

TRANSLATION FROM GERMAN

BEARING ELEMENT FOR UPHOLSTERY SUPPORT FOR
A SEAT OR BED SYSTEM

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The invention relates to a bearing element for upholstery in particular for rear-ventilated upholstery supports such as upholstery, mattress or the like for seat or bed systems, which bearing element is provided with a base and can be fastened on a support and has a bearing plate holding upholstery: it further relates to a bed system
10 with an upholstery support provided with such bearing elements, wherein the bearing elements are placed on a plate or fixed to laths.

Upholstery supports serve as supports for upholstery, on which the body can be placed in an ergonomically appropriate manner. Such type of upholstery is known
15 from EP 0401 712, where the entire area of the support is covered with elastic elements, which is supported in U-profiles to avoid overloading and to limit the available spring deflection, so that for the placing of seats or bed systems the bearing surface for an upholstery support such as a mattress - as is already known from DE 36 12 603 A1 - is divided into subareas, which are arranged in a regular
20 pattern, and where each individual one of these spring elements is designed to be spring-loaded.

Upholstery resting on surfaces absorbs body moisture and during a sitting or resting period gets wet, in particular in areas where people are resting in a humid atmosphere for lengthy periods and where the bearing surface is impermeable to
25 moisture - such as for instance in caravans and in boats. To allow ventilation, EP 0 653 174 suggests to provide the bearing plate with openings. An unsatisfactory aspect of these proposals is that the height of the individual bearing elements must be (relatively) great, since the available range of spring deflection is only a fraction of the height of the unloaded bearing element. It is therefore the object of the
30 present invention to further develop the known bearing elements in such a way that the range of spring deflection consists of a substantial proportion of the total height,

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whereby with the ventilation maintained, the bearing elements are easy and economical to produce and have a wide range of applications; in addition, a bed system with such bearing elements shall be proposed which can be easily and economically produced and is of versatile use.

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In accordance with the invention, this object is achieved by the characteristics specified in the independent claims; advantageous further developments and preferred embodiments describe the subclaims referring to the independent claims.

- 10 In order to achieve the spring action in a first embodiment, at least two bearing arms are provided which are directed outwardly from a base, which bearing arms are defined as leaf springs with a spring deflection aimed in the direction of the bearing pressure. Each of these bearing arms is provided with a terminal bearing surface; these bearing surfaces of a bearing element together form the bearing plate holding
- 15 the upholstery, to which bearing plate they are fastened between the bearing surfaces in the region of bridging connections. When the springs are compressed, the bearing surfaces are forced outwardly. These bearing surfaces are coupled with further spring elements in such a manner that the outward movement loads these further spring elements. In this case, both springs act in the same direction: When
- 20 the springs of the bearing arms are being loaded by being pressed down, the bearing plates moving outwardly cause a loading of the further spring element, so that ultimately the spring load-deflection curve of the bearing element can be set as required or as desired by the combination of both curves. The deflection of the bearing surfaces being possible down to the base, it is possible to achieve spring
- 25 deflections which - up to material thickness - correspond to the height of the bearing element itself.

- Advantageously, the bearing arms have a rotationally symmetric arrangement, so that the angular distance of three bearing arms is 120° and that of four bearing arms
- 30 90° . When the leaf springs forming the bearing arms are designed in such a way that

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their spring constants are equal, there results, also in lateral force components, a deflection without the "canting" (known from other upholstery supports) so that a correct upholstery is obtained; it is however obvious that the spring constants are selected independently of this consideration. If, furthermore, by a corresponding
5 design of the bearing surfaces, the bearing plate contains a free inner space, at least of the size of the base area, ranges of spring deflections can be achieved which - apart from the material thickness - correspond to the height of the bearing element itself, so that this deflection can even occur down to the plane of the base. In this case it is advantageous if the bearing arms supplying the spring force are made of a
10 correspondingly high-quality elastomer and the bearing surfaces of an economical plastic material, which plastic parts can be produced by way of the two-component-injection moulding process or in separate production processes.

One advantageous embodiment proposes the use of undulated springs as spring
15 elements in the bearing arms. The stretching of the bearing arms in this case leads to a compression of the undulated spring, resulting in counteracting the change of position of the bearing surface. The coupling spring elements in this embodiment are designed as Omega-type springs between the bearing surfaces which are divided, linking them. In particular the Omega design allows a spring deflection which is not
20 reduced by undulations. By means of these further spring elements these bearing surfaces are coupled in such a manner that the outward movement results in a loading of these further spring elements. Both springs work in the same direction. If the springs of the bearing arms are loaded by downward pressure, the bearing plates moving outwardly cause a loading of the further spring elements so that ultimately
25 the spring load-deflection curve of the bearing elements can be set by means of the combination of both spring load-deflection curves in such a way as is necessary or desirable.

In order to fasten these bearing elements on a support, the base is designed
30 accordingly. If differences in height in the installation are to be adjusted in such a

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- manner that all bearing plates are positioned in a plane, the base is advantageously defined as a base plate or as a base body of corresponding height. In one embodiment the base plate/the base body is provided with a central hole. The fastening is performed by means of a screw or a dowel pin wherein the screw or
- 5 dowel pin penetrate into the support. In a similar manner the base plate is provided with two holes or dowels which are diametrically opposite to each other relative to the centre of the base plate. Also in this case the fastening is achieved by means of screws or dowel pins: the connection thus screwed or doweled is torsionproof due to its hole configuration.
- 10 If a T-shaped holder is fastened on the support, the central hole for secure fastening by overlapping has at least one, preferably however two flattened sides opposite each other. Due to the flattened sides, the T-shaped holder can be fixed to the support: the bearing element is then placed on top and fixed by a rotation of approximately 90°.
- 15 In a further embodiment, the base plate has hook-shaped laths: these laths interact with holding elements provided on the support in such a manner that the hook-shaped laths engage with corresponding projections at these holding elements and form a conjugate connection. If these hook-shaped laths are elongated and arranged
- 20 on both sides of the centre of the base plate, they form one part of a sliding connection the other part of which defines the holding elements provided on the support so that the bearing elements can be slipped onto such holding elements: if the laths are arcuate and arranged diametrically opposite relative to the centre of the base plate, they define part of a twist-lock connection, the other part of which is
- 25 defined by corresponding holding elements provided on the support. The bearing elements can be fastened to the holding elements in the manner of a bayonet-type twist-lock connection. An advantageous design of the laths proposes the provision of stop means to limit the twist-lock or sliding range. Both these arrangements allow the bearing elements to be fixed in a simple and secure manner to the support,
- 30 wherein the stop means allow for the fixing of the desired positioning.

