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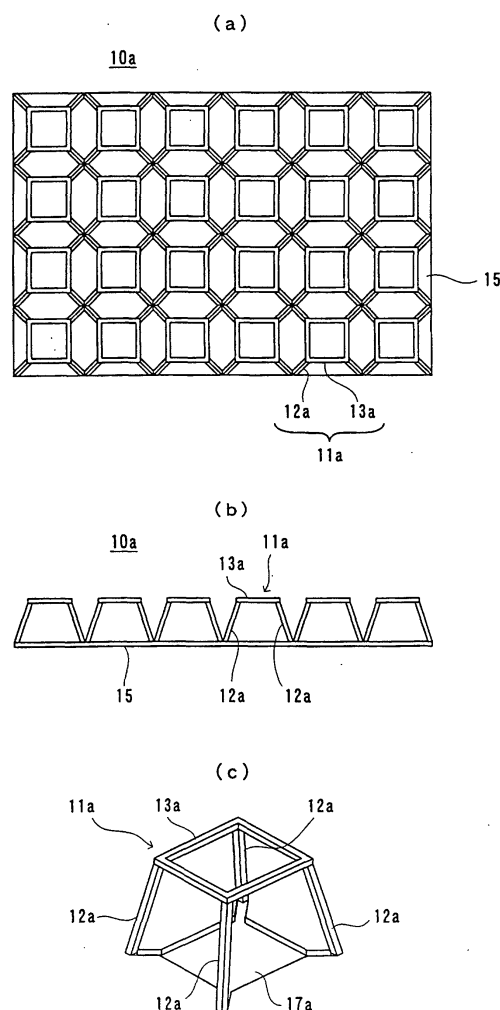
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(54) **SPACER**

(57) The present invention provides a spacer adapted to improve a ventilating ability and having excellent mass-productivity. Such a spacer is formed in a substantially flat shape so as to contact with an object by at least one surface of the spacer which is substantially perpendicular to the thickness direction of the spacer. The spacer comprises: a plurality of column-shaped members 12a having length components in the thickness direction, and a plurality of connecting members 13a for connecting the tip ends of the plurality of column-shaped members 12a. The plurality of column-shaped members 12a are integrally formed to be physically and continuously joined via base member 15. Concretely, this spacer is formed by injection molding of soft plastics. Such a constitution allows air to naturally flow through the interior of the spacer, and enables to reduce the contacting area of an object at that side thereof which contacts with the spacer.

FIG. 1



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Description

TECHNICAL FIELD

[0001] The present invention relates to a spacer such as used concerning seat cushions, underlying futons, chairs, sofas, shoes insoles, schoolchild's satchels (ransasels), construction materials, closet mats, refrigerator trays, tatami underlays, and duckboards.

BACKGROUND ART

[0002] There have been frequently used rattan seat cushions during a hot season such as summer. Rattan seat cushions are woven out of rattan with coarse meshes, to thereby allow air to naturally flow through the cushions themselves and to thereby allow users sitting thereon to feel coolness at their hips. Such rattan seat cushions can be regarded as serving as spacers which support hips of users and allow air to flow through the spacers.

[0003] However, such rattan seat cushions have narrower spaces for flowing air therethrough and have larger areas contacting with the hips, thereby failing to obtain a sufficient cooling effect. Further, rattan seat cushions are relatively hard, to thereby cause rugged feeling upon sitting, complicate fabrication, and hinder mass-production. As such, there have been desired realization of spacers which can be substituted for such rattan seat cushions, have an improved ventilating ability, and have excellent mass-productivity.

DISCLOSURE OF THE INVENTION

[0004] The present invention has been carried out in view of the conventional technical circumstances, and it is therefore an object of the present invention to provide a spacer adapted to improve a ventilating ability and having excellent mass-productivity.

[0005] To achieve the above object, the present invention resides in a spacer formed in a substantially flat shape so as to contact with an object by at least one surface of the spacer which is substantially perpendicular to the thickness direction of the spacer, the spacer comprising: a plurality of column-shaped members having length components in the thickness direction of the spacer, and one or a plurality of connecting members for connecting one ends of the plurality of column-shaped members; wherein the plurality of column-shaped members are integrally formed to be physically continuous.

[0006] The plurality of column-shaped members and the one or plurality of connecting members are preferably formed by injection molding of plastics. By integral forming in such a manner, the plurality of column-shaped members and the one or plurality of connecting members are free of overlapping with other members of the spacer via space along the thickness direction of the

spacer. Then, the spacer may further comprise a sheet member fixed to that side of the spacer, which side is at the other ends of the plurality of column-shaped members.

[0007] Further, the number of the column-shaped members to be connected to the one connecting member is preferably at least three. It is further preferable that the plurality of connecting members are formed into frame shapes, respectively.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

FIG. 1(a), FIG. 1(b) and FIG. 1(c) are a schematic plan view, a schematic side view of a spacer according to an Embodiment 1 of the present invention, and a schematic perspective view of a projecting portion of the spacer, respectively;

FIG. 2(a), FIG. 2(b) and FIG. 2(c) are a schematic plan view, a schematic side view of a spacer according to an Embodiment 2 of the present invention, and a schematic perspective view of a projecting portion of the spacer, respectively;

FIG. 3(a), FIG. 3(b) and FIG. 3(c) are a schematic plan view, a schematic side view of a spacer according to an Embodiment 3 of the present invention, and a schematic perspective view of a projecting portion of the spacer, respectively;

FIG. 4(a), FIG. 4(b) and FIG. 4(c) are a schematic plan view, a schematic side view of a spacer according to an Embodiment 4 of the present invention, and a schematic perspective view of a projecting portion of the spacer, respectively;

FIG. 5(a), FIG. 5(b) and FIG. 5(c) are a schematic plan view, a schematic side view of a spacer according to an Embodiment 5 of the present invention, and a schematic perspective view of a projecting portion of the spacer, respectively;

FIG. 6(a), FIG. 6(b) and FIG. 6(c) are a schematic plan view, a schematic side view of a spacer according to an Embodiment 6 of the present invention, and a schematic perspective view of a projecting portion of the spacer, respectively;

FIG. 7(a) and FIG. 7(b) are a schematic plan view, and a schematic side view of a spacer according to an Embodiment 7 of the present invention, respectively;

FIG. 8(a), FIG. 8(b) and FIG. 8(c) are a schematic plan view, a schematic side view of a spacer according to an Embodiment 8 of the present invention, and a schematic perspective view of a projecting portion of the spacer, respectively;

FIG. 9(a), FIG. 9(b) and FIG. 9(c) are a schematic plan view, a schematic side view of a spacer according to an Embodiment 9 of the present invention, and a schematic perspective view of a projecting portion of the spacer, respectively;

