of which are able to be snapped on the projections of another adjacent spring module assembled on the mounting rack via the base. The beneficial technical effect of the preferred embodiment is at least that, multiple adjacent spring modules mounted on the mounting rack with different mounting directions may be connected with each other through the flexible connecting belts as well as the

projections, which is more stable and more difficult to dislocate on the whole.
(24) According to a preferred embodiment of the present disclosure, at least one cylindrical pin is provided on an outer side of the first part of the base, and at least one receiving hole is provided at a corresponding position on an outer side of the second part of the base, such that when two or more spring modules are assembled on the mounting rack, the cylindrical pin of one spring module is able to be aligned with and inserted into a corresponding receiving hole of another adjacent spring module, so as to connect adjacent spring modules. The beneficial technical effect of the preferred embodiment is at least that, multiple adjacent spring modules mounted on the mounting rack with the same mounting direction may be connected with each other, which is more stable and difficult to dislocate on the whole.
(25) According to a preferred embodiment of the present disclosure, a top of the base is provided with an annular wall extending around the opening, and threads are provided on an outside surface of the annular wall, such that a bottom wall of a slideway of one spring module is able to be screwed between the threads and the top of the base of another spring module as two or more spring modules sleeved on one another. The beneficial technical effect of the preferred embodiment is at least that, multiple spring modules may be nested with each other more stably.
(26) According to a preferred embodiment of the present disclosure, an outer periphery of the base is provided with one or more snap parts extending upwards as well as one or more snap notches positioned below the one or more snap parts, thereby enabling the snap part of one spring module to be locked in the corresponding snap notch of another spring module as two or more spring modules sleeved on one another. The beneficial technical effect of the preferred embodiment is at least that, multiple spring modules may be nested with each other more stably.
(27) According to a preferred embodiment of the present disclosure, a flexible connecting piece is integrally formed at an outer side of the flexible strap, and when a plurality of the spring modules are installed in the spring cushion, the flexible connecting piece of one spring module is able to be detachably connected with a corresponding connecting piece of another adjacent spring module. The beneficial technical effect of the preferred embodiment is at least that, when multiple spring modules are mounted on the mounting rack, the multiple spring modules may be connected via the flexible connecting pieces, which is more stable and more difficult to dislocate on a whole.
(28) According to a preferred embodiment of the present disclosure, the flexible connecting piece comprises a neck part and a T-shaped groove, and the neck part as well as the T-shaped groove are dimensioned such that one flexible connecting piece of two adjacent flexible connecting pieces is able to be detachably locked in the T-shaped groove of the other flexible connecting piece through allowing the neck part to pass through the T-shaped groove. The beneficial technical effect of the preferred embodiment is at least that, the flexible connecting piece is simple in structure, which is easy to assemble and disassemble.
(29) According to a preferred embodiment of the present disclosure, a vertical distance between the flexible connecting piece and the end cover is about ⅓ of an overall height of the spring module. The beneficial technical effect of the preferred embodiment is at least that, the connecting relationship of multiple spring modules is more stable, which is not easy to fall over.
(30) According to a preferred embodiment of the present disclosure, at least a portion of the conical spring is a double-wire spring part. The beneficial technical effect of the preferred embodiment is at least that, the spring module may have an ideal stiffness or elastic coefficient.
(31) According to a preferred embodiment of the present disclosure, the double-wire spring part extends from a large-diameter end of the conical spring to about ⅔ height of the conical spring. The beneficial technical effect of the preferred embodiment is at least that, The spring module may have an ideal stiffness or elastic coefficient.
(32) In another aspect, the present disclosure further provides a spring cushion used for furniture, the spring cushion comprising: a plurality of the spring modules according to the embodiments described above; a mounting rack which is foldable, and the spring modules are detachably

assembled on the mounting rack; a sponge cover covering the plurality of the spring modules; and an outer cover covering the sponge cover, wherein the outer cover wraps the spring modules and the sponge cover assembled on the mounting rack.

(33) According to a preferred embodiment of the present disclosure, a top of the sponge cover is provided with a plurality of nest structures, and a position of each of the plurality of nest structures corresponds to a position of the end cover of the plurality of the spring modules mounted on the mounting rack one by one, thus enabling a top of each spring module to be accommodated in a corresponding nest structure. The beneficial technical effect of the preferred embodiment is at least that, the sponge cover may assist in fixing the top of the spring module, so that the spring module is easier to maintain a position and posture, and the sponge cover is not easy to move.

(34) According to a preferred embodiment of the present disclosure, the mounting rack comprises: two side frames positioned at both lateral sides of the mounting rack, the side frame having a longitudinal extending part and a plurality of transverse protruding parts extending perpendicular to the longitudinal extending part toward one side; a plurality of intermediate frames positioned between the two side frames, the intermediate frame having a longitudinal extending part and a plurality of transverse protruding parts extending perpendicular to the longitudinal extending part toward both lateral sides; a plurality of connectors rotatably connecting corresponding transverse protruding parts of two adjacent frames together. The beneficial technical effect of the preferred embodiment is at least that, the mounting rack is simple in structure and able to be folded, thus saving space for storage and transportation.

(35) According to a preferred embodiment of the present disclosure, the side frames, the intermediate frames and the connectors are all formed of metal, and the side frames as well as the intermediate frames are all closed frames made of metal wires through bending. The beneficial technical effect of the preferred embodiment is at least that, the mounting rack is simple in structure and low in manufacturing.

(36) According to a preferred embodiment of the present disclosure, the side frames and the intermediate frames are made of steel bars through bending and welding, and the connectors are made of metal sheets through winding. The beneficial technical effect of the preferred embodiment is at least that, the mounting rack is simple in structure and low in manufacturing.

(37) According to a preferred embodiment of the present disclosure, the steel bar at the longitudinal extending part is configured to be slidably cooperated with the slideway of the base, such that the base of the spring module is able to be slidably mounted to the mounting rack along the longitudinal extending part of the mounting rack.

(38) According to a preferred embodiment of the present disclosure, middle portions of the steel bars positioned at longitudinal ends of the side frames and the intermediate frames protrude in a direction perpendicular to a plane of the longitudinal extending parts and the transverse protruding parts, so as to facilitate the assembly of the spring modules. The beneficial technical effect of the preferred embodiment is at least that, it is beneficial for the assembly and disassembly of the spring module and the mounting rack, moreover, the mounting rack is simple in structure and low in manufacturing.

(39) According to a preferred embodiment of the present disclosure, the side frames comprises a first side frame and a second side frame, and the plurality of intermediate frames comprise a plurality of first intermediate frames and a plurality of second intermediate frames arranged at intervals from each other, a longitudinal length of the first side frame is not equal to that of the second side frame, and a longitudinal length of the first intermediate frame is not equal to that of the second intermediate frame. The beneficial technical effect of the preferred embodiment is at least that, the longitudinal ends of the first side frame and the second side frame are staggered with each other, and the longitudinal ends of the first intermediate frames and the second intermediate frames are staggered with each other, thus enabling the mounting rack to be folded more compactly.

(40) According to a preferred embodiment of the present disclosure, the mounting rack comprises a plurality of longitudinally extending section bars and a plurality of flexible connectors positioned between the plurality of longitudinally extending section bars and connecting them together, and a middle portion of the flexible connector forms a flexible hinge. The beneficial technical effect of the preferred embodiment is at least that, the support is simple in structure, low in manufacturing, and foldable.

(41) According to a preferred embodiment of the present disclosure, a center of the longitudinally extending section bar is provided with two T-shaped grooves with downward openings, and two T-shaped projections are formed on both sides of a top of the flexible connector, and the T-shaped groove is configured to slidably receive the T-shaped projection. The beneficial technical effect of the preferred embodiment is at least that, the connecting mode between the flexible connector and the longitudinally extending section bar is simple, and no additional fixing part is required.

(42) According to a preferred embodiment of the present disclosure, the longitudinally extending section bar further comprises: a pair of first transverse projections extending transversely outward, the first transverse projections being positioned at both lateral sides of the section bar; and a pair of second transverse projections extending transversely outward, the second transverse projections being positioned at the center of the section bar, wherein, a distance between the pair of first transverse projections is greater than a distance between the pair of second transverse projections, and the second transverse projections are positioned at higher positions than the first transverse projections. The beneficial technical effect of the preferred embodiment is at least that, the first transverse projections and the second transverse projections respectively form two sets of guide rails, such that the spring module may be assembled on the mounting rack with the base facing down, and may also be assembled on the mounting rack with the end cover facing down.

(43) According to a preferred embodiment of the present disclosure, the slideways at the bottom of the base are configured to slidably cooperate with the first transverse projections, and the module mounting part further comprises two slideways arranged at the top of the end cover which are parallel to each other, and the slideways arranged at the top of the end cover are configured to slidably cooperate with the second transverse projections. The beneficial technical effect of the preferred embodiment is at least that, the spring module may be assembled on the mounting rack with the base facing down, and may also be assembled on the mounting rack with the end cover facing down.

(44) According to a preferred embodiment of the present disclosure, the mounting rack comprises: a plurality of first section bars extending longitudinally, the first section bar having a flat body extending longitudinally and first slide rails extending longitudinally and positioned at two transverse sides of the flat body; a plurality of second section bars extending longitudinally, the second section bar having a flat body extending longitudinally and a second slide rail extending longitudinally and positioned in a middle position of a top surface of the flat body; and wherein, the first section bars and the second section bars are arranged at intervals along a transverse direction and are connected together via a plurality of flexible connectors; and wherein, the base of the spring module is configured to be slidably assembled on the mounting rack through a sliding fit between the first slideways and the first slide rails, and the end cover of the spring module is configured to be slidably assembled on the mounting rack through a sliding fit between the second slideway and the second slide rail. The beneficial technical effect of the preferred embodiment is at least that, the mounting rack is simple in structure, low in manufacturing, and foldable, and furthermore, the spring module may be assembled on the mounting rack with the base facing down, and may also be assembled on the mounting rack with the end cover facing down.

(45) According to a preferred embodiment of the present disclosure, the spring cushion further comprises a one-piece fixing net, and the one-piece fixing net is provided with a plurality of ring parts, each ring part being configured to sleeve on a corresponding spring module. The beneficial technical effect of the preferred embodiment is at least that, the one-piece net may assist in

maintaining the position and posture of the spring module, which enables the whole to be more stable and less prone to dislocation.
(46) According to a preferred embodiment of the present disclosure, when the ring part is sleeved on the spring module, a vertical distance between the ring part and the end cover is about ⅓ of the overall height of the spring module. The beneficial technical effect of the preferred embodiment is at least that, the connecting relationship of multiple spring modules may be more stable and not easy to fall over.
(47) According to a preferred embodiment of the present disclosure, the one-piece fixing net is flexible, and a plurality of hook parts are provided at an edge of which, and when the one-piece fixing net is sleeved on the spring modules, the hook parts are configured to be hooked on the mounting rack. The beneficial technical effect of the preferred embodiment is at least that, the connection between the fixing net and the mounting rack may be more stable.
(48) According to a preferred embodiment of the present disclosure, the spring cushion further comprises a plurality of filling sponge strips which are placed on the one-piece fixing net and are sized to be able to fill gaps between the spring modules in the spring cushion. The beneficial technical effect of the preferred embodiment is at least that, the filling sponge strips may fill the gaps between the spring modules, so that the comfort of the spring cushion may be improved.
(49) According to a preferred embodiment of the present disclosure, the one-piece fixing net further comprises a plurality of small ring parts which are respectively positioned between the ring parts. The beneficial technical effect of the preferred embodiment is at least that, small spring modules may be arranged in the small ring parts to fill the gaps between the spring modules, thus improving the using comfort of the spring cushion.
(50) According to a preferred embodiment of the present disclosure, the spring cushion further comprises a plurality of gap-filling spring modules which are substantially frustoconical, and when the one-piece fixing net is sleeved on the spring modules, small ends of the gap-filling spring modules are configured to be fixed on the small ring parts in order to fill the gaps between the spring modules. The beneficial technical effect of the preferred embodiment is at least that, the small spring modules may be arranged in the small ring parts of the one-piece net so as to fill the gaps between the spring modules, thus improving the using comfort of the spring cushion.
(51) According to a preferred embodiment of the present disclosure, the gap-filling spring module comprises an end cover, and a plurality of hook parts extending outwards are formed on an outer periphery of the end cover, and the gap-filling spring module is configured to be fixed on the small ring part through the hook parts so as to fill the gaps between the spring modules. The beneficial technical effect of the preferred embodiment is at least that, the small spring modules are simple in structure and may be nested with each other, and because of the existence of the flexible straps, the springs of multiple small spring modules are not easy to be wound.
(52) It is obvious that the elements or features described in the above single embodiment may be used alone or in combination in other embodiments.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
(1) The dimensions and proportions in the accompanying drawings do not represent the dimensions and proportions of the actual products. The accompanying drawings are merely illustrative, and some unnecessary elements or features are omitted for clarity.
(2) FIG. **1**A exemplarily shows a perspective view of a spring module according to a preferred embodiment of the present disclosure.
(3) FIG. **1**B exemplarily shows a spring of the spring module in FIG. **1**A.
(4) FIG. **1**C exemplarily shows a spring bracket of the spring module in FIG. **1**A.

(5) FIG. **1**D exemplarily shows an exploded view of the spring module in FIG. **1**A.
(6) FIG. **1**E exemplarily shows a front view of the spring module in FIG. **1**A.
(7) FIG. **1**F exemplarily shows a bottom view of the spring module in FIG. **1**A.
(8) FIG. **2** exemplarily shows a perspective view of a mounting rack according to a preferred embodiment of the present disclosure.
(9) FIG. **3**A exemplarily shows a front view of the mounting rack in FIG. **2** in an unfolded state.
(10) FIG. **3**B exemplarily shows a bottom view of the mounting rack in FIG. **2** in an unfolded state.
(11) FIG. **3**C exemplarily shows a side view of the mounting rack in FIG. **2** in a folded state.
(12) FIG. **3**D exemplarily shows a front view of the mounting rack in FIG. **2** in a folded state.
(13) FIG. **4**A exemplarily shows that the spring modules in FIG. **1**A are assembled to the mounting rack in FIG. **2**.
(14) FIG. **4**B exemplarily shows a partial enlarged view of part I in FIG. **4**A.
(15) FIG. **4**C exemplarily shows a partial front view when the spring modules in FIG. **1**A is assembled to the mounting rack in FIG. **2**.
(16) FIG. **4**D schematically shows a perspective view when the spring modules in FIG. **1**A is assembled to the mounting rack in FIG. **2**.
(17) FIG. **5**A exemplarily shows a perspective view of a spring module according to another preferred embodiment of the present disclosure.
(18) FIG. **5**B exemplarily shows a spring bracket of the spring module in FIG. **5**A.
(19) FIG. **5**C exemplarily shows an exploded view of the spring module in FIG. **5**A.
(20) FIG. **5**D exemplarily shows a bottom view of the spring module in FIG. **5**A.
(21) FIG. **5**E schematically shows a partial front view when the spring modules in FIG. **5**A is assembled to the mounting rack in FIG. **2**.
(22) FIG. **5**F exemplarily shows a condition in which a flexible connecting piece of the spring module in FIG. **5**A is connected with the flexible connecting piece of an adjacent spring module.
(23) FIG. **5**G exemplarily shows the flexible connecting piece of the spring module in FIG. **5**A.
(24) FIG. **5**H exemplarily shows a condition in which the flexible connecting pieces of the spring module in **5**A is connected with the flexible connecting pieces of adjacent spring modules when the spring module is mounted on the mounting rack.
(25) FIG. **6** exemplarily shows a condition when a plurality of the spring modules in FIG. **1**A are stacked and nested together.
(26) FIG. **7**A exemplarily shows a spring module with threads.
(27) FIG. **7**B exemplarily shows a condition when a plurality of the spring modules in FIG. **7**A are stacked and nested together.
(28) FIG. **7**C exemplarily shows a spring module having a snap structure.
(29) FIG. **7**D exemplarily shows a condition when a plurality of the spring modules in FIG. **7**C are stacked and nested together.
(30) FIG. **7**E exemplarily shows a partial enlarged view of part II in FIG. **7**D.
(31) FIG. **8** exemplarily shows a perspective view when spring modules according to yet another preferred embodiment of the present disclosure are mounted on a mounting rack according to another preferred embodiment of the present disclosure.
(32) FIG. **9**A exemplarily shows a partial perspective view of a longitudinally extending section bar of the mounting rack in FIG. **8**.
(33) FIG. **9**B exemplarily shows a perspective view of a flexible connector of the mounting rack in FIG. **8**.
(34) FIG. **9**C exemplarily shows a partial front view of the mounting rack in FIG. **8** in an unfolded state.
(35) FIG. **9**D exemplarily shows a front view of the mounting rack in FIG. **8** in a folded state.
(36) FIG. **10**A exemplarily shows a perspective view of the spring module in FIG. **8**.
(37) FIG. **10**B exemplarily shows a front view of the spring module in FIG. **8**.

