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(71) Applicant: **Carpe Diem Beds of Sweden AB**
453 38 Lysekil (SE)

(72) Inventor: **Jansson, Ulf**
453 31, LYSEKIL (SE)

(74) Representative: **Mossmark, Anders Lennart**
Albihns AB
P.O. Box 142
401 22 Göteborg (SE)

(54) **Load-bearing device for bed**

(57) Bed device for creating support for a recumbent person by providing different load-bearing capacity in different zones in the bed. The device comprises a load-bearing layer (2), a bedding (3), and a device for raising and lowering a section of the load-bearing layer. The load-bearing layer (2) rests on a frame (10). The load-bearing layer comprises a plurality of different, mutually separate rigid sections (13, 14, 15). The bedding (3) is supported by and disposed on the load-bearing layer (2). Outer sections (13, 14) of the load-bearing layer (2) are disposed by the short sides of the bed and are fixedly arranged in the frame (10). That section (15) of the load-bearing layer which is disposed between the outer sections (13, 14) of the load-bearing layer in the middle portion of the bed can be raised and lowered in relation to the fixedly arranged outer sections (13, 14) by means of the raising and lowering device. The middle section (15) further has means (25) for preventing lateral and longitudinal displacement of the middle section.

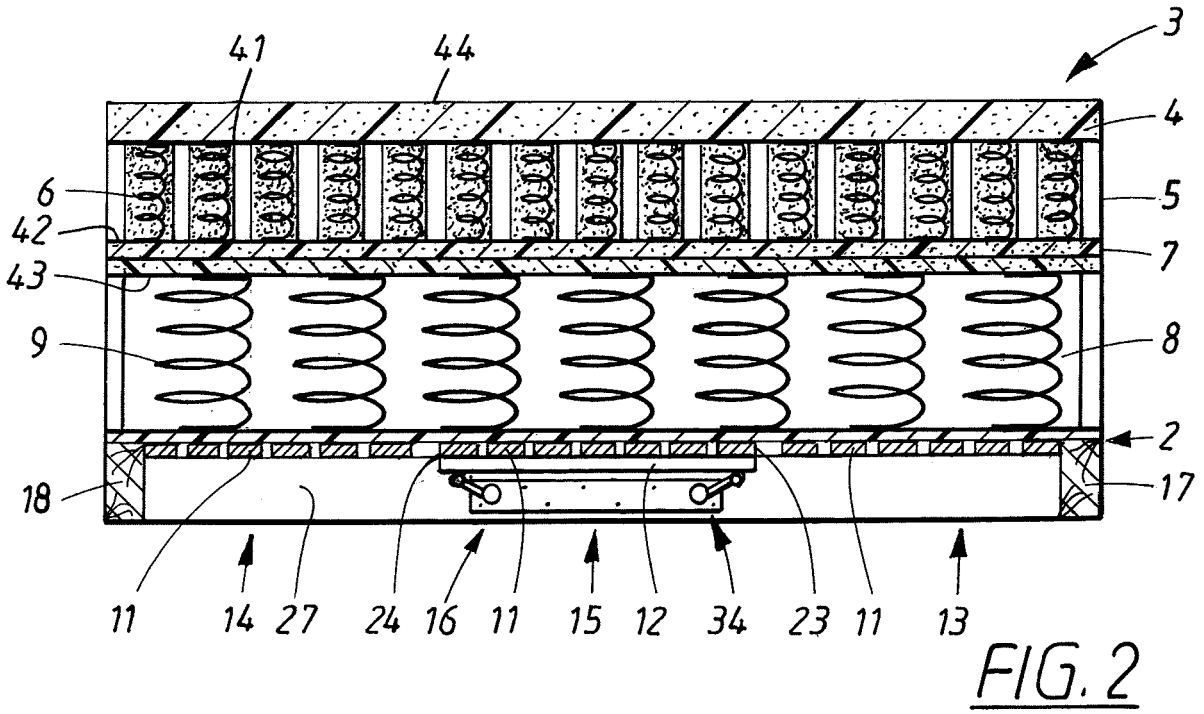

FIG. 2

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Description

TECHNICAL FIELD

[0001] The present invention relates to a bed device for supporting a human body by providing different load-bearing capacity in different zones in the bed, comprising a load-bearing layer and a frame, which load-bearing layer is composed of a plurality of different, mutually separate rigid sections, a bedding supported by and disposed on the load-bearing layer, and a device for raising and lowering a section of the load-bearing layer.

BACKGROUND ART

[0002] There is currently a wide selection of beds available on the market for most requirements and desires, such as pressure relief for the body of a recumbent person, adjustment of the head end and foot end in a bed for the achievement of a correct and comfortable sitting position or, alternatively, lying position on the back.

[0003] In beds, the aim is that a recumbent person shall receive a natural bending of the spine and that prominent and heavier body portions, such as a hip portion, an abdomen, etc., shall not be able to sink so far down into the bed that a "hammock effect" occurs, with the result that a recumbent person experiences an unnatural bending of the spine, at the same time as support can be given from the mattress in respect of portions of the body which do not protrude, such as a waist or a bottom.