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In a second embodiment, the spring action is achieved by the bearing element having a spring body arranged between a foot mount and a bearing plate, wherein the foot mount has disposed on it one part of the lock and the bearing plate the other
5 part of the lock designed as means for the fixable and releasable insertion of the spring body as well as for the releasable attachment of the bearing plate onto the foot plate. The spring body itself has at one end the upper part of the locking means and at the other end the lower part of the locking means and can thus have one of its
10 spring body ends placed on the base plate and its other spring body end attached to the bearing plate; base mount and bearing plate are placed at a greater distance from one another by being spaced apart by the spring body. In this way a spring-loaded bearing element is produced which, when provided with spring bodies of different heights, can be used at different heights and thus facilitate a height adjustment, wherein the height of the spring body determines the height of the bearing surface.

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A flat bearing element is solely formed by the combination of a foot mount with a bearing plate placed on a support structure, which arrangement is joined together by means of locking means, advantageously as a bayonet-type twist-lock connection, where projections engage in recesses shaped as circle segments, and which are
20 provided in the central part of the bearing plate and allow for twist-locking. The projections are advantageously defined as mushroom-shaped protrusions engaging in recesses behind the central part. Locking means are provided for this arrangement which interact by latching into place, and which are generally defined as lugs, protrusions or the like as well as corresponding recesses or indentations.

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In one embodiment, the spring body between spring body foot and spring body head is defined by two double polygons, with their tips directed towards each other, whose outwardly directed surfaces form the spring body foot and the spring body head. The polygon tips directed towards each other are joined in such a way that
30 they form between them a tube piece of essentially rectangular cross section, which

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acts as a spring tube and stabilises the polygon spring and, when compressed, forms a bearing with its own spring load-deflection curve.

In a further embodiment the spring body is formed by a single polygon. Here the outer sides of the polygon form the foot plate or the spring body head, whilst the
5 surfaces directed laterally outwardly define the tips directed outwardly. The inner side of the spring body head has a tube piece integrally formed with it which - analogous to the tube spring in the double polygons - define a semi-tube spring, which when compressed bears against the inner side of the spring body foot and thus forms a bearing with its own spring load-deflection course.

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In order to stabilise this spring body against lateral sheering forces, at both sides the tips of the polygons pointing outwardly can be connected with each other via a lateral support strap. The design and layout of these support straps also permit an adjustment of the spring constant of the spring body to the respective requirements.

15 Advantageously, the width of the lateral support straps is at least equal to half the width of the spring members defining the polygons. To achieve a ball bearing which is capable of permitting similar compressibility, the tips of the polygons pointing outwardly have circle segment recesses : this design is possible in the double polygon as well as in the single polygon and results in a spring body which allows
20 great mobility in all directions of the plane normal in relation to the action of forces.

The bearing plate in one embodiment has at least two bearing arms directed outwardly - each one running into an outer bearing surface - and are arranged opposite each other. Furthermore, the bearing plate has an inner bearing surface,
25 supported on the central plate. Radial connectors link the central plate to the outer bearing surfaces, wherein the outer bearing surfaces relative to the height of the inner bearing surfaces are arranged at a higher level. In a further development of this embodiment there are arranged in the bearing arms between each of the outer and inner bearing surfaces intermediate bearing surfaces, which are integrally formed
30 with the radial connectors at a higher level than the inner bearing surface, but at a

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lower level than the outer bearing surfaces which are arranged at an inclined position. This stepped height variation results in an essential reduction of the contact area of the underside of the mattress or the like. The bearing surface is advantageously reinforced with bent off edge regions with C-shaped or U-shaped cross section of at least the outer bearing surfaces.

In order to adjust the deflection of the stepped bearing surfaces to the requirements, the radial connectors are defined as bridging elements linking the individual bearing surfaces, the rigidity of which bridging elements determines the necessary force required for the deflection. To adjust these forces to the requirements, these bridging elements are adjusted in width and thickness. In a preferred embodiment, these bridging elements are designed as spring members, wherein the spring members are preferably equipped with undulated springs as spring elements. The spring elements are adjustable to the desired or required force ratio by an appropriate design. In this design the venting is considerably improved, wherein it is advantageous, if independent therefrom the radial connectors and/or the bearing surfaces are provided with ventilation openings; in addition an improved accommodation of the physiological sleeping position is thereby achieved.

A further development has three or four bearing arms at angular distances of 120° or 90°: when several bearing elements are assembled with bearing plates into one upholstery support, these bearing arms of adjacent bearing plates can be positioned in such a manner that an (almost) continuous bearing surface is provided, in particular when the bearing arms are shaped accordingly. In three-arm bearing plates, the bearing plates are placed at a "turned over" arrangement, so that in each case two bearing arms of the one bearing plate engage with a bearing arm of the adjacent bearing arm. When four bearing arms are used, these are positioned advantageously on a grid as support structure, in such a manner that the lath is "inclined" relative to the crossed bearing arms.