(38) FIG. **10**C exemplarily shows a first half of a spring bracket of the spring module in FIG. **10**A.
(39) FIG. **10**D exemplarily shows a second half of the spring bracket of the spring module in FIG. **10**A.
(40) FIG. **11**A exemplarily shows a partial front view of the spring module and the mounting rack in FIG. **8** in a first assembled state.
(41) FIG. **11**B exemplarily shows a partial front view of the spring module and the mounting rack in FIG. **8** in a second assembled state.
(42) FIG. **12**A exemplarily shows a perspective view of a spring module according to yet another preferred embodiment of the present disclosure.
(43) FIG. **12**B exemplarily shows a perspective view of a spring bracket of the spring module in FIG. **12**A.
(44) FIG. **12**C exemplarily shows a front view of the spring bracket in FIG. **12**A.
(45) FIG. **12**D exemplarily shows a top view of the spring bracket in FIG. **12**A.
(46) FIG. **13**A exemplarily shows that the spring modules in FIG. **12**A are assembled to a mounting rack.
(47) FIG. **13**B exemplarily shows a partial enlarged view of part III in FIG. **13**A.
(48) FIG. **13**C schematically shows a partial front view when the spring modules in FIG. **13**A is assembled to the mounting rack.
(49) FIG. **13**D exemplarily shows a partial enlarged view of part IV in FIG. **13**C.
(50) FIG. **14**A exemplarily shows a perspective view of a spring module according to yet another preferred embodiment of the present disclosure.
(51) FIG. **14**B exemplarily shows an exploded view of the spring module in FIG. **14**A.
(52) FIG. **14**C exemplarily shows a front view of the spring module in FIG. **14**A.
(53) FIG. **14**D exemplarily shows a side view of the spring module in FIG. **14**A.
(54) FIG. **14**E exemplarily shows a top view of the spring module in FIG. **14**A.
(55) FIG. **15** exemplarily shows a condition when a plurality of the spring modules in FIG. **14**A are stacked and nested together.
(56) FIG. **16** exemplarily shows that the spring modules in FIG. **14**A are assembled to a mounting rack of a spring cushion.
(57) FIG. **17**A exemplarily shows a perspective view of spring modules according to yet another preferred embodiment of the present disclosure.
(58) FIG. **17**B exemplarily shows an exploded view of the spring modules in FIG. **17**A.
(59) FIG. **17**C exemplarily shows a front view of the spring modules in FIG. **17**A.
(60) FIG. **17**D exemplarily shows a side view of the spring modules in FIG. **17**A.
(61) FIG. **17**E exemplarily shows a top view of the spring modules in FIG. **17**A.
(62) FIG. **18** exemplarily shows a condition when a plurality of the spring modules in FIG. **17**A are stacked and nested together.
(63) FIG. **19** exemplarily shows that the spring modules in FIG. **17**A are assembled to a mounting rack of a spring cushion.
(64) FIG. **20**A exemplarily shows a spring cushion according to a preferred embodiment of the present disclosure.
(65) FIG. **20**B exemplarily shows the internal structure of the spring cushion in FIG. **20**A.
(66) FIG. **20**C exemplarily shows an exploded view of the spring cushion in FIG. **20**A.
(67) FIG. **21**A exemplarily shows a one-piece fixing net for spring modules in a spring cushion according to a preferred embodiment of the present disclosure.
(68) FIG. **21**B exemplarily shows a condition when the one-piece fixing net in FIG. **21**A is sleeved on spring modules.
(69) FIG. **22**A exemplarily shows a one-piece fixing net for spring modules in a spring cushion according to another preferred embodiment of the present disclosure.
(70) FIG. **22**B exemplarily shows that the one-piece fixing net in FIG. **22**A with its periphery bent.

(71) FIG. **22**C exemplarily shows a condition when the one-piece fixing net in FIG. **22**A is sleeved on the spring modules and hooked on the mounting rack.
(72) FIG. **22**D exemplarily shows a partial enlarged view of part V in FIG. **22**C.
(73) FIG. **23**A exemplarily shows a top structure of a sponge cover for a spring cushion according to a preferred embodiment of the present disclosure.
(74) FIG. **23**B exemplarily shows a sectional view of the top structure of the sponge cover in FIG. **23**A.
(75) FIG. **24**A exemplarily shows filling sponge strips for a spring cushion according to a preferred embodiment of the present disclosure.
(76) FIG. **24**B exemplarily shows an exploded view of a spring cushion having the sponge filled strips shown in FIG. **24**A.
(77) FIG. **24**C exemplarily shows a one-piece fixing net in FIG. **24**B.
(78) FIG. **25**A exemplarily shows gap-filing spring modules for spring modules in a spring cushion according to a preferred embodiment of the present disclosure.
(79) FIG. **25**B exemplarily shows an exploded view of a spring cushion having the gap-filling spring modules shown in FIG. **25**A.
(80) FIG. **25**C exemplarily shows the one-piece fixing net in FIG. **25**B.
(81) FIG. **25**D exemplarily shows a condition when the gap-filling spring modules in FIG. **25**A are assembled on the one-piece fixing net in FIG. **25**C.
(82) FIG. **25**E exemplarily shows a perspective view of the gap-filling spring module in FIG. **25**A.
(83) FIGS. **26**A-**26**B exemplarily show a spring module with constraint holes.
(84) FIGS. **27**A-**27**C exemplarily show a constraint member for constraining a spring module.
(85) FIG. **27**D exemplarily shows a condition when a plurality of constraint members shown in FIGS. **27**A-**27**C are stacked and nested together.
(86) FIG. **27**E exemplarily shows a condition when the constraint members shown in FIGS. **27**A-**27**C are arranged on the spring modules.
(87) FIGS. **28**A-**28**C exemplarily show a rotary fixing device of a spring module.
(88) FIGS. **28**D and **28**E exemplarily show a condition when two spring modules are fixed together via the rotary fixing device shown in FIGS. **28**A-**28**C.
(89) FIG. **28**F is a partial enlarged view of FIG. **28**E.
(90) FIGS. **29**A and **29**B exemplarily show an embodiment of a locking structure of a spring module.
(91) FIG. **29**C exemplarily shows a condition when a plurality of spring modules are interlocked together through the locking structures shown in FIGS. **29**A and **29**B.
(92) FIGS. **30**A and **30**B exemplarily show another embodiment of a locking structure of a spring module.
(93) FIG. **30**C exemplarily shows a condition when a plurality of spring modules are combined together via the locking structures shown in FIGS. **30**A and **30**B.
(94) FIG. **30**D exemplarily shows yet another embodiment of a locking structure of a spring module.
(95) FIGS. **30**E and **30**F exemplarily show two conditions when a plurality of spring modules are combined together via the locking structures shown in FIG. **30**D.
(96) FIGS. **31**A and **31**B exemplarily show an embodiment of a spring module having a T-shaped connection.
(97) FIG. **31**C exemplarily shows a condition when two spring modules having the T-shaped connections shown in FIGS. **31**A and **31**B are connected together via an I-shaped connector.
(98) FIG. **31**D exemplarily shows a condition when multiple rows of the spring modules having the T-shaped connections shown in FIGS. **31**A and **31**B are connected together via the I-shaped connectors shown in FIG. **31**C.
(99) FIG. **31**E exemplarily shows another embodiment of a spring module having a T-shaped

connection.
(100) FIG. **31**F exemplarily shows an I-shaped connector for connecting the spring module shown in FIG. **31**E.
(101) FIGS. **31**G and **31**H exemplarily show a condition when a plurality of spring modules shown in FIG. **31**E are connected together through the I-shaped connectors shown in FIG. **31**F.
(102) FIGS. **31**I and **31**J exemplarily show an embodiment of a spring module having a wedge-shaped splicing part.
(103) FIG. **31**K exemplarily shows a condition when two spring modules shown in FIGS. **31**I and **31**J are spliced together.
(104) FIGS. **31**L and **31**M exemplarily show spring cushions of different sizes assembled by the spring modules and the I-shaped connectors shown in FIGS. **31**E-**31**H.
(105) FIGS. **31**N and **31**O exemplarily show spring cushions of different sizes assembled by the spring modules shown in FIGS. **31**I-**31**K and the I-shaped connectors shown in FIG. **31**F.
(106) FIG. **32**A exemplarily shows a spring module in which a base and an end cover can be snapped together according to a preferred embodiment of the present disclosure.
(107) FIGS. **32**B-**32**D exemplarily show a perspective view, a top view and a side view of the base of the spring module shown in FIG. **32**A, respectively.
(108) FIGS. **32**E and **32**F exemplarily show a perspective view and a top view of the end cover of the spring module shown in FIG. **32**A, respectively.
(109) FIG. **32**G and FIG. **32**H exemplarily show a perspective view and a top view when the base and the end cover of the spring module shown in FIG. **32**A are snapped together, respectively.
(110) FIG. **32**I exemplarily shows a condition when a plurality of the spring modules in a compressed configuration shown in FIGS. **32**G and **32**H are stacked together.
(111) FIGS. **32**J-**32**M exemplarily show spring modules in which a base and an end cover can be snapped together according to other preferred embodiments of the present disclosure, respectively.
(112) FIG. **33**A exemplarily shows a spring module in which a base and an end cover can be snapped together according to another preferred embodiment of the present disclosure.
(113) FIG. **33**B exemplarily shows an exploded view of the spring module shown in FIG. **33**A.
(114) FIG. **33**C exemplarily shows a perspective view of a spring bag in the spring module shown in FIG. **33**A.
(115) FIG. **33**D exemplarily shows a condition when the base and the end cover of the spring module shown in FIG. **33**A are snapped together.
(116) FIG. **33**E exemplarily shows the base of the spring module shown in FIG. **33**A.
(117) FIG. **33**F exemplarily shows the end cover of the spring module shown in FIG. **33**A.
(118) FIG. **33**G exemplarily shows a condition when the base and the end cover of the spring module shown in FIG. **33**A are snapped together.
(119) FIG. **33**H exemplarily shows a spring module in which a base and an end cover can be snapped together according to yet another preferred embodiment of the present disclosure.
(120) FIG. **33**I exemplarily shows a condition when the base and the end cover of the spring module shown in FIG. **33**H are snapped together.
(121) FIG. **33**J exemplarily shows a condition when a plurality of the spring modules shown in FIG. **33**A are connected together via a flexible bottom pad.
(122) FIG. **33**K exemplarily shows a condition when a plurality of the spring modules shown in FIG. **33**H are connected together via a flexible bottom pad.
(123) FIG. **33**L exemplarily shows a condition when two rows of the spring modules shown in FIG. **33**H are connected together via a flexible bottom pad.
(124) FIGS. **33**M and **33**N exemplarily show a condition when the bottom pad with two rows of the spring modules mounted thereon shown in FIG. **33**L is folded.
(125) FIG. **33**O exemplarily shows a spring cushion having the spring modules and the flexible bottom pads as shown in FIG. **33**L.

(126) FIG. **34**A exemplarily shows a spring module in which a base and an end cover can be snapped together according to yet another preferred embodiment of the present disclosure.
(127) FIGS. **34**B-**34**D exemplarily show a perspective view, a top view and a side view of the base of the spring module shown in FIG. **34**A, respectively.
(128) FIGS. **34**E and **34**F exemplarily show a perspective view and a top view of the end cover of the spring module shown in FIG. **34**A, respectively.
(129) FIG. **34**G exemplarily shows a condition when the base and the end cover of the spring module shown in FIG. **33**A are snapped together.
(130) FIGS. **35**A and **35**B exemplarily show a perspective view and a side view of a spring module according to yet another preferred embodiment of the present disclosure, respectively.
(131) FIGS. **35**C and **35**D exemplarily show a perspective view and a side view of a spring module according to yet another preferred embodiment of the present disclosure, respectively.
(132) FIG. **35**E exemplarily shows a condition when a plurality of the spring modules shown in FIGS. **35**A to **35**D are nested together.
(133) FIGS. **35**F and **35**G exemplarily show an exploded view and a sectional view of a spring module according to yet another preferred embodiment of the present disclosure, respectively.
(134) FIG. **35**H is a partial enlarged view of FIG. **35**G.
(135) FIG. **35**I exemplarily shows a condition when a plurality of the spring modules shown in FIGS. **35**F and **35**G are nested together.
(136) FIG. **35**J exemplarily shows a perspective view of a spring module according to yet another preferred embodiment of the present disclosure.
(137) FIG. **35**K exemplarily shows a conical spring in the spring module shown in FIG. **35**J.
(138) FIGS. **36**A and **36**B exemplarily show a perspective view and a perspective view of a spring module according to yet another preferred embodiment of the present disclosure, respectively.
(139) FIG. **36**C exemplarily shows a perspective view of a spring module according to yet another preferred embodiment of the present disclosure.
(140) FIG. **36**D exemplarily shows a condition when the spring module shown in FIG. **36**C is compressed and stored in a storage box.
(141) FIG. **36**E exemplarily shows a condition when a plurality of the storage boxes shown in FIG. **36**D are stacked together.
(142) FIG. **37** exemplarily shows a perspective view of a spring module according to yet another preferred embodiment of the present disclosure.
(143) FIGS. **38**A and **38**B exemplarily show a stereoscopic exploded view and a stereoscopic sectional view of a spring module (spring bag) according to yet another preferred embodiment of the present disclosure, respectively.
(144) FIGS. **39**A and **39**B exemplarily illustrate conditions when the spring bag shown in FIGS. **38**A and **38**B are fixed on the base in different fixing ways, respectively.
(145) FIG. **39**C exemplarily shows a condition when a plurality of the spring modules shown in FIG. **39**A or **39**B are nested together.
(146) FIGS. **40**A to **40**C exemplarily show different embodiments of non-conical springs that can be used in the spring module of the present disclosure.
(147) FIG. **40**D exemplarily shows a spring module having the spring shown in FIG. **40**B.
(148) FIG. **40**E exemplarily shows a different embodiment of a conical spring that can be used in the spring module of the present disclosure.
(149) FIG. **40**F exemplarily shows a spring module having the conical spring shown in FIG. **40**E.
(150) FIG. **40**G exemplarily shows a different embodiment of a conical spring that can be used in the spring module of the present disclosure.
(151) FIG. **40**H exemplarily shows a spring module having the conical spring shown in FIG. **40**G.
(152) FIG. **41**A exemplarily shows a spring cushion according to yet another preferred embodiment of the present disclosure.

