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(71) Applicant: **Dimaflex S.A.**
43800 Valls Tarragona (ES)

(72) Inventor: **Marti Solanes, Ana Maria**
E-43800 Valls (Tarragona) (ES)

(74) Representative: **Ungria Lopez, Javier et al**
Avda. Ramón y Cajal, 78
28043 Madrid (ES)

(54) **Suspension structure for mattress support**

(57) Suspension structure for supporting a mattress or small mattress on a piece of furniture for resting, which comprises a support sheet (1), a suspension sheet (4) and at least one elastic suspension support (2,3) placed between the support sheet (1) and the suspension sheet (4) that acts like a suspension mechanism in the vertical direction and as a suspension mechanism in the horizontal direction so as to allow the rocking movement of the suspension structure in the vertical direction and in the horizontal direction, namely, an integral adaptation. It contemplates the use of tension members through which the hardness of the suspension supports is adjusted according to the different resting areas and the needs of the user.

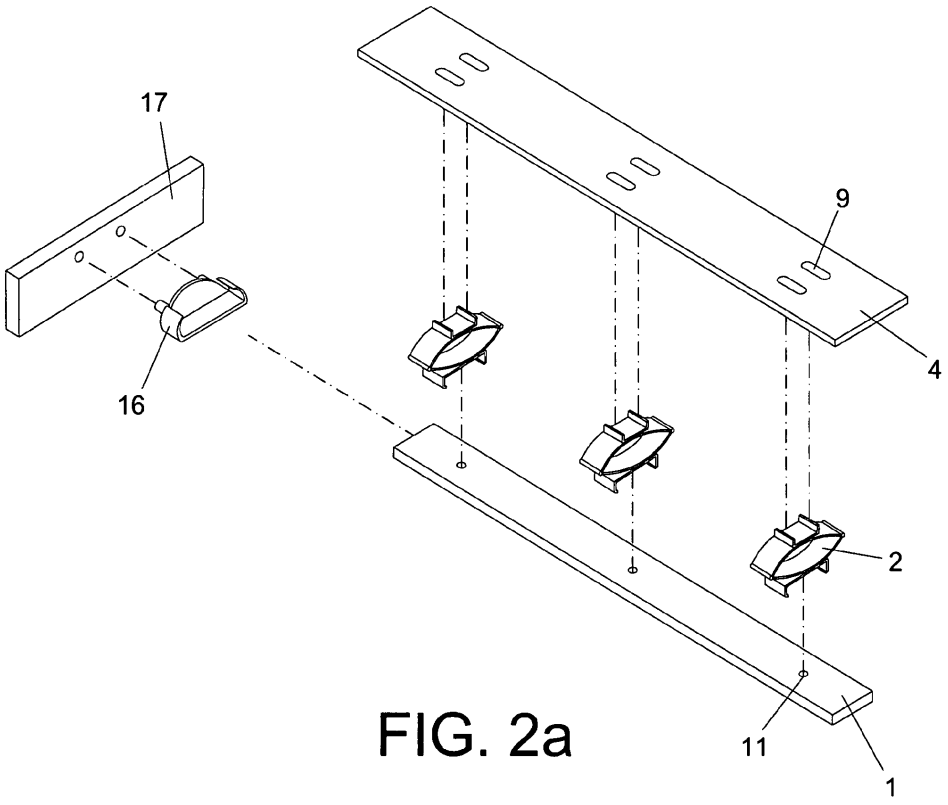

FIG. 2a

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Description

[0001] The present invention, as this specification states in its title, is intended to provide a suspension structure for supporting a mattress, small mattress or an element for resting to a piece of furniture intended for resting o relaxation, which is capable of vertically and horizontally rocking in order to adapt the resting surface to the user's contour needs.
[0002] Another object of the present invention is to improve the comfort and hygienic properties of traditional mattress supports.

STATE OF THE ART PRIOR TO THE INVENTION

[0003] Structures for supporting a mattress or small mattress on a piece of furniture intended for resting are known from the state of the art.
[0004] Patent WO-1994027548 describes improvements implemented in hospital beds. One of the proposed improvements is provided for allowing the patient to support his/her body on one or the other of the two sets of slats constituting the mattress support, each set being associated with a group of movable elements in an upward and downward direction. Another included improvement is that the mattress support slats can be complemented with a pneumatic chamber located at the top along the entire length of the slat, by fitting together at their ends into side supports that will be later connected to the mattress support crossbar. Thus, it is achieved to cushion the supporting points in the user's body.
[0005] Spanish Patent N° 2070083 describes mattress supports that include some pneumatic elements or blisters placed, each one of them, on a lower slat. Said blisters are composed of two cavities in communication with each other through tubes forming part of the blister itself. These are coupled by their ends to side supports that are fitted into the mattress support spars.
[0006] Spanish utility model U1018243 describes an elastic platform for beds, equivalent to a conventional mattress support with wooden slats, with the peculiarity that the platform can adapt a flat position and can additionally adapt any warped profile so that it can be used in special positions.
[0007] European Patent EP0428227 describes the use of a resistant element for fastening the slats of a mattress support to the frame. The object of the invention comprises two elastically deformable tubular elements connected to each other, these being arranged in parallel, using an elastic part.

DESCRIPTION OF THE INVENTION

[0008] The object of the present invention is to provide a suspension structure used in a piece of furniture intended for resting in order to provide a support that adapts to specific needs of each user.
[0009] Thus, a suspension structure for supporting a mattress or small mattress in a piece of furniture for resting is proposed, which comprises;

- a support sheet,
- a suspension sheet and
- at least one elastic suspension support placed between both sheets that joins them, and that acts like a suspension mechanism in a vertical direction and as a suspension mechanism in a horizontal direction so as to allow the rocking movement of the suspension structure in the vertical and horizontal directions. The rocking movement of the suspension structure allows it to be capable of adapting to the user's needs and providing flexibility.

[0010] The support sheet is located in the bottom part of the suspension structure. The at least one suspension support is positioned thereon, and onto it the suspension sheet is positioned. The suspension sheet is in contact with the mattress or small mattress on the piece of furniture intended for resting wherein the invention is used.
[0011] Both the support sheet and suspension sheet may be rectangular and be shaped like a mattress support slat. In this case, the length of the sheets is adapted to the width of the piece of furniture for resting in which it is used, and the width of the sheets is adapted to the measurement of the at least one elastic suspension support. The number of suspension structures to be used depends on the user's needs and the size of piece of the piece of furniture intended for resting wherein it is used.
[0012] The support sheet and suspension sheet can have the same shape as the mattress or small mattress of the piece of furniture intended for resting wherein these will be used. In this case, there is more than one elastic suspension support in the suspension structure and the elastic suspension supports are located throughout the entire surface between the support sheet and the suspension sheet. The distribution of the elastic suspension supports will be made according to the user's needs.
[0013] In a preferred embodiment, there is more than one elastic suspension support for each suspension structure and the number of elastic suspension supports to be placed in each suspension structure varies depending on the width

of the piece of furniture for resting.

[0014] Between the space that the at least one elastic suspension support leaves between the suspension sheet and support sheet, the airflows freely towards the outside removing the moisture and the accumulated heat. Thus the comfort and hygienic properties of the whole equipment for resting are maintained, including the suspension structure, the mattress or small mattress and the piece of furniture for resting.

[0015] Each of the suspension structures object of the invention is completely covered with a cover. Said cover is made of a breathable fabric and is completely removable.

[0016] The cover is custom-built to the suspension structure of the invention. In order to ensure that the cover is completely removable, it is provided with a zipper.

[0017] In order to ensure that the cover is completely removable, it can be sewn, or have Velcro or other closing systems.

[0018] In a preferred embodiment of the invention, the cover is a 3D mesh fabric between 3 mm and 4 mm thick. In a preferred embodiment of the invention, the cover is a 3D mesh fabric 3.5 mm thick. By using this mesh it is possible for the air to flow through the cover.

[0019] In another preferred embodiment of the invention, the cover may be any other breathable fabric such as stretch fabrics or cotton fabrics.

[0020] The support sheet acts like a support for the rest of the suspension structure, that is, for the elastic suspension supports and the suspension sheet.

[0021] The support sheet is made of a material selectable from the group consisting of wood, plastic, copper, aluminium, steel and any combination thereof.

[0022] In a preferred embodiment of the invention, the support sheet is made of multilayered beech wood.

[0023] The support sheet may have some mechanization, specifically holes, which are intended for positioning and anchoring the elastic suspension supports forming part of the suspension structure. In a preferred embodiment, there are as many mechanizations as elastic suspension supports. The number of mechanizations in the support sheet may also depend on the number of positioning and fastening elements carried by each elastic suspension support in order to be used with the same.