In an advantageous further development there are between the bearing surfaces of adjacent bearing arms connecting arches provided as coupling means; all bearing surfaces together with the coupling means form a closed structure. These coupling means ensure that the individual bearing surfaces cannot be moved independently
5 from another, but that the movement of one bearing surface transfers to adjacent bearing surfaces. Advantageously, the coupling elements are defined as springs which for instance can be OMEGA-shaped flat springs or undulated springs. In the OMEGA-shaped design the opening of the OMEGA is directed outwardly and both its feet are connected with the two bearing surfaces of adjacent bearing plates. To be
10 able to cancel the rigidity, the bent off edge regions of the outer bearing surfaces are interrupted in the region of the coupling elements. With the design of these springs, the degree of coupling is adjustable in such a way that the desired spring properties are maintained.

15 In a further, also advantageous, embodiment, the bearing plates are closed to form a ring. Also in this case the bearing surfaces are stepped, wherein each outer bearing surface compared with the inner bearing surface/s is at a higher level relative to the upper side of the head part from the foot part. The ring-shaped bearing surfaces are connected with each other via radial connectors, wherein these are formed in
20 angular position. Radial connectors and/or bearing surfaces can be provided with recesses in order to improve the ventilation even further. Advantageously two ring-shaped, closed, stepped bearing surfaces connected with each other via radial connectors are provided; in a further development three ring-shaped, closed bearing surfaces connected with each other via radial connectors are provided. The form of
25 the ring shaped bearing surfaces is circular or - alternatively - square.

In a preferred embodiment, the bearing element is a plastic injection moulded part. The bearing element of this embodiment is simple to produce, the costs for the injection moulding tool because of the large quantity of the bearing elements do not
30 lead to a noticeable cost increase of the individual piece. It is understood that for the production of such bearing elements with regard to their durability against

mechanical loads or chemical effects high quality plastics must be used which have sufficient durability. Plastics preferably used are thermoplastic elastomers.

In order to produce a bed system with these bearing elements, these bearing
5 elements are placed on a plate or are fixed to a lath, wherein corresponding fastening means to fasten the bearing elements are provided. In one embodiment a grid support made from intersecting support structure elements (undercrosses) is placed on the plate with fastening means for the bearing elements at the intersections. The individual undercrosses, whose number corresponds to that of the
10 bearing elements, can be joined together by means of socket connectors.

In one embodiment, the bearing element is fixed to a plate, to a grid support placed on the plate or to a lath by means of bonding or welding; in a further embodiment by means of screws (alternatively nails or tacks) or by dowel pins. In another
15 embodiment, the bearing element is fixed to the plate, to the grid support placed on the plate or to the laths by means of plugging into a plug-in connection or by twist-locking into a twist-locking connection, wherein the latter is provided on the plate, on the grid support placed on the plate or to the lath in such number which corresponds to the number of the bearing elements provided in the top surface.

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The second embodiment of a bed system, equipped with such bearing elements, besides the resolution of the top surface also has steps in the deflection, so that a greater upholstery comfort can be expected, since the bearing elements in accordance with the invention have varying heights. Thereby zones of varying
25 deflection can be formed in a surprisingly simple manner in such a way that in the zone of minor loading - for instance in the area of the head, lower leg/foot - bearing elements without spring bodies between foot support and bearing plate are provided, wherein here the laths are set "high" by means of the known stepped dowel. In the zone of increased loading - for instance in the region of the thighs, pelvis, trunk - by
30 contrast bearing arms with spring bodies arranged between foot mount and bearing

plate, and in this arrangement the laths are set "low" by means of the stepped dowels.

In this way, zones of differing firmness result transverse to the extension of the laths, which compensate for the differing loads in these zones. However, also within the zone region of a lath, skewness does not occur, the lath ends are at the same height, the deflections result at certain points due to the individual bearing elements. Advantageously, at least two zones are provided, one zone with bearing elements which are formed of base plate and bearing plate and one zone with bearing elements, formed of foot support, bearing body and bearing plate, wherein by means of stepped dowels, which allow a high and a low position, the first zone is arranged at the frame in a higher position and the second zone in a lower position. In these arrangements, the second zone with bearing elements with spring bodies is essentially provided in the centre of the grid, corresponding to the position of the buttocks of a reclining occupant. At either side of this second zone, a first zone with bearing elements without spring bodies is provided.

Advantageously, the frame is provided with a hinged frame part, the frame having hinges opposite each other. This allows at least one frame part to be elevated; in a further development also the second frame part is designed to be elevated. It is further advantageous to hinge a further frame part onto the elevatable frame part, which again is equipped with at least two laths with bearing elements. This frame part in a grid for a bed defines a head rest, for instance to facilitate reading. Each of the frame parts which can be elevated in relation of the base frame has furthermore at least two rows of bearing elements. Here at least one row of the bearing elements of the outermost of the elevatable frame parts have bearing elements, formed of foot support and bearing plate, whilst the other rows are provided with bearing elements, formed of foot support, spring body and bearing plate. The lower parts and/or the bearing plates and/or the spring bodies of the two embodiments are advantageously made of plastic injection-moulded parts and can also be economically produced in large quantities.

The essence of the invention is explained in more detail by reference to the embodiment examples shown in figs. 1 to 16. Shown are in:

- 5 Fig. 01: Bearing element with four leaf springs, originating from a base plate, with bearing plate.
 Fig. 1a: Perspective top view, part section.
 Fig. 1b: Section. Bearing element with base plate.
 Fig. 1c: Section. Bearing element with base body.
- 10 Fig. 02: Bearing element with four leaf springs, originating from a base plate, with bearing plate with bearing surfaces linked via coupling springs.
 Fig. 2a: perspective top view, section.
 Fig. 2b: perspective section.
- Fig. 03: Bearing element to be fastened by screws, perspective top view,
 15 section.
- Fig. 04: Bearing element to be fastened by dowel pins. Side view.
- Fig. 05: Bearing element for clamping, perspective underside view.
- Fig. 06: Bearing element with twist-locking connection.
 Fig. 6a: Top view.
- 20 Fig. 6b: Section.
- Fig. 07: Support structure comprised of intersecting support structure elements (undercrosses) with bearing elements disposed thereon.
 Fig. 7a: Section.
 Fig. 7b: Detail support structure (undercrosses)
- 25 Fig. 08: Bearing element with bearing plate.
 Fig. 8a: Top view.
 Fig. 8b: Side view, section
 Fig. 8c: with spring body. Side view. Section.
- Fig. 09: Spring body. Schematic perspective.
- 30 Fig. 9a: Spring body with support strap.