(153) FIG. **41**B exemplarily shows a spring cushion according to yet another preferred embodiment of the present disclosure.
(154) FIG. **41**C exemplarily shows a sponge pad in the spring cushion shown in FIG. **41**B.
(155) FIG. **41**D exemplarily shows a spring cushion according to yet another preferred embodiment of the present disclosure.
(156) FIG. **42**A exemplarily shows a fixing net assembly for a spring cushion according to yet another preferred embodiment of the present disclosure.
(157) FIG. **42**B exemplarily shows a partial sectional view of the fixing net assembly shown in FIG. **42**A.
(158) FIG. **42**C exemplarily shows an exploded view of a fixing net assembly for a spring cushion according to yet another preferred embodiment of the present disclosure.
(159) FIGS. **42**D to **42**G exemplarily show partial cross-sectional views of the fixing net assembly shown in FIG. **42**C.
(160) FIG. **42**H exemplarily shows a spring cushion according to yet another preferred embodiment of the present disclosure.
(161) FIG. **42**I exemplarily shows a sectional view of the spring cushion shown in FIG. **42**H.
(162) FIG. **42**J exemplarily shows a spring cushion according to yet another preferred embodiment of the present disclosure.
(163) FIG. **42**K exemplarily shows a sectional view of the spring cushion shown in FIG. **42**J.
(164) FIG. **42**L exemplarily shows a spring pad in the spring cushions shown in FIGS. **42**H and **42**J.
(165) FIG. **42**M exemplarily shows a partial sectional view of the spring pad shown in FIG. **42**L.
(166) FIG. **42**N exemplarily shows a spring cushion according to yet another preferred embodiment of the present disclosure.
(167) FIG. **42**O exemplarily shows a spring cushion according to yet another preferred embodiment of the present disclosure.
(168) FIG. **42**P exemplarily shows a retracted state of the spring cushion shown in FIG. **42**O.
(169) FIG. **43**A exemplarily shows a spring cushion according to yet another preferred embodiment of the present disclosure.
(170) FIG. **43**B exemplarily shows a spring cushion according to yet another preferred embodiment of the present disclosure.
(171) FIG. **43**C exemplarily shows an outer cover having compartments in the spring cushions shown in FIGS. **43**A and **43**B.
(172) FIG. **43**D exemplarily shows a base cloth in the spring cushions shown in FIGS. **43**A and **43**B, wherein curtains of the base cloth is in an open state.
(173) FIG. **43**E exemplarily shows the base cloth in the spring cushion shown in FIGS. **43**A and **43**B, wherein the curtains of the base cloth is in a closed state.
(174) FIGS. **43**F to **43**H exemplarily show outer covers having compartments of different shapes/sizes according to different embodiments of the present disclosure.
(175) FIG. **43**I exemplarily shows an outer cover having honeycomb-shaped (hexagonal) compartments according to a preferred embodiment of the present disclosure.
(176) FIGS. **44**A to **44**E exemplarily show sponge blocks according to different embodiments of the present disclosure.
(177) FIG. **45**A exemplarily shows a sponge block according to a preferred embodiment of the present disclosure.
(178) FIG. **45**B exemplarily shows the sponge block shown in FIG. **45**A in a folded/compressed state.
(179) FIG. **45**C exemplarily shows that the sponge block in a folded/compressed state is received in a storage cup.
(180) FIG. **46**A exemplarily shows a condition when a plurality of the sponge blocks shown in

FIG. **45**A are received in an elongated storage bag.
(181) FIGS. **46**B and **46**C exemplarily illustrate packaging methods of the elongated storage bag receiving a plurality of the sponge blocks shown in FIG. **46**A, respectively.
(182) FIGS. **47**A to **47**C exemplarily show yet another packaging method of the sponge block according to the present disclosure.
(183) FIGS. **48**A to **48**F exemplarily show a sponge block storage box and a sponge block receiving method according to a preferred embodiment of the present disclosure.
(184) FIGS. **49**A and **49**B exemplarily show an outer cover for a spring cushion according to a preferred embodiment of the present disclosure.
(185) FIGS. **50**A and **50**B exemplarily show an outer cover for a spring cushion according to another preferred embodiment of the present disclosure.
(186) FIGS. **51**A to **51**C exemplarily illustrate components of different parts of the outer covers shown in FIGS. **49**A and **49**B as well as FIGS. **50**A and **50**B, respectively.
DETAILED DESCRIPTION OF EMBODIMENTS
(187) The spring module and the spring cushion of the present disclosure will be described in detail below with reference to the accompanying drawings. What are described herein are only preferred embodiments according to the present disclosure, and those skilled in the art can think of other ways to achieve the present disclosure on the basis of the preferred embodiments, which also fall within the scope of the present disclosure.
(188) FIGS. **1**A to **1**F exemplarily show a spring module **100** according to a first preferred embodiment of the present disclosure. As shown in the figures, the spring module **100** comprises a spring bracket **120** and a conical spring **110** provided in the spring bracket **120**. The spring bracket **120** is used for removably mounting the spring module **100** to a foldable mounting rack. The spring bracket **120** comprises a base **121**, an end cover **122** and a plurality of flexible straps **123**, in a preferred embodiment, the number of the flexible straps **123** is four, and the flexible straps **123** are uniformly distributed around the periphery of the spring bracket **120**. Of course, the number of the flexible straps **123** may also be two, six or other numbers. The base **121** has a spring mounting seat, the center of which is provided with an opening **1211** and a spring fixing part for fixing the conical spring **110**, the base **121** further optionally comprises an module mounting part for removably mounting the spring module to the mounting rack, the large-diameter end of the conical spring **110** is fixed to the spring fixing part, and the small-diameter end of the conical spring **110** abuts against the end cover **122**. In various embodiments of the present disclosure, the spring fixing part may be a hook part or a recess, and in the present embodiment, the spring fixing part is configured as a plurality of hook parts **1212** uniformly arranged around the inner circumference of the opening **1211**. The flexible straps **123** are provided outside the conical spring **110**, and two ends of each flexible strap **123** are fixedly connected to the base **121** and the end cover **122**, respectively. When the spring **110** is installed in the spring bracket **120**, it can have a predetermined initial pressure, such that the spring module has a desired stiffness. With the support of the spring, the spring module **100** is substantially frustoconical.
(189) Preferably, the spring bracket **120** is a one-piece spring bracket formed integrally, however, of course, it can also be an assembly assembled from a plurality of components.
(190) As mentioned above, the spring bracket **120** is substantially frustoconical, which enables the end cover **122** of the spring module **100** to enter into the interior of another spring module through the opening **1211** of the base **121** of the other spring module, thus forming nesting, as shown in FIG. **6**.
(191) In order to form a more stable nesting, preferably, the top of the base **121** is provided with an annular wall extending around the opening **1211**, and the outside surface of the annular wall is provided with threads **124** (as shown in FIG. **7**A), when a plurality of spring modules **100** are nested, the bottom wall of the slideway **1213** of one spring module **100** can enter between the threads **124** and the top of the base **121** of another spring module **100** by rotation, thus forming a

stable nesting (as shown in FIG. **7**B). Alternatively or additionally, the outer periphery of the base **121** is provided with one or more snap parts **125** extending upward, and one or more snap notches **126** located below the snap parts **125** (as shown in FIG. **7**C), then when a plurality of spring modules **100** are nested, the snap parts **125** of the lower spring module can be snapped into the corresponding snap notches **126** of the upper spring module, thus forming a stable nesting (as shown in FIGS. **7**D and **7**E).

(192) Preferably, the module mounting part is configured as two slideways **1213** arranged in parallel at the bottom of the base **121**, and the base **121** can be slidably mounted onto the slide rails of the foldable mounting rack, and the slideways **1213** are configured to be hook parts which can be hooked onto the slide rails of the mounting rack in order to prevent the spring module **100** from being separated from the mounting rack.

(193) Preferably, the opening **1211** is a circular opening, and the middle part of each slideway **1213** is formed with an arc part matching the circular radian of the opening **1211**, such as part A in FIG. **1**F, so as not to hinder the superposition and nesting of a plurality of spring modules. Alternatively, each slideway **1213** may be configured as segmented slideways which are discontinuous in-between.

(194) FIGS. **2** and **3**A-**3**D exemplarily show a mounting rack **400** according to a first preferred embodiment of the present disclosure. As shown in the figures, the mounting rack **400** comprises two side frames **410** located at both lateral sides of the mounting rack **400**, a plurality of intermediate frames **420** located between the two side frames **410**, and a plurality of connectors **430** rotatably connecting the side frames **410** and the intermediate frames **420** with each other. Since the side frames **410** and the intermediate frames **420** can rotate around the connectors **430**, the mounting rack **400** is foldable, as shown in FIGS. **3**C and **3**D in which the mounting rack **400** is in a folded state.

(195) Preferably, the side frames **410**, the intermediate frames **420** and the connectors **430** are all formed of metal, more preferably, the side frames **410** and the intermediate frames **420** are made of steel bars by bending and welding while the connectors **430** are made of metal sheets by winding. And as shown in FIG. **2**, both the side frames **410** and the intermediate frames **420** are closed frames.

(196) As shown in FIG. **2**, the side frame **410** has a longitudinal extending part **411** extending along its length and a plurality of transverse protruding parts **412** perpendicular to the longitudinal extending part and extending to one side, the intermediate frame **420** has a longitudinal extending part **421** extending along its length and a plurality of transverse protruding parts **422** perpendicular to the longitudinal extending part and extending to both lateral sides, and the connectors **430** rotatably connect the corresponding transverse protruding parts of two adjacent frames together, such that the mounting rack **400** is foldable.

(197) As described above, the steel bars at the longitudinal extending parts **411** is configured to be slidably engaged with the slideways **1213** of the base **121**, so that the base **121** of the spring module **100** can be slidably mounted onto the mounting rack **400** along the longitudinal extending parts **411**, **421** of the mounting rack **400**. That is, the longitudinal extending parts **411**, **421** can serve as slide rails cooperating with the slideways **1213** of the base **121**. Preferably, the middle portions **413**, **423** of the steel bars at the longitudinal ends of the side frames **410** and the intermediate frames **420** protrude in a direction perpendicular to the plane of the longitudinal extending parts and the transverse protruding parts (downward direction shown in the figure), so that the slideways of the spring module can slide through the ends of the frames and further along the longitudinal extending parts **411**, **421**.

(198) In a preferred embodiment according to the present disclosure, there may be two types of side frames and two types of intermediate frames with different lengths, in order to facilitate the folding of the mounting rack. For example, the side frame **410** may comprise a first side frame **410**A having a longer length and a second side frame **410**B having a shorter length, and the

intermediate frame **420** may comprise a plurality of first intermediate frames **420**A and a plurality of second intermediate frames **420**B spaced apart from each other, and wherein, similarly, the longitudinal length of the first intermediate frames **420**A are slightly greater than that of the second intermediate frames **420**B. The purpose of arranging frame members with different lengths is that, when folding, the protrusions **413**, **423** at the ends of adjacent frame members can readily realize folding without interfering with each other. FIGS. **3**C and **3**D show the folded state of the frame **400** with frame members having different lengths, in which the ends A of the longer frame members and the ends B of the shorter frame members are staggered from each other without interference.

(199) FIGS. **4**A-**4**D exemplarily show that the spring modules **100** according to the first preferred embodiment of the present disclosure are mounted onto the mounting rack **400** according to the first preferred embodiment of the present disclosure. As shown in the figures, the slideways **1213** of the spring module **100** can be slidably mounted onto the longitudinal extending parts **411**, **421** of the frame members at the notches formed by the protrusions **413**, **423**.

(200) FIGS. **5**A-**5**E exemplarily show a spring module **200** according to a second preferred embodiment of the present disclosure and its installation on the mounting rack **400**. As shown in the figures, the spring module **200** comprises a spring bracket **220** and a conical spring **110** provided in the spring bracket **220**. The spring bracket **220** is used to removably mount the spring module **200** to the mounting rack **400** which is foldable. The spring bracket **220** comprises a base **221**, an end cover **222** and a plurality of flexible straps **223**. In a preferred embodiment, the number of the flexible straps **223** is four, and the flexible straps **223** are uniformly distributed around the periphery of the spring bracket **220**. The base **221** comprises a spring mounting seat, the center of the spring mounting seat is provided with an opening **2211**, and a spring fixing part for fixing the conical spring **110**, and the base **221** further comprises a module mounting part for detachably mounting the spring module onto the mounting rack, the large-diameter end of the conical spring **110** is fixed to the spring fixing part while the small-diameter end of the conical spring **110** abuts against the end cover **222**. In this preferred embodiment, the spring fixing part is configured as a plurality of hook parts **2212** uniformly arranged around the inner circumference of the opening **2211**. The flexible straps **223** are provided outside the conical spring **110**, and two ends of each flexible strap **223** are fixedly connected to the base **221** and the end cover **222**, respectively. When the spring **110** is installed in the spring bracket **220**, it can have a predetermined initial pressure, such that the spring module has a desired stiffness. With the support of the spring, the spring module **200** is substantially frustoconical. Different from the spring bracket **120**, the center of the end cover **222** of the spring bracket **220** has a circular opening **224**, that is, the end cover **222** is an annular end cover.

(201) Preferably, the spring bracket **220** is a one-piece spring bracket formed integrally, although of course, it can also be an assembly assembled from a plurality of components.

(202) As described above, the spring bracket **220** is substantially frustoconical, which enables the end cover **222** of the spring module **200** to enter into the interior of another spring module through the opening **2211** of the base **221** of the other spring module, thus forming nesting. In order to form more stable nesting, the threads and the snap structures of the base **121** of the spring module **100** can similarly be applied to the base **221** of the spring module **200**.

(203) Preferably, the module mounting part of the spring module **200** is configured as two slideways **2213** parallel with each other arranged at the bottom of the base **121**, unlike the inward slideways **1213** with the directions of the openings facing with each other, the slideways **2213** are outward slideways with the directions of the openings facing away from each other. The base **221** can be slidably mounted onto the slide rails of the mounting rack **400**, i.e., the longitudinal extending parts **411**, **421** of the frame members, through the slideways **2213**. In the present embodiment, as shown in FIG. **5**D, each slideway **1213** may be configured as segmented slideways which are discontinuous in-between. Moreover, similar to the slideway **1213**, the slideway **2213** is

a hook part, which can be hooked onto the slide rail of the mounting rack in order to prevent the spring module **200** from being disengaged from the mounting rack.

(204) FIGS. **5**E-**5**G exemplarily illustrate a flexible connecting piece structure that may be applied to the spring module **200**, which may be used to form a connecting relationship between a plurality of spring modules mounted on the mounting rack, such that a single spring module is not easy to flip and fall over, and the springs of the plurality of spring modules are not easy to wind together. As shown in the figures, a flexible connecting piece **225** may be integrally formed on the outer side of the flexible strap **223**, when the plurality of spring modules **200** are mounted onto the mounting rack, the flexible connecting piece **225** of one spring module can be detachably connected with the corresponding flexible connecting piece **225** of an adjacent spring module. Preferably, the flexible connecting piece **225** comprises a neck part **2251** and a T-shaped groove **2252**, and the neck **2251** as well as the T-shaped groove **2252** are such designed that one of two adjacent flexible connecting pieces can be detachably locked in the T-shaped groove **2252** of the other flexible connecting piece through the neck **2251**. More preferably, the vertical distance between the flexible connecting piece **225** and the end cover **222** is about ⅓ of the overall height of the spring module **200**.

(205) FIG. **5**H exemplarily shows that a plurality of spring modules **200** mounted on the mounting rack are connected with each other via flexible connecting pieces **225**.

(206) Those skilled in the art will know that the above-mentioned flexible connecting piece structure may also be applied to flexible straps of spring modules in other preferred embodiments of the present disclosure, such as the spring module **100** and the spring module **300** to be described below.

(207) FIGS. **8** and **9**A-**9**D exemplarily illustrate a foldable mounting rack **500** according to a second preferred embodiment of the present disclosure. As shown in the figures, the mounting rack **500** comprises a plurality of longitudinally extending section bars **510** and a plurality of flexible connectors **520** positioned between the plurality of longitudinal section bars and configured to connect them together, a middle portion **522** of the flexible connector **520** is thin and can be bent to form a flexible hinge. Both the longitudinal section bar **510** and the flexible connector **520** may be made of plastic, and the longitudinal section bar **510** may be a plastic part formed by extrusion. As shown clearly in FIGS. **9**A and **9**B, the middle portion of the longitudinal section bar **510** is provided with two T-shaped grooves **511** with downward openings, and the top of the flexible connector **520** is provided with T-shaped projections **521** matching the shapes of the T-shaped grooves **511**, and the T-shaped grooves **511** can slidably accommodate the T-shaped projections **521**, thus enabling the plurality of longitudinal section bars **510** to be connected together through the flexible connectors **520**, as shown in FIG. **9**C.

(208) Since the middle portion **522** of the flexible connector **520** is thin and can be bent, the mounting rack **500** is substantially foldable, and FIG. **9**D shows the mounting rack **500** in a folded state.

(209) As shown in FIGS. **9**A and **9**B, the longitudinal section bar **510** comprises a pair of first transverse projections **512** extending transversely and a pair of second transverse projections **513** provided above which, the distance between the pairs of first transverse projections **512** is greater than the distance between the pairs of second transverse projections **513**.