[0004] In beds having a raisable and lowerable head and foot end, the aim is to achieve comfortable sitting positions and a comfortable and correct lying position for a person lying on his/her back. The aim is here to provide support for the whole of the back by adjusting the foot end and head end of the bed such that the curve of the back comes down in the bed and receives support. The drawback with this bed is that the recumbent person must lie on the back and sleep all the time, since, if the recumbent person lies on his/her side in the bed, when the head end and the foot end are raised, this will lead to an incorrect and even damaging bending of the spine. For persons who often change their lying position, from side to back and vice versa, many times per sleep, this solution is not especially suitable.

[0005] At present, there are also beds available on the market which have pressure-relieving foam mattresses made of sluggishly elastic material. The sluggishly elastic material allows the body to sink down into the material, whereupon the material shapes itself to the body and, that being the case, especially with a view to the prominent body portions, e.g. a hip portion. The material springs back after the recumbent person has vacated the mattress. The spring-back of the material is delayed in the event of compression, which means that the counterspring force, when compression occurs, is limited, in which case substantially the same supporting force is provided against and over the whole of the body surface without the facility to compensate for heavier or lighter body portions. This material has drawbacks, however, such as that those body parts which do not protrude, e.g. the waist, receive less support. In addition, the body surface is pressed down into the material, in which case it is difficult for air to enter between the mattress and the recumbent person. A further drawback is that the material is expensive.

[0006] Regardless of whether a person lies on the side or the back, the bottom is a problem region. In the bottom there are the most prominent body portions, and the hip portion is also a relatively pressure-sensitive region. Moreover, the body has its greatest weight in the bottom, which gives large weigh-down effects. To prevent stressing of the spine, at the same time a proper support in the waist and the lumbar region, "the curve of the back", is demanded. Two directly adjoining body regions are therefore obtained, of which the bottom and the hip portion demand a ductile and supportive support to prevent a "hammock effect", close to the hip portion, and the waist and the curve of the back demand a proper support to enable the recumbent person to lie comfortably with natural curvature of the spine. Moreover, this effect must be obtained at any chosen site within the middle region of the bedding support. The effect must, within certain limits, be obtained independently of the length and positioning of the recumbent person in the bedding.

DISCLOSURE OF INVENTION

Problem definition

[0007] The object of the present invention is to configure the device described in the introduction such that this eliminates the problems associated with the prior art. In particular, the invention sets out to configure the subject of the invention such that uniform support is provided against the body of the recumbent person, and to alter the support from below for different body parts in the bed.

Solution to the problem

[0008] The objective on which the invention is based is achieved if the device described in the introduction is characterized in that outer sections of the load-bearing layer, disposed by the short sides of the bed, are fixedly arranged in the frame, in that that section of the load-bearing layer which is disposed between the outer sections of the load-bearing layer in the middle portion of the bed can be raised and lowered in relation to the fixedly arranged outer sections of the load-bearing layer by means of the raising and lowering device, and in that the middle section of the load-bearing layer has means for preventing lateral and longitudinal displacement of the middle section.

BRIEF DESCRIPTION OF DRAWINGS

[0009] The invention shall now be described on the basis of the appended drawings, in which:

Fig. 1 shows an isometric view of the subject of the invention,

Fig. 2 shows a sectional view through the subject of the invention according to Fig. 1, with a bedding disposed thereon,

Fig. 3 shows an isometric view of the subject of the invention,

Fig. 4 shows an isometric view according to Fig. 3 without a middle section, and

Fig. 5 shows a bottom view of the subject of the invention.

MODES FOR CARRYING OUT THE INVENTION

[0010] In the description below, position indications such as downwards, upwards, sideways, under, over, etc. will be used. These position indications relate to a bed which, in normal usage position, stands on a support such as a floor.

[0011] The subject of the invention relates to a bed device for supporting a human body by providing different load-bearing capacity in different zones in the bed. Fig. 1 shows a load-bearing layer 2 for a bed 1 without bedding 3, and Fig. 2 shows the load-bearing layer 2 together with bedding 3.

[0012] In Fig. 2, the various main layers of the bedding 3 are shown together with a top mattress 4, a so-called bedding mattress. The bedding mattress 4 is preferably made of a porous material, e.g. latex, to provide comfort for the recumbent person.

[0013] The various main layers of the bedding comprise firstly an upper bedding 5, the purpose of which is to provide comfort for the recumbent person. The upper bedding 5 has springs. The springs can possibly be configured as a "pocket-spring core", which has a large number of spring units 6, preferably having the same hardness throughout the bedding 5. The spring units 6 preferably consist of helical springs enclosed by textile casings (not shown). The textile casings are preferably joined together along one portion, which is preferably centrally located in relation to the longitudinal extent of the spring units.