[0024] The suspension sheet acts like a support for the mattress or small mattress.

[0025] The suspension sheet may be made of plastic, copper, wood, aluminium, steel or materials with similar properties. In a preferred embodiment of the invention, the suspension sheet is made of wood or plywood.

[0026] The support sheet may have some mechanizations intended for positioning and anchoring the elastic suspension supports forming part of the suspension structure. Said mechanizations can be grooves.

[0027] In a preferred embodiment, there are two mechanizations for each elastic suspension support in the suspension sheet. In this embodiment of the invention, the grooves are rectangular with rounded vertexes and they are arranged in pairs along the length of the suspension sheet.

[0028] In a preferred embodiment of the invention, the at least one elastic suspension support has a hardness of 72 HS. However, the hardness of at least one elastic suspension support can be adjusted in terms of the client's needs. Other hardnesses of 70 HS, 68 HS, 65 HS or 63 HS can be obtained among other values.

[0029] In a first preferred embodiment of the invention, the at least one elastic suspension support is defined by two arched wings opposite to each other, one at the top and another at the bottom, defining a spindle-shaped central space and the ends of which come together in some coupling housings wherein a tension member can be placed.

[0030] The coupling housings are in communication with the spindle-shaped central space, which at the same time are delimited by some circumferential path curved narrow portions.

[0031] The upper arched wing includes an outer "U"-shaped surrounding clamp the free ends of which end in bent ends directed towards the inside.

[0032] The lower arched wing includes an outer surrounding clamp larger than the outer surrounding clamp of the upper arched wing, shaped as a reversed "U" the free ends of which end in bent ends directed towards the inside

[0033] From the center of the connection between the surrounding outer clamp and the lower arched wing, a cylindrical stub protrudes.

[0034] In a preferred embodiment of the invention, the elastic suspension support has some approximate measurements of 10 cm in the horizontal direction, 7.5 cm in the vertical direction, and 3 cm wide.

[0035] In this first preferred embodiment, the at least one elastic suspension support shrinks a maximum distance comprised between 2.5 cm and 3.5 cm in the vertical direction. The distance to which the elastic suspension support shrinks in the vertical direction is called comfort stroke. In a preferred embodiment of the invention wherein the elastic suspension supports described in the previous paragraphs are used, this stroke is approximately 3 cm.

[0036] In this first preferred embodiment, the suspension structure comprises at least one tension member in the at least one elastic suspension support for adjusting its hardness and thus its comfort stroke.

[0037] In an additional preferred embodiment of the first preferred embodiment, said tension member includes a flat body made of elastic material with some extreme thicknessings.

[0038] The tension member further includes a larger central orifice flanked by two sets of longitudinally aligned orifices

increasing in size towards the ends wherein the extreme thicknessings are located.

[0039] The longitudinal edges of the transverse tension member include straight sections pairs coming together towards the center where they are joined in a rounded manner to a pair of circumferential path sections.

[0040] The extreme thicknessings of the tension member are designed to be inserted within the coupling housings of the suspension elastic support so that the tension member is transversely positioned in relation to the central space of the suspension elastic support.

[0041] In a further preferred embodiment of the first preferred embodiment, the tension member comprises an angular body made of elastic material, the identical branches of which come together in a common connection, from which an outer rib with circular section protrudes.

[0042] The branches have a slight bowing on both faces delimiting a decrease in thickness towards their free edges opposite to the common connection for joining both branches.

[0043] The extreme corners of the angular body have some cylindrical addendums protruding outside the outer faces of both branches of that angular body.

[0044] The outer rib with circular section of the tension member is designed to be inserted into a coupling housing of the elastic suspension support.

[0045] The cylindrical addendums have as a function to axially fix the position of the tension member.

[0046] In a second preferred embodiment, the at least one elastic suspension support is defined by a top circular base and a bottom circular base defining a central cylindrical body wherein grooves are defined, which pass in a vertical direction extending from the top part of the central cylindrical body to the bottom part.

[0047] The top circular base is a flat surface, in the central part of which is a concentric circular bulge in which center there is a rectangular cleft. A first quarter of the flat surface has at least two holes, a second quarter which is adjacent to the first has a through groove that extends following the profile of the concentric circular bulge from said bulge towards the edge of the circular flat surface, a third quarter which is adjacent to the second, is the same as the first quarter and a fourth quarter which is adjacent to the third is the same as the second.

[0048] The bottom circular base is the same as the top circular base.

[0049] The top circular base can be coupled to the suspension sheet by screws. In a preferred embodiment of the invention, it is coupled by four screws.

[0050] The bottom circular base can be coupled to the support sheet by screws. In a preferred embodiment of the invention, it is coupled by four screws.

[0051] In this second preferred embodiment, the elastic suspension support measures approximately 9.5 cm in the horizontal direction, 8 cm in the vertical direction and 9.5 cm wide.

[0052] In this second preferred embodiment, the at least one elastic suspension support has a comfort stroke between 6.5 cm and 7.5 in the vertical direction. In this preferred embodiment of the invention, this stroke is approximately 7 cm.

[0053] Thus, this second preferred embodiment is the best alternative for users who need a longer elastic stroke of the suspension structure or who are heavier.

[0054] Preferably, in this second embodiment of the invention at least one tension member is used, which serves for adjusting the hardness of the elastic suspension support, and comprising at least one spring. This tension member is placed inside the elastic suspension support and serves for adapting the hardness to the user's needs or to the different resting areas.

[0055] By including a different tension member in each suspension element according to the needs of each person, fully customized suspension structures are obtained. Therefore, if there is for example, a piece of furniture intended for resting with several suspension structures where, in each of which, there are several elastic suspension supports, each one of the supports can be adapted by adjusting its hardness so as to present greater resistance in the user's heavier areas such as in the lumbar area and less resistance in lighter areas such as the extremities. In a preferred embodiment of the invention in which several suspension structures are used as mattress support slats, if it is a double bed, the hardness of the elastic supports can be adapted customizing them at each area to the corresponding user.

[0056] In a further preferred embodiment of the invention, at least one elastic suspension support is made of an elastomeric material.

[0057] In a further preferred embodiment of the invention, the at least one elastic suspension support is made of TPEE (thermoplastic polyester elastomer).

[0058] The described geometries for the at least one elastic suspension support allows it to act as a suspension mechanism in a vertical direction and, at the same time, as a suspension mechanism in the horizontal direction, allowing the suspension structure to rock.

[0059] The suspension structure may include a support through which it is fastened to a rack placed in the structure of the piece of furniture for resting. Said support can be used to fasten the suspension structure directly to the structure of the piece of furniture for resting.

[0060] In a preferred embodiment of the invention, said support is made of nylon.

[0061] The support has some measurements that are adapted to fit the width of the support sheet since the support

sheet is the one hooked in said support.

[0062] In a preferred embodiment of the present invention, the piece of furniture for resting is a bed.

[0063] Another object of the present invention is a bed comprising at least one suspension structure as any of the previously defined.

[0064] In a preferred embodiment of the invention, the piece of furniture for resting comprises a sufficient number of suspension structures so as to, when the user lays on the mattress or small mattress, said mattress or small mattress shifts the pressure to the suspension structures of the piece of furniture for resting so that these automatically rock horizontally and vertically to adapt the entire resting surface to the contour needs of the user, providing optimal support for his/her vertical column.

[0065] One of the uses of the present suspension structure is as slat for a mattress support.

[0066] Another use of the present suspension structure is for placing a mattress or small mattress on it.

[0067] Thus, the present suspension structure is preferably used together with more suspension structures as slat in order to form a mattress support for a piece of furniture for resting, which can be a bed or a resting and/or relaxing surface.

[0068] In a preferred embodiment of the invention, suspension structures comprising elastic suspension supports as those described for the first preferred embodiment and as those described for the second preferred embodiment are used in a piece of furniture for resting. The possibility of combining both types of elastic suspension supports enables a much higher capacity to adapt to the user's needs.

BRIEF DESCRIPTION OF THE DRAWINGS

[0069] Next, representative figures of one of the embodiments of the invention are presented, by way of example only and, therefore, are not restrictive of the present invention, and wherein:

Figure 1 a shows an embodiment of the suspension structure assembly object of the present invention. The direction in which the load is applied, which is the user's weight, is shown by some vertical arrows. The vertical rocking and horizontal rocking movements allowed by the suspension structure are also shown by arrows.

Figure 1b shows the same suspension structure but here the airflow is represented. It can be seen how the airflow circulates freely in the space between the suspension sheet and support sheet.

Figure 2a shows an exploded view of the suspension structure in which elastic suspension supports as those described for the first preferred embodiment of the invention have been used. The support fastening the suspension structure to the bed structure is also shown.