(210) FIGS. **10**A to **10**D exemplarily illustrate a spring module **300** according to a third preferred embodiment of the present disclosure. As shown in the figures, similar to the spring modules **100**, **200**, the spring module **300** comprises a spring bracket **320** and a conical spring **110** provided in the spring bracket **320**. The spring bracket **320** is used to removably mount the spring module **300** onto the foldable mounting rack **500**. The spring bracket **320** comprises a base **321**, an end cover **322** and a plurality of flexible straps **323**. In a preferred embodiment, the number of the flexible straps **323** is four, and the flexible straps **323** are uniformly distributed around the periphery of the spring bracket **320**. The base **321** comprises a spring mounting seat, the center of which is provided with an opening **3211** at the center and a spring fixing part for fixing the conical spring **110**, and the

base **321** further comprises a module mounting part for removably mounting the spring module onto the mounting rack, the large-diameter end of the conical spring **110** is fixed to the spring fixing part while the small-diameter end of the conical spring **110** abuts against the end cover **322**. In this preferred embodiment, the spring fixing part is configured to be an annular groove **3212** formed around the inner circumference of the opening **3211**. The flexible straps **323** are provided outside the conical spring **110**, and two ends of each flexible strap **323** are fixedly connected to the base **321** and the end cover **322**, respectively. When the spring **110** is installed in the spring bracket **320**, it may have a predetermined initial pressure, such that the spring module has a desired stiffness. With the support of the spring, the spring module **300** is substantially frustoconical.

(211) As described above, the spring bracket **320** is substantially frustoconical, which enables the end cover **322** of the spring module **300** to enter into the interior of another spring module through the opening **3211** of the base **321** of the other spring module, thus forming nesting. In order to form a more stable nesting, the segmented threads and the snap structure of the bases **121**, **221** of the spring modules **100**, **200** may also be applied to the base **321** of the spring module **300**.

(212) Preferably, the module mounting part of the spring module **300** comprises two slideways **327** parallel with each other arranged at the bottom of the base **321**, through which the base **321** can be slidably mounted onto the slide rails of the mounting rack **500**, i.e., the first transverse projections **512** of the longitudinal section bar **510**. The slideways **327** at the bottom of the base **321** may be slidably cooperated with the first transverse projections **512**, such that the spring module **300** may be mounted onto the mounting rack **500** through the base **321**, as shown in FIG. **11**A. Alternatively or additionally, the module mounting part of the spring module further comprises two slideways **328** arranged parallel to each other at the top of the end cover **322**, which may be slidably cooperated with the slide rails of the longitudinal section bar **510**, i.e., the second transverse projections **513**, so that the spring module **300** may be mounted onto the mounting rack **500** through the end cover **322**, as shown in FIG. **11**B.

(213) Different from the spring modules **100** and **200**, the spring bracket **320** of the spring module **300** is a two-piece spring bracket, which is removably assembled from a first half **320**A as shown in FIG. **10**C and a second half **320**B as shown in FIG. **10**D through a snap device such as a plug **325** and a socket **326**. The first half **320**A and the second half **320**B respectively comprise one or more complete flexible straps **323**, part of the base **321** and part of the end cover **322**, and the first half **320**A as well as the second half **320**B are integrally formed. Preferably, the first half **320**A and the second half **320**B respectively comprise two complete flexible straps **323**, a half base **321** and a half end cover **322**.

(214) FIGS. **12**A to **12**D exemplarily show a spring module **700** according to a fourth preferred embodiment of the present disclosure. As shown in the figures, the spring module **700** comprises a spring bracket **720**, and a conical spring **110** provided in the spring bracket **720**. The spring bracket **720** is used to detachably mount the spring module **700** onto the foldable mounting rack. The spring bracket **720** comprises a base **721**, an end cover **722** and a plurality of flexible straps **723**. In a preferred embodiment, the number of the flexible straps **723** is four, and the flexible straps **723** are uniformly distributed around the periphery of the spring bracket **720**. The base **721** comprises a spring mounting seat, the center of which is provided with a circular opening **7211** and a spring fixing part **7212** for fixing the conical spring **110**, and the base **721** further comprises a module mounting part **7213** for removably mounting the spring module onto the mounting rack, the large-diameter end of the conical spring **110** is fixed to the spring fixing part **7212** while the small-diameter end of the conical spring **110** abuts against the end cover **722**. In various embodiments of the present disclosure, the spring fixing part may be a hook part or a groove. In the present embodiment, the spring fixing part is a groove **7212** arranged around the inner circumference of the circular opening **7211**. The flexible straps **723** are provided outside the conical spring **110**, and two ends of each flexible strap **723** are fixedly connected to the base **721** and the end cover **722**, respectively. When the spring **110** is installed in the spring bracket **720**, it may have a

predetermined initial pressure, such that the spring module has a desired stiffness. With the support of the spring, the spring module **700** is substantially frustoconical.

(215) As mentioned above, the spring bracket **720** is substantially frustoconical, which enables the end cover **722** of the spring module **700** to enter into the interior of another spring module through the circular opening **7211** of the base **721** of the other spring module, thus forming nesting.

(216) Preferably, the spring bracket **720** is a one-piece spring bracket formed integrally, as shown in FIGS. **12**A-**12**D, the base **721** of the spring bracket **720** is configured as four parts splicing together, namely a first part **721**A, a second part **721**B, a third part **721**C and a fourth part **721**D, wherein the second part **721**B is arranged parallel to and opposite to the first part **721**A, the third part **721**C is arranged adjacent to the first part **721**A and is transversely to the first part **721**A, and the fourth part **721**D is arranged parallel to and opposite to the third part **721**C, and further adjacent to the first part **721**A as well as the second part **721**B. At least one flexible strap **723** is fixedly connected at the top surface of each of said four parts, and the four parts may be detachably butted mutually through a locking device **7216** to form the base **721**.

(217) Preferably, the module mounting part **7213** is configured as two slideways **7213** parallel with each other formed at the outer sides of the third part **721**C and the fourth part **721**D of the base **721**, such that the base **721** may be slidably assembled onto the mounting rack **600** through the sliding fit between the slideways **7213** and the slide rails **611** of the mounting rack **600** (which will be described below), that is, the spring module **700** may be assembled onto the mounting rack with its thick end down. In addition, the top surface of the end cover **722** is further provided with two second slideways **7221** parallel to the slideways **7213**, so that the end cover **722** may be slidably assembled onto the mounting rack **600** through the sliding fit between the slideways **7221** and the sliding rails **621** of the mounting rack **600**, that is, the spring module **700** may be assembled onto the mounting rack **600** with its thin end down.

(218) Preferably, in order to enable the relative positions among a plurality of spring modules **700** to be more stable and not easy to be dislocated, flexible connecting belts **7214** are respectively arranged at both sides of the ends of the slideways **7213** positioned at the outer sides of the third part **721**C and the fourth part **721**D of the base **721**, the ends of the flexible connecting belts **7214** are provided with holes, and on the top surface of the end cover **722**, two projections **7222** are respectively provided outside each slideway **7221**. When a plurality of spring modules **700** are mounted onto the mounting rack **600**, the plurality of spring modules **700** may be mounted onto the mounting rack **600** with the thick end down and the thin end down successively at intervals in order to take full advantage of space. The flexible connecting belts **7214** of one spring module **700** mounted onto the mounting rack **600** through the end cover **722** (with the thin end down) may be snapped to the projections **7222** of another adjacent spring module **700** mounted onto the mounting rack **600** through the base **721** (with the thick end down), thereby enabling the relative positions among the plurality of spring modules **700** to be more stable.

(219) More preferably, in order to further enable the relative positions among the spring modules **700** assembled in the same orientation to be more stable and prevent them from being dislocated, at least one cylindrical pin **7215** (two in the figures) is arranged at the outer side of the first part **721**A of the base **721**, and at least one receiving hole **7217** (two in the figures) is arranged at the corresponding position of the outer side of the second part **721**B of the base **721**. When the plurality of spring modules **700** are mounted onto the mounting rack **600** in rows, the cylindrical pin **7215** of one spring module **700** may be inserted into the corresponding receiving hole **7217** of the adjacent spring module **700** so as to assist alignment and fixation.

(220) FIGS. **13**A to **13**D exemplarily show a foldable mounting rack **600** according to a third preferred embodiment of the present disclosure. As shown in the figures, the mounting rack **600** comprises a plurality of longitudinally extending first section bars **610** and a plurality of longitudinally extending second section bars **620**, wherein the first section bar **610** comprises a longitudinally extending flat body and longitudinally extending slide rails **611** on both transverse

sides of the flat body, and the second section bar **620** comprises a longitudinally extending flat body and a longitudinally extending slide rail **621** located in the middle of the top surface of the flat body. The first section bars **610** and the second section bars **620** are arranged at intervals along the transverse direction and connected together through a plurality of flexible connectors, which can be bent thus allowing the mounting rack **600** to be foldable.

(221) Furthermore, the base **721** of the spring module **700** may be slidably mounted onto the mounting rack **600** through the sliding fit between the slideways **7213** and the slide rails **611**, and the end cover **722** of the spring module **700** may be slidably mounted onto the mounting rack **600** through the sliding fit between the slideways **7221** and the slide rails **621**. The longitudinal section bars **610**, **620** as well as the flexible connectors may all be made of plastic, and the longitudinal section bars **610**, **620** may be plastic parts formed by extrusion. As clearly shown in FIG. **13**D, the cross-sectional shape of the slide rails **621** is substantially inverted trapezoidal, and the shape of the gap between two slide rails **7221** corresponds to the cross-sectional shape of the slide rails **621**, such that the spring module **700** mounted with the thin end down is impossible to move in the direction perpendicular to the mounting rack **600**. Similarly, the slide rail **611** is a hook part, which prevents the spring module **700** mounted with the thick end down from moving in the direction perpendicular to the mounting rack **600**.

(222) The spring module described in the above embodiments only comprises a single conical spring, and the spring module according to the present disclosure may also comprise a plurality of conical springs, in this way, the assembly and disassembly times of the spring modules in the spring cushion may be reduced.

(223) FIGS. **14**A to **14**E exemplarily show a spring module **5000** according to a fifth preferred embodiment of the present disclosure. As shown in the figures, the spring module **5000** comprises a spring bracket **5220** and three conical springs **110** arranged in rows in the spring bracket **5220**. The spring bracket **5220** may be used to detachably mount the spring module **5000** onto the mounting rack of the spring cushion. The spring bracket **5220** comprises a common base **5221**, a plurality of end covers **5222** and a plurality of flexible straps **5223**, wherein two ends of each flexible strap **5223** are fixedly connected to the base **5221** and a corresponding end cover **5222**, respectively, in a preferred embodiment, each end cover **5222** is connected with four flexible straps **5223** which are uniformly distributed around the outer side of the corresponding conical spring **110**. The base **5221** comprises three spring mounting seats, each of which has a spring fixing part **52212** for fixing the conical spring **110**, and a module mounting part **52213** for removably mounting the spring module onto the mounting rack. Each end cover **5222** together with the plurality of flexible straps **5223** connected thereto are configured as substantially frustoconical as a whole, and the internal shape of which matches the shape of the conical spring **110**. Each end cover **5222** forms a frustoconical-shaped small-diameter end, and the corresponding spring mounting seats of the base **5221** form a plurality of frustoconical-shaped large-diameter ends, the base **5221** has an opening **52211** at the central position of each large-diameter end, such that a plurality of end covers **5222** as well as most or all flexible straps **5223** of another spring module **5000** may enter into the interior of said spring module **5000** via the corresponding openings **52211** thus forming nesting. The large-diameter end of the conical spring **110** is fixed to the spring fixing part **52212** of the corresponding spring mounting seat while the small-diameter end of the conical spring **110** abuts against the end cover **5222**. In this preferred embodiment, the spring fixing part **52212** is configured as a plurality of hook parts **52212** uniformly arranged around the inner circumference of the opening **52211**. The flexible straps **5223** are arranged outside the conical spring **110**, and two ends of each flexible strap **5223** are fixedly connected to the base **5221** and the corresponding end cover **5222**, respectively. When the spring **110** is installed in the spring bracket **5220**, it may be provided with a predetermined initial pressure, such that the spring module has a desired stiffness. The center of the end cover **5222** of the spring bracket **5220** may be provided with a circular opening **5224**, that is, the end cover **5222** may be an annular end cover.

(224) Preferably, the spring bracket **5220** is a one-piece spring bracket formed integrally.
(225) As described above, the spring bracket **5220** presents a plurality of substantially frustoconical shapes, which enables the end covers **5222** of the spring module **5000** to enter into the interior of another spring module through the openings **52211** of the base **5221** of the other spring module thus forming nesting, as shown in FIG. **15**.
(226) Preferably, the module mounting part of the spring module **5000** is configured as one or more pairs of parallel slideways **52213** arranged at the bottom surface of the base **5221**. In the embodiment shown in FIGS. **14**A-**14**E, the opening directions of the pair of slideways **52213** face with each other, as an alternative embodiment, the opening directions of each pair of slideways **52213** may also face away from each other. The base **5221** may be slidably mounted onto the mounting rack of the spring cushion through the slideways **52213**. In the present embodiment, as shown in FIG. **14**C, each slideway **52213** may be configured as segmented slideways which are discontinuous in-between, corresponding to the number of the conical springs **110** and the openings **52211** along the extending direction of the slideway **52213**, in the present embodiment, each slideway **52213** comprises four segments **52213**A, **52213**B, **52213**C and **52213**D, and the purpose of segmentation is to prevent the slideways **52213** from interfering with the openings **52211**, and further to reduce the size of the base **5221**. The slideways **52213** are hook parts, which are configured to be hooked onto the slide rails of the mounting rack so as to prevent the spring module **5000** from being separating from the mounting rack.
(227) FIG. **16** exemplarily shows a condition when the spring modules **5000** having a plurality of conical springs **110** are mounted onto a mounting rack of a spring cushion.
(228) FIGS. **17**A-**17**E exemplarily show a spring module **6000** according to a sixth preferred embodiment of the present disclosure. As shown in the figures, the spring module **6000** comprises a spring bracket **6220** and four conical springs **110** distributed in an array manner arranged in the spring bracket **6220**. The spring bracket **6220** may be used to removably mount the spring module **6000** onto the mounting rack of the spring cushion. The spring bracket **6220** comprises a common base **6221**, a plurality of end covers **6222** and a plurality of flexible straps **6223**, wherein two ends of each flexible strap **6223** are fixedly connected to the base **6221** and a corresponding end cover **6222**, respectively. In a preferred embodiment, each end cover **6222** is connected with four flexible straps **6223** which are uniformly distributed around the outer side of the corresponding conical spring **110**. The base **6221** has four spring mounting seats, each of which has a spring fixing part **62212** for fixing the conical spring **110**, and a module mounting part **62213** for removably mounting the spring module onto the mounting rack. Each end cover **6222** and the plurality of flexible straps **6223** connected thereto are configured as substantially frustoconical as a whole, and the internal shape of which matches the shape of the conical spring **110**. Each end cover **6222** forms a frustoconical-shaped small-diameter end, and the corresponding spring mounting seats of the base **6221** form a plurality of frustoconical-shaped large-diameter ends, the base **6221** has an opening **62211** at the central position of each large-diameter end, such that a plurality of end covers **6222** as well as most or all flexible straps **6223** of another spring module **6000** may enter into the interior of said spring module **6000** via the corresponding openings **62211** thus forming nesting. The large-diameter end of the conical spring **110** is fixed to the spring fixing part **62212** while the small-diameter end of the conical spring **110** abuts against the end cover **6222**. In this preferred embodiment, the spring fixing part **62212** is composed of a plurality of hook parts **62212** uniformly arranged around the inner circumference of the opening **62211**. The flexible straps **6223** are located outside the conical spring **110**, and two ends of each flexible strap **6223** are fixedly connected to the base **6221** and the corresponding end cover **6222**, respectively. When the spring **110** is installed in the spring bracket **6220**, it may be provided with a predetermined initial pressure, such that the spring module has a desired stiffness. The center of the end cover **6222** of the spring bracket **6220** may be provided with a circular opening **6224**, that is, the end cover **6222** may be an annular end cover.