[0014] The upper bedding 5 rests on a layer 7 of a sluggishly elastic material, also referred to as viscoelastic material. This material is a foamed plastic with the peculiarity that it has a delayed spring-back when compressed, the counterspring force of the material upon compression being limited. When relieved of load, the material regains its original shape, however, yet with a certain delay.

[0015] The sluggishly elastic layer 7 rests, in turn, on a second bedding 8 comprising springs 9. The springs 9 may be so-called "pocket-spring springs" and may be disposed, as stated above, in the upper bedding 5. The springs 9 in the second bedding 8 preferably have the same hardness throughout the bedding 8 and the springs 9 have the task of absorbing motions and providing support in the bed 1 from below for the various body parts.

[0016] The second bedding 8 rests, in turn, on the load-bearing layer 2, in the drawings shown together with a frame 10. The load-bearing layer 2 can be constituted, for example, by a board or a slatted bottom comprising slats 11. The frame 10, together with the slatted bottom 11, forms the whole of the rigid load-bearing layer 2 of the bedding, which load-bearing layer can be supported by a firm support, for example legs or a bed stand.

[0017] In the case of steady and usually not particularly spread load, so-called point load, the material in the sluggishly elastic layer 7 sinks down as a result of the pressure from the springs 6 in the upper bedding 5, so that the compression of the springs 6 does not fully need to correspond to the depression shown on the top side 41 of the upper bedding 5, which depression is required for lying comfort. A point load from a prominent body portion, e.g. a hip portion, makes the springs 6 in the point-loaded region in the upper bedding 5 act upon a like-sized region of the sluggishly elastic layer 7, the sluggishly elastic layer 7, due to its inertia, only sagging in a like-sized region on its top surface 42 and keeping its bottom surface 43 relatively flat. This means that a point load acting through the sluggishly elastic layer 7 acquires a greater spread on the lower bedding 8, and is therefore supported by a larger region on the lower bedding 8, which prevents the person lying in the bed 1 from experiencing an unnatural bending of the spine.

[0018] Once the press-down force has ceased or diminished, the sluggishly elastic material regains with a certain delay its original thickness, so that no remaining depression is found in the top surface 44 of the bedding 3.

[0019] The load-bearing layer 2 is composed of a plurality of different rigid sections 13, 14, 15 comprising slats 11. The slats 11 in the frame 10 preferably run transversely across the bed 1, shown in Fig. 1. The slats 11 running transversely to the bed 1 are connected to one another with slats 12 running along the length of the bed 1 and placed below the transverse slats 11. The slats 11 are connected to one another in sections 13, 14, 15 and are arranged in a plurality of different rigid sections 13, 14, 15. The sections 13, 14, 15 of the load-bearing layer 2 are disposed in the frame 10 and separate from one another. There is also a device 16 for raising and lowering a section of the load-bearing layer 2. Outer sections 13, 14 of the load-bearing layer 2 are fixedly arranged in the frame 10, by the short sides 17, 18 of the bed. One section 15 of the load-bearing layer 2 is disposed in the middle portion of the bed, between the fixed outer sections 13, 14, and can be raised and lowered in relation to the fixedly

arranged outer sections 13, 14 of the load-bearing layer 2 by means of the raising and lowering device 16. The middle section 15 further has means 25 for preventing lateral and longitudinal displacement of the middle section 15.

[0020] In an alternative embodiment, the middle section 15 can be constituted by a plurality of slatted rigid sections.

[0021] In Fig. 3, the means 25 for preventing lateral displacement of the middle section 15 is shown. The means 25 comprises a plurality of belts 19, 20, 21, 22, of which two belts 19, 20 are fastened in a crisscross arrangement firstly to that edge 23 of the middle section which faces one short side 17 of the frame, and secondly to the opposite side of the longitudinal edge 26 of the frame, and two belts 21, 22 are fastened in a crisscross arrangement firstly to that edge 24 of the middle section which faces the other short side 18 of the frame, and secondly to the opposite side of the longitudinal edge 27 of the frame.

[0022] A first belt 19 is secured on one transverse edge 23 of the middle section, preferably a first corner portion 28, as well as at the opposite longitudinal edge 26 of the frame. To the same transverse edge 23 in the middle section 15 a second belt 20 is fastened, preferably in a second corner portion 29, as well as at the opposite longitudinal edge 27 of the frame. The two belts 19, 20 thus form a cross and cross each other. The belts 19, 20 are fastened firstly to that edge 23 of the middle section which faces one short side 17 of the frame, and secondly to an opposite and opposing side 26 of the frame 10.

[0023] The means 25 further comprises a third belt 21 secured on the second transverse edge 24 of the middle section, preferably a third corner portion 30, as well as at the opposite longitudinal edge 26 of the frame. On the same second transverse edge 24 in the middle section 15 a fourth belt 22 is fixed, preferably in a fourth corner portion 31, as well as at the opposite longitudinal edge 27 of the frame. The belts 21, 22 here too form a cross and cross each other. The belts 21, 22 are fastened firstly to that edge 24 of the middle section which faces one short side 18 of the frame, and secondly to an opposite and opposing side 27 of the frame 10. The belts 19, 20, 21, 22 are preferably fastened with rivets, staples, etc.