- Fig. 9b: Spring body with circular arc recess.
- Fig. 10: Detail spring body
- Fig. 10a: Spring body with double polygon. Side view.
- Fig. 10b: Spring body with single polygon. Side view.
- 5 Fig. 10c: Spring body foot. Top view.
- Fig. 10d: Spring body head. Top view.
- Fig. 11: Bed system with grid.
- Fig. 11a: Top view.
- Fig. 11b: Side view (Frame parts elevated).
- 10 Fig. 12: Detail support structure (Longitudinal section).
- Fig. 12a: Lath set low, high bearing elements.
- Fig. 12b: Lath set high, low bearing elements.
- Fig. 13: Four-arm bearing plate with stepped radial bridging elements.
- Fig. 13a: Top view
- 15 Fig. 13b: Cross section.
- Fig. 14: Four-arm bearing plate with undulated spring bridging elements.
- Fig. 14a: Top view.
- Fig. 14b: Cross section.
- Fig. 15: Bearing plate with ring-shaped bearing surface and with undulated
20 spring bridging elements.
- Fig. 15a: Top view.
- Fig. 15b: Cross section.

The bearing element 10 shown in Figures 1, has a central base 11, which can be
25 placed on a support (not shown in detail) and can be fixed on this support: this base
in this arrangement is defined as a base plate 11.1 (Fig. 11b) or - to compensate for
the height differences as base body 11.2 (Fig. 11c). To this base plate 11.1 or the
base body 11.2, curved leaf springs are connected as bearing arms 12, to the free
ends of which the bearing surfaces 14 defining the bearing plate 15 are provided. To
30 compensate for the lengthening resulting from the compression of the bearing arms
12, undulated spring elements 13 are provided, which are capable of

accommodating the lengthening resulting from stretching due to the compression of the bearing arms 12 being forced together. The free ends of the bearing arms 12 with the undulated spring elements 13 are connected to bridging elements 14.2 of the bearing plate 15, which join the individual bearing surfaces 14 defining the bearing plate 15 to one closed ring on which rests an upholstery, for instance a mattress.

For the purpose of better ventilation, the bearing surfaces 14 are provided with openings 14.1. The bearing plates 15 created in this way offer sufficient open surface that an upholstery support placed thereon is sufficiently ventilated for the purpose of moisture removal. In this embodiment the bearing plate 15 can be vertically lowered so that canting and the like does not occur. In this arrangement the bearing plate 15 can be stiffened by bending off the outer and the inner edges (similar to the bending off in the bearing element 20, as shown in figures 2, 3, 4 and 5).

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The bearing element 20 shown in figures 2 has - as does the bearing element 10 (shown in figures 1) - a base plate 21 (or - as described above - a base body), to place on and fasten on a support (not shown in detail). Attached to this base plate 21 are also in this arrangement four bearing arms 22 defined as leaf springs, which project towards the bearing plate 25 in a curved manner and in the region between two bearing surfaces 24 are connected with these via the bridging elements 24.2. To compensate for the lengthening which occurs during the compressing of the bearing arms 22, Omega shaped spring connectors 23 are provided, which connect the bearing surfaces 24 defining the bearing plates and which bearing surfaces are divided in this instance. During the compression, the divided bearing surfaces 24 are forced apart so that the OMEGA-shaped spring connectors 23 are loaded.

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Also in this embodiment, the bearing plate 25 forms a ring with bearing surfaces 24 projected towards the inside, which bearing surfaces 24, which are connected to each other by way of OMEGA-shaped spring connectors 23, wherein also in this instance openings 24.1 are provided for improving the rear ventilation of an

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upholstery support. To improve the stability of the bearing plate 25 at least the outer edges including the connecting bridging elements 24.2, advantageously also the inner edges of the bearing plate, and the edges of the opening 24.1 are bent off (as can be clearly seen in Fig. 5 or 6).

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Whilst the bearing elements 10 or 20 of Figures 1 and 2 can be fastened by nailing, stapling, bonding or the like, to any type of support (not shown in detail), Figures 3 to 5 by reference to the bearing elements 20 (the same also applies obviously to the bearing elements 10 as per Figures 1) show different fastening methods. In Figure 3 a bearing element 20 is shown, whose base plate 21 has a central hole 26 to receive a screw or a dowel pin (not shown): naturally, also two (or more) screws or dowel pins can be provided, for instance for a torsion-proof fastening. The bearing element 20 in Fig. 4 shows a base plate 21, with dowel pin 27 on the underside, by means of which the bearing element 20 can be inserted into corresponding bores in the support (not shown), wherein the two dowel pins provide a torsion-proof fastening. Finally, Fig. 5 shows a clamp fastening, where a clamp 28 is attached to the underside of the base plate 21, which overlaps the laths of a normal grid (as shown in this instance), corresponding laths, wherein also other holding means interacting with the clamp are possible.

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Figures 6 and 7 show a type of fastening of the bearing elements 20 on any type of support, formed by intersecting support structure elements (undercrosses) 80, which can be joined together in a level support not necessarily of rectangular shape. To form this level surface, the webs 81 of adjacent undercrosses are joined up. Towards this end, two of the webs 81 have integrally formed dowel-like lugs 82, whilst the other two webs 81 from the underside are provided with recesses and at the upper side with an integrally formed projection 83 provided with holes 85. The recesses 84 are designed in such a way that they are able to accommodate the webs 81 with the lugs 82, whereby these lugs 82 inserted through the holes 85 secure the position of the undercrosses 80 to one another. In this instance several holes 85 in the projections 83 ensure that varying distances can be set between the individual

undercrosses 80. To facilitate the joining up, the lugs 82 are provided with grooves 82.1, which enable the use of even (relatively) rigid plastic materials for the undercrosses 80. In the crossing region of the undercrosses 80 fastening means in the form of a twist-lock plate 87 arranged on a pin 86 are provided.