(229) Preferably, the spring bracket **6220** is a one-piece spring bracket formed integrally.
(230) As described above, the spring bracket **6220** is substantially frustoconical, which enables the end covers **6222** of the spring module **6000** to enter into the interior of another spring module through the openings **62211** of the base **6221** of the other spring module thus forming nesting, as shown in FIG. **18**.
(231) Preferably, the module mounting part of the spring module **6000** is composed of one or more pairs of parallel slideways **62213** arranged at the bottom surface of the base **6221**. In the embodiment shown in FIGS. **17**A-**17**E, the opening directions of two pairs of slideways **62213** face away from each other, as an alternative embodiment, the opening directions of each pair of slideways **62213** may also face with each other. The base **6221** may be slidably mounted onto the mounting rack of the spring cushion through the slideways **62213**. In the present embodiment, as shown in FIG. **17**C, each slideway **62213** may be composed of segmented slideways which are discontinuous in-between and corresponding to the number of the conical springs **110** and the openings **62211** along the extending direction of the slideways **62213**, in the present embodiment, each slideway **62213** comprises three segments **62213**A, **62213**B and **62213**C, and the purpose of segmentation is to prevent the slideways **62213** from interfering with the openings **62211**, and further to reduce the size of the base **6221**, the slideways **62213** are hook parts, which are configured to be hooked onto the slide rails of the mounting rack so as to prevent the spring module **6000** from being separating from the mounting rack.
(232) FIG. **19** exemplarily shows a condition when the spring modules **6000** having a plurality of conical springs **110** are mounted onto a mounting rack of a spring cushion.
(233) It can be known from the above exemplary embodiments that the spring module according to the present disclosure may comprise any number of a plurality of conical springs, and the plurality of conical springs may be distributed in the spring module in any pattern.
(234) According to a preferred embodiment of the present disclosure, in order to better maintain the spring module in the spring cushion in a proper position, the spring cushion **1000** may further comprise a one-piece fixing net. FIGS. **21**A and **21**B show a one-piece fixing net **1300** according to a first preferred embodiment of the present disclosure, which comprises a plurality of ring parts **1310** with each ring part **1310** such configured that part of the corresponding spring module in the spring cushion can pass therethrough. Preferably, when the one-piece fixing net **1300** is arranged on the spring modules, the vertical distance between the ring part **1310** and the end cover of the spring module is about ⅓ of the overall height of the spring module.
(235) FIGS. **22**A-**22**D show a one-piece fixing net **1400** according to a second preferred embodiment of the present disclosure. As shown in the figures, the one-piece fixing net **1400** is flexible, and a plurality of hook parts **1420** are provided at the edge of which. When the one-piece fixing net **1400** is arranged on the spring modules, the hook parts **1420** are configured to hook on the mounting rack **400**.
(236) Further preferably, the top of the sponge cover **1100** may comprise a plurality of nest structures **1110**, as shown in FIGS. **23**A and **23**B, and the positions of the plurality of nest structures **1110** correspond to the positions of the end covers of each spring module on the foldable mounting rack in the spring cushion, such that the top of each spring module may be accommodated within the corresponding nest structure, thereby restricting the movement of the spring modules in the lateral direction and preventing the spring modules from being dislocated or the adjacent springs from being wound together.
(237) As shown in FIGS. **24**A to **24**B, the spring cushion **1000** according to the present disclosure may further comprise a plurality of filling sponge strips **900**, which are placed on the one-piece fixing net **2300**, and the plurality of filling sponge strips **900** are sized to be filled in the gaps between the spring modules as well as the gaps between the frustocones of each spring module in the spring cushion, so as to prevent the spring modules from shaking and dislocation thus improving the use comfort of the spring cushion. As shown in FIG. **24**C, similar to the one-piece

fixing nets **1300**, **1400**, the one-piece fixing net **2300** comprises a plurality of ring parts **2310** with each ring part **2310** such configured that part of the corresponding spring module in the spring cushion can pass therethrough. Preferably, when the one-piece fixing net **2300** is arranged on the spring modules, the vertical distance between the ring part **2310** and the end cover of the spring module is about ⅓ of the overall height of the spring module.

(238) As shown in FIGS. **25**C and **25**D, the spring cushion **1000** of the present disclosure may comprise a one-piece fixing net **3300**, which comprises a plurality of small ring parts **3320** for restraining the spring module in addition to the ring parts **3310**, and the small ring parts **3320** are respectively located between the ring parts **3310**, and the ring parts **3310** as well as the small ring parts **3320** are arranged at intervals in an array manner, such that when the one-piece fixing net **3300** is arranged on the spring modules, the plurality of small ring parts **3320** are just above the gaps between the spring modules as well as the gaps between the frustocones of each spring module.

(239) Similarly, when the fixing net **3300** is arranged on the spring modules, the vertical distance between the ring part **3310** and the end cover of the spring module is about ⅓ of the overall height of the spring module.

(240) As shown in FIGS. **25**A and **25**B, the spring cushion **1000** of the present disclosure may further comprise a plurality of gap-filling spring modules **800**, which are generally frustoconical, and can be used to fill in the gaps between the spring modules as well as the gaps between the frustoconical shapes of each spring module with the thin end down, so as to prevent the spring modules from shaking and dislocation thus improving the use comfort of the spring cushion. The small-diameter ends of the gap-filling spring modules **800** may be fixed onto the small ring parts **3320** for filling the gaps.

(241) FIG. **25**E exemplarily shows a gap-filling spring module **800** for filling gaps according to a preferred embodiment of the present disclosure. As shown in the figure, the gap-filling spring module **800** comprises a spring bracket **820** and a small conical spring **810** provided in the spring bracket **820**. The spring bracket **820** is used to removably assemble the gap-filling spring module **800** to the one-piece fixing net **3300**. The spring bracket **820** comprises a base **821**, an end cover **822** and a plurality of flexible straps **823**, in a preferred embodiment, the number of the flexible straps **823** is four, and the flexible straps **823** are uniformly distributed around the periphery of the spring bracket **820**. The center of the base **821** comprises a circular opening, and the large-diameter end of the small conical spring **810** is fixed to a spring fixing part of the base **821**, the spring fixing part may be an annular groove extending around the inner circumference of the circular opening of the base **821**. The small-diameter end of the conical spring **810** abuts against the end cover **822**. The flexible straps **823** are located outside the small conical spring **810**, and two ends of each flexible strap **823** are fixedly connected to the base **821** and the end cover **822**, respectively. When the spring **810** is installed in the spring bracket **820**, it may be provided with a predetermined initial pressure, so that the gap-filling spring module **800** may have a desired stiffness. With the support of the spring, the gap-filling spring module **800** has a frustoconical shape as a whole.

(242) Preferably, the spring bracket **820** is a one-piece spring bracket formed integrally, but of course, it may also be an assembly assembled from multiple components.

(243) As described above, the spring bracket **820** is substantially frustoconical, which enables the end cover **822** of the gap-filling spring module **800** to enter into the interior of another gap-filling spring module through the circular opening of the base **821** of the other gap-filling spring module thus forming nesting.

(244) Furthermore, in order to allow the end cover **822** of the gap-filling spring module **800** to be more stably fixed on the small ring part **3320** of the one-piece fixing net **3300**, a plurality of hook parts **8221** extending toward the small-diameter end of the small conical spring **810** may be formed at the outer periphery of the end cover **822**, and the small-diameter end of the gap-filling spring module **800** may be fixed on the small ring part **3320** through the hook parts **8221** so as to fill the

gaps. Preferably, the plurality of hook parts **8221** and the plurality of flexible straps **823** are arranged at intervals along the periphery of the gap-filling spring module **800**. Alternatively, the hook part **8221** may also be configured as an annular hook part extending 360 degrees along the entire periphery of the end cover **822**.

(245) The present disclosure further provides a spring cushion. As shown in FIGS. **20**A-**20**C, a spring cushion **1000** according to a preferred embodiment of the present disclosure may comprise the mounting rack **400**, **500**, **600** as described in the above embodiments, and a plurality of spring modules **100**, **200**, **300**, **700**, **5000**, **6000** mounted on the mounting rack. The spring cushion **1000** may further comprise the sponge cover **1100** sleeved on the plurality of spring modules mounted on the mounting rack, and a cloth cover **1200** sleeved on the sponge cover.

(246) Various spring modules according to various embodiments of the present disclosure may also have other functional parts/components, which will be described in detail below.

(247) FIGS. **26**A and **26**B show a spring module with constraint holes according to a preferred embodiment of the present disclosure, wherein the end cover is provided with a main body part which is substantially planar, and four constraint holes **224***a* uniformly distributed around the center of the end cover may be provided in the main body part, and the constraint holes are configured to receive constraint members (FIG. **27**A) so as to constrain the relative position between four adjacent spring modules. FIGS. **27**A-**27**C exemplarily show a constraint member **10** for constraining the spring module, the constraint member comprises a square main frame and four cylindrical parts **11** located at four corners of the square main frame, as shown in the figures, the square main frame is provided with reinforcing bars **12** extending along the diagonals of which; Each cylindrical part **11** extends from the square main frame toward the same side in the direction perpendicular to the square main frame, and the main frame as well as the cylindrical part are such sized that each cylindrical part **11** may be inserted into the corresponding constraint hole **224***a* in the end covers of four adjacent spring modules. In addition, each cylindrical part **11** has a tapered end for guiding the cylindrical part **11** to be inserted into the constraint hole **224***a*. As shown in FIG. **27**C, an snap-fit part **13** is provided on the outer surface of the cylindrical part **11**, and the snap-fit part **13** is configured to be snap fitted in the constraint hole **224***a*. As shown in FIG. **27**B, the cylindrical part **11** is provided with a central hole **14** in which a groove **15** for receiving the snap-fit part **13** is formed, and the central hole **14** is such sized to receive the tapered end of the cylindrical part **11** of another constraint member **10** so that a plurality of constraint members **10** may be nested with each other, as shown in FIG. **27**D.

(248) FIG. **27**E exemplarily shows a condition when a plurality of the spring modules shown in FIG. **26**A are fixed together through the constraint members **10** shown in FIG. **27**A.

(249) FIGS. **28**A-**28**C show a spring module with a rotary fixing device according to a preferred embodiment of the present disclosure, the rotary fixing device comprises a pair of protrusions **21** and a pair of arc openings **22** provided on the end cover of the spring module in a central symmetrical manner along the circumferential direction, and the protrusions **21** as well as the arc openings **22** are alternately arranged along the circumferential direction of the end cover. Each protrusion **21** comprises a thin base portion **211***a* which is substantially cylindrical, and a thick end **212***a* which is substantially frustoconical. Each arc opening **22** comprises a narrow arc extending portion **221***a*, and a wide end opening portion **222***a* located at one end of the arc opening **22**, that is, the radial dimension of the end opening portion **222***a* is larger than that of the arc extending portion **221***a*. The radial (width) dimension of the opening portion **222***a* is designed to allow the thick end **212***a* of the protrusion **21** to pass therethrough, while the radial (width) dimension of the arc extending portion **221***a* is designed to prevent the thick end **212***a* from passing therethrough, so that when the end covers of two spring modules face with each other, a pair of protrusions **21** of one end cover may pass through a pair of end opening portions **222***a* of the other end cover, at the same time, a pair of protrusions **21** of the other end cover may pass through a pair of end opening portions **222***a* of the one end cover, by rotating the two spring modules along a locking direction,

the base portion **211***a* of each protrusion **21** moves into the arc extending portion **221***a* of which along the corresponding arc opening **22** and is locked into the narrow arc extending portion **221***a* through the thick end **212***a* of each protrusion, thereby fixing the two spring modules together in an end cover-to-end cover manner, as shown in the figures.

(250) FIG. **28**F is a partial enlarged view of FIG. **28**E, showing an optional interlocking device provided on the end cover, which comprises a pair of arc walls **23** and a pair of uprights **24** arranged on the end cover in a central symmetrical manner along the circumferential direction of the end cover, the arc walls **23** and the uprights **24** are alternately arranged mutually along the circumferential direction of the end cover. Corresponding to the interlocking device, the base portions **211***a* of the protrusions **21** of the rotary fixing device of in the height direction of the spring modules are sized to allow the two spring modules to move a certain distance relative to each other along the height direction of the spring modules when fixing together in an end cover-to-end cover manner, the distance is designed to be larger than the dimension of the uprights **24** in the height direction of the spring modules, so that when rotating the two spring modules along the locking direction, the arc walls **23** of one spring module are allowed to pass over the uprights **24** of the other spring module. When the two spring modules are already locked in an end cover-to-end cover manner, the uprights **24** of one spring module engage one end of the arc walls **23** of the other spring module to prevent the two spring modules from rotating relative to each other in an unlocking direction opposite to the locking direction, as shown in FIG. **28**F. When requiring disassembly, the two spring modules may be moved away from each other manually thus disengaging the arc walls **23** from the uprights **24**, and then, the two spring modules may be rotated in the unlocking direction. Preferably, the interlocking devices **23**, **24** are positioned radially outside the rotary fixing device **21**, **22**.

(251) FIGS. **29**A and **29**B show a spring module having locking structures **31**, **32** adapted in shape according to a preferred embodiment of the present disclosure, which are arranged on four sides of the base of the spring module and comprise convex parts **31** extending outward perpendicular to the corresponding sides in the horizontal direction of the base and concave parts **32** extending inward perpendicular to the corresponding sides in the horizontal direction of the base. The convex parts **31** and the concave parts **32** are mutually arranged in alternation on the sides of the base, and the convex parts **31** and the concave parts **32** are shaped to be adapted mutually, so that the convex parts **31** and the concave parts **32** of one spring module may respectively insert into and receive the corresponding concave parts **32** and the corresponding convex parts **31** of another adjacent spring module in the direction perpendicular to the plane of the base, thereby limiting relative movement between adjacent spring modules in the horizontal direction. The convex part **31** comprises a neck and a head positioned at the end of the neck and wider than which. The concave part **32** comprises an opening part and an enlarged concave part positioned inside the opening part and wider than which, and the shapes of the opening part as well as the enlarged concave part are respectively adapted to the neck as well as the head of the convex part, so that the convex part **31** and the concave part **32** of one spring module may respectively insert into and receive the corresponding concave part and the corresponding convex part of another adjacent spring module in the direction perpendicular to the surface of the base.

(252) Preferably, each convex part **31** further comprises a slider **311***a* and an spring member **312***a*. The slider **311***a* is configured to slide outward and inward along the horizontal direction of the base perpendicular to the corresponding side in the convex part **31**, and the outer side of the slider **311***a* is provided with an outwardly protruding tongue part **3111***a*. One end of the spring member **312***a* is fixed on the base while the other end of which is a free end, the spring member **312***a* passes through the slider **311***a* and fixes which between the fixed end and the free end of the spring member **312***a*, the spring member **312***a* is used to apply elasticity to the slider allowing it to slide outward. Two limiting members **313***a*, **314***a* are provided on the base for limiting the movement range of the free end of the spring member **312***a*, wherein the first limiting member **313***a* is used to

limit the free end of the spring member **312***a* in a first position so that the slider is in a retracted position, and the second limiting member **314***a* is used to limit the free end of the spring member **312***a* in a second position so that the slider is in an extended position. A groove **322***a* for accommodating the tongue part **3111***a* of the slider in the extended position is provided in each concave part **32** so as to limit relative movement along the height (vertical) direction between the adjacent spring modules. Preferably, the edges of each concave part **32** on the upper and lower surfaces of the base are further provided with a guiding inclined surface **321***a* for guiding the tongue part **3111***a* into the concave part **32**. FIG. **29**C exemplarily shows a condition when a plurality of spring modules are interlocked together through the interlocking device shown in FIGS. **29**A, **29**B, as can be seen from the figures, the convex parts **31** of each spring module are adapted within the concave parts **32** of the adjacent spring module, and the slider **311***a* is in an extended position so that the tongue part **311***a* is inserted into the groove **322***a*.