FIG. 10(a) is a schematic partial plan view of a spacer of an Embodiment 10, FIG. 10(b) is a schematic cross-sectional view of the spacer as viewed from an A-A arrow direction, and FIG. 10(c) is a schematic perspective view of a column-shaped member of the spacer;

FIG. 11 is a view showing a situation where a seat cushion applied with the spacer of the Embodiment 9 is placed on a chair;

FIG. 12(a) is a schematic plan view of the seat cushion of FIG. 11, and FIG. 12(b) is a schematic cross-sectional view of the seat cushion as viewed from a B-B arrow direction;

FIG. 13 is a schematic perspective view of a school-child's satchel applied with the spacer of the Embodiment 9;

FIG. 14(a) is a schematic plan view of a flooring member applied with the spacer of the Embodiment 9, and FIG. 14(b) is a schematic cross-sectional view of the flooring member as viewed from a C-C arrow direction;

FIG. 15(a) is a schematic front view of a leisure mat applied with the spacer of the Embodiment 9, and FIG. 15(b) is a schematic cross-sectional view of the leisure mat as viewed from a D-D arrow direction;

FIG. 16(a) is a schematic partial perspective view of a gypsum-aimed bandage applied with the spacer according to the present invention, and FIG. 16(b) is a view showing a state where the gypsum-aimed bandage is wound around a patient's forearm;

FIG. 17 is a view showing a modified embodiment of projecting portions of the spacer of the present invention; and

FIG. 18 is a view for explaining a conventional vibration isolating material.

BEST MODE FOR CARRYING OUT THE INVENTION

[0009] There will be described hereinafter the best mode for carrying out the present invention, with reference to the accompanying drawings.

[0010] Generally, spacers are used to keep a distance between two objects (including user's body) constant. For example, it is possible to keep an object at a constant height from a floor surface, by placing the object on a spacer on the floor. Meanwhile, there should be obtained various merits, if an object could be floated in the air without contacting with the object. Namely, it is possible then that the whole surface of the object is allowed to contact with the naturally flowing air, to thereby improve the ventilating ability around the object. Further, the object can be then isolated in the air, to thereby substantially preventing heat conduction to the object from other objects. Moreover, impingement of fluid or powder onto the object never causes the object to be sunk such as in fluid. Other various merits will be also obtained. It

is of course impossible to keep an object in a state floated in the air without contacting with the object. Herein, it is assumed that a spacer capable of bringing an object closer to a floating state in the air by placing the object on the spacer shall be called "ideal spacer".

[0011] Such an ideal spacer is required to satisfy the following requirements. Namely, it is firstly required to increase an opening ratio in the direction perpendicular to the thickness direction of the spacer. This widens the space within the spacer to thereby enable air to readily pass through the space. Secondly, it is required to increase an opening ratio of the spacer also at the side thereof contacting with the object. This reduces the contacting area between the object and spacer to thereby allow to bring the object closer to a floating state in the air, and allows air to sufficiently contact with that surface of the object which contacts with the spacer. In addition, there are required various requirements such as corresponding to usage of the spacer. For example, it is required for the spacer to have a lower density and to be sufficiently lightweight, in view of the portable expediency. Further, the spacer is required to have flexibility of a certain degree, in case of using the spacer by contacting it with a user's body. In using the spacer as an underlying futon, for example, the spacer is required to have a sufficient strength to support a body weight. It is further required to prevent the spacer from damaging the object supported by the spacer, and from providing uncomfortable feeling such as rugged feeling for the user sitting on the spacer.

[0012] The aforementioned conventional rattan seat cushions fail to fully satisfy the requirements, so that such seat cushions are said to be far from the ideal spacer. Contrary, the spacers according to the present invention have been worked out so as to sufficiently satisfy the aforementioned requirements to thereby approach the ideal spacer as close as possible.

[0013] There will be hereinafter explained the structural features of the spacers according to the present invention.

[0014] Each spacer of the present invention is formed to be substantially flat, contacts with an object at that one surface of the spacer which is perpendicular to the thickness direction of the spacer, and comprises: a plurality of column-shaped members having length components along the thickness direction of the spacer; and one or a plurality of connecting members for connecting the tip ends of the plurality of column-shaped members. Herein, to be called "projecting portion" is the portion constituted of one connecting member and those column-shaped members connected by the connecting member, in case of providing the plurality of connecting members.

[0015] Actually, such a spacer is integrally formed such that the column-shaped members are physically joined to become continuous via base member. This is because, separating column-shaped member complicates manufacturing of the spacer, and is impractical.

Only, it is unnecessary for the spacer to be wholly integral, in use. It is possible to use the spacer by dividing it into a plurality of segments, or to use duly arranged smaller 5-cm square spacers.

[0016] Concretely, each spacer of the present embodiment can be readily manufactured such as by injection molding of soft plastics. Namely, the spacer is formed by pouring heated and fluidized plastics into a metal mold. Since the spacer is integrally formed by using the metal mold, the spacer has no portions which overlap with other portions of the spacer via space in the thickness direction of the spacer upon such integral forming. Apart from this limitation, the shapes of the connecting members and column-shaped members can be extremely freely determined. This provides such an advantage that the spacer of the present embodiment can be applied to various purposes. Note, when the spacer has been fabricated by attaching a sheet-like reinforcing member to the base member after integral formation, the sheet-like reinforcing member may overlap with other segments via space in the thickness direction of the spacer.

[0017] The present embodiment adopts soft plastics as a material of the spacer, thereby providing such advantages that the material cost is reduced and the adjustment of the strength of the spacer can be readily conducted. Among plastics, it is desirable to adopt polyethylene, because polyethylene is so inexpensive and has a less affection to the environment such as upon incineration.

[0018] In such a spacer, how the allocation density of column-shaped members and the shapes of the column-shaped members and connecting members are to be designed shall be determined in consideration of the strength of the material and the usage of the spacer and so forth. It is possible here to adjust the weight resistance and flexibility of the spacer, by varying the material and shape of the spacer.

[0019] The thickness of the spacer is also mainly determined correspondingly to its usage. For example, in case of using the spacer so as to contact with a user's body, the thickness of the spacer is required to be within a certain range in consideration of feeling upon usage and of the strength of the spacer. On the other hand, the thickness of the spacer can be roughly determined where the spacer is to be used as a closet mat, since it is then enough for the spacer to carry a futon thereon without collapse of the spacer to thereby ensure a flow passage of air. It is typically desirable that the thickness of the spacer is within a range of 2 mm to 50 mm.