Figure 2b shows a view of the suspension structure shown in Figure 2a but with the support sheet, the elastic suspension supports, the suspension sheet and the support already coupled together in their relative positions.

Figure 3 shows the suspension structure assembly object of the present invention fully covered by the breathable fabric cover.

Figure 4 shows a view of the elastic suspension support used in the first preferred embodiment of the invention.

Figure 5 shows a view of a tension member defined by a flat body with some extreme thicknessings which can be used in the embodiment shown in Figure 4.

Figure 6 shows a view of the tension member defined by an angular body which can be used in the embodiment shown in Figure 4.

Figure 7 shows an exploded view of the suspension structure in which elastic suspension supports as those described for the second preferred embodiment of the invention have been used. The support by means of which it is fastened to the bed structure is also shown.

Figure 8a shows a view of an elastic suspension support, as shown in Figure 4, into which one tension member as the one shown in Figure 5 has been inserted.

Figure 8b shows a view of an elastic suspension support, as the one shown in Figure 4, into which two tension members as the one shown in Figure 6 have been inserted.

References:

[0070]

1: support sheet

2: elastic suspension support used in the first preferred embodiment

3: elastic suspension support used in the second preferred embodiment

4: suspension sheet

5: cover

6: central space

7: upper arched wing

8: lower arched wing

9: grooves in the suspension sheet

10: cylindrical stub

11: orifices in the support sheet

12: tension member

13: central cylindrical body

14: top circular base

15: bottom circular base

16: support

17: structure

18: coupling housings

19: extreme thicknessings

20: tension member

21: outer rib

22: cylindrical addendums

23: orifices

A: direction in which the user weight acts

B: rocking allowed in a horizontal direction

C: rocking allowed in a vertical direction

D: airflow passing through the suspension structure

MODES OF EMBODIMENT OF THE INVENTION

[0071] In order to reach a better understanding of the object and functionality of this patent, and without being construed as restrictive solutions, a description of two preferred embodiments of the invention based on the above-mentioned figures is made below.

[0072] It is about a suspension structure for supporting a mattress or small mattress on a piece of furniture for resting, which includes:

- a support sheet (1),
- a suspension sheet (4) and
- at least one elastic suspension support (2, 3) placed between the support sheet (1) and the suspension sheet (4) joining them, and which acts like a suspension mechanism in a vertical direction and as a suspension mechanism in a horizontal direction so that it allows the rocking movement of the suspension structure in vertical direction (C) and in horizontal direction (B). These vertical (C) and horizontal (B) rocking movements can be seen in Figure 1 a wherein the direction in which the user's weight acts (A) is also shown.

[0073] The support sheet (1) is located at the bottom part of the suspension structure. The at least one elastic suspension support (2, 3) is positioned thereon, and onto it the suspension sheet (4) is positioned, which is where the mattress or small mattress is placed on.

[0074] In a preferred embodiment of the invention, the support sheet (1) and the suspension sheet (4) have the shape of a mattress support slat. In an embodiment example, wherein the suspension structure is used as a mattress support slat, the ratio between the mattress support nominal width measurements and the suspension sheet (4) width measurement can be set according to the values in the table below:

SUSPENSION SHEET 'ε'	
Mattress support nominal width (cm)	Sheet X measurement (mm)
67.5	660
75	735
80	785
90	885
100	985
105	1035
120	1185
135	1335
140	1385
150	1485
160	1585
180	1785
200	1985
210	2085
220	2185

[0075] The ratio between the mattress support nominal width measurements and the support sheet (1) width measurement can be set according to the values in the table below:

SUSPENSION SUPPORT STRUCTURE 'C'	
Mattress support nominal width (cm)	Sheet X measurement (mm)
67.5	600
75	675
80	725
90	825
100	925
105	975
120	1125
135	1275
140	1325
150	1425
160	1525
180	1725
200	1925
210	2025
220	2125

[0076] In a further preferred embodiment of the invention, the support sheet (1) and the suspension sheet (4) may have the same shape as the mattress or small mattress present in the piece of furniture intended for resting. In this case there is more than one elastic suspension support (2, 3), and these are placed all over the surface of the sheets according to the user's needs.

[0077] In a further preferred embodiment, the piece of furniture for resting comprises more than one suspension structure and each suspension structure has more than one elastic suspension support (2, 3).

[0078] The piece of furniture for resting comprises a sufficient number of suspension structures so that when the user lays on the mattress or small mattress, said mattress or small mattress shifts the pressure (A) to the suspension structures of the bed so that these automatically rock laterally (B) and vertically (C) to adapt the entire resting surface of the mattress support of the piece of furniture for resting to the contour needs of the user, providing optimal support for his/her vertical column.

[0079] The space between the support sheet (4) and the suspension sheet (1) is determined by the height of the elastic suspension support (2, 3).

[0080] By means of the space between both sheets the circulation therebetween of an airflow (D) removing the moisture and accumulated heat towards the outside keeping the hygienic properties of the entire resting equipment is achieved, including the suspension structure, the mattress or small mattress and the piece of furniture for resting. Figure 1b shows the airflow (D) passing through the free space between the support sheet (1) and the suspension sheet (4).

[0081] The suspension structure object of the invention is completely covered with a cover (5). Said cover (5) is a breathable and completely removable fabric. Figure 3 shows the suspension structure object of the invention completely covered with the cover (5).

[0082] The cover (5) is custom built to the suspension structure and is provided with a zipper in order to be completely removable.

[0083] Said cover (5) is made of a 3.5 mm thick 3D mesh fabric. This mesh allows the airflow (D) to pass through the cover.

[0084] The support sheet (1) acts like a support for the rest of the suspension structure, that is for the elastic suspension supports (2, 3) and the suspension sheet (4). The support sheet (1) is made of multilayered beech wood.

[0085] The suspension sheet (4) acts like a support surface for the mattress or small mattress. Said suspension sheet (4) is made of wood.

[0086] The support sheet (1) may have some holes intended for positioning and anchoring the elastic suspension supports (2, 3).

[0087] In a preferred embodiment of the invention, the support sheet (1) has as many holes as elastic suspension supports (2, 3) are provided in the suspension structure.

[0088] The suspension sheet (4) may have grooves for positioning and anchoring the elastic suspension supports (2, 3).

[0089] In a preferred embodiment of the invention, the suspension sheet (4) has as many pairs of grooves as elastic suspension supports (2, 3) are used in the suspension structure. Said grooves can be rectangular with rounded-vertexes.

[0090] The elastic suspension support (2, 3) has a standard hardness of HS 72. However, the hardness of the elastic suspension support (2, 3) can be adjusted in terms of the client's needs. Different hardnesses as 70 HS, 68 HS, 65 HS, 63 HS... can be obtained. To adjust this hardness, a tension member is included in the elastic suspension support (2, 3).

[0091] In a first preferred embodiment of the invention, shown in Figure 2a, the elastic suspension support (2) is defined by two arched wings (7, 8) opposite to each other, one at the top (7) and another at the bottom (8), defining a spindle-shaped central space (6). The ends of said arched wings come together in coupling housings (18) wherein a tension member can be placed, and said coupling housings (18) are in communication with the spindle-shaped central space (6), which at the same time are delimited by some circumferential path curved narrow portions.

[0092] The upper arched wing (7) includes an outer "U"-shaped surrounding clamp the free ends of which end in bent ends directed towards the inside. At the junction of the upper arched wing (7) and the outer surrounding clamp, a through hole centred according to an upper recess and another opposed lower recess leading to opposite edges is defined.

[0093] The lower arched wing (8) includes an outer surrounding clamp larger than the outer surrounding clamp of the upper arched wing, in the form of reversed "U", the free ends of which end in bent ends directed towards the inside and from the center of the lower arched wing (8), a cylindrical stub (10) protrudes. In turn, in the inner face of the lower arched wing (8) a centred recess occupying more than half the width of said wing (8), while leading to an edge of such wing (8), is defined.

[0094] The geometry of the elastic suspension support (2) of the first preferred embodiment is clearly shown in Figure 4.

[0095] In an even more preferred embodiment, a tension member (12) is provided in the elastic suspension support (2) in order to adjust the hardness of said elastic suspension support (2).

[0096] The tension member (12) is defined by a flat body with some extreme thicknessings (19), further including a larger central orifice flanked by two sets of longitudinally aligned orifices (23) increasing in size towards the ends wherein the extreme thicknessings (19) are. The longitudinal edges of the transverse tension member comprise pairs of straight sections coming together towards the center where they are joined in a rounded manner to a pair of circumferential path sections.

[0097] The extreme thicknessings (19) of the tension member (12) are designed to be inserted into the coupling housings (18) of the elastic suspension support (2) so that the tension member (12) is transversely positioned in relation to the central space of the elastic suspension support (2).