(253) FIGS. **30**A and **30**B show a spring module having locking structures **41**, **42** adapted in shape according to another preferred embodiment of the present disclosure, wherein the convex parts **41** and the concave parts **42** are mutually arranged in alternation on four sides of the base. As shown in the figures, the spring module comprises locking structures provided on four sides of the base, and the locking structure comprises a convex part **41** extending outward perpendicular to the corresponding side along the horizontal direction of the base and a concave part **42** extending inward perpendicular to the corresponding side in the horizontal direction of the base. The shape of the convex part **41** and the shape of the concave part **42** are mutually adapted or complementary, so that the convex part **41** of one spring module may be inserted into the concave part **42** of another spring module in the horizontal direction. Preferably, the convex part **41** and the concave part **42** are substantially triangular. Further preferably, a boss **411***a* is provided on the upper surface and/or the lower surface of the convex part **41**, and a through hole **421***a* is provided in the upper wall and/or the lower wall of the concave part **42**, and the boss **411***a* may enter into and exit from the through hole **421***a* of the concave part of another spring module. FIG. **30**C exemplarily shows a condition when a plurality of spring modules are combined together through the locking structures shown in FIGS. **30**A and **30**B, since the locking structure on each side of the base of the spring module is the same, thereby allowing various splicing.

(254) FIG. **30**D shows a spring module having locking structures adapted in shape according to yet another preferred embodiment of the present disclosure. As shown in the figure, the spring module comprises locking structures provided on four sides of the base, the locking structure comprises a convex part **43** extending outward perpendicular to the corresponding side in the horizontal direction of the base, and a concave part **44** extending inward perpendicular to the corresponding side in the horizontal direction of the base, the convex parts **43** and the concave parts **44** are arranged opposite to each other on four sides of the base, for example, one side of the base is provided with a pair of convex parts **43**, and another side of the base opposite to said side is provided with a pair of concave parts **44**, as shown in the figure. The shape of the convex part **43** and the concave part **44** are mutually adapted or complementary, so that the convex part **43** of one spring module may be inserted into the concave part **44** of another spring module in the horizontal direction. Preferably, the convex part **43** and the concave part **44** are substantially triangular. Further preferably, a boss **431***a* is provided on the upper surface and/or the lower surface of the convex part **43**, and a through hole **441***a* is provided in the upper wall and/or the lower wall of the concave part **44**, and the boss **431***a* may enter into and exit from the through hole **441***a* of the concave part of another spring module. FIGS. **30**E and **30**F exemplarily show two conditions when a plurality of spring modules are combined together through the locking structures shown in FIGS. **30**C and **30**D.

(255) FIGS. **31**A and **31**B show a spring module having a T-shaped (or wedge-shaped) connection according to a preferred embodiment of the present disclosure. As shown in the figures, one or more sides of the base of the spring module are provided with a T-shaped (or wedge-shaped)

connection **51** extending along the corresponding side, and the T-shaped connection **51** comprises a first flange **511***a* extending upward along the height direction of the spring module, and a second flange **511***b* extending downward along the height direction of the spring module, when two T-shaped connections **51** of two spring modules are arranged adjacently, the two T-shaped connections **51** may be connected together by a connector **52** (as seen in FIGS. **31**C and **31**F) having a pair of upper flanges **521***a* extending downward as well as a pair of lower flanges **521***b* extending upward, and the connector **52** may slide along the first flange **511***a* as well as the second flange **511***b* so as to pass between two spring modules arranged side by side and connect them together. As shown in FIG. **31**C, the connector **52** comprise: an intermediate wall; a pair of upper flanges **521***a* extending downward as well as a pair of lower flanges **521***b* extending upward positioned at both sides of the intermediate wall which may pass between two adjacently arranged connections **51** of two adjacently arranged spring modules so as to connect the two adjacently arranged spring modules together through the upper flanges **521***a* as well as the lower flanges **521***b*. The upper flange **521***a* and the lower flange **521***b* of the connection **52** on the same side of the intermediate wall form a slideway in which the first flange **511***a* and the second flange **511***b* of the spring module may slide through. Preferably, the slideway may be wedge-shaped, and the first flange **511***a* as well as the second flange **511***b* may form a wedge-shaped shape adapted to the wedge-shaped shape of the slideway. FIG. **31**D exemplarily shows a condition when the spring modules having the T-shaped connections **51** shown in FIGS. **31**A and **31**B are connected in rows through the I-shaped connectors shown in FIG. **31**C.

(256) FIG. **31**E shows a spring module having a T-shaped (or wedge-shaped) connection **51** according to another preferred embodiment of the present disclosure. As shown in the figure, four sides of the base of the spring module with multiple springs (the spring module shown in the figure comprises four springs, which may also comprise any other number of springs, such as three, five, etc.) are all provided with T-shaped connections **51**, and a stop part **511***c* for limiting the I-shaped connector **52** is provided in the middle of the second flange **511***b* in order to prevent the I-shaped connector **52** from sliding further inward.

(257) FIGS. **31**G and **31**H exemplarily show a condition when a plurality of spring modules shown in FIG. **31**E (springs omitted) are connected together through the I-shaped connectors shown in FIG. **31**F, wherein a three-in-one spring module (three springs installed in one one-piece spring bracket) and a four-in-one spring module (four springs installed in one one-piece spring bracket) are shown, those skilled in the art will realize that the spring module may also be a spring module containing other numbers of springs. Any number of spring modules may be spliced together in any way according to actual requirements (such as the size of the spring cushion).

(258) FIGS. **31**L and **31**M exemplarily show spring cushions of different sizes which are made by splicing the spring modules and the I-shaped connectors shown in FIG. **31**E-**31**H, because four sides of the base of the spring module of the present embodiment are all provided with T-shaped (or wedge-shaped) connections **51**, the spring modules arranged adjacently in the transverse and longitudinal directions are connected together through the I-shaped connectors **52**.

(259) FIGS. **31**I and **31**J show a spring module having wedge-shaped (or T-shaped) splicing parts **53**, **54** according to a preferred embodiment of the present disclosure. As shown in the figures, one side of the base is provided with a wedge-shaped (or T-shaped) groove **54**, and the opposite side is provided with a wedge-shaped (or T-shaped) protrusion **55** capable of shape matching with the wedge-shaped (or T-shaped) groove **54**, the other two opposite sides are respectively provided with wedge-shaped protrusions **53**, the wedge-shaped protrusion **55** may slide within the wedge-shaped groove **54** of the base of another spring module so as to connect the two spring modules together, and the wedge-shaped protrusion **53** of one spring module may be connected together with the wedge-shaped protrusion **53** of another spring module by the I-shaped connector **52** shown in FIG. **31**F. Preferably, the two side walls **541***a*, **541***b* forming the wedge-shaped grooves **54** are discontinuous, and the side walls **541***a*, **541***b* are distributed in a staggered manner. FIG. **31**K

exemplarily shows an enlarged sectional view when two spring modules shown in FIGS. **31**I and **31**J are spliced together through the wedge-shaped protrusions **55** and the wedge-shaped grooves **54**.

(260) FIGS. **31**N and **31**O exemplarily show spring cushions of different sizes assembled by the spring modules shown in FIGS. **31**I-**31**K and the I-shaped connectors shown in FIG. **31**F, as shown in the figures, because one pair of opposite sides of the base of the spring module of the present embodiment are respectively provided with the wedge-shaped grooves **54** and the wedge-shaped protrusions **55** which may be matched with each other, and further, the other pair of opposite sides are respectively provided with the T-shaped (or wedge-shaped) connections **53**, transversely (the horizontal direction shown in the figures) adjacent spring modules are connected with each other by the I-shaped connectors **52**, while longitudinally (the vertical direction shown in the figures) adjacent spring modules are connected with each other by their own wedge-shaped grooves **54** and wedge-shaped protrusions **55**.

(261) FIG. **32**A shows a spring module according to a preferred embodiment of the present disclosure in which the base and the end cover may be snapped together so that the spring is compressed therebetween, the volume of the spring module is greatly reduced when the base and the end cover are snapped together, thus convenient for storage and transportation. FIGS. **32**B-**32**D respectively illustrate a perspective view, a top view and a side view of the base of the spring module shown in FIG. **32**A, and FIGS. **32**E, **32**F respectively illustrate a perspective view and a top view of the end cover of the spring module shown in FIG. **32**A. As shown in the figures, the spring module comprises a spring **110***e* and a spring bracket **120***a* capable of holding and fixing the spring, and the spring bracket **120***a* comprises a base **121***a*, an end cover **122***a* and flexible connecting straps **123***a*. The base **121***a* comprises a spring mounting seat having first spring fixing parts **1212***a*, each of which may be configured to fix a first end of the spring **110***e*. The end cover **122***a* comprises a spring mounting seat having second spring fixing parts **1222***a* capable of fixing a second end of the spring. Two ends of each flexible connecting strap **123***a* are fixedly connected to the base **121***a* and the end cover **122***a*, respectively, and are positioned outside each spring **110***e*. A rotary locking assembly is provided on the base **121***a* as well as the end cover **122***a*, and the base is configured to be removably locked together with the end cover through the rotary locking assembly, so that the spring is compressed therebetween. As shown in FIGS. **32**B-**32**F, the rotary locking assembly comprises one or more locking posts **127***a* provided on the outer region of the base **121***a*, and one or more arc openings **128***a* provided on the corresponding outer region of the end cover **122***a*. Each locking post **127***a* comprises a base **1271***a* as well as an end **1272***a* having a larger sectional size than that of the base. Each arc opening **128***a* comprises an arc extending portion **1281***a* and an end opening portion **1282***a* positioned at one end of the arc opening and larger in size than the arc extending portion. The end opening portion **1282***a* of each arc opening **128***a* is sized to allow the thicker end **1272***a* of the corresponding locking post **127***a* to pass therethrough, and the narrower arc extending portion of each arc opening **128***a* is sized not to allow the end **1272***a* of the corresponding locking post **127***a* to pass therethrough, therefore, when compressing the spring and rendering the thick end of each locking post **127***a* to pass through the corresponding end opening portion **1282***a*, by rotating the base **121***a* and the end cover **122***a* along the locking direction, the base **1271***a* of each locking post **127***a* moves along the corresponding arc opening **128***a* into the arc extending portion **1281***a* of which and is locked therein by the end **1272***a*, thereby releasably locking the base and the end cover together. FIGS. **32**G and **32**H schematically respectively show a perspective view and a top view when the base and the end cover of the spring module shown in FIG. **32**A are snapped together. FIG. **32**I exemplarily shows a condition when a plurality of spring modules shown in FIGS. **32**G and **32**H are stacked together, wherein the spring modules are in a compressed configuration. The compressed and locked spring modules may greatly save space for storage and transportation.

(262) FIGS. **32**J and **32**K exemplarily show spring modules with the base and the end cover of

which can be snapped together according to another preferred embodiments of the present disclosure, respectively, wherein the flexible connecting part of the spring module shown in FIG. **32**J is composed of flexible ropes **123***b*, and the flexible connecting part of the spring module shown in FIG. **32**K is a one-piece flexible sleeve **123***c* surrounding the spring with 360 degrees.

(263) FIGS. **32**L and **32**M exemplarily show spring modules with the base and the end cover of which can be snapped together according to other preferred embodiments of the present disclosure, respectively, wherein the spring module shown in FIG. **32**L has a spring bracket **120***b* in which three springs can be accommodated, and the spring bracket **120***b* comprises a base **121***b* and an end cover **122***b* in which three springs can be accommodated, and the spring module shown in FIG. **32**M has a spring bracket **120***c* in which four springs can be accommodated, and the spring bracket **120***c* comprises a base **121***c* and an end cover **122***c* in which four springs can be accommodated. The bottom surfaces of the bases **121***a*, **121***b* and **121***c* of the spring modules as described above may also be provided with module mounting parts **1213***a* for detachably mounting the spring modules into the spring cushions. Preferably, the module mounting part **1213***a* is a slideway or a slide rail, so that the base of the spring module may be slidably assembled onto the mounting rack in the spring cushion. Furthermore, the spring brackets **120***a*, **120***b* and **120***c* may be integrally formed. More preferably, the spring is installed in the spring bracket with a predetermined initial compression force. Alternatively, the base may be provided with an opening **1211***a* at the center of which, and the end cover may be provided with an opening **1221***a* at the center of which.

(264) FIGS. **33**A-**33**F exemplarily show a spring module as well as its components according to another preferred embodiment of the present disclosure, in which a base and an end cover can be snapped together. As shown in the figures, the spring module comprises a base **121***d*, an end cover **122***d* and a spring bag. The base **121***d* comprises a pair of first locking mechanisms **1211***d* provided at the periphery of which, and the end cover **122***d* comprises a pair of second locking mechanisms **1221***d* provided at the periphery of which. The spring bag is removably fixed between the base **121***d* and the end cover **122***d*, each spring bag comprises a spring **110***f* and a flexible sleeve **123***d* encompassing the spring. The base **121***d* and the end cover **122***d* may be releasably snapped together by the first locking mechanism **1211***d* and the second locking mechanism **1221***d* to compress the spring bag between the base and the end cover. Preferably, the spring is enclosed in the flexible sleeve **123***d* with a predetermined initial compression force. Although the spring shown in the figures is a convex spring with a convex center, those skilled in the art may realize that the spring may also be a cylindrical spring or a concave spring with a concave center. The locking mechanisms **1211***d*, **1221***d* will be described in detail below with reference to FIGS. **33**E-**33**G, as shown in the figures, the pair of first locking mechanisms **1211***d* extend outward from the base **121***d* along the radial direction, and each first locking mechanism comprises a first protrusion **12112***d* located between the first locking mechanism **1211***d* and the base **121***d*. The pair of second locking mechanisms **1221***d* extend outward from the end cover **122***d* along the radial direction, and each second locking mechanism comprises a spring tongue part **12211***d* capable of moving toward and away from the end cover **122***d*, and a second protrusion **12212***d* located outside the tongue part. And the second protrusion **12212***d* may engage with the first protrusion **12112***d* so as to lock the base with the end cover. The second protrusion **12212***d* may be disengaged from the first protrusion **12112***d* as the tongue part **12211***d* moves toward the end cover, thereby releasing the end cover from the base. Preferably, each first locking mechanism **1211***d* further comprises a notch **12111***d*, which is located in the middle of the first locking mechanism, so that a user may press the tongue part **12211***d* toward the end cover through the notch **12111***d* thus releasing the end cover.

(265) FIG. **33**H exemplarily shows a spring module according to another preferred embodiment of the present disclosure in which the base and the end cover can be locked together, and FIG. **33**I shows the compressed configuration of the spring module, as shown in the figures, unlike the spring module shown in FIGS. **33**A-**33**G, the spring module comprises a base **121***e* and an end cover **122***e* in which four spring bags can be accommodated. Similarly, the base **121***e* comprises a

pair of first locking mechanisms **1211***e* provided at the periphery of which and the end cover **122***e* comprises a pair of second locking mechanisms **1221***e* provided at the periphery of which. The spring bags are detachably fixed between the base **121***e* and the end cover **122***e*, and the base **121***e* and the end cover **122***e* may be releasably locked together through the first locking mechanism **1211***e* and the second locking mechanism **1221***e* so as to compress the spring bags between the base and the end cover. The first pair of locking mechanisms **1211***e* extend outward from the base **121***e* along the radial direction, and each first locking mechanism comprises a first protrusion **12112***e* positioned between the first locking mechanism **1211***e* and the base **121***e*. The pair of second locking mechanisms **1221***e* extend outward from the end cover **122***e* along the radial direction, and each second locking mechanism comprises a spring tongue part **1221***e* capable of moving toward and away from the end cover **122***e*, and a second protrusion **12212***e* positioned outside the tongue part. The second protrusion **12212***e* may engage with the first protrusion **12112***e* in order to lock the base and the end cover together. The second protrusion **12212***e* may be disengaged from the first protrusion **12112***e* as the tongue part **12211***e* move towards the end cover, thereby releasing the end cover from the base.

(266) FIGS. **33**J-**33**L exemplarily show a condition when a plurality of the spring modules shown in FIG. **33**A or **33**H are connected in rows through flexible bottom pads **60***a*, **60***b* and **60***c*, as shown in the figures, the spring modules are fixed on a first surface of the flexible bottom pad, and the flexible bottom pad may be bent to allow a first part of a second surface of which opposite to the first surface to engage with a second part of the second surface, as shown in FIGS. **33**M, **33**N. FIG. **33**O exemplarily shows a spring cushion having the spring modules as well as the flexible bottom pads **60***b* or **60***c* shown in FIG. **33**L.