[0020] Each spacer of the present embodiment is typically used such that an object contacts with the connecting member side of the spacer. As such, wider distances between projecting portions of the spacer in using it to contact with a user's body will cause rugged feeling due to the projecting portions when the user is placed on the projecting portions. To restrict such rugged feeling, it is necessary to restrict the upper limit of

the distances between projecting portions themselves. Concretely, such as when one connecting member connects three or four column-shaped members together, it is desirable to set the distance between the column-shaped members themselves at 30 mm at the utmost. However, this is not true, when the spacer is to be applied to a particular usage such as a construction material or large sized structure.

[0021] Each spacer of the present embodiment also has its purpose to allow air to naturally flow through the spacer. Thus, it is necessary to increase the opening ratio of the spacer in the direction perpendicular to the thickness direction of the spacer to a certain extent so as to improve the ventilating ability for air. Concretely, such an opening ratio is preferably 30 % or more. On the other hand, it is also necessary to increase the opening ratio of the spacer at the side contacting with the object, so as to increase the ratio at which the air naturally flowing through the interior of the spacer contacts with the object. Concretely, such an opening ratio is preferably 20 % or more. In this way, the spacer of the present embodiment is capable of improving its ventilating ability and reducing the contacting area of the object with the spacer, to thereby have reduced heat conduction and an improved heat insulating ability. Thus, such as in using the spacer as a seat cushion, the spacer provides a cooling effect to prevent a sweaty condition of hips of a user and to allow the user to feel coolness at hips.

[0022] In each spacer of the present embodiment, it is desirable that at least three column-shaped members are connected to the one connecting member. This allows the connecting member to have a shape approximating a surface, rather than a point or a line. This allows to increase the contacting area with the object to be supported, to thereby further reducing the rugged feeling. It is further desirable to form the connecting member into a frame shape. This also allows the connecting member to have a shape approximating a surface, to thereby further reducing the rugged feeling. Moreover, this provides an advantage to allow an increased opening ratio of the object-contacting side of the spacer.

[0023] There will be hereinafter described concrete embodiments of the spacers according to the present invention.

[0024] FIGS. 1 through 10 are views for explaining various spacers. In FIGS. 1 through 9, there are shown small pieces of spacers such as 5 cm x 4 cm.

[Embodiment 1]

[0025] FIG. 1(a), FIG. 1(b) and FIG. 1(c) are a schematic plan view, a schematic side view of a spacer according to an Embodiment 1, and a schematic perspective view of a projecting portion of the spacer, respectively.

[0026] The spacer 10a shown in FIG. 1 includes a plu-

ality of projecting portions 11a which are arranged on a rectangular base member 15. The spacer 10a is formed in a substantially flat shape as a whole. The projecting portions 11a are physically joined to become continuous via base member 15.

[0027] As shown in FIG. 1(c), each projecting portion 11a comprises four column-shaped members 12a and a square frame-shaped connecting member 13a. Each column-shaped member 12a is drawn obliquely upwardly from the base member 15. Each column-shaped member 12a has its tip end connected to one of corners of the connecting member 13a. Further, each column-shaped member 12a of each pertinent projecting portion 11a has a lower end connected to lower ends of column-shaped members 12a of three projecting portions 11a adjacent to the pertinent projecting portion 11a, so that all projecting portions 11a are arranged regularly.

[Embodiment 2]

[0028] FIG. 2(a), FIG. 2(b) and FIG. 2(c) are a schematic plan view, a schematic side view of a spacer according to an Embodiment 2, and a schematic perspective view of a projecting portion of the spacer, respectively.

[0029] The spacer 10b shown in FIG. 2 includes a plurality of projecting portions 11b which are arranged on a rectangular base member 15. The spacer 10b is formed in a substantially flat shape as a whole. Namely, the projecting portions 11b are physically joined to become continuous via base member 15.

[0030] As shown in FIG. 2(c), each projecting portion 11b comprises three column-shaped members 12b and a circular frame-shaped connecting member 13b. Each column-shaped member 12b is drawn obliquely upwardly from the base member 15. The tip ends of column-shaped members 12b are connected to the connecting member 13b. Herein, adjacent two column-shaped members 12b form an angle of 120° therebetween when viewed from the above of the spacer 10b as shown in FIG. 2(a). Further, each column-shaped member 12b of each pertinent projecting portion 11b has a lower end connected to lower ends of column-shaped members 12b of two projecting portions 11b adjacent to the pertinent projecting portion 11b. Thus, the respective projecting portions 11b are arranged regularly, and present a substantially honeycomb pattern when viewed from the above.

[Embodiment 3]

[0031] FIG. 3(a), FIG. 3(b) and FIG. 3(c) are a schematic plan view, a schematic side view of a spacer according to an Embodiment 3, and a schematic perspective view of a projecting portion of the spacer, respectively.

[0032] The spacer 10c shown in FIG. 3 is a modified embodiment of the spacer 10b of FIG. 2, such that main-

ly the connecting member has a modified shape. In the spacer 10c of FIG. 3, each projecting portion 11c comprises three column-shaped members 12c and a connecting member 13c which is an equilateral triangle shaped frame. Each column-shaped member 12c has its tip end connected to one of corners of the connecting member 13c. The other structure is substantially the same as the spacer 10b of FIG. 2.

10 [Embodiment 4]

[0033] FIG. 4(a), FIG. 4(b) and FIG. 4(c) are a schematic plan view, a schematic side view of a spacer according to an Embodiment 4, and a schematic perspective view of a projecting portion of the spacer, respectively.

[0034] The spacer 10d shown in FIG. 4 is a modified embodiment of the spacer 10b of FIG. 2, such that mainly the connecting member has a modified shape. In the spacer 10d of FIG. 4, each projecting portion 11d comprises three column-shaped members 12d and a connecting member 13d which has an inverted "Y" shape. Each column-shaped member 12d has its tip end connected to one of tip ends of the connecting member 13d. The other structure is substantially the same as the spacer 10b of FIG. 2.

[Embodiment 5]

30 **[0035]** FIG. 5(a), FIG. 5(b) and FIG. 5(c) are a schematic plan view, a schematic side view of a spacer according to an Embodiment 5, and a schematic perspective view of a projecting portion of the spacer, respectively.

35 **[0036]** The spacer 10e shown in FIG. 5 is a modified embodiment of the spacer 10b of FIG. 2, such that mainly the connecting member has a modified shape. In the spacer 10e of FIG. 5, each projecting portion 10e comprises three column-shaped members 12e and a connecting member 13e which has a double-circle ring shape. The other structure is substantially the same as the spacer 10b of FIG. 2.

[Embodiment 6]

45 **[0037]** FIG. 6(a), FIG. 6(b) and FIG. 6(c) are a schematic plan view, a schematic side view of a spacer according to an Embodiment 6, and a schematic perspective view of a projecting portion of the spacer, respectively.