[0098] In order to obtain different hardnesses, the tension members (12) are manufactured with greater or lower thickness, and the number of holes made therein is varied.

[0099] The geometry of the tension member (12) used in this preferred embodiment is shown in Figure 5. Figure 7a shows the tension member (12) placed in the elastic suspension support (2).

[0100] In a further even more preferred embodiment, a tension member (20) is provided in the elastic suspension support (2) in order to adjust the hardness of said elastic suspension support (2).

[0101] Said tension member (20) is defined by an angular body the identical branches of which come together in a common connection, from which an outer rib (21) with circular section protrudes. The branches of the tension member (20) have a slight bowing on both of their faces defining a decrease in thickness towards their free edges opposite to the common connection that joins both branches. The extreme corners of the angular body have some cylindrical addendums (22) protruding outside the outer faces of both branches of that angular body.

[0102] The cylindrical addendums (22) have as a function axially fastening the position of the tension member.

[0103] In a further preferred embodiment two tension members (20) are added, placing the outer rib (21) of each one of them into one of the coupling housings (18) of the elastic suspension support (2).

[0104] The geometry of this tension member (20) is clearly seen in Figure 6 and Figure 7b shows an embodiment wherein two tension members (20) are positioned on an elastic suspension support (2).

[0105] In this preferred embodiment of the invention, the elastic suspension support (2) has some approximate measurements of 10 cm in horizontal direction, 7.5 cm in vertical direction and 3 cm wide.

[0106] In this first preferred embodiment, the at least one elastic suspension support (2) has a comfort stroke between 2.5 cm and 3.5 cm in the vertical direction, said comfort stroke being about 3 cm.

[0107] The provision of the tension members (12, 20) helps to adjust the hardness of the elastic suspension support (2) and varies its comfort stroke.

[0108] In this first preferred embodiment, the elastic suspension support (2) is fastened in its position on the suspension structure through its upper arched wing (7) and its lower arched wing (8).

[0109] In a further embodiment of this first preferred embodiment, the upper arched wing (7) is useful for fastening the position of the elastic suspension support (2) in relation to the suspension sheet (4). The outer "U"-shaped surrounding clamp of the upper arched wing (7) has two ends, which are the ends of the "U", which are inserted into the grooves with rectangular profile and rounded vertexes in the suspension sheet (4).

[0110] In a further embodiment of this first preferred embodiment, the lower arched wing (8) is useful for fastening the position of the elastic suspension support (2) in relation to the support sheet (1). The cylindrical stub (10) of the elastic suspension support (2) is inserted into the holes existing in the support sheet (1) and the outer surrounding clamp of the lower arched wing (8), which is larger than the outer clamp of the upper arched wing (7), couples the support sheet (1) between its ends.

[0111] In a second preferred embodiment, the elastic suspension support (3) is defined by a top circular base (14) and a bottom circular base (15) defining a central cylindrical body (13) in which through grooves are defined in the vertical direction extending from the top of the central cylindrical body (13) towards the bottom.

[0112] The top circular base (14) is a flat surface in the central part of which is a concentric circular bulge in the center of which is a rectangular cleft. In said top circular base (14) a first quarter of the flat surface has at least two holes, a second quarter which is adjacent to the first has a through groove extending following the profile of the concentric circular bulge from said bulge towards the circular flat surface edge, a third quarter, adjacent to the second, is the same as the first quarter and a fourth quarter, adjacent to the third is the same as the second.

[0113] The bottom circular base (15) is the same as the top circular base (14).

[0114] The elastic suspension support (3) of this second preferred embodiment can be anchored to the support sheet (1) and the suspension sheet (4) by screws. In a preferred embodiment of the invention four screws are used to anchor the top circular base (14) of the elastic suspension support (2) to the support sheet (1), and four screws to anchor the bottom circular base (15) of said elastic suspension support (2) to the suspension sheet (4).

[0115] The elastic suspension support (3) can be used with at least one tension member which is placed inside said elastic suspension support (3). This tension member includes at least one spring.

[0116] In this second preferred embodiment, the at least one elastic suspension support (3) has a comfort stroke between 6.5 cm and 7.5 cm in the vertical direction, said comfort stroke being about 7 cm.

[0117] Thus, the second preferred embodiment of the invention is the suitable embodiment when a suspension support with a larger comfort stroke is needed or when the user is heavier.

[0118] The provision of a tension member in the elastic suspension support (3) assists to adjust its hardness and varies its comfort stroke.

[0119] In a preferred embodiment of the invention, the elastic suspension support (2, 3) is made of thermoplastic polyester elastomer.

[0120] In a preferred embodiment of the invention, the tension member (12, 20) used in the elastic suspension support (2, 3) is made of thermoplastic polyester elastomer (TPEE).

[0121] The geometry of the elastic suspension supports (2, 3) proposed in the present invention allows them to act as suspension mechanisms in the vertical direction (B) and, at the same time, as horizontal suspension mechanisms (C) allowing the suspension structure to rock.

[0122] The suspension structure of the preferred embodiments already described also includes a support (16) through which it is fastened to the structure (17) of the piece of furniture for resting. This support (16) is made of nylon.

[0123] In a preferred embodiment of the invention, the support (16) has a geometry in which the central part is a vertical flat surface with a horizontal flat extension on which the support sheet leans, and comprises a stiffening element going from the vertical flat surface to the horizontal flat surface and said anchoring means has, at the ends of the horizontal flat extension some clamps by means of which the anchoring of the support sheet is achieved, the vertical flat surface having at least one pivot on the rear face which is pressure-inserted into at least one hole made in a rack which is placed in the piece of furniture for resting. The at least one pivot may be pressure-inserted into a hole made in a structure placed in the piece of furniture for resting.

[0124] The suspension structure object of the present invention is intended to support a mattress or small mattress on a piece of furniture for resting, said piece of furniture for resting being a bed.

[0125] Another object of the present invention is a bed comprising at least one suspension structure as any of the ones described above.

[0126] In a preferred embodiment of the invention, the suspension structure is used as a slat for the mattress support for a piece of furniture for resting.

[0127] In a preferred embodiment of the invention, the suspension structure is used to place a mattress or small mattress thereon.

Claims

1. Suspension structure for supporting a mattress or small mattress on a piece of furniture for resting, **characterized in that** it comprises:

    - a support sheet (1),

- a suspension sheet (4) and
- at least one elastic suspension support (2, 3) placed between the support sheet (1) and the suspension sheet (4) joining them, and which acts like a suspension mechanism in a vertical direction and as a suspension mechanism in a horizontal direction so as to allow the rocking movement of the suspension structure in vertical direction (C) and in horizontal direction (B).

2. Suspension structure according to claim 1, **characterized in that** it is completely covered by a cover (5).

3. Suspension structure according to claim 2, **characterized in that** said cover (5) is made of a breathable fabric and is completely removable.

4. Suspension structure according to claim 2, **characterized in that** the cover (5) is a 3.5 mm thick 3D mesh fabric.

5. Suspension structure according to claim 1, **characterized in that** the support sheet (1) is made of a material selectable from the group consisting of wood, plastic, copper, aluminium, steel, and combinations thereof.

6. Suspension structure according to claim 1, **characterized in that** the support sheet (1) is made of multilayered beech wood.

7. Suspension structure according to claim 1, **characterized in that** the suspension sheet (4) is made of wood.

8. Suspension structure according to claim 1, **characterized in that** the at least one elastic suspension support (2) is defined by two arched wings (7, 8) opposite to each other, one at the top (7) and another at the bottom (8), defining a spindle-shaped central space (6) and the ends of which come together in some coupling housings (18) wherein a tension member can be placed, and said coupling housings (18) are in communication with the spindle-shaped central space (6), which at the same time are delimited by some circumferential path curved narrow portions.

9. Suspension structure according to claim 8, **characterized in that** the upper arched wing (7) includes an outer "U"-shaped surrounding clamp the free ends of which end in bent ends directed towards the inside.

10. Suspension structure according to claim 8, **characterized in that** the lower arched wing (8) includes an outer surrounding clamp larger than the outer surrounding clamp of the upper arched wing, shaped as a reversed "U", the free ends of which end in bent ends directed towards the inside and from the center of the lower arched wing (8) a cylindrical stub (10) protrudes.

11. Suspension structure according to any of claims 8, 9 or 10, **characterized in that** it includes at least one tension member (12) defined by a flat body with some extreme thicknessings (19), further including a larger central orifice flanked by two sets of longitudinally aligned orifices (23) increasing in size towards the ends where the extreme thicknessings (19) are located, and the longitudinal edges of the transverse tension member include pairs of straight sections coming together towards the center where they are joined in a rounded manner to a pair of circumferential path sections.