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For the interaction of these undercrosses 80, the base plates 21 of the bearing elements 20 are in this instance provided with central twist-lock openings 29, through which the twist-lock plate 87 is led. The flattened edges 29.1 of the central twist-lock openings 29 after a rotation of for instance 90° engage the twist-lock plate 87 from behind. Stop means - in figure 6b recognisable as projection 29.2, which interacts with a corresponding stop projection at the underside of the twist-lock plate 87 - ensure that a position secured by twist-locking is retained against reversal.

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Figures 8 show a bearing element 40 in top view (Fig. 8a) with the bearing plate 40, which latter has four bearing arms 45, on which the mattress (not shown) is placed and by which it is supported; these bearing arms 45 have bearing surfaces 48 with recesses 48.1 for rear ventilation, so that an air exchange is possible through surfaces which are closed within themselves. Advantageously, also the central plate 41 forms the inner bearing surface, and further bearing surfaces can be provided between the central plate and the outer bearing surface 48, wherein outwardly extending bridging elements 49 connect the central plate 41 with the bearing surfaces 48. In this arrangement each bearing surface is advantageously spaced at a greater height than the preceding one so that the outermost bearing surface 48 compared with the (inwardly) following bearing surfaces 47 is placed at the highest position, etc. down to the innermost bearing surface 46 which in this sense has the lowest position. The unloaded mattress thus only rests on the outermost of the bearing surfaces 48 and has therefore good rear ventilation. With increased loading, the bearing surfaces positioned further towards the interior will be brought into play until, at maximum loading, the mattress is in full contact with all its bearing surfaces.

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A section through this bearing element 40 is shown in figures 8b and 8c. On one hand the bearing plate 40 is placed directly on the base plate 31 (Fig. 8b) positioned on lath 9, and on the other hand, for greater spring deflection, a spring body is placed between foot support 31 and bearing plate 40 (Fig. 8c). In addition, the foot support 31 has two circle segments 32, provided with overhangs 33, which define one part of a twist-lock connection, as well as two diametrically opposite projections 37. For the purpose of positioning onto the support, for instance a lath 9 of a grid 1, the foot support 31, on the side turned away from the twist-lock connection, is provided with a bearing shell 31.1 engaging the lath 9 in a form-fitting manner. A pin 31.2 engaging the bore 9.1 of the lath 9 secures the position of the bearing element 30.

The bearing plate 40 has a supporting plate 42, in which are provided two circle segment-shaped recesses 43 defining the corresponding further (second) part of the twist-lock bayonet catch. The circle segments 32 are inserted into these recesses 43 when the foot support 31 and the bearing plate 40 are to be connected. By rotating the bearing plate 40, the overhangs 33 engage the edges of the recesses 43 from behind, so that a fixed connection is achieved. Furthermore, in the supporting plate 42, recesses 44 are provided; projections 34 of the foot support 31 engage these recesses 44 so that a reversed twisting can only occur by overcoming the locking force of the locking connection formed in this manner. The spring body 3 is designed in such a way that it can be inserted between foot support 31 and bearing plate 40. The spring body head 35.2 is correspondingly provided with circle segments 32 (s. Fig. 9), which can interact with the recesses 43, so that the bearing plate 40 can be placed on top of a high spring body 35 or a low spring body 35'.

Figures 9 and 10 show spring bodies 35 or 35' in a schematic perspective or in side view. A high spring body 35 - as shown in Fig. 10A - is defined by a double polygon 38, whose sides turned away from one another are defined by the spring body foot

35.1 or the spring body head 35.2; the tips 38.1 of the polygons 38 which are directed towards one another are deformed into a spring tube 39.

For a bearing element of medium height - Fig. 10b - a spring body 35' is provided,
5 whose spring element is defined as a single polygon 35'. In this arrangement, the tube spring 39 is deformed into a semi-tube spring 39' moulded onto the interior side of the head plate. Both spring elements 35 or 35' have the same spring body foot 35.1 and the same spring body head 35.2, so that this spring body 35' - as described above - can be inserted between foot support 31 and bearing plate 40, 50
10 or 60. The spring body feet 35.1, of equal design, of both spring bodies 35 or 35' (Fig. 10c) have - analogous to the supporting plate 42 of the bearing plate 40 - circle segment-shaped recesses 36 as well as protrusions 37, which define the one part of a twist-lock catch - as described above - so that the spring body 35 as well as the spring body 35', analogous to the bearing plate 40, can be fixed at the foot support
15 31. The protrusions 37, after twisting, engage recesses 34 and thus secure the spring body 35 against a reversed twisting and thus against release. The spring body head 35.2 (Fig. 10d) is - analogous to foot support 31 - equipped with two circle segments 32 provided with overhangs 33 forming one part of a twist-lock catch, which interact with the recesses 43 of the supporting plate 42 as a twist-lock catch,
20 wherein the spring body head 35.2 has protrusions 37, which lock into the recesses 44 and thus - in the above described manner - prevent an unintended release of the bearing plate 40 from the spring body 35; the wedge-shaped protrusions 37 (see part section next to Fig. 10c) facilitate the locking of the catch and render its release difficult.