(267) FIG. **34**A exemplarily shows a spring module with a base and an end cover of which may be locked together according to another preferred embodiment of the present disclosure. FIGS. **34**B-**34**D illustrate a perspective view, a top view and a side view of the base of the spring module shown in FIG. **34**A, and FIGS. **34**E, **34**F illustrate a perspective view and a top view of the end cover of the spring module shown in FIG. **34**A, respectively. As shown in the figures, the spring module comprises a spring **110***e*, a base **121***f* and an end cover **122***f*. The base **121***f* comprises a spring mounting seat with a first spring fixing part **1212***f* capable of fixing a first end of the spring, and the end cover **122***f* comprises a spring mounting seat with a second spring fixing part **1222***f* capable of fixing a second end of the spring. The base and the end cover are provided with a rotary locking assembly, and the base may be releasably locked together with the end cover by the rotary locking assembly, so that the spring is compressed therebetween. Specifically, the rotary locking assembly comprises one or more locking posts **127***f* positioned on the outer region of the base and one or more arc openings **128***f* positioned on the corresponding outer region of the end cover. Each locking post **127***f* comprises a thin base **1271***f* and a thick end **1272***f*. Each arc opening **128***f* comprises a narrow arc extending portion **1281***f* and a wide end opening portion **1282***f*, and the end opening portion **1282***f* is positioned at one end of the arc opening **128***f*. The end opening portion **1282***f* of each arc opening **128***f* is sized to allow the end **1272***f* of the corresponding locking post **127***f* to pass therethrough, while the arc extending portion **1281***f* of each arc opening **128***f* is sized not to allow the end of the corresponding locking post to pass therethrough, so that when compressing the spring and rendering the end **1272***f* of each locking post to pass through the corresponding end opening portion **1282***f*, by rotating the base and the end cover along the locking direction, the base **1271***f* of each locking post moves along the corresponding arc opening **128***f* into the arc extending portion **1281***f* of which and is locked in the arc extending portion **1281***f* through the end **1272***f*, thereby releasably locking the base and the end cover together. FIG. **34**G exemplarily shows a condition when the base and the end cover of the spring module shown in FIG. **34**A are locked together. Preferably, the base **121***f* further comprises a module mounting part **1213***f* for removably mounting the spring module into the spring cushion, and the module mounting part **1213***f* may be a slideway or a slide rail arranged on the bottom surface of the base, so that the

base of the spring module may be slidably assembled onto the mounting rack in the spring cushion through the module mounting part **1213***f*. Alternatively, the base may be provided with an opening **1211***f* at the center of which, and the end cover may be provided with an opening **1221***f* at the center of which.

(268) FIGS. **35**A and **35**B schematically show a perspective view and a side view, respectively, of a spring module according to yet another preferred embodiment of the present disclosure. As shown in the figures, the spring module comprises a conical spring **110** and a plurality of flexible straps **123***e*, each flexible strap **123***e* respectively comprises a main body **1231***e*; a first hook **1232***e* at one end of the main body; and a second hook **1233***e* at the other end of the main body. The first hook **1232***e* is removably hooked on the large-diameter end of the conical spring, and the second hook **1233***e* is removably hooked on the small-diameter end of the conical spring, and the flexible straps **123***e* are all positioned outside the conical spring. Preferably, the lengths of the plurality of flexible straps **123***e* are designed such that the conical spring has a predetermined initial compression force. Further preferably, the flexible straps **123***e* are integrally formed and made of plastic. Optionally, the width and/or thickness of the main body **1231***e* of the flexible strap **123***e* gradually decreases from one end to the other end.

(269) FIGS. **35**C and **35**D exemplarily show a perspective view and a side view, respectively, of a spring module according to yet another preferred embodiment of the present disclosure. As shown in the figures, the spring module comprises a conical spring **110** and a plurality of flexible straps **123***f*, and each flexible strap **123***f* comprises a main body **1231***f*; a first hook **1232***f* positioned at one end of the main body; and a second hook **1233***f* positioned at the other end of the main body. The first hook **1232***f* is hooked on the large-diameter end of the conical spring, the second hook **1233***f* is hooked on the small-diameter end of the conical spring, and the flexible straps **123***f* are all positioned outside the conical spring. The lengths of the plurality of flexible straps **123***f* are preferably designed such that the conical spring has a predetermined initial compression force. Further preferably, the main body **1231***f* of the flexible strap **123***f* is made of woven fabric, and the first hook **1231***f* as well as the second hook **1232***f* of the flexible straps **123***f* are made of metal or plastic. Optionally, the width and/or thickness of the main body **1231***e* of the flexible straps **123***e* gradually decreases from one end to the other.

(270) FIG. **35**E exemplarily shows a condition when the plurality of spring modules shown in FIGS. **35**A to **35**D are nested together.

(271) FIGS. **35**F and **35**G exemplarily show an exploded view and a sectional view of a spring module, respectively, according to yet another preferred embodiment of the present disclosure, and FIG. **35**H is a partial enlarged view of FIG. **35**G. As shown in the figures, the spring module comprises a conical spring **110**, a one-piece flexible sleeve **1231***g* having a closed end and an open end, and one or more fasteners **129***g*. The conical spring **110** passes through the open end of the one-piece flexible sleeve **1231***g* and enters the interior of which, so that the one-piece flexible sleeve encompasses outside the conical spring, and wherein the end of the open end of the one-piece flexible sleeve **1231***g* is bent around the large-diameter end of the conical spring **110** toward the interior of the conical spring and fixed to an adjacent part of the one-piece flexible sleeve **1231***g* positioned outside the conical spring **110** by one or more fasteners **129***g* (as shown in FOG. **35**H). Preferably, the one-piece flexible sleeve **1231***g* and the one or more fasteners **129***g* cooperate with each other so that the conical spring may have a predetermined initial compression force. In a preferred embodiment, the one-piece flexible sleeve **1231***g* is a one-piece cloth sleeve, and the fastener **129***g* is a rivet. FIG. **35**I exemplarily shows a condition when a plurality of spring modules shown in FIGS. **35**F and **35**G are nested together.

(272) FIG. **35**J exemplarily shows a spring module according to another preferred embodiment of the present disclosure, and FIG. **35**K shows a conical spring **110***b* of which. Unlike the spring module shown in FIGS. **35**F-**35**H, the flexible sleeve **1231***h* as well as the conical spring **110***b* are square conical.

(273) FIGS. **36**A and **36**B exemplarily show a perspective view and a perspective view of a spring module according to yet another preferred embodiment of the present disclosure, which comprises a plurality of connected cylindrical cloth sleeves **1231***i* in rows and a plurality of cylindrical springs encompassed therein. FIG. **36**C exemplarily shows a perspective view of a spring module according to another preferred embodiment of the present disclosure, FIG. **36**D exemplarily shows a condition when the spring module shown in FIG. **36**C is compressed and stored in a storage box, and FIG. **36**E exemplarily shows a condition when a plurality of storage boxes shown in FIG. **36**D are stacked together.

(274) FIG. **37** exemplarily shows a perspective view of a spring module according to yet another preferred embodiment of the present disclosure. As shown in the figure, the spring module comprises a conical spring **110**, a base **121***j* and a plurality of flexible straps **123***j*. The base has a spring mounting seat with a spring fixing part **1212***j* for fixing the large-diameter end of the conical spring, one end of each flexible strap **123***j* is fixedly coupled to the base, while the other end has a hook part **1233***j* which is detachably hooked on the small-diameter end of the conical spring, and the plurality of the flexible straps **123***j* are all positioned outside the conical spring **110**. Preferably, the lengths of the plurality of flexible straps **123***j* are designed such that the conical spring **110** has a predetermined initial compression force. Further preferably, the flexible strap **123***j* is entirely made of plastic. Optionally, the main body of the flexible strap **123***j* is made of woven fabric, and the hook part **1233***j* is made of metal or plastic. Optionally, the width and/or thickness of the main body of the flexible strap **123***j* gradually decreases from one end to the other end. In a preferred embodiment, the bottom surface of the base **121***j* is further provided with a module mounting part **1213***j* for removably mounting the spring module into a spring cushion. Preferably, the module mounting part **1213***j* may be slideways or slide rails arranged on the bottom surface of the base, so that the base can be slidably assembled to the mounting rack in the spring cushion through the module mounting part **1213***j*. In another preferred embodiment, the base **121***j* may also be provided with locking structures **31** and **32** shown in FIGS. **29**A-**29**C, locking structures **41**, **42** shown in FIGS. **30**A-**30**C, locking structures **43**, **44** shown in FIGS. **30**D-**30**F, or T-shaped (or wedge-shaped) connections **51** shown in FIGS. **31**A-**31**D.

(275) FIGS. **38**A, **38**B exemplarily show a perspective exploded view and a perspective sectional view of a spring module (spring bag) according to yet another preferred embodiment of the present disclosure, respectively. As shown in the figures, the spring module (spring bag) comprises a conical spring **110** and a double-layer flexible sleeve, the double-layer flexible sleeve comprises: a frustoconical outer layer **123***m* having a closed end and an open end, and the open end of the frustoconical outer layer is provided with a first flange **1231***m* extending outward; and a frustoconical inner layer **123***n* positioned inside the frustoconical outer layer **123***m*, wherein the frustoconical inner layer **123***n* has a closed end and an open end, and the open end of the frustoconical inner layer **123***n* is provided with a second flange **1231***n* extending outward. The radial dimension of the frustoconical inner layer **123***n* is smaller than that of the frustoconical outer layer **123***m*, and the height dimension of the frustoconical inner layer **123***n* is approximately equal to that of the frustoconical outer layer **123***m*, the conical spring **110** is positioned between the frustoconical outer layer **123***m* and the frustoconical inner layer **123***n*. The first flange **1231***m* of the frustoconical outer layer **123***m* is fixedly coupled with the second flange **1231***n* of the frustoconical inner layer **123***n*, and the closed end of the frustoconical outer layer is fixedly coupled with the closed end of the frustoconical inner layer. Preferably, the height dimension of the frustoconical outer layer **123***m* and that of the frustoconical inner layer **123***n* are designed to allow the conical spring therebetween to have a predetermined initial compression force. Preferably, the frustoconical outer layer **123***m* and the frustoconical inner layer **123***n* are coupled together by adhesive or ultrasonic welding.

(276) FIGS. **39**A, **39**B respectively illustrate conditions when the spring bag shown in FIGS. **38**A, **38**B are fixed on the base through different fixing ways, the spring bag is fixedly coupled to the

base through an engaging part on the base in FIG. **39**A, while in FIG. **39**B the spring bag is fixedly coupled to the base through fasteners. FIG. **39**C exemplarily shows a condition when a plurality of spring modules shown in FIG. **39**A or **39**B are nested together. The base may be provided with locking structures **31** and **32** shown in FIGS. **29**A-**29**C, locking structures **41** and **42** shown in FIGS. **30**A-**30**C, locking structures **43** and **44** shown in FIGS. **30**D-**30**F, or T-shaped (or wedge-shaped) connections **51** shown in FIGS. **31**A-**31**D.

(277) FIGS. **40**A-**40**C exemplarily show different embodiments of non-conical springs that can be used in the above-mentioned spring module, and FIG. **40**D exemplarily shows a spring module having the spring shown in FIG. **40**B. FIG. **40**E exemplarily shows a different embodiment of a conical spring that can be used in the above-mentioned spring module, and FIG. **40**F exemplarily shows a spring module **200***a* comprising the conical spring shown in FIG. **40**E, which comprises a spring bracket **220***a* and a square conical spring **110***b* installed therein.

(278) FIG. **40**G exemplarily shows a different embodiment of a conical spring that can be used in the spring module of the present disclosure, wherein at least a part of the conical spring is formed by a double spiral wire, and preferably, a double-wire spring part with the double spiral wire occupies about ⅔ of the overall height of the conical spring. FIG. **40**H exemplarily shows a spring module comprising the conical spring shown in FIG. **40**G.

(279) On the other hand, the present disclosure also provides a spring cushion comprising various spring modules as described above.

(280) FIG. **41**A exemplarily shows a spring cushion according to a preferred embodiment of the present disclosure. As shown in the figure, the spring cushion comprises various spring modules described in the above embodiments; a first sponge pad **1300***a*, each having a plurality of holes, each hole being configured such that a part of the corresponding spring module may pass therethrough; a second sponge pad **1100***a* sleeved on the first sponge pad **1300***a*; an outer cover **1200***a* sleeved on the second sponge pad **1100***a* so as to wrap the spring module, the first sponge pad as well as the second sponge pad therein.

(281) FIG. **41**B exemplarily shows a spring cushion according to another preferred embodiment of the present disclosure, which is different from the spring cushion shown in FIG. **41**A in that a first sponge pad **1300***b* comprises a plurality of separate parts arranged side by side, wherein each separate part may have different stiffness and color, so as to be arranged at different positions of the mattress as required and be easy to distinguish, as shown in FIG. **41**C.

(282) FIG. **41**D exemplarily shows a spring cushion according to yet another preferred embodiment of the present disclosure. As shown in the figure, the spring cushion is different from the spring cushions shown in FIGS. **41**A, **41**B in that it further comprises a fixing net **1400***a* having a plurality of ring parts, each of which is configured to allow a part of the corresponding spring module to pass therethrough. When the fixing net **1400***a* is arranged on the spring module, the vertical distance between the ring part and the top of the spring module is about ⅓ of the overall height of the spring module.

(283) FIG. **42**A exemplarily shows a fixing net assembly **1400***b* for a spring cushion according to a preferred embodiment of the present disclosure, and FIG. **42**B exemplarily shows a partial sectional view of the fixing net assembly shown in FIG. **42**A. As shown in the figures, the fixing net assembly **1400***b* comprises a flexible sheet **1410***b* having a plurality of holes, and a plurality of caps **1420***b*, wherein the holes of the flexible sheet **1410***b* are positioned corresponding to the positions of the spring modules, and each cap **1420***b* comprises a cavity **1421***b* for accommodating the top end part of the spring module and a flange **1422***b* surrounding the cavity, wherein, the wall forming the cavity **1421***b* is sized to be smaller than the hole so as to enable the wall to pass therethrough, and the flange **1422***b* is sized to be larger than the hole so as to enable the flange to engage with part of the flexible sheet around the hole, and wherein the flange **1422***b* is fixedly coupled to the part of the flexible sheet around the hole by adhesive or ultrasonic welding, and the cavity **1421***b* may accommodate the top of the spring module.