12. Suspension structure according to any of claims 8, 9 or 10, **characterized in that** it includes at least one tension member (12) defined by an angular body the identical branches of which come together in a common connection, from which an outer rib (21) with circular section protrudes, the branches of the tension member (20) have a slight bowing on both of their faces delimiting a decrease in thickness towards their free edges opposite to the common connection that joins both branches, and the extreme corners of the angular body have some cylindrical addendums (22) protruding outside the outer faces of both branches of that angular body.

13. Suspension structure according to claim 12, **characterized in that** it comprises two tension members (20).

14. Suspension structure according to claim 8, **characterized in that** the at least one elastic suspension support (2) shrinks a maximum distance comprised between 2.5 cm and 3.5 cm in the vertical direction.

15. Suspension structure according to claim 1, **characterized in that** the at least one elastic suspension support (3) is defined by a top circular base (14) and a bottom circular base (15) defining a central cylindrical body (13), wherein through grooves are defined in the vertical direction extending from the top part of the central cylindrical body (13) to the bottom part.

16. Suspension structure according to claim 15, **characterized in that** the top circular base (14) is a flat surface, in the central part of which is a concentric circular bulge, in the center of which is a rectangular cleft, and in said top circular base (14) a first quarter of the flat surface has at least two holes, a second quarter, which is adjacent to the first, has a through groove that extends following the profile of the concentric circular bulge from said bulge towards the circular flat surface edge, a third quarter, which is adjacent to the second, is like the first quarter, and a fourth quarter, which is adjacent to the third is like the second.

17. Suspension structure according to claim 15, **characterized in that** the bottom circular base (15) is like the top circular base (14).

18. Suspension structure according to any one of claims 15, 16 or 17, **characterized in that** the at least one elastic suspension support (3) shrinks a maximum distance comprised between 6.5 cm and 7.5 cm in the vertical direction.

19. Suspension structure according to any one of claims 15, 16, 17 or 18, **characterized in that** it comprises at least one tension member placed inside the elastic suspension support (3), and comprises at least one spring.

20. Suspension structure according to any one of claims 8 or 16, **characterized in that** the at least one elastic suspension support (2, 3) is made of thermoplastic polyester elastomer.

21. Suspension structure according to any one of claims 11, 12 or 19, **characterized in that** the at least one tension member is made of thermoplastic polyester elastomer.

22. Suspension structure according to claim 1, **characterized in that** the suspension structure includes a support (16) through which it is fastened to a structure (17) which is placed on the piece of furniture for resting.

23. Suspension structure according to claim 1, **characterized in that** the support (16) is made of nylon.

24. Suspension structure according to claim 1, **characterized in that** the piece of furniture for resting is a bed.

25. Bed comprising at least one suspension structure defined in any one of the preceding claims 1 to 23.

26. Use of the suspension structure defined in any one of claims 1 to 23 as a slat for the mattress support of a piece of furniture for resting.

27. Use of the suspension structure defined in any one of claims 1 to 23 for placing a mattress or small mattress thereon.