[0024] The belts 19, 20, 21, 22 are preferably woven belts, which are unelastic and have an insignificant longitudinal extent. The longitudinal extent of the belts 19, 20, 21, 22 when the middle section 15 is raised is in the order of magnitude of a few millimetres. In the fully lowered state of the middle section 15, the belts 19, 20, 21, 22 are pretensioned in order to achieve control of the middle section 15, in the lateral direction, when this is raised or lowered with the aid of the raising and lowering device 16. The belts 19, 20, 21, 22 are pretensioned to such a degree that the middle section 15 is allowed to be raised. The belts 19, 20, 21, 22 maximally allow a movement of 10 mm in the lateral direction, from the centred original position of the middle section 15.

[0025] The means for preventing longitudinal displacement (not shown) of the middle section 15 comprises a sheet of material, preferably a cloth which is fastened to the middle section 15. The cloth is fastened in centred arrangement with fastening members in the transverse direction of the bed, shown with dashed line 32, to the middle section 15, and is also fastened in the surrounding frame 10. The cloth is fastened on the top side of the middle section to the centremost of the transverse slats 33 with, for example, rivets, staples. The cloth is fastened to the centremost slat 33 of the middle section 15 in order to achieve an even pretensioning of the cloth in the longitudinal direction of the bed 1 over the load-bearing layer 2, so as to control the middle section 15 in the longitudinal direction of the bed when it is raised and lowered. The cloth is pretensioned to the degree that the middle section 15 is allowed to be raised.

[0026] One advantage of using belts 19, 20, 21, 22 and a cloth of textile material as means 25 for preventing lateral and longitudinal displacement is that the belts 19, 20, 21, 22 and the cloth are quiet during operation, by comparison with stabilizing link arms, etc., which can squeak and produce noise.

[0027] The raising and lowering device 16 allows the middle section 15 to be raised and lowered at the first edge 23, which faces one of the short sides 17, 18 of the bed, and/or the second edge 24, which faces the other short side 18 of the bed.

[0028] The middle section 15, shown in Fig. 3 in a raised state, realizes a raising in the case of a body portion which is prominent and heavy, such as a hip portion. The raising for the middle section 15 is individual and is adaptable to each individual.

[0029] The raising of the middle section 15, in interaction with the bedding 3 and the sluggishly elastic layer 7 thereof, the function of which has been described above, means that the adjustment of the support for the different body portions is made in two interacting steps. In the fully or partially raised state of the middle section 15, the heavy hip portion is supported in order to achieve a natural curvature of the spine of the recumbent person for prevention of the so-called "hammock effect", at the same time as the springs 6, 9 in the bedding 3 are compressed. Simultaneously with this, the bedding 3 achieves a distribution of the point load arising by the hip portion, together with, at the same time, support for the less prominent parts of the body, such as the curve of the back. The middle section 15 preferably constitutes one third of the length of the supporting layer.

[0030] In summary it can be said that the raising of the middle section 15 changes the support in the bed 1 from below, at the same time as the surface softness in the upper bedding 3 is unaltered.

[0031] The device 16 for raising and lowering the middle section 15, shown in Fig. 4 and 5, comprises a drive mechanism 34. The drive mechanism 34 can comprise two separate motors, shown schematically at 46, which are operated independently of each other by means of a

control device. The control device is preferably a form of remote control, with which the person lying in the bed 1 can adjust the height of the middle section 15.

[0032] The drive mechanism 34 is fastened in a space beneath the slats 11 of the middle section 15 in the longitudinal sides 26, 27 of the frame, by means of fastening brackets 35. The drive mechanism 34 further comprises shafts 36, 37, preferably two, which are supported in fixed bearings. The shafts 36, 37 are preferably mounted in the fastening brackets 35 and the shafts 36, 37 are further provided with fixedly arranged lifting arms 38, which lift the middle section 15 when the shafts 36, 37 are driven by the drive mechanism 34. The shafts 36, 37 are rotatable in relation to the frame 10 and the number of lifting arms 38 which is used on each shaft 36, 37 depends on the width of the bed. The lifting arms 38 are arranged such that they protrude at right angles to the shafts 36, 37, which are formed from tube profiles.

[0033] The lifting arms 38 have rotatable rollers 39 disposed at their outer ends, which rollers 39 are arranged in contact with plates 40 on the underside 45 of the middle section 15, i.e. on the underside of the slats 11. The plates 40 are oblong and arranged in the longitudinal direction of the bed 1 and are as many in number as the rollers 39. The rollers 39 run against and along the plates 40 when the shafts 36, 37 are driven by the drive mechanism 34, thus upon raising and lowering of the middle section 15.

[0034] In a lowered state, the middle section 15 of the load-bearing layer 2 rests on the rollers 39 of the lifting arms 38. The middle section 15 is controlled in the lateral direction and longitudinal direction by the above-described means 25 for preventing lateral and longitudinal displacement in the fully lowered state of the middle section 15 and in the partially or fully raised state.