50 **[0038]** FIG. 6 shows a spacer 10f including a plurality of projecting portions 11f which are arranged on a rectangular base member 15. The spacer 10f is formed in a substantially flat shape as a whole. The projecting portions 11f are physically joined to become continuous via base member 15.

[0039] As shown in FIG. 6(c), each projecting portion 11f comprises two column-shaped members 12f and a

rod-like connecting member 13f. Each column-shaped member 12f is drawn vertically upwardly from the base member 15. Each column-shaped member 12f has its tip end connected to one of tip ends of the connecting member 13f. The projecting portions 11f are regularly arranged at predetermined intervals such that the longitudinal directions of projecting portions 11f are aligned.

[Embodiment 7]

[0040] FIG. 7(a) and FIG. 7(b) are a schematic plan view, and a schematic side view of a spacer according to an Embodiment 7, respectively.

[0041] The spacer 10g shown in FIG. 7 is a modified embodiment of the spacer 10f shown in FIG. 6, in which only the way to arrange projecting portions 11f is modified. Namely, there are regularly and alternately arranged those rows of projecting portions 11f having the longitudinal directions thereof directed laterally of the spacer, and those rows of projecting portions 11f having the longitudinal directions thereof directed longitudinally of the spacer. Thus, the projecting portions 11f are arranged in a substantially square-meshed pattern when viewed from the above. Other structure is substantially the same as the spacer 10f of FIG. 6.

[Embodiment 8]

[0042] FIG. 8(a), FIG. 8(b) and FIG. 8(c) are a schematic plan view, a schematic side view of a spacer according to an Embodiment 8, and a schematic perspective view of a projecting portion of the spacer, respectively.

[0043] The spacer 10h shown in FIG. 8 includes a plurality of projecting portions 11h which are arranged on a rectangular base member 15. The spacer 10h is formed in a substantially flat shape as a whole. The projecting portions 11h are physically joined to become continuous via base member 15.

[0044] As shown in FIG. 8(c), each projecting portion 11h comprises four column-shaped members 12h and a cross-shaped connecting member 13h. Each column-shaped member 12h is drawn vertically upwardly from the base member 15. The tip end of each column-shaped member 12h is connected to one of tip ends of the connecting member 13h. Further, the projecting portions 11h are regularly arranged at predetermined intervals.

[Embodiment 9]

[0045] FIG. 9(a), FIG. 9(b) and FIG. 9(c) are a schematic plan view, a schematic side view of a spacer according to an Embodiment 9, and a schematic perspective view of a projecting portion of the spacer, respectively.

[0046] The spacer 10i shown in FIG. 9 is a modified

embodiment of the spacer 10h of FIG. 8, such that mainly the shape of the connecting member is modified. In the spacer 10i of FIG. 9, each projecting portion 11i comprises three column-shaped members 12i and a connecting member 13i which is a square shaped frame. Each column-shaped member 12i has its tip end connected to a center portion of one side of the connecting member 13i. Other structure is substantially the same as the spacer 10h of FIG. 8.

[0047] There will be hereinafter explained those items common to the spacers 10a, 10b,..., 10i of the Embodiments 1 through 9.

[0048] In each of spacers 10a, 10b,..., 10i of the Embodiments 1 through 9, the diameter of each column-shaped member in a section cut along a plane perpendicular to the thickness direction of the spacer is set at 0.2 mm to 1 cm, for example. Further, the distance between column-shaped members themselves is set at 2 mm to 30 mm, for example. Thus, the number of column-shaped members per 1 cm² is 0.1 to 25 when viewed from the thickness direction of the spacer. Moreover, the thickness (height of the projecting portion) of each of the spacers 10a, 10b,..., 10i is set at about 10 mm. Such thinness of the spacer never causes a problem of a storage place of the spacer in disuse thereof. These features are also true in an Embodiment 10 to be described hereinafter.

[0049] Further, in each of spacers 10a, 10b,..., 10i, the projecting portions are arranged at intervals of about 1 cm, longitudinally and laterally. This reduces rugged feeling of the spacer even when it is used to contact with a user's body. To further restrict the rugged feeling, it is sufficient to provide a meshed material on the connecting members.

[0050] Each of the spacers 10a, 10b,..., 10i is integrally formed such as by injection molding of soft plastics. Thus, the column-shaped members and accompanying connecting members are continuous in a seamless manner as a matter of course, and some of column-shaped members continuously and smoothly transfer to the connecting member depending on the shapes of the column-shaped members and connecting members. By virtue of such integral formation, none of the spacers 10a, 10b,..., 10i has portions which overlap with other portions of the spacer via space along the thickness direction of the spacer. Thus, in each of the spacers 10a, 10b,..., 10i shown in (c) of FIG. 1 through FIG. 9, there is formed a predetermined hole 17a, 17b,..., 17i such as at those areas of the base member, which oppose to the column-shaped members drawn obliquely upwardly from the base member and which oppose to the connecting member.

[0051] In addition, there exist the following methods to obtain a larger spacer such as in a size of 2 m x 2 m from those spacers made of small pieces as shown in Embodiments 1 through 9. Namely, it is possible to readily fabricate a larger spacer by arranging and mutually abutting sides of respective pieces and by heat welding

them, when the material of the spacer is plastics. Alternatively, it is possible to ultrasonically fuse respective pieces with one another. Such a method allows to readily fabricate a spacer of a desired size. At this time, it is possible to readily obtain a spacer of a smaller size or of a particular shape, by cutting it out of a larger spacer. It is also possible to fabricate a large spacer by adhering the respective pieces onto a large plate, or by connecting the respective pieces by connectors such that the respective pieces can be folded relative to one another.

[0052] The features of the spacers of the Embodiments 1 through 9 include a reduced degree of rugged feeling, since each spacer has a large number of connecting members per a unit area when viewed from the thickness direction. Further, each spacer has increased flexibility and is capable of bearing a heavier load, considering the light weight of the spacer. Moreover, each spacer can be used for various applications, since the projecting portions of the spacer can be formed in various shapes. For example, the spacer 10a having the square framed connecting members shown in FIG. 1 is capable of bearing a considerably heavy load, by increasing the thickness of respective members. Thus, the spacer can be used as an underlying futon, for example. Conversely, reducing the thickness of respective members extremely reduces the weight and improves the flexibility, to thereby allow to use the spacer to bear a lightweight object. In this way, the spacers of the present invention have versatility.

[0053] In each of the spacers of Embodiments 1 through 9, projecting portions have been formed independently, resulting in a possibility that the projecting portions are collapsed due to excessively large pushing forces from the above. Thus, when it is desired to increase the strength of each spacer, it is possible, for example, to provide reinforcing members for mutually connecting adjacent column-shaped members themselves or adjacent connecting members themselves, concerning some of the plurality of projecting portions.