(284) FIG. **42**C exemplarily shows an exploded view of a fixing net assembly **1400***c* for a spring cushion according to a preferred embodiment of the present disclosure, as shown in the figure, the fixing net assembly **1400***c* comprises a flexible sheet **1410***c* without holes; a plurality of upper caps **1420***c* or **1420***d* located on one side of the flexible sheet, each of which is provided with a first snap feature **1422***c* or **1422***d*: a plurality of lower caps **1430***c* or **1430***d* located on the other side of the flexible sheet, each of which is provided with a second snap feature **1432***c* or **1432***d*. The first snap feature of the upper cap is configured to snap fit with the second snap feature of the lower cap and clamp the flexible sheet therebetween, and the lower cap **1430***c* and **1430***d* may accommodate the top of the spring module.
(285) FIGS. **42**D, **42**E exemplarily show a process in which the upper cap **1420***c* and the lower cap **1430***c* are clamped on the flexible sheet **1410***c*, as shown in the figures, the upper cap **1420***c* has an annular wall **1421***c* and an annular protrusion **1422***c* located outside the annular wall **1421***c*, while the lower cap **1430***c* has a circular hole **1431***c*, and the annular protrusion **1422***c* may be locked on the edge **1432***c* of the circular hole **1431***c* so as to clamp the flexible sheet **1410***c* therebetween.
(286) FIGS. **42**F and **42**G exemplarily show a process in which the upper cap **1420***d* and the lower cap **1430***d* are clamped on the flexible sheet **1410***c*, as shown in the figures, different from the above-mentioned caps **1420***c* and **1430***c*, the inner and outer sides of the annular wall of the upper cap **1420***d* are all provided with annular protrusions **1422***d*, and the lower cap **1430***d* is provided with an annular groove **1431***d*, in which an snap-fit part **1432***d* is provided, and the annular protrusions **1422***d* may be locked with the snap-fit part **1432***d* in the annular groove **1431***d* so as to clamp the flexible sheet **1410***c* therebetween.
(287) FIG. **42**H exemplarily shows a spring cushion according to yet another preferred embodiment of the present disclosure, and FIG. **42**I exemplarily shows a sectional view of the spring cushion. As shown in the figures, the spring cushion comprises various spring module assemblies shown in the above embodiments, especially in FIGS. **33**J-**33**N. The spring cushion of the present embodiment further comprises a spring pad **1500***a* spread on the spring module assemblies, and an outer cover **1600***a* having a quilted sponge layer, which covers the spring pad **1500***a* and wraps the spring module assemblies as well as the spring pad **1500***a*.
(288) Furthermore, FIG. **42**L exemplarily shows the foregoing spring pad **1500***a*, and FIG. **42**M exemplarily shows a partial sectional view of the spring pad **1500***a*. As shown in the figures, the spring pad **1500***a* comprises: a plurality of cylindrical springs **1530***a*, a first non-woven fabric layer **1510***a* located at one side of the plurality of cylindrical springs **1530***a*, and a second non-woven fabric layer **1520***a* at the other side of the plurality of cylindrical springs **1530***a*. The first non-woven fabric layer **1510***a* and the second non-woven fabric layer **1520***a* are coupled together around each cylindrical spring **1530***a* by adhesive or ultrasonic welding, so as to separate adjacent cylindrical springs and fix the cylindrical springs between the two non-woven fabric layers thus forming a one-piece spring pad. In other words, the first non-woven fabric layer **1510***a* and the second non-woven fabric layer **1520***a* are coupled together around each small cylindrical spring **1530***a* by adhesive or ultrasonic welding so as to form compartments for accommodating the plurality of small cylindrical springs, such that the adjacent small cylindrical springs may be separated mutually. The elastic coefficient of the cylindrical spring **1530***a* is preferably smaller than that of the spring in the spring module positioned at the bottom layer, thus providing stiffness close to sponge. Furthermore, the plurality of cylindrical springs **1530***a* are preferably denser than the plurality of spring modules positioned at the bottom layer so as to provide better comfort. In other words, the radial dimension of the cylindrical springs **1530***a* is preferably smaller than that of the springs in the spring modules, and the number of the cylindrical springs **1530***a* is preferably larger than that of the spring modules. The spring pad **1500***a* may be used to replace the sponge pad, and is comfortable, air-permeable and cost-saving.
(289) FIG. **42**J exemplarily shows a spring cushion according to yet another preferred embodiment of the present disclosure, and FIG. **42**K exemplarily shows a sectional view of the spring cushion.

As shown in the figures, the spring cushion comprises various spring modules or spring module assemblies shown in the above embodiments, especially in FIGS. **29**A-**31**O. The spring cushion of the present embodiment further comprises a spring pad **1500***a* spread on the spring module assemblies, and an outer cover **1600***a* having a quilted sponge layer, which covers the spring pad **1500***a* and wraps the spring module assemblies as well as the spring pad **1500***a*. Unlike the spring cushion shown in FIGS. **42**H, **42**I, the spring cushion of the present embodiment further comprises a fixing net assembly **1400***b* or **1400***c* shown in FIGS. **42**A-**42**G. The fixing net assembly **1400***b* or **1400***c* is provided between the spring modules and the spring pad **1500***a*.

(290) FIG. **42**N exemplarily shows a spring cushion according to yet another preferred embodiment of the present disclosure. Unlike the embodiment shown in FIGS. **42**J and **42**K, in the present embodiment, the sponge pad **1300***a* shown in FIG. **41**A is used instead of the fixing net assembly **1400***b* or **1400***c*. As described above, the sponge pad **1300***a* has a plurality of holes, each hole configured to allow part of the corresponding spring module to pass therethrough. Similarly, the sponge pad **1300***a* may also be replaced by the sponge pad **1300***b* having the plurality of separate parts arranged side by side as shown in FIGS. **41**B and **41**C.

(291) FIG. **42**O exemplarily shows a spring cushion according to yet another preferred embodiment of the present disclosure, which comprises the above-mentioned spring pad **1500***a* and an outer cover **1700***a* covering the outside of the spring pad **1500***a*. As shown in the figure, the outer cover **1700***a* has a quilted sponge layer **1710***a* which is positioned on the upper side and the lower side of the spring pad **1500***a*. As described above, since the elastic coefficient of the spring in the spring pad **1500***a* is low, the spring cushion may be rolled up in a compressed state to save the storage space, the process of compression as well as rolling up is shown in FIG. **42**P.

(292) FIG. **43**A exemplarily shows a spring cushion according to yet another preferred embodiment of the present disclosure. As shown in the figure, the spring cushion comprises: a base cloth **1200***d*; a first outer cover **1300***d*, a bottom end of the first outer cover being open and a top end being closed, and an edge of the bottom end of the first outer cover **1300***d* is sewn together with an edge of the base cloth **1200***d* so as to form a closed accommodating space; a plurality of spring modules described in the above embodiments, each spring module comprising a spring bracket and a spring installed in the spring bracket, and the plurality of spring modules are arranged in the accommodating space; a plurality of sponge blocks **1400***d* arranged in the accommodating space, and each sponge block is respectively arranged on the top of the corresponding spring module among the plurality of spring modules. The first outer cover **1300***d* comprises a plurality of separate compartments, with one or more spring modules as well as one or more sponge blocks **1400***d* respectively arranged in each compartment. The base cloth **1200***d* is provided with a plurality of openings, each of which is aligned with one or more compartments of the plurality of compartments, and is provided with a curtain **1210***d* and a zipper **1220***d* provided on the curtain (as seen in FIG. **43**D) for opening and closing each of the openings. Preferably, as shown in FIG. **43**B, the spring cushion may further comprise a second outer cover **1500***d* sleeved outside the first outer cover **1300***d*.

(293) FIG. **43**C exemplarily shows the outer cover **1300***d* having compartments in the spring cushions shown in FIGS. **43**A, **43**B, wherein the shape of each compartment is the same.

(294) FIGS. **43**D and **43**E exemplarily show the first outer cover **1300***d* sewn with the base cloth **1200***d*, in FIG. **43**D, the curtains **1210***d* as well as the zippers **1220** of the base cloth are in an open state, each elongated opening of the base cloth is aligned with a row of compartments of the outer cover **1300***d*, as can be seen from the figure. In FIG. **43**E, the curtains **1210***d* as well as the zippers **1220** of the base cloth are in a closed state.

(295) FIGS. **43**F-**43**H exemplarily show outer covers with compartments of different shapes/sizes according to different embodiments of the present disclosure, which can be used to accommodate different types of spring modules. FIG. **43**I exemplarily shows an outer cover having honeycomb-shaped (hexagonal) compartments according to a preferred embodiment of the present disclosure.

(296) FIGS. **44**A-**44**E exemplarily show sponge blocks according to different embodiments of the present disclosure, as can be seen from the figures, in order to be used for different types of spring modules, the sponge block may be flat, or it may have protrusions or depressions.
(297) FIG. **45**A exemplarily shows a sponge block according to a preferred embodiment of the present disclosure. As shown in the figure, the sponge block **1400***d* comprises a concave part **1410***d* for accommodating the top of the spring module, and grooves **1420***d* positioned on four sides of the concave part **1410***d*, which are helpful for folding and compressing the sponge block, FIG. **45**B exemplarily shows the sponge block shown in FIG. **45**A in a folded/compressed state, and the folded sponge block may be stored in a storage cup as shown in FIG. **45**C. The sponge block **1400***d* may also be placed in an elongated storage bag in a natural state, and the storage bag filled with the sponge blocks may be rolled up and placed in a box or packaged and fixed as shown in FIGS. **46**A-**46**C.
(298) FIGS. **47**A-**47**C exemplarily show another packaging method of the sponge blocks according to the present disclosure, and each sponge block **1400***d* may be compressed and stored in a single box.
(299) FIGS. **48**A-**48**F exemplarily show a sponge block storage box and a sponge block storage method according to a preferred embodiment of the present disclosure. As shown in the figures, the sponge block storage box has a long and narrow hollow rectangular shape, and at least one end along the longitudinal direction of the sponge block storage box is provided with an opening **2010***d* for inserting the sponge block **1400***d* therethrough. The lateral wall of the sponge block storage box may be opened integrally to form a storage box cover **2020***d* for taking out the sponge block **1400***d* stored therein. A flange **2030***d* is provided around the opening **2010***d* for engaging with the periphery of the sponge block **1400***d* accommodated therein so as to prevent which from exiting the storage box from the opening **2010***d*. Optionally, the other end along the longitudinal direction of the sponge block storage box may also be provided with an opening.
(300) FIGS. **49**A, **49**B exemplarily show an outer cover **2000***d* used for a spring cushion, according to a preferred embodiment of the present disclosure, the outer cover **2000***d* is provided with an open bottom end (shown as an upper end in the figures) and a closed top end (shown as a bottom end in the figures), and the outer cover **2000***d* comprises: a top part **2100***d* having four edges **2110***d*; and four side parts **2200***d*, each side part of the four side parts **2200***d* being sewn to a corresponding edge of the four edges **2110***d* of the top part **2100***d*, and mutually adjacent edges of every two adjacent side parts **2200***d* being provided with zippers **2210***d*, so as to detachably connecting the edges mutually adjacent of the side parts **2200***d* together to partially wrap the spring modules. Preferably, the top part **2100***d* sequentially comprises a non-woven fabric layer, a high-elastic sponge layer, a non-woven fabric layer, a quilted sponge layer, a silk floss layer and a cloth layer, from an inner side to an outer side of the spring cushion; each side part **2200***d* sequentially comprises a non-woven fabric layer, a quilted sponge layer, a silk floss layer and a cloth layer, from the inner side to the outer side of the spring cushion.
(301) Preferably, each side part **2200***d* comprises a hem part **2300***d* sewn with it, and each hem part only comprises a cloth layer.
(302) In a preferred embodiment, the spring cushion further comprises one or more pairs of tethers **2400***d* arranged on the hem parts **2200***d* for fastening the outer cover to the plurality of spring modules.
(303) FIGS. **50**A, **50**B exemplarily show an outer cover for a spring cushion, according to another preferred embodiment of the present disclosure. As shown in the figures, the outer cover **3000***d* is a closed outer cover and comprises: a top part **3100***d*; four side parts **3210***d*, **3220***d*, **3230***d* and **3240***d*; and a bottom part **3300***d*. The first edge of the top part **3100***d* is sewn to the first side part **3210***d*, the second edge of the top part opposite to its first edge is sewn to the second side part **3220***d*, the first edge of the bottom part **3300***d* is sewn to the first side part **3210***d*, and two edges perpendicular to the first edge of the bottom part **3300***d* are respectively sewn to the third side part

3230*d* and the fourth side part **3240***d*. Wherein zippers **3400***d* are provided at all non-sewn edges of the top part **3100***d*, the four side parts **3210***d*, **3220***d*, **3230***d*, **3240***d*, and the bottom part **3300***d*, in order to detachably connect the non-sewn edges together to wrap a plurality of spring modules. Preferably, the top part **3100***d* sequentially comprises a non-woven fabric layer, a high-elastic sponge layer, a non-woven fabric layer, a quilted sponge layer, a silk floss layer and a cloth layer from the inner side to the outer side of the spring cushion; and the lateral parts **3210***d*, **3220***d*, **3230***d* and **3240***d* sequentially comprise non-woven fabric layers, quilted sponge layers, silk floss layers and cloth layers from the inner side to the outer side of the spring cushion; and the bottom part **3300***d* only comprises a cloth layer.

(304) FIGS. **51**A-**51**C show the structures of different parts of the spring cushion outer covers, marked by “AA”, “BB” and “CC” in FIGS. **49**A, **49**B and **50**A, **50**B, respectively.

(305) Those skilled in the art may realize that various springs, spring brackets, bases, end covers, flexible straps, flexible sleeves, various functional components/parts (such as module mounting parts used for mounting spring modules onto mounting racks, various snap-fit parts/components, fixing parts/components, locking structures/components and constraint members, for limiting or fixing relative position relationship between adjacent spring modules) described in the above embodiments. At the same time, different spring cushions may be formed by any combination of spring bags, spring modules, mounting brackets, sponge covers, sponge blocks, fixing nets, spring cushion outer covers, spring cushion base cloths, etc. described in the above embodiments as required.

(306) The scope of protection of the present disclosure is limited only by the claims. Thanks to the teaching of the present disclosure, those skilled in the art will appreciate that alternative structures of the structures disclosed in the present disclosure may be regarded as feasible alternative embodiments, and the embodiments disclosed in the present disclosure may be combined to produce new embodiments, which also fall within the scope of the accompanying claims.

Claims

1. A spring cushion for furniture, the spring cushion comprising: a plurality of spring modules, each spring module including: a plurality of conical springs, each conical spring having a first end and a second end; a spring bracket having a base including a spring mounting seat, each spring mounting seat having a spring fixing part for fixing a first end of one of the conical springs, an end cover at a second end of each conical spring, and a plurality of flexible straps between one of the spring mounting seats and a corresponding end cover; the spring modules detachably assembled on a folding mounting rack; a sponge cover covering the plurality of the spring modules; and an outer cover covering the sponge cover, wherein the outer cover wraps the spring modules and the sponge cover assembled on the mounting rack.

2. The spring cushion of claim 1 wherein a top of the sponge cover includes a plurality of nest structures, each nest structure corresponding to an end cover position.

3. The spring cushion of claim 1 wherein the mounting rack comprises a plurality of longitudinally extending section bars and a plurality of flexible connectors positioned between the plurality of longitudinally extending section bars and connecting them together, and a middle portion of the flexible connector forming a flexible hinge.

4. The spring cushion of claim 3 wherein a center of the longitudinally extending section bar is provided with two T-shaped grooves with downward openings, and two T-shaped projections are formed on both lateral sides of a top of the flexible connector, and the T-shaped groove is configured to be slidably receive the T-shaped projection.

5. The spring cushion of claim 4 wherein the longitudinally extending section bar further comprises: a pair of first transverse projections extending transversely and outwardly, the first transverse projections at both lateral sides of the section bar; and a pair of second transverse

projections extending transversely outward, the second transverse projections at the center of the section bar, wherein a distance between the pair of first transverse projections is greater than a distance between the pair of second transverse projections, and the second transverse projections are positioned higher than the first transverse projections.

6. The spring cushion according to claim 1 wherein the mounting rack comprises: a plurality of first section bars extending longitudinally, each first section bar having a flat body extending longitudinally and first slide rails extending longitudinally and positioned at both lateral sides of the flat body; a plurality of second section bars extending longitudinally, each second section bar having a flat body extending longitudinally and a second slide rail extending longitudinally and positioned in a middle position of a top surface of the flat body; wherein the first section bars and the second section bars are arranged at intervals along a transverse direction and are connected together via a plurality of flexible connectors; and wherein the base of each spring module is configured to be slidably assembled on the mounting rack through a sliding fit on the first slide rails, and the end cover of the spring module is configured to be slidably assembled on the mounting rack through a sliding fit on the second slide rails.

7. The spring cushion of claim 1 wherein in each spring module, of the conical spring abuts against the end cover, and the end cover is formed with four constraint holes uniformly distributed around a center of the end cover, each constraint hole is configured to engage with a constraint member, enabling four adjacently arranged spring modules to be positioned relative to each other.

8. The spring cushion of claim 7 wherein the constraint member comprises: a square main frame having diagonal reinforcing bars; a cylindrical part at each corner of the main frame, each cylindrical part having a tapered end and extending in a direction perpendicular to a plane of the main frame; wherein the main frame and the cylindrical parts are dimensioned to allow each cylindrical part is able to be inserted into one of the constraint holes to allow four adjacently arranged spring modules to be positioned relative to each other.

9. The spring module of claim 8 further including a snap-fit part on an outer surface of each cylindrical part configured to be snap fitted into one of the constraint holes.

10. The spring module of claim 8 wherein each cylindrical part has a central hole sized to receive a tapered end of the cylindrical part of another constraint member to enable a plurality of the constraint members to be nested together.