Claims

1. Bed device for supporting a human body by providing different load-bearing capacity in different zones in the bed, comprising a load-bearing layer (2) and a frame (10), which load-bearing layer (2) is composed of a plurality of different, mutually separate rigid sections (13, 14, 15), a bedding (3) supported by and disposed on the load-bearing layer (2), and a device (16) for raising and lowering a section of the load-bearing layer (2), **characterized in that** outer sections (13, 14) of the load-bearing layer (2), disposed by the short sides (17, 18) of the bed, are fixedly arranged in the frame (10), **in that** that section (15) of the load-bearing layer (2) which is disposed in the middle portion of the bed, between the outer sections (13, 14) of the load-bearing layer (2), can be raised and lowered in relation to the fixedly arranged outer sections (13, 14) of the load-bearing layer (2) by means of the raising and lowering device (16), and **in that** the middle section (15) of the load-bearing layer has means (25) for preventing lateral and longitudinal displacement of the middle section.

2. Device according to Claim 1, **characterized in that** the means (25) for preventing lateral and longitudinal displacement of the middle section (15) comprises a plurality of belts (19, 20, 21, 22), which form a cross and are fastened firstly to that edge (23) of the middle section which faces one short side (17) of the frame, and secondly to an opposite and opposing side of the frame (10) and form a cross, and are fastened firstly to that edge (24) of the middle section which faces the other short side (18) of the frame, and secondly to an opposite and opposing side of the frame (10).

3. Device according to Claim 1 or 2, **characterized in that** the means (25) for preventing lateral and longitudinal displacement of the middle section (15) comprises a cloth, which is fastened in centred arrangement with fastening members disposed in the transverse direction of the bed to the middle section (15), and is also fastened to the surrounding frame (10).

4. Device according to any of Claims 1, **characterized in that** the raising and lowering device allows the middle section (15) to be raised and lowered at the first edge (23), which faces one of the short sides (17) of the bed, and/or the second edge (24), which faces the other short side (18) of the bed.

5. Device according to Claim 4, **characterized in that** the device (16) for raising and lowering the middle section (15) comprises a drive mechanism (34) using two separate electric motors, which are operated independently of each other by means of a control device.

6. Device according to Claim 4 or 5, **characterized in that** the drive mechanism (34) comprises bearing-mounted shafts (36, 37), having fixed lifting arms (38) which lift the middle section (15) when the shafts (36, 37) are driven by the drive mechanism (34).

7. Device according to Claim 6, **characterized in that** the lifting arms (38) have rollers (39) at their outer ends, which rollers are arranged in contact with plates (40) on the underside (45) of the middle section, against which plates (40) the rollers (39) run when the shafts (36, 37) are driven by the motors upon raising and lowering of the middle section (15).

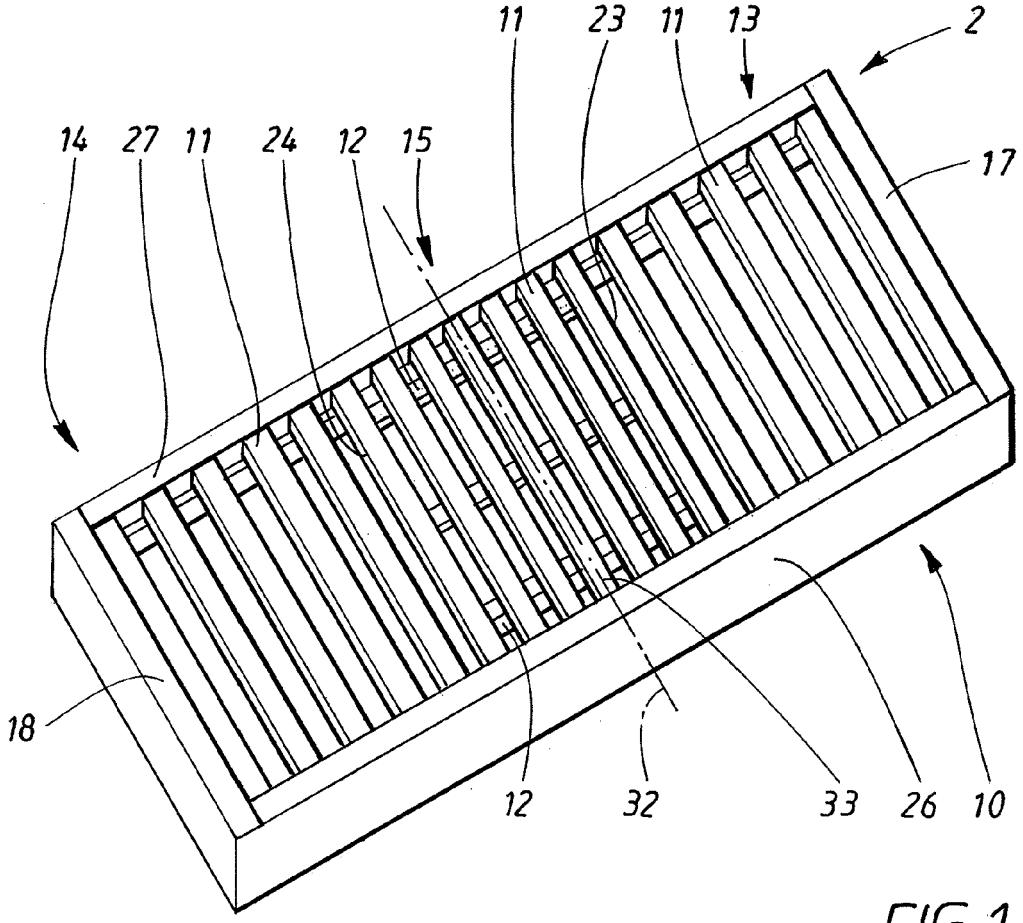
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FIG. 1