[0054] Meanwhile, in those spacers of the aforementioned Embodiments 1 through 9, it is desirable to form a lot of large holes in the base members, as required. Namely, those spacers having the plurality of projecting portions arranged on the respective base members shall be used to face the respective base members downwardly and to place the user's body on the upper ends of the projecting portions, in case of using each spacer as a seat cushion. However, it is certain that a seat cushion is used invertedly. As such, forming large holes in the base member reduces that area of the spacer which contacts with the user's body, to thereby allow to use the seat cushion invertedly. Moreover, forming a large number of large holes in the base member further lightens the spacer to thereby advantageously increase the flexibility of the spacer.

[Embodiment 10]

[0055] FIG. 10(a) is a schematic partial plan view of a spacer 20 of an Embodiment 10, FIG. 11(b) is a schematic cross-sectional view of the spacer 20 as viewed from an A-A arrow direction, and FIG. 10(c) is a schematic perspective view of a column-shaped member of the spacer 20.

[0056] The spacer 20 shown in FIG. 10 comprises a first mesh member 21, a second mesh member 22, and a plurality of column-shaped members 23. The first mesh member 21 includes a plurality of first upper rails 21a and a plurality of second upper rails 21b. The plurality of first upper rails 21a are laterally extended at predetermined intervals in the vertical direction in FIG. 10(a), while the plurality of second upper rails 21b are vertically extended at predetermined intervals in the lateral direction in FIG. 10(a). In the above, the predetermined intervals for the first upper rails 21a are the same as those for the second upper rails 21b, to thereby form each of meshes of the first mesh member 21 into a square shape.

[0057] The second mesh member 22 includes a plurality of first lower rails 22a and a plurality of second lower rails 22b. In FIG. 10(a), the plurality of first lower rails 22a are arranged at predetermined intervals in a state inclined to the lateral direction by 45 degrees in the counterclockwise direction, while the plurality of second lower rails 22b are arranged at predetermined intervals in a state inclined to the lateral direction by 45 degrees in the clockwise direction. In the above, the predetermined intervals for the first lower rails 22a are the same as those for the second lower rails 22b, to thereby form each of meshes of the second mesh member 22 into a square shape. Further, the mesh of the second mesh member 22 is formed to be larger than the mesh of the first mesh member 21.

[0058] The first mesh member 21 and second mesh member 22 are arranged such that, when viewed from the bottom, the intersections between the first lower rails 22a and second lower rails 22b coincide with the intersections between the first upper rails 21a and second upper rails 21b. Each of the column-shaped members 23 is provided to interconnect each intersection of the second mesh member 22 and the corresponding intersection of the first mesh member 21. Only, the column-shaped members 23 are provided at every other intersection between the first upper rails 21a and second upper rails 21b, in both of the longitudinal direction and the lateral direction. Thus, the plurality of column-shaped members 23 are physically joined to become continuous, via first mesh member 21 or second mesh member 22. Further, each column-shaped member 23 has its substantially equilateral octagonal cross section taken along a plane perpendicular to the thickness direction of the spacer.

[0059] In the Embodiment 10, the first mesh member 21 (or second mesh member 22) corresponds to the

connecting member of the present invention, and the second mesh member 22 (or first mesh member 21) corresponds to the base member such as referred to in the Embodiment 1. In considering so, the connecting member is regarded as being singular.

[0060] The spacer 20 of this Embodiment 10 can be formed such as by injection molding of plastics. Thus, the spacer 20 has no portions which overlap with other portions of the spacer via space in the thickness direction.

[0061] Since the spacer 20 of the Embodiment 10 has upper and lower meshes, the spacer 20 provides reduced rugged feeling, is extremely lightweight, and has larger flexibility. Further, such a spacer 20 has a feature of an unchanged function even if inverted. Thus, the spacer 20 can be used invertedly. Further, when the spacer 20 is required to have increased strength, it is sufficient to thicken the column-shaped members 23. The spacer 20 of this Embodiment 10 approximates the aforementioned ideal spacer, to the maximum.

[0062] The spacers of the present invention can be classified into several categories, from the standpoint of objects to be supported by the spacers. Such categories include those spacers aiming at supporting a user's body or a part thereof, those aiming at supporting objects other than a user's body, and those aiming at other purposes. Those spacers aiming at supporting a user's body or a part thereof can be used concerning seat cushions, chairs, sofas, underlying futons, shoes insoles, flooring member and artificial lawns as construction materials, leisure mats, bath aimed duckboards, beach sandals, and gypsum (Gips), for example. Further, those spacers for supporting objects other than a user's body can be used concerning closet mats, refrigerator trays, tatami underlays, tatami interlays, kitchen draining tools, for example. Those spacers for other purposes can be used concerning schoolchild's satchels and rucksacks, and anti-insect clothes. There will be individually explained hereinafter application examples of the spacers of the present invention.

[Application Example to Seat Cushion, Chair and Sofa]

[0063] FIG. 11 is a view showing a situation where a seat cushion applied with the spacer of the Embodiment 9 is placed on a chair. FIG. 12(a) is a schematic plan view of the seat cushion of FIG. 11, and FIG. 12(b) is a schematic cross-sectional view of the seat cushion as viewed from a B-B arrow direction.

[0064] As shown in FIG. 11, such a seat cushion 50 is used by placing it on a chair X. The seat cushion 50 can be of course used such as by placing it on a bench or sofa. As shown in FIG. 12, the seat cushion 50 comprises a square spacer 10i of a size of 400 mm x 400 mm and a cloth sheet 51. Namely, this example adopts the spacer 10i shown in FIG. 9. Typically, the seat cushion 50 is placed such that the connecting members 13i of the spacer come to the upper side.

[0065] The cloth sheet 51 covers the upper and lower sides of the spacer 10i. The material of the cloth sheet 51 may be whatever readily allows air to sufficiently permeate therethrough. Such a cloth sheet 51 is provided for comfortable feeling to a user sitting thereon.

[0066] By virtue of the spacer 10i, this seat cushion 50 ensures an air flow passage just under hips of a user sitting on the seat cushion 50. Since the spacer 10i has a larger opening ratio at its upper side and an improved ventilating ability, sitting for a long time causes no increase of the temperature of those portions of the spacer 10i which contact with hips because of the user's body temperature, to thereby prevent a sweaty condition and to thereby provide comfortable feeling. Providing a lot of large holes at the base member 15 of the spacer 10i allows to keep a ventilating ability and to prevent a sweaty condition even when the seat cushion 50 is used invertedly.