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The spring properties are imparted to these spring bodies 35 or 35' by the elastic walls of the polygons 38 and 38' with their tips 38.2 and 38.2' respectively which tips are turned outwardly. They are determined by the material constants as well as by their dimensions. In order to achieve a "stiffening" of the spring action in a wide
30 deflection of the spring body 35 or 35' respectively, a tube spring 39 (Fig. 10a) is proposed in the region of the tips directed towards each other, or a semi-tube spring

39' (Fig. 10b) corresponding to the former and moulded onto the interior side of the spring body head 35.2. This tube spring 39 or 39' respectively causes the spring body head 35.2 at high loading to press against the tube spring and to press the latter against the spring body foot 35.1. In this way, the tube spring 39 acts as an independent spring with a different spring load-deflection curve, which now controls a continuing compression, the spring constant increasing accordingly. For a further compression, a proportionately greater force than previously will be required.

The outwardly directed tips 38.2 for the purpose of adjusting the spring constant to the desired values and to catch lateral sheering forces, can be connected via drawn in, bridging, arched support straps 35.3 (Fig. 9a); another possibility is by using circle segment recesses 35.4 of these outwardly directed tips 38.2. If recesses 35.4 are proposed at the outwardly directed tips 38.2 or 39.2' respectively of the polygons 38 or 38' respectively, the spring body even when forced together acts like a ball bearing mounting. The bearing plate placed thereon is able to yield in any direction.

Figures 11 and 12 show a bed system with grid 1 with base frame 2 and two elevated frame parts 3,5 as well as a head part 7, the side bars of which frame parts have laths 9 which are fastened with dowel pins 8 and are provided with such bearing elements 10 (Fig. 11a, 11b), as well as the laths equipped with bearing elements 10 or 10' (Fig. 12a, 12b). The elevated frame parts 3 and 5 are hinge-mounted with hinges 4 to the frame 2 or hinge-mounted to each other; the head rest 7 proposed in the frame part 5 is hinged on with a further hinge 6, so that the head rest can also be elevated. Naturally, in this arrangement also the base frame 2 to raise the position of the foot region can be designed to be elevated, if desired. As the side view (with recessed side bars) shows, the laths 9 in the region of the buttocks are up to the shoulders equipped with bearing elements 10 with bearing plates 40, which have spring bodies 35 enabling a greater range of spring deflection and thus an increased deflection in the loading region; in the remaining regions, bearing elements 30' without interpositioned springbodies 35 are provided. In order to provide, in the unloaded state, a planar bearing surface despite this greater spring deflection, the laths with

lath holders are fixed by means of known stepped dowel pins 8 to the bars of frames 3, 5 or head rest 7 respectively. In this arrangement only the critical zones are springy, wherein only for these zones the more expensive bearing elements 10 with spring bodies 35 are required.

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Figures 13, 14 and 15 show differing bearing plates: Figure 13 shows a bearing plate 50 with 4 bearing arms 55 at an angular distance of 90° , the inclined radial connectors 59 are stepped to form an intermediate bearing surface 57. The outer bearing surfaces 58 are defined as arrow-shaped and, if arranged appropriately, fit together. The internal bearing surface has been removed so that the central plate 51 with the recesses 52 defining the part can be recognised as part of a twist-lock bayonet catch, which interacts with the lugs provided on the upper face of the central part and forming the second part of the bayonet catch in such a way that the bearing plate 50 when turned by approximately 90° can be fixed to the central part.

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15 Further recesses allow a securing of the bearing plate 50, whereby the recesses are engaged by protrusions on the upper face of the central part - as described above.

Each of these bearing arms 55 has three bearing surfaces 56, 57 and 58 in a stepped arrangement, which are connected with one another via inclined radial connectors 59. The inclination of the radial connectors 59 results in a stepped arrangement, wherein the height difference of the steps is determined by the angular position and length of the radial connectors. In order to maintain the elasticity it is essential that the angular position of the surfaces of the connectors is not too steep: the closer the angle is to 90° , the stiffer and more inflexible is the connection of the following higher-positioned bearing surface 56 compared with the central plate 51, or the bearing surface 57 compared with the bearing surface 56, or the bearing surface 58 compared with the bearing surface 57 respectively. In this arrangement, the bearing surfaces 56, 57 or 58 respectively can have further recesses, facilitating a rear ventilation. (see Fig. 8).

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A bearing plate 60 of a different design but also with 4 bearing arms 65 at angular distance of 90° is shown in Fig. 14. Here, the four bearing arms 69 are provided with undulated springs 69.1 to improve the spring properties. This bearing plate 60 is identical in its further characteristics to the embodiment shown in Fig. 13. The
5 bearing arms 55 or 65 are arranged diametrically opposite these bearing plates 50 or 60 respectively, without restricting the invention to this arrangement. In the same manner also two bearing arms diametrically opposite each other, or three bearing arms at an angular distance of 120° can be arranged. In these bearing plates, all contours - as can be seen in Figures 13 and 13* - are provided with upstanding edges
10 for the purpose of stiffening and greater stability.

The Figures 15 show a bearing plate 70 with annular bearing surfaces 76, 77, 78, in which arrangement it is understood that besides circular shapes also square or oval shapes can be used. The bearing surfaces 76, 77, 78 are connected via the inclined
15 radial connectors 79 or 79 respectively defined as bridging elements, wherein the reference numbers in the top views are each only marked in one quadrant. Advantageously, also in this case the bridging elements 79 are defined as undulated springs 79.1, the undulations of which - as seen in the section - have flanks which extend essentially parallel. This design of the undulations of these undulated springs
20 allows for an adjustment of the spring constants.

The bearing plates 40 (Fig. 8), 50 (Fig. 13), 60 (Fig. 14) and 70 (Fig. 15) of this type of design have good mould ejection properties during their production as plastic injection moulding parts. In the embodiment example in accordance with the
25 Figures 14, the interior bearing surface 66 is formed by an insert (66) which is inserted into a corresponding recess of the central plate 61. The edges of the outer bearing surfaces 48, 58, 69 or 78 respectively are designed in such a way that the recesses ensuring a rear ventilation are formed between this edging and the respective bridging element. Coupling links are provided, in order to transfer the
30 movability of the individual bearing surfaces to adjacent bearing surfaces of the same bearing plate.