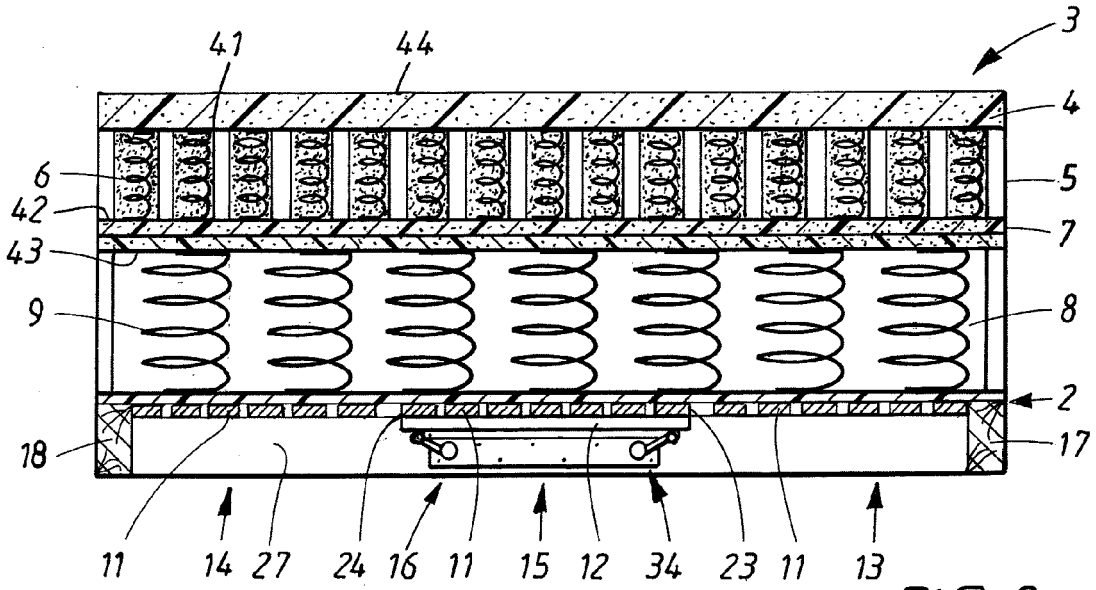
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FIG. 2