[0067] The seat cushion 50 can be also used, in case of sitting on an outdoor bench. Namely, users are to place the seat cushion 50 on the bench and sit thereon. In this case, the seat cushion 50 can be readily rounded and carried, by virtue of the flexibility and light weight of the spacer 10i. Particularly, even in sitting on an outdoor bench in the blazing midsummer, the spacer 10i exhibits extremely lower heat conduction from the bench to hips, so that hips will be never heated.

[0068] The seat cushion 50 is not necessarily provided with the cloth sheet 51. Such a cloth sheet 51 is provided for improving the sitting feeling. Thus, merely and densely forming the projecting portions of the spacer 10i prevents rugged feeling, for example.

[0069] Further, each spacer of the present invention can be also used such as by incorporating it into a seat portion of a chair or sofa.

[Application Example to Underlying Futon]

[0070] Each spacer of the present invention can be used as an underlying futon. Such an underlying futon may have the substantially same constitution as the aforementioned seat cushion. Only, the spacer is not necessarily covered by a cloth sheet, since the underlying futon is typically used by covering it by a normal sheet.

[0071] Such an underlying futon ensures an air flow passage by virtue of the spacer just under a body of a user lying thereon, to thereby prevents the temperature of those portions of the spacer which contact with the user's body from being increased by the user's body temperature even after sleeping for a long time, and to thereby prevent a sweaty condition and provide comfortable feeling. The present inventors have conducted an evaluation test of such an underlying futon. The test result has shown that using the present underlying futon at tropical night at the temperature of 25°C or higher provides sufficient cool feeling to thereby allow a calm sleep.

[Application Example to Shoes Insoles]

[0072] Each spacer of the present invention can be used as shoes insoles. In this case, there can be readily obtained shoes insoles tailored to a user, such as by cutting foot shapes out of spacers of 30 cm x 15 cm. Adopting the shoes insoles fabricated from the spacers allow to prevent sweaty conditions of soles by virtue of the ventilating abilities of the spacers, and to provide an advantage of an excellent cushioning ability and foot comfort by virtue of the flexibility of the spacers. Particularly, such as small stones happened to enter the shoes will drop from the connecting member side toward the base member to thereby prevent uncomfortable feeling of feet due to the small stones.

[0073] Note, in using the spacers as shoes insoles, it is necessary to thicken the column-shaped members to a certain degree, for example, in view of the increased supporting weight (pressure) per unit area of the spacers.

[Application Example to Schoolchild's Satchel and Rucksack]

[0074] FIG. 13 is a schematic perspective view of a schoolchild's satchel applied with the spacer of the Embodiment 9. FIG. 13 shows the spacer in a simplified manner.

[0075] As shown in FIG. 13, such a satchel 60 includes a satchel body 61 and a spacer 10i attached to that portion of the satchel body 61 which contacts with the back of a user. The spacer 10i is removably attached to the satchel body 61 such as by a planar tape such that the connecting members face to the user's back.

[0076] In case of a conventional satchel, putting a lot of loads thereinto, for example, may cause the satchel to push a user's back to thereby cause a sweaty condition at the user's back, resulting in a lot of perspiration. The satchel 60 shown in FIG. 13 ensures an air flow passage between the user's back and the satchel body 61 by virtue of the spacer 10i when the satchel 60 is carried on the user's back, to thereby prevent a sweaty condition and a lot of perspiration on the user's back.

[0077] Similarly to the situation of satchel, the spacer of the present invention can be applied to rucksacks, for example.

[Application Example to Flooring Member and Artificial Lawn]

[0078] FIG. 14(a) is a schematic plan view of a flooring member applied with the spacer of the Embodiment 9, and FIG. 14(b) is a schematic cross-sectional view of the flooring member as viewed from a C-C arrow direction.

[0079] While flooring members as construction materials generally include carpets, tatami mats, wooden plates, the spacers of the present invention can be used

as such flooring members. As shown in FIG. 14, such a flooring member 70 includes a square spacer 10i of 30 cm length x 30 cm width, and a cloth sheet 71.

[0080] The cloth sheet 71 is to cover the connecting member 13i side of the spacer 10i. The material of the cloth sheet 71 may be whatever has a good ventilating ability and is tough. Such a cloth sheet 71 is fixed to the connecting members 13i by ultrasonic fusion. Providing the cloth sheet 71 restricts rugged feeling. To further restrict the rugged feeling, it is enough to interpose a meshed material between the cloth sheet and the connecting members.

[0081] In use, the flooring members 70 of 30 cm x 30 cm are fully laid over the floor surface such that the connecting members 13i of the spacer 10i are brought to the upper side.

[0082] According to such a flooring member 70, the spacer 10i has an improved heat insulating ability so that a user will not feel coldness even by walking on the flooring member 70 by naked foot during cold winter, similarly to a situation of a carpet. Still more, the spacer 10i has an excellent ventilating ability, to thereby prevent a sweaty condition due to night sweat from a body of a user lying on the spacer during a hot season. Further, the spacer 10i has excellent flexibility, to thereby provide comfortable feeling to a user walking thereon, and with a small footfall similarly to a carpet. Further, even tumbling on the spacer never leads to severe injuries. Moreover, covering the surface of the spacer by the cloth sheet 71 prevents entrance of dust and rubbish and simplifies cleaning as compared with a carpet. Still more, unlike carpets, no mite and tick are caused.

[0083] Concerning the flooring member 70 shown in FIG. 14, there has been described a situation where the cloth sheet 71 is previously fixed to the predetermined size of spacer 10i. However, it is possible to fix a single cloth sheet to the upper surface of spacers 10i of predetermined sizes after laying them over the floor surface. To fix the cloth sheet to spacers 10i then, it is enough to apply ultrasonic waves to predetermined connecting members 13i through the cloth sheet, to thereby fuse the cloth sheet and the connecting members 13i in a spotted manner. This allows to cover all spacers 10i by a single cloth sheet, to thereby completely prevent entrance of dust and rubbish and to thereby extremely simplify the cleaning of the spacers 10i.

[0084] The spacers of the present invention can be used as artificial lawns, similarly to the situation of the aforementioned flooring member. Only, it is required to color the spacers in green. Further, the spacers are to be used as they are without covering them by a cloth sheet thereon, in view of the function of artificial lawns. Typically, whether spacers are to be covered by a cloth sheet(s) is determined depending on usage of the spacers. Such artificial lawns adopting the spacers are different from conventional artificial lawns densely formed with artificial leaves, to thereby provide an advantage for allowing an easy cleaning operation by a cleaner.