CLAIMS



- 5
1. Bearing element for upholstery, in particular for rear-ventilated upholstery supports such as upholstery, mattress or the like for seat or bed systems, which bearing element is provided with a base and can be fastened on a support and has a bearing plate holding upholstery, characterised by spring elements disposed between base (11) and bearing plate (15, 20, 40, 50, 60, 10 70) which spring elements are defined as leaf spring-type bearing arms (12, 22) with a range of spring deflection aimed in the direction of the bearing pressure, and where at least two of these spring elements are provided extending from the base (11) outwardly, the outer end of each ending in the 15 bearing plate (15, 25).
2. Bearing element in accordance with Claim 1, characterised by three or four rotationally symmetrically arranged bearing arms (12, 22), the angular distance of three bearing arms (12, 22) being 120° and of four bearing arms 20 (12, 22) 90°.
3. Bearing element in accordance with Claim 1 or 2, characterised in that the leaf springs forming the bearing arms (12, 22) have equal spring constants, wherein preferably the bearing arms (12, 22) are made of a high-quality 25 elastomer and the bearing surfaces (15, 25) of an economical plastic.
4. Bearing element in accordance with one of the Claims 1 to 3, characterised in that the leaf-spring-type bearing arms (12, 22) are comprised of undulated springs (13).
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5. Bearing element in accordance with one of the Claims 1 to 4, characterised in that the bearing plate (15, 25) is formed by a plurality of bearing surfaces (14, 24), which are coupled by means of spring elements in such a manner that a balance is automatically provided for the path directed outwardly when deflection of the bearing surfaces (14, 24) occurs, for which purpose the coupling spring elements connecting these bearing surfaces (14, 24) are in the form of OMEGA-type springs (23) or undulated springs.
6. Bearing element in accordance with one of the Claims 1 to 5, characterised in that the base (11) as base plate (11.1) or as base body (11.2) is defined by a height enabling a balance for differing height levels of the base.
7. Bearing element in accordance with Claim 6, characterised in that the base plate (11.1) or the base body (11.2) are provided with one or two holes (26, 29) which are diametrically opposite each other relative to the centre of the base plate (11, 21), and which holes enable fastening by means of screws or dowel pins on the support.
8. Bearing element in accordance with Claim 7, characterised in that the central hole (26, 29) for the purpose of fastening at a T-shaped holder (86, 87) on the support has at least one, preferably two flattened sides (29.1) arranged opposite each other.
9. Bearing element in accordance with one of the Claims 1 to 5, characterised in that base plate (11.1) or base body (11.2) for the purpose of fastening to the support has a clamp (28) which interacts with a correspondingly formed mating parts on the support.
10. Bearing element in accordance with one of the Claims 1 to 5, characterised in that base plate (11.1) or base body (11.2) for the purpose of fastening to a



support has hook-shaped laths, which are designed elongated or arcuate and are arranged on both sides of the centre of base plate (11.1) or base body (11.2), and which form one part of a sliding connection or twist lock connection, and preferably have stop means to limit the twist-lock or sliding range.

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11. Bearing element for upholstery, in particular for rear-ventilated upholstery supports such as upholstery, mattress or the like for seat or bed systems, which bearing element is provided with a base plate and can be fastened on a support and has a bearing plate holding upholstery, which bearing plate has openings permitting rear ventilation, characterised by a spring body (35, 35') disposed between base plate (11.1) or base body (11.2) and bearing plate (40, 50, 60, 70), where the spring body head (35.2) and the spring body foot (35.1) as well as the bearing plate (40, 50, 60, 70) and base plate (11.1) or base body (11.2) have corresponding locking parts, so that the bearing plate can be releasably placed on the spring body (35, 35') as well as on the base plate (11.1) or base body (11.2).

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12. Bearing element in accordance with Claim 11, characterised in that as locking means a twist-lock connection in the manner of a bayonet connection is proposed, wherein preferably the locking parts interacting in pairs have interacting means which latch into place.

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13. Bearing element in accordance with Claim 11 or 12, characterised in that as spring body (35') a single polygon (38') of an elastomer is used, whose tip (38.1') directed towards the foot plate (31) defines the spring body foot (35.1) and the tip directed to the bearing plate (20, 40, 50) defines the spring body head (35.2), wherein the spring body foot (35.1) defines the upper part