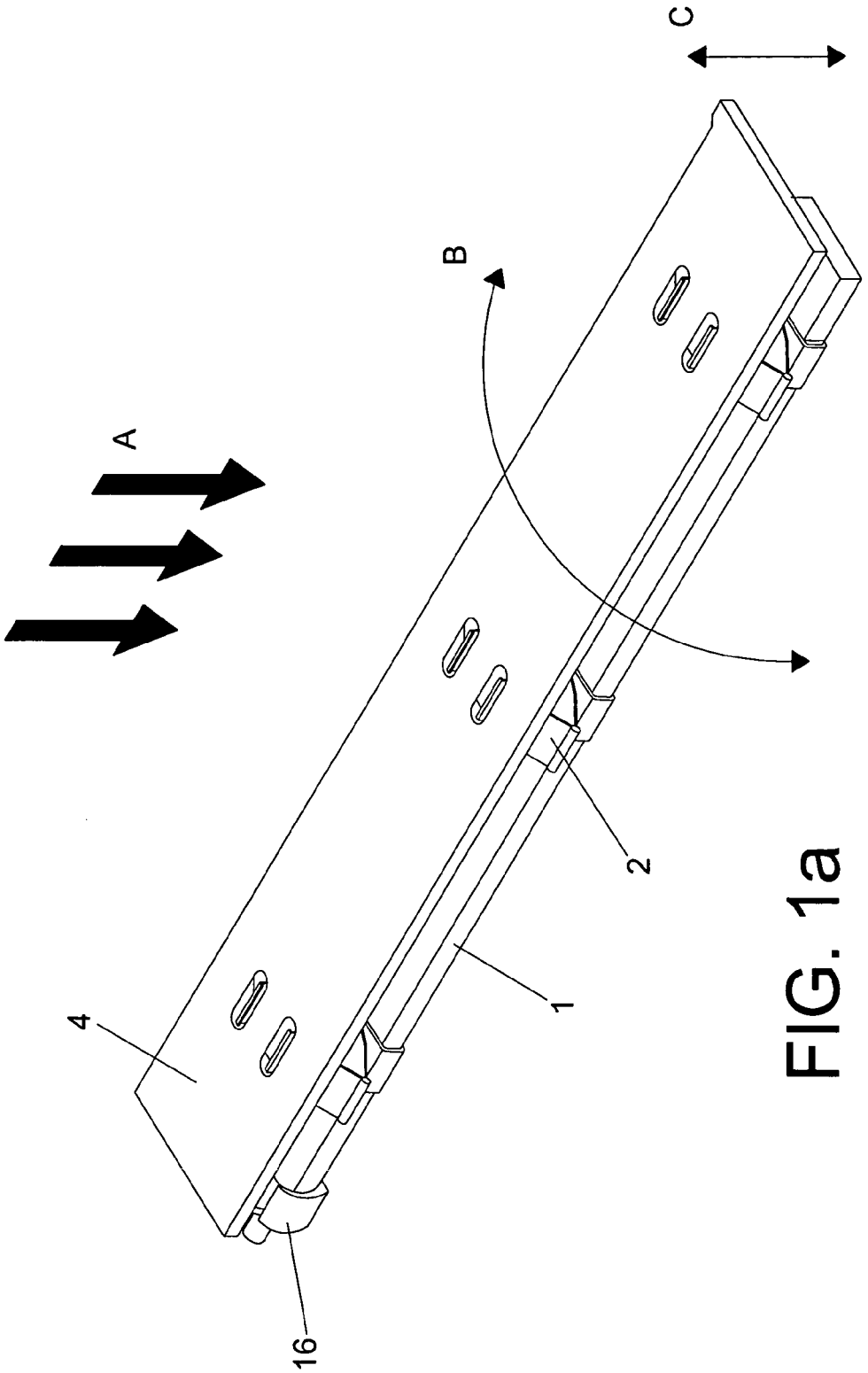

FIG. 1a

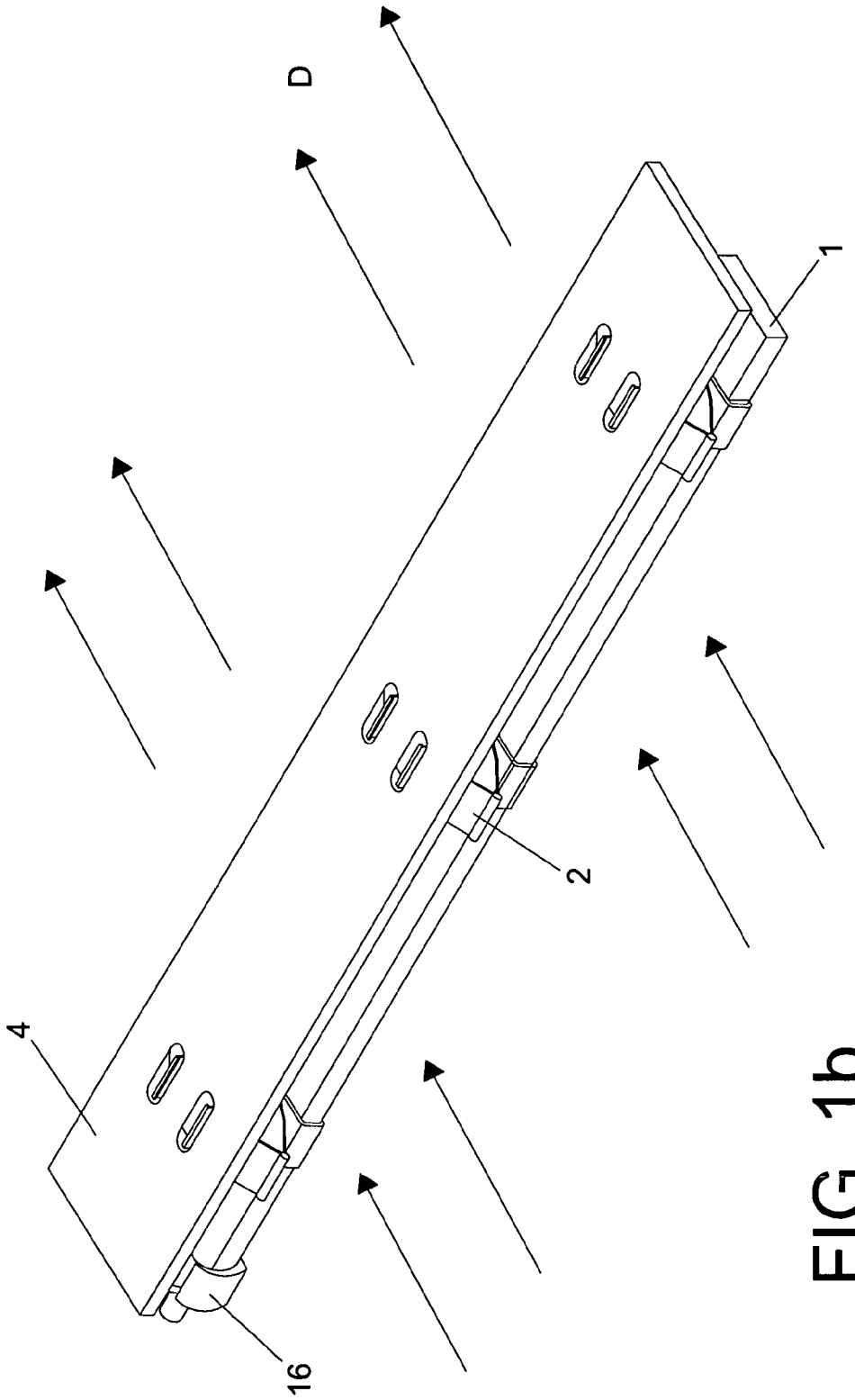

FIG. 1b

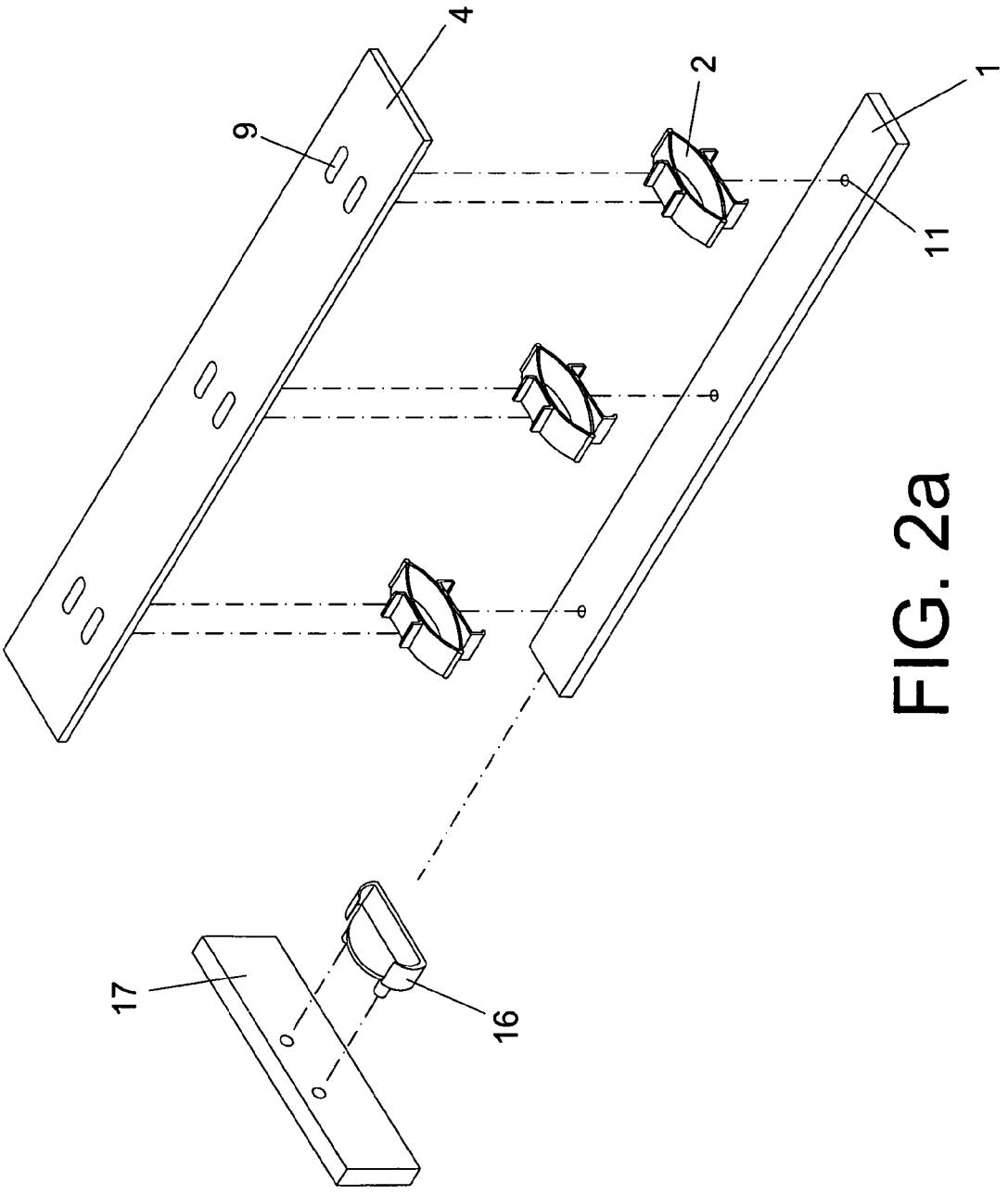

FIG. 2a

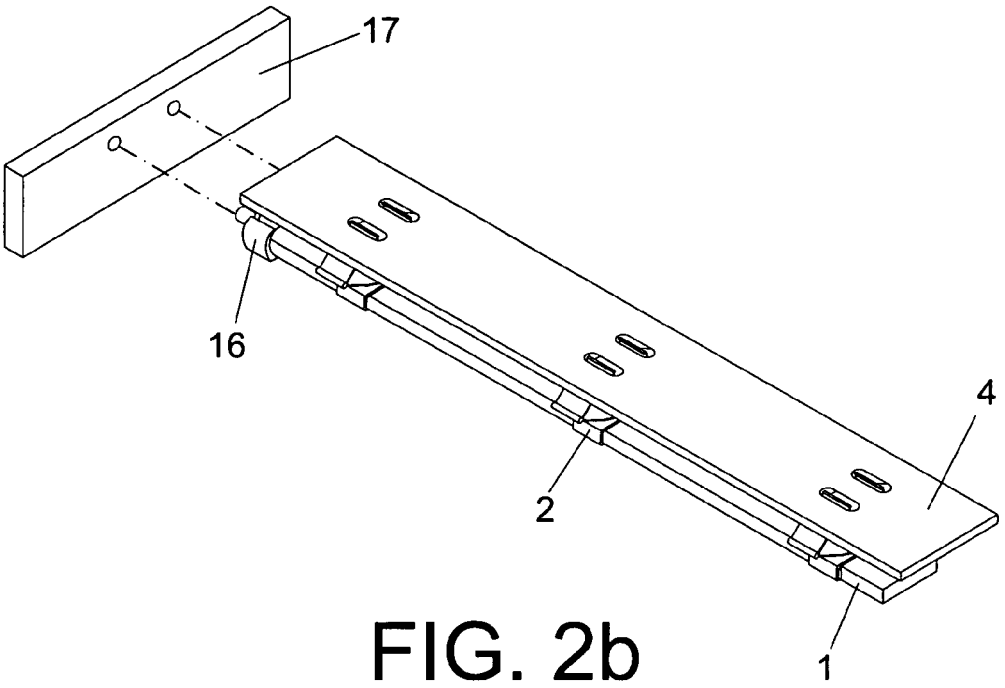

FIG. 2b

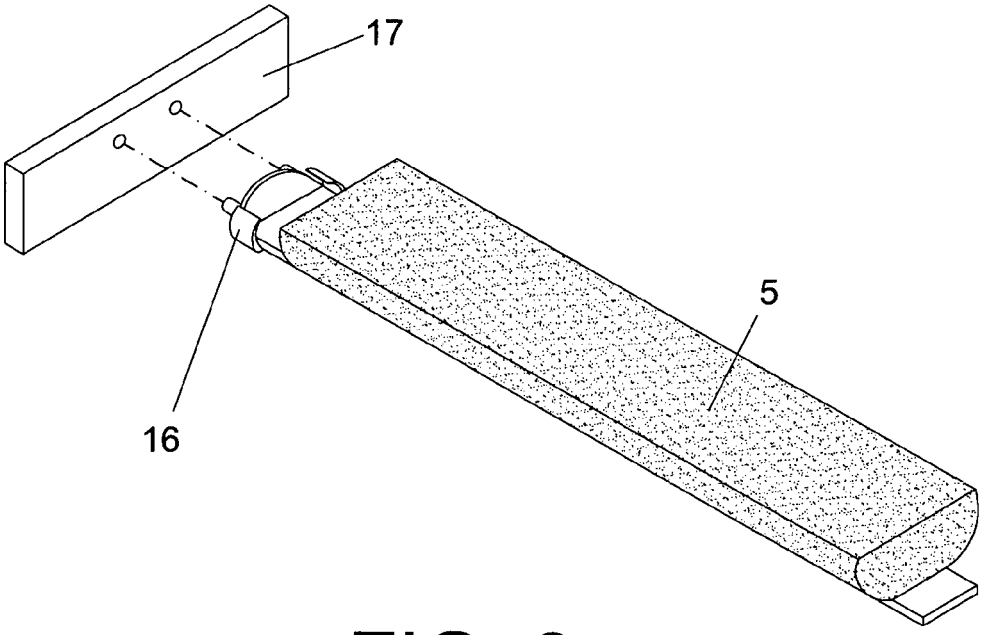

FIG. 3

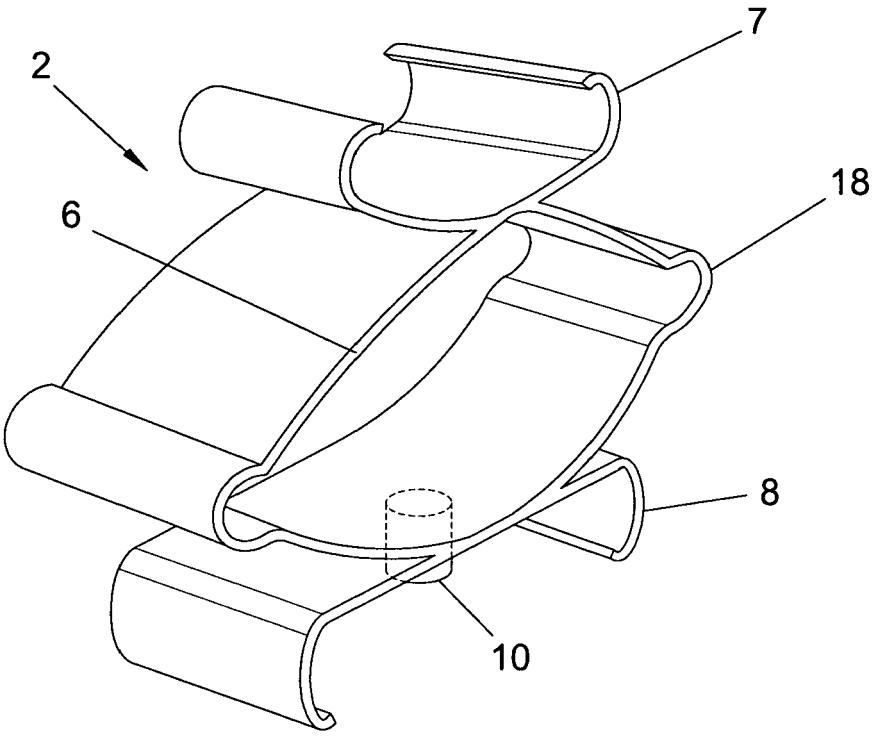

FIG. 4

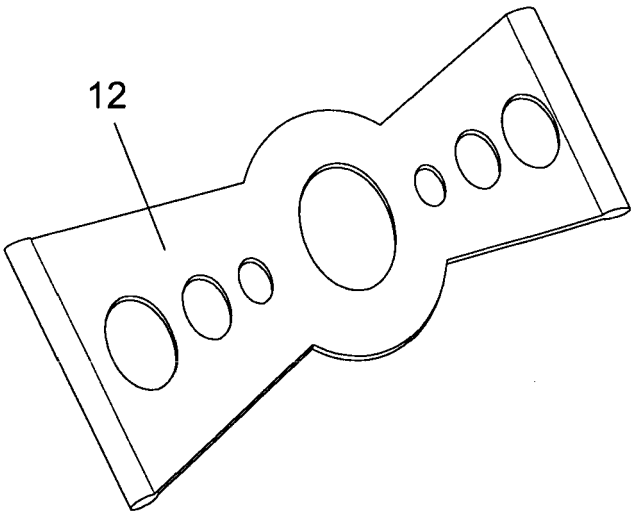

FIG. 5

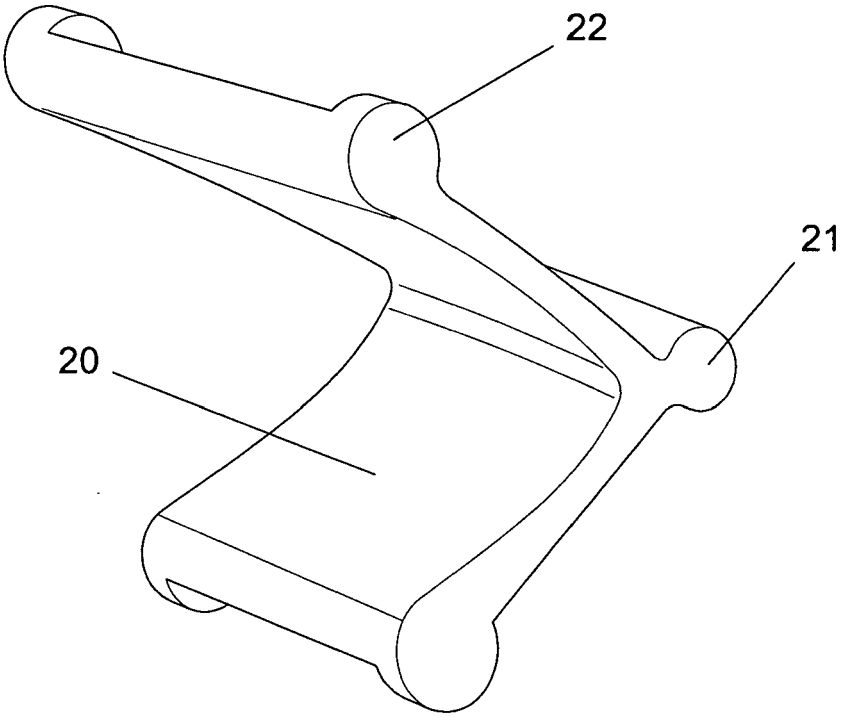

FIG. 6

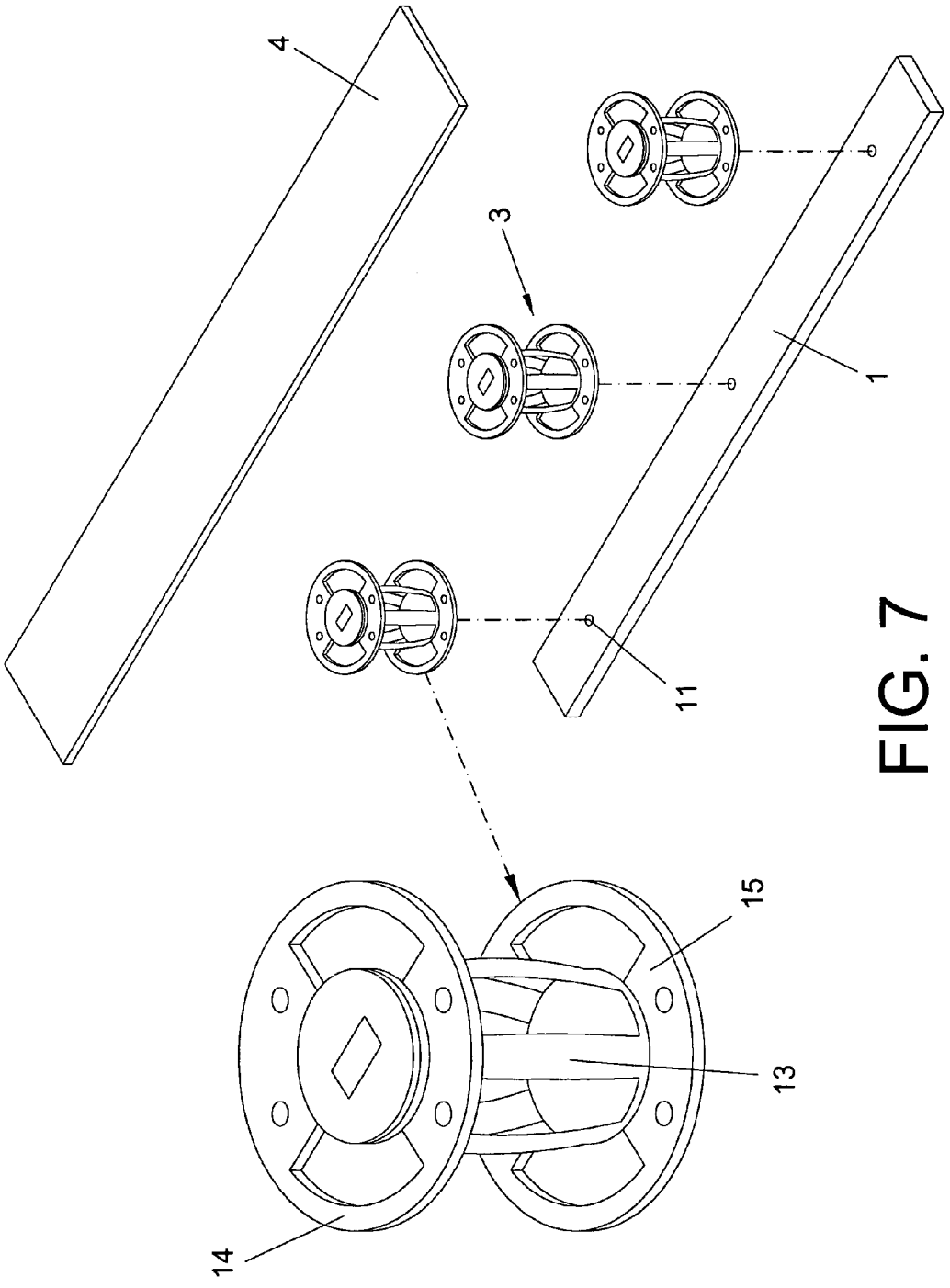

FIG. 7

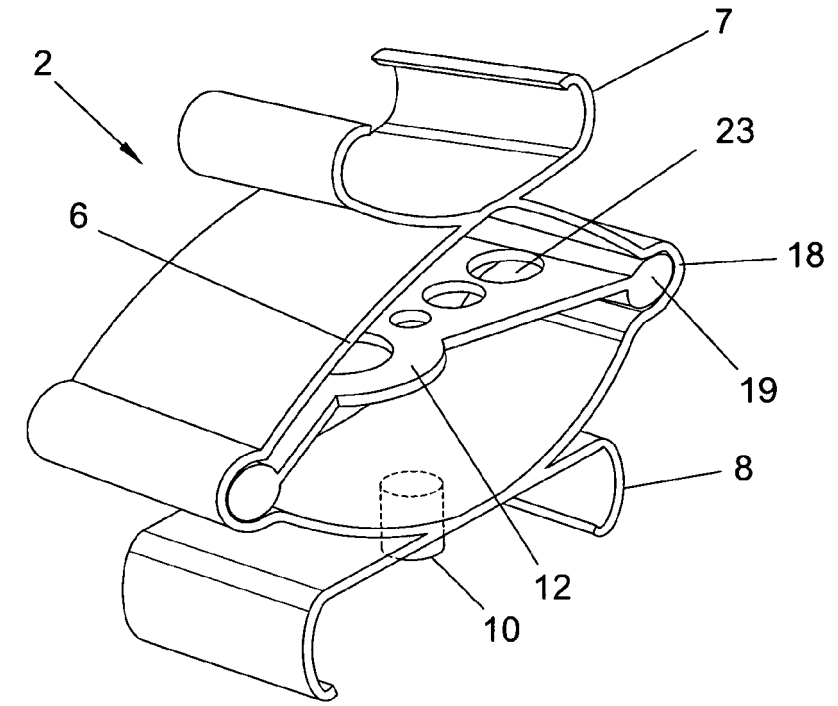

FIG. 8a

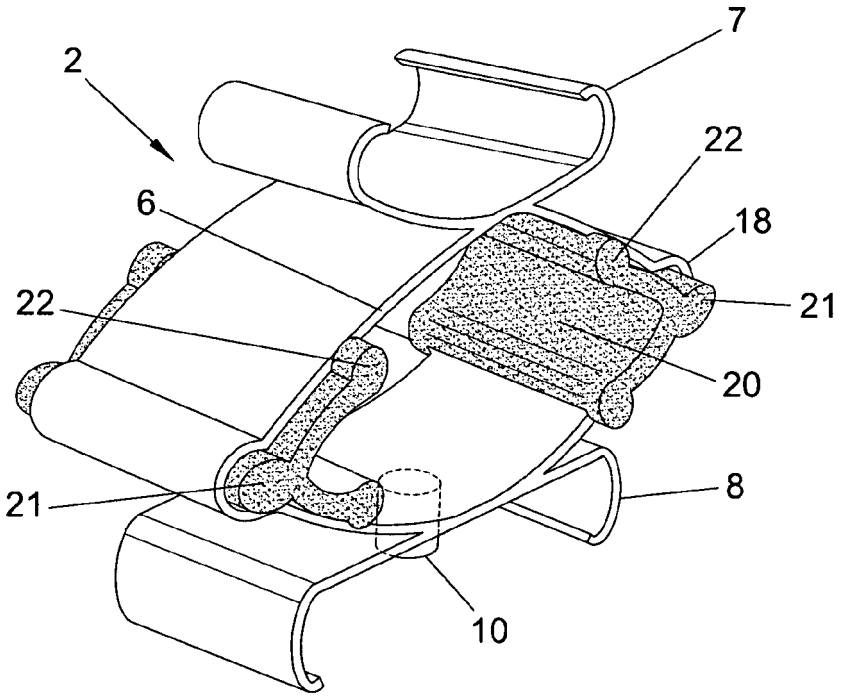

FIG. 8b

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EUROPEAN SEARCH REPORT

Application Number
EP 10 38 0134

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	FR 2 575 378 A1 (TRECA SA [CH]) 4 July 1986 (1986-07-04) * page 3, line 27 - page 4, line 7; figures 1-5 *	1-4, 24-27	INV. A47C23/06
X	EP 1 425 996 A2 (TOURNADRE SA STANDARD GUM [FR]) 9 June 2004 (2004-06-09) * the whole document *	1,8,9,15	
X	BE 1 005 814 A6 (SEDAC MECOBEL [BE]) 8 February 1994 (1994-02-08) * page 1 - page 3; figures 1-8 *	1,15	
X	FR 2 784 015 A1 (DELAHOUSSE ET FILS SA [FR]) 7 April 2000 (2000-04-07) * figures 1-4 *	22	
X	WO 02/087392 A1 (ZACCARA JOSEPH [FR]) 7 November 2002 (2002-11-07) * page 2, lines 28-33; figures 1-14 *	1,2, 24-27	