[0085] It is also possible to use the spacers of the present invention, as poolside flooring members. Usually, since poolside are made of concrete, trying to walk thereon by naked foot in the blazing midsummer has frequently resulted in failure of walking due to the heated poolside. Since the spacers of the present invention have improved heat insulating abilities, using these spacers as poolside flooring members leads to the substantially unraised temperature of the flooring members even in the blazing midsummer, so that walking thereon by naked foot never leads to feeling of heat. Still more, water splashed onto the flooring members falls down to lower sides of the spacers, thereby resulting in a good water draining ability of the flooring members.

[0086] Moreover, the spacers of the present invention can be used as flooring members in livestock barns such as cattle sheds. In this situation, those excrements dropped onto such flooring members can be readily cleaned up, by merely brushing them while sprinkling water thereon. Further, such flooring members are always dried and extremely hygienic, by virtue of the improved water draining abilities thereof.

[Application Example to Leisure Mat and Beach Mat]

[0087] FIG. 15(a) is a schematic front view of a leisure mat applied with the spacer of the Embodiment 9, and FIG. 15(b) is a schematic cross-sectional view of the leisure mat as viewed from a D-D arrow direction.

[0088] The leisure mat 80 shown in FIG. 15 comprises a spacer 10i and a plastic film 81 as a sheet member. The plastic film 81 is fixed to a base member 15 from the lower sides of the spacer 10i. The provision of the plastic film 81 is required, because leisure mats are typically used by spreading them on the ground so that directly using the spacer 10i itself as a leisure mat leads to entrance of soil and sands from many holes formed at the base member of the spacer 10i.

[0089] To fix the plastic film 81 to the spacer 10i, it is enough to use an adhesive suitable for the material of the plastic film 81. Alternatively, it is possible to heat weld the spacer 10i and plastic film 81 by joining them after heating one of them to thereby slightly fuse it. Particularly, smaller sizes of the leisure mat 80 allows to readily fuse the spacer 10i and plastic film 81, by contacting them with each other after partly fusing one of them by means of ultrasonic waves.

[0090] Even when such a leisure mat 80 is spread over a considerably rough ground surface, users sitting on the leisure mat 80 are substantially prevented from feeling the roughness, by virtue of the flexibility of the spacer 10i. Further, even when a user has stepped on the leisure mat 80 while wearing shoes to thereby contaminate the connecting members 13i such as by soil, such soil can be readily dropped from the connecting members 13i to the base member 15 thereunder by simply manually sweeping the soil. Further, even when spilt water drops onto the base member 15, the surfaces of

the connecting members 13i exhibit lesser sticky feeling. Thus, the leisure mat 80 provides excellent operability, in addition to the good ventilating ability and the lesser heat conduction.

[0091] Note, the spacers of the present invention can be also applied to those beach mats having the same usage purpose as the leisure mats. Such beach mats may have the same constitution as the aforementioned leisure mats.

[Application Example to Bath Aimed Duckboards]

[0092] The spacers of the present invention can be also used as bath aimed duckboards. Such a duckboard has features that the temperature of the duckboard is not immediately changed by virtue of the excellent heat insulating ability of the spacer and that the duckboard has a good water draining ability by virtue of many holes formed in the spacer.

[Application Example to Beach Sandals]

[0093] The spacers of the present invention can be applied to beach sandals. In such beach sandals, the spacers are placed on the foot placing surfaces of the beach sandals, respectively, such that the connecting members are faced toward feet soles. In this case, it is desirable to use spacers having larger opening ratios at those sole contacting sides of the spacers. In this way, sands and water falling onto the beach sandals such as during play on a sandy beach will drop from the upper surfaces of the spacers onto lower surfaces thereof, resulting in lesser adherence such as of sands to the feet soles.

[Application Example to Gypsum]

[0094] Typically, gypsum is used to fix an affected part of a patient by pasting plaster onto a bandage wound around the affected part and by solidifying the plaster, such as in a case of bone fracture. However, provision of gypsum deteriorates the affected part, to thereby cause a sweaty condition and itchy sensation, resulting in severe pain of the patient. Such a problem can be solved by applying the spacer of the present invention to a bandage for gypsum.

[0095] FIG. 16(a) is a schematic partial perspective view of a gypsum-aimed bandage applied with a spacer according to the present invention, and FIG. 16(b) is a view showing a state where the gypsum-aimed bandage is wound around a patient's forearm. The gypsum-aimed bandage 90 shown in FIG. 16(a) comprises a spacer 10i and an adhering portion 91. FIG. 16(a) shows the spacer 10i in a simplified manner. This spacer 10i is formed into an elongated belt having a thickness on the order of about 3 mm. Thus, the gypsum-aimed bandage 90 has improved flexibility. The adhering portion 91 is formed along one of the longitudinal sides of the spacer

10i, so as to be continuous with the base member. Such a spacer 10i and adhering portion 91 are integrally formed by injection molding of plastics. Further, there is applied an adhesive to that surface of the adhering portion 91 which is the same side as the connecting members of the spacer 10i.

[0096] For example, in case of bone fracture of arm, the gypsum-aimed bandage 90 is wound around the affected part such that the connecting members are faced to the affected part. At this time as shown in FIG. 16(b), the gypsum-aimed bandage 90 can be assuredly fixed to the affected part, by overlapping and adhering the adhering portion 91 with and to a part of the base member of the spacer 10i. Such a gypsum-aimed bandage 90 is extremely thin, so that the gypsum-aimed bandage 90 can be smoothly wound around and fixed to those substantially cylindrical portions such as of arm and/or leg, in a shape-adapted manner. In case of slight bone fracture, simply winding the gypsum-aimed bandage 90 in the above manner allows to sufficiently fix the affected part. In case of severe bone fracture, the affected part is to be fixed by further applying plaster onto the gypsum-aimed bandage 90.

[0097] Such a gypsum-aimed bandage 90 preserves the ventilating ability of the affected part by the spacer, to thereby dramatically improve problems of the sweaty condition of and itchy sensation at the affected part.

[Application Example to Anti-Insect Clothes]

[0098] The spacers of the present invention can be applied to anti-insect clothes which are to be worn to cover the whole body of an operator such as upon conducting a honeycomb removing operation or a bee-keeping operation. In preparing such anti-insect clothes, those spacers formed into substantially flat shapes by injection molding of plastics are firstly formed into shapes corresponding to respective parts of a user's body by thermoforming. Then, sewing up these spacers of respective parts provides the anti-insect clothes. In this case, it is further required such as to densify or decrease the arranging distance between projecting portions of the spacers and to increase the height of column-shaped members to a certain extent, lest the user wearing the anti-insect clothes is stung by a bee. Such anti-insect clothes are capable of assuredly preventing the operator from being stung by a bee, and of allowing the operator to readily conduct a predetermined operation by virtue of the excellent ventilating ability of the spacers.