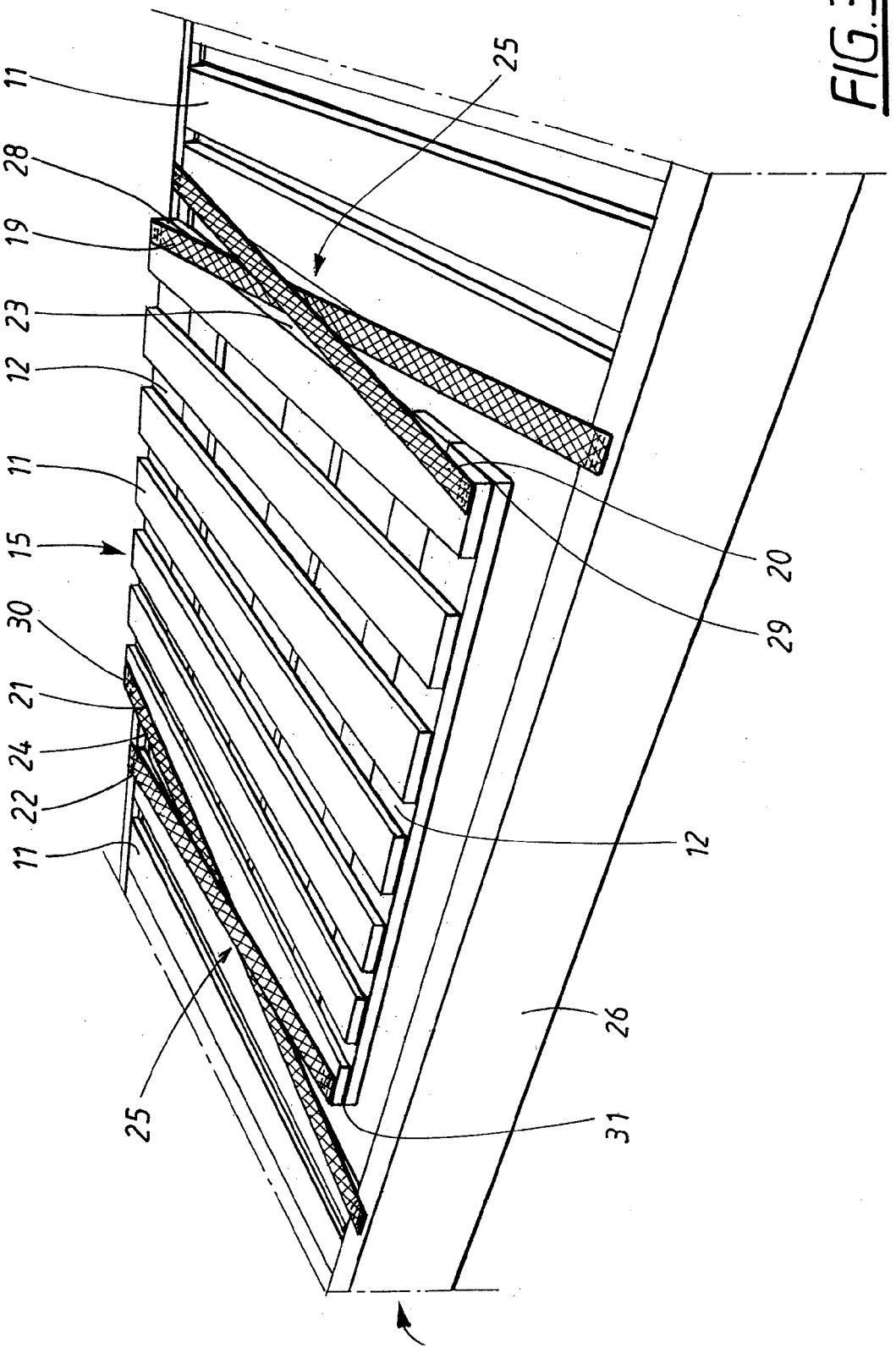

FIG.3

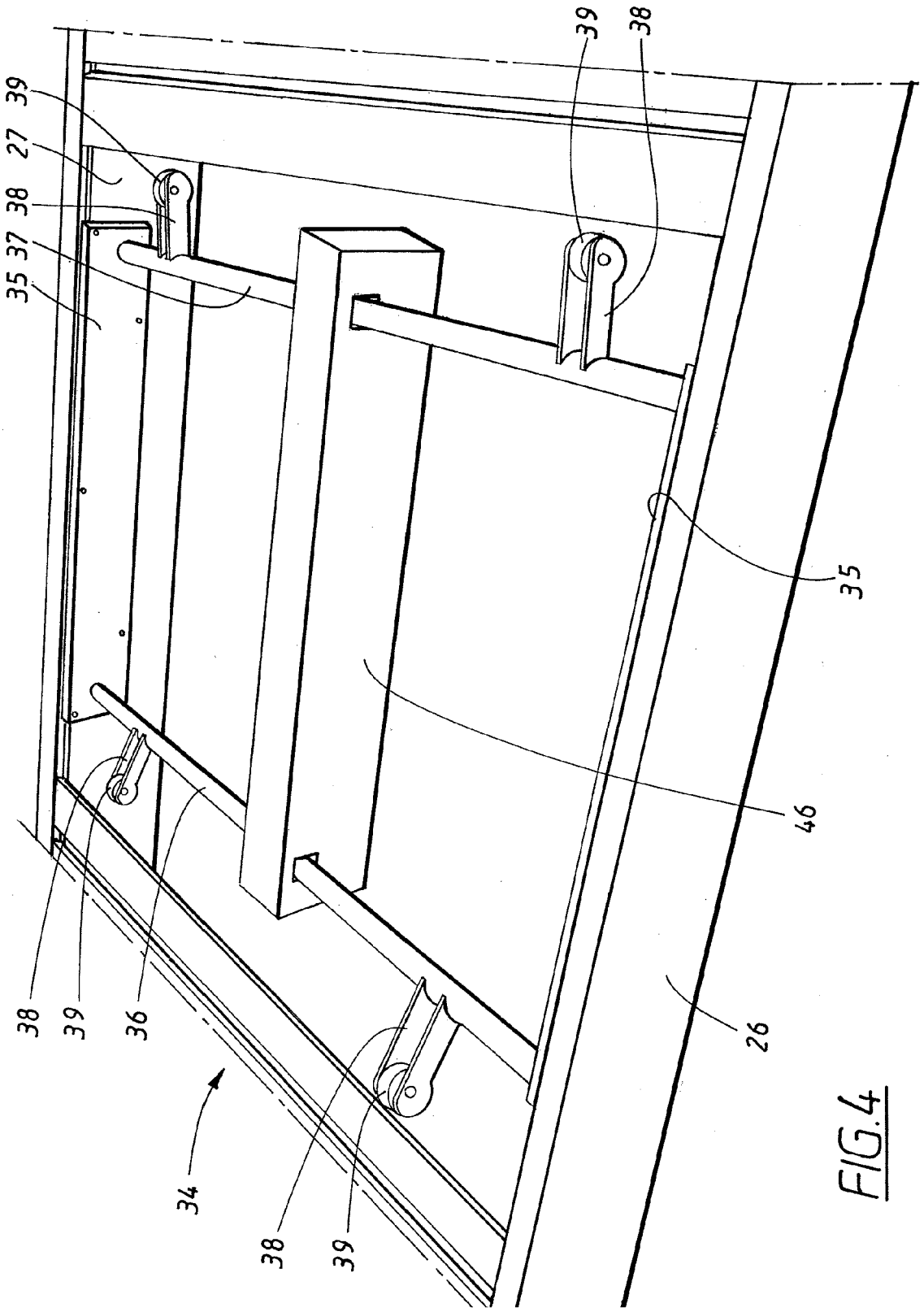