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- 5 and the spring body head (35.2) defines the lower part of the locking means, both of which interacting with the corresponding upper and lower locking parts of base plate (11.1) or base body (11.2) and bearing plate (40, 50, 60, 70) enable an insertion of the spring body (35') between foot mount (31) and bearing plate (40, 50, 60, 70), and wherein preferably a semi-tube spring (39') is integrally formed with the inner side of the spring body head (35.2).
- 10 14. Bearing element in accordance with Claim 11 or 12, characterised in that as spring body (35) a double polygon (38.38) of an elastomer is used, whose tip directed to the base plate (11.1) or base body (11.2) defines the spring body foot (35.1) and the tip directed to the bearing plate (40, 50, 60, 70) defines the spring body head (35.2), wherein the spring body foot (35.1) defines the upper part and the spring body head (35.2) defines the lower part of the locking means, both of which interacting with the corresponding upper and lower locking parts of base plate (11.1) or base body (11.2) and bearing plate (40, 50, 60, 70) enable an insertion of the spring body (35) between base plate (11.1) or base body (11.2) and bearing plate (40, 50, 60, 70), and wherein preferably the tips (38.1) of the two polygons (38) which are directed towards each other are joined in such a manner that a tube spring (39) is formed between them.
- 25 15. Bearing element in accordance with Claim 13 or 14, characterised in that the outwardly directed tips (38.2) of the polygons (38) have circle segment-shaped recesses symmetrical to the centre, wherein the width of the recesses (35.4) is less than that of the polygons (38), preferably however at least equal to half of the spring members forming the polygons (38).
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16. Bearing element in accordance with Claim 14, characterised in that the
5 outwardly directed tips (38.2) of the polygons (38) are connected with each
other via a lateral support strap (35.3), where the width of the support strap
(35.3) is less than that of the polygons (38), but preferably at least equal to
half of the spring members forming the polygons (38).
- 10
17. Bearing element in accordance with one of the Claims 11 to 16, characterised
in that the bearing plate (40, 50, 60, 70) which can be placed on the base
plate (11.1) or base body (11.2) and is designed as a spring-loaded stepped
bearing plate, has bearing surfaces (46, 47, 48; 56, 57, 58; 66, 547, 68; 76,
15 77, 78) which are connected with one another by bridging elements or radial
connectors (49; 59; 69; 79) which are spaced at different heights from one
another from the inside towards the outside in such a manner, that the
innermost of the bearing surfaces (46; 56; 66; 76) occupy the lowest level,
the following bearing surfaces (47; 57; 67; 77) higher levels and the
20 outermost bearing surfaces (48; 58; 68; 78) the highest level, wherein the
bridging elements or radial connectors (49; 59; 69; 79) are formed as spring
members which as spring elements preferably have an undulated spring
(49.1; 59.1).
- 25
18. Bearing element in accordance with Claim 17, characterised in that the
bearing plate (70) has at least one outer bearing surface (78), formed by a
circular, oval or rectangular ring, as well as an inner bearing surface (76),
wherein the inner bearing surface (76) is supported directly on the central
plate (71) or is formed by the latter, wherein bridging elements or radial
30 connectors (79.1) are provided between the inner bearing surface (76) and



the outer bearing surface (78), and where preferably bearing surfaces (76; 77; 78) and/or radial connectors (79.1) have recesses as ventilation openings.

- 5 19. Bearing element in accordance with Claim 18, characterised in that the bearing plate (40, 50, 60) has at least two, preferably three or four bearing arms (45; 55; 65) arranged at an angle of 120° or 90° respectively and directed outwardly, the outer ends of which are formed as bearing surfaces (48; 58; 68), as well as an inner bearing surface (46; 56; 66), which
- 10 preferably is supported directly on the central plate (41; 51; 61) or is formed by the latter, and wherein bridging elements or radial connectors (49; 59; 69) are provided between the inner bearing surfaces (46; 56; 66) and the outer bearing surfaces (48; 58; 68).
- 15 20. Bearing element in accordance with Claim 18 or 19, characterised in that between the outer bearing surface (48; 58; 68) and the inner bearing surface (46; 56; 66) an intermediate bearing surface (47; 57; 67) is provided, whose height is above that of the inner bearing surface (46; 56; 66), but below that of the outer bearing surface (48; 58; 68), which intermediate bearing surface
- 20 is integrally formed with the bridging elements or radial connectors (49; 59; 69), and where the bridging elements or radial connectors (49; 59; 69) and/or bearing surfaces (46, 47, 48; 56, 57, 58; 66, 67, 68) of the bearing plate (40; 50; 60) are preferably provided with recesses as ventilation openings (48.1; 58.1; 68.1).
- 25 21. Bearing element in accordance with Claim 18, 19 or 20, characterised in that at least the outer bearing surface (48; 58; 69) of the bearing plate (40; 50; 60) has bent off edge regions to form a U-profile or C-profile for increased stability.
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22. Bearing element in accordance with one of the Claims 11 to 21, characterised by a multi-armed bearing plate (40; 50; 60) whose outer bearing surfaces (48; 58; 68) are connected via arched links (48.2; 58.2; 68.2) as coupling bridging elements with their respective adjacent bearing surfaces (48), where the outer bearing surfaces (48; 58; 68) together with the coupling bridging elements form a closed structure, wherein the coupling bridging elements are formed as springs, preferably as OMEGA-shaped flat springs or as undulated springs.
23. Bearing element in accordance with one of the Claims 1 to 22, characterised by the base plate (11.1) or base body (11.2), spring body (36;35') and bearing plate (40; 50; 60; 70) being plastic injection-moulded parts.
24. Bed system with an upholstery support provided with a bearing element in accordance with one of the Claims 1 to 23, wherein the upholstery elements are placed on a plate or fastened to laths, characterised by fastening means provided on the plate or the lath.
25. Bed system in accordance with Claim 24, characterised in that onto the plate a grid made of intersecting support structure elements (undercrosses) (80) is placed, wherein each of the latter are in the crossing regions provided with fastening means for the bearing element (10), wherein the undercrosses (80) can be joined by means of socket connectors.
26. Bed system in accordance with Claim 24 or 25, characterised in that the bearing elements (10) are attached to the plate, to the grids comprised of undercrosses (80) placed on the plate or to the laths by means of a plug-in connector provided there.
27. Bed system in accordance with Claim 24 or 25, characterised in that the bearing elements (10) are attached to the plate, to the grids comprised of

undercrosses (80) placed on the plate or to the laths by means of a twist-lock provided there.

28. Bed system in accordance with one of the Claims 24 to 27, characterised by a first zone (I) with bearing elements (10'), formed of base plate (11.1) or base body (11.2) and bearing plate (40; 50; 60; 70) and a second zone (II) with bearing elements (10), formed of base plate (11.1) or base body (11.2), spring body (35; 35') and bearing plate (40; 50; 60; 70), wherein the laths (9) of the first zone are arranged at a higher level and those of the second zone at a lower level relative to the frame (2), wherein preferably the bearing elements (10) with spring body (35, 35') of the second zone (II) are essentially provided corresponding to the position of the buttocks of a reclining occupant in the middle of the grid (1), and the bearing elements (10') of the first zone only with foot support (31) and bearing plate (40; 50; 60; 70) on both sides of the second zone (II), wherein preferably zone I is proposed at least in the region of the outer of the elevatable frame parts.



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