X	ES 2 070 083 A2 (BANO ANTON CARLOS [ES]; BA O ANTON JOSE) 16 May 1995 (1995-05-16) * the whole document *	1,24-27	TECHNICAL FIELDS SEARCHED (IPC) A47C

~~The present search report has been drawn up for all claims~~

Place of search	Date of completion of the search	Examiner
The Hague	4 July 2011	Vollering, Johannes

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

3

EPO FORM 1503 03.82 (P04C01)

Europäisches Patentamt
European Patent Office
Office européen des brevets

Application Number
EP 10 38 0134

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☒ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

8-27

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

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LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 10 38 0134

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-4(completely); 24-27(partially)

   suspension structure completely covered by a cover

   ---

2. claims: 5(completely); 24-27(partially)

   suspension structure of which the support sheet is made of wood, plastic, copper, aluminium, or steel, and combinations thereof.

   ---

3. claims: 6(completely); 24-27(partially)

   suspension structure of which the support sheet is made of multilayered beech wood.

   ---

4. claims: 7(completely); 24-27(partially)

   suspension structure of which the suspension sheet is made of wood.

   ---

5. claims: 8-14(completely); 20, 21, 24-27(partially)

   suspension structure of which the elastic suspension support is defined by two arched wings opposite to each other.

   ---

6. claims: 15-19(completely); 20, 21, 24-27(partially)

   suspension structure of which the suspension support is defined by a top circular base and a bottom circular base defining a central cylindrical body.

   ---

7. claims: 22, 23(completely); 25-27(partially)

   suspension structure which includes a support through which it is fastened to a structure

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 10 38 0134

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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04-07-2011

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EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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- WO 1994027548 A **[0004]**
- ES 2070083 **[0005]**
- ES 1018243 U **[0006]**
- EP 0428227 A **[0007]**