FIG.4

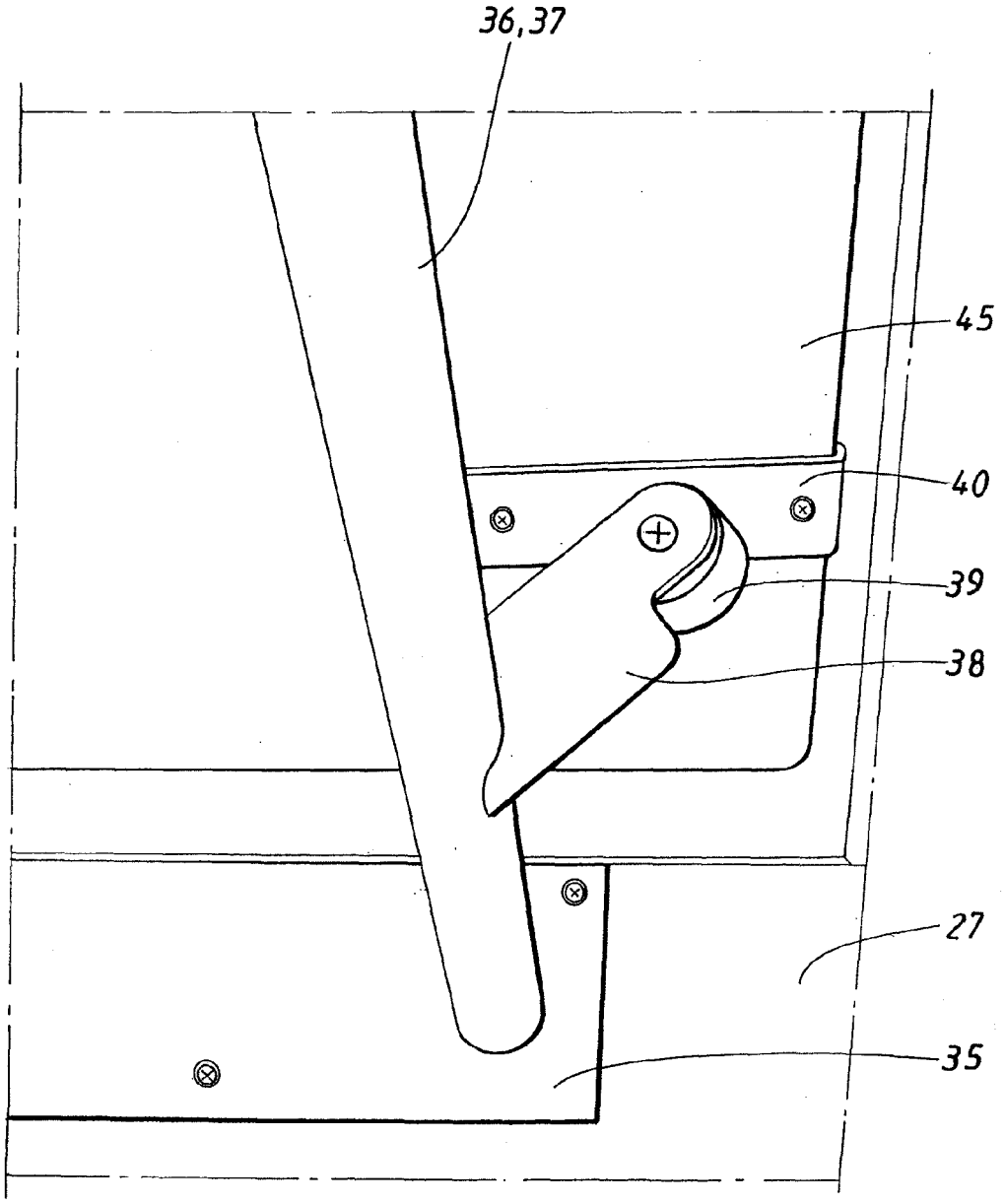

FIG. 5