[Application Example to Closet Mat]

[0099] The spacers of the present invention can be used as closet mats. Stacking up futons in a closet sometimes results in wetness of those portions of futons contacted with the closet floor, by dew formation. Closet mats are to be laid over a closet floor to thereby improve

the ventilating ability between the floor and futons. Conventional closet mats include frequently used wooden duckboards which are so thick to bear the load of futons and have increased contacting areas with futons, thereby failing to ensure a sufficient ventilating ability. Wooden duckboards have a further problem of an increased manufacturing cost.

[0100] Contrary, thickening the column-shaped members of the spacers of the present invention to a certain degree allows the spacers to bear loads such as of futons and ensures sufficient ventilating abilities. Thus, utilizing the spacers of the present invention as closet mats assuredly prevent wetness of futons. The spacers have a further advantage of a reduced manufacturing cost. Moreover, cutting predetermined sizes of pieces out of a large spacer allows to readily obtain closet mats of sizes suitable for individual closets.

[Application Example to Refrigerator Tray]

[0101] The spacers of the present invention can be applied as refrigerator trays. In refrigerators, cooled air is circulated internally. When refrigerator trays carry thereon foods, for example, it is required to cause cooled air to impinge onto the whole surfaces of the foods, in order to sufficiently and uniformly refrigerate the foods. Since the spacers of the present invention have larger opening ratios at object contacting sides and are adapted to be formed with a lot of holes along the vertical direction or the thickness direction of the spacer, those refrigerator trays fabricated of such spacers allow those objects such as foods placed on the trays to be sufficiently exposed to the air flowing in the vertical direction. This allows to sufficiently refrigerate such foods or the like and to uniformly refrigerate respective parts of the foods.

[Application Example to Tatami Underlay and Tatami Interlays]

[0102] The spacers of the present invention can be used as tatami underlays to be laid between a floor board and a tatami mat. Simply laying a tatami mat on a floor board may result in wetness of the underside of the tatami mat contacting with the floor board, and in decay of the wet portion of the tatami mat. Since the spacers of the present invention have excellent ventilating abilities and heat insulating abilities, using such a spacer as a tatami underlay allows to prevent decay of the underside of the tatami mat.

[0103] Meanwhile, recent tatami mats include those inexpensive ones only a surface of each of which is tatami-styled while including an interlay made of urethane. Substituting the spacers of the present invention for urethane in such tatami mats enables to improve the ventilating abilities. Adopting the spacers of the present invention as tatami interlays also allows to provide tatami mats at the same prices as those in case of urethane.

[Application Example to Kitchen Draining Tool]

[0104] The spacers of the present invention have excellent water draining abilities, and thus can be utilized as kitchen draining tools. Particularly, excellent flexibility of such spacers prevents them from breaking even upon dropping such as dishes and cups thereto.

[0105] As explained above, each of the spacers according to the present invention includes: a plurality of column-shaped members having length components in the thickness direction of the spacer; and one or a plurality of connecting members for connecting one ends of the plurality of column-shaped members. This allows air to naturally flow through the interior of the spacer and to improve the ventilating ability thereof, and enables to reduce the contacting area of an object at that side thereof which contacts with the spacer, thereby providing lower heat conduction and an excellent heat insulating ability. Further, the mass-productivity of the spacers of the present invention is improved by integrally forming the plurality of column-shaped members to become physically continuous such as by injection molding of plastics. Thus, such spacers are preferably used for seat cushions, underlying futons, chairs, sofas, shoes insoles, schoolchild's satchels, construction materials, closet mats, refrigerator trays, tatami underlays, and duckboards and so forth.

[0106] Note, the present invention is not limited to the aforementioned embodiments, and can be variously modified within the scope of the gist of the invention.

[0107] For example, those spacers shown in FIGS. 1 through 9 have been described about a situation where the plurality of projecting portions have been formed at the upper surfaces of the base members, respectively. However, the projecting portions may be formed on both of the upper and lower surfaces of the base members, respectively.

[0108] Further, those spacers shown in FIGS. 1 through 9 have been described about a situation where the column-shaped members have been formed linearly. However, the column-shaped members may be formed curvedly if they are formed by injection molding. FIG. 17 shows an example of a projecting portion 11j having its curvedly formed column-shaped members 12j. Curvedly forming the column-shaped members 12j in this way allows the projecting portion 11j to have suitable elasticity in each of vertical direction, fore-and-aft direction and lateral direction.

[0109] Utilizing the elasticity of such projecting portion 11j allows the spacer of the present invention to be used as a vibration isolating material or shock isolating material. Vibration isolating materials are used such as by interposing them between an object and a floor one of which is vibrating, for the purpose of preventing vibration of the vibrating one from transmitting to the other. Conventional vibration isolating materials include one made of rubber having many plate-like projecting portions arranged at predetermined intervals such as shown in

FIG. 18. However, such a vibration isolating material made of rubber had an unsatisfactory vibration isolating effect. Contrary, the spacer having the projecting portion 11j as shown in FIG. 17 has excellent elasticity, so that those vibration isolating materials applied with such spacers have vibration isolating effects superior to the conventional. Such a spacer also has an advantage to facilitate to take countermeasures against vibrations in a predetermined frequency band which is desired to be restricted.

INDUSTRIAL APPLICABILITY

[0110] As explained above, the spacers according to the present invention are capable of improving the ventilating ability and have excellent heat insulating abilities and excellent mass-productivity, so that the spacer can be utilized such as concerning seat cushions, underlying futons, chairs, sofas, shoes insoles, satchels, construction materials, closet mats, refrigerator trays, tatami underlays, and duckboards.

Claims

1. A spacer formed in a substantially flat shape so as to contact with an object by at least one surface of said spacer which is substantially perpendicular to the thickness direction of said spacer, said spacer comprising:

a plurality of column-shaped members having length components in the thickness direction of said spacer, and one or a plurality of connecting members for connecting one ends of said plurality of column-shaped members;

wherein said plurality of column-shaped members are integrally formed to be physically continuous.

2. A spacer of claim 1, wherein said plurality of column-shaped members and said one or plurality of connecting members are formed by injection molding of plastics.
3. A spacer of claim 1, wherein said plurality of column-shaped members and said one or plurality of connecting members are free of overlapping with other members of said spacer via space along the thickness direction of said spacer.

4. A spacer of claim 3, further comprising:

a sheet member fixed to that side of said spacer, which side is at the other ends of said plu-

rality of column-shaped members.

5. A spacer of claim 1,
wherein the number of said column-shaped
members to be connected to said one connecting member is at least three. 5
6. A spacer of claim 1,
wherein said plurality of connecting members
are formed into frame shapes, respectively. 10
7. A spacer of claim 1,
wherein said one connecting member is
formed into a meshed shape. 15

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FIG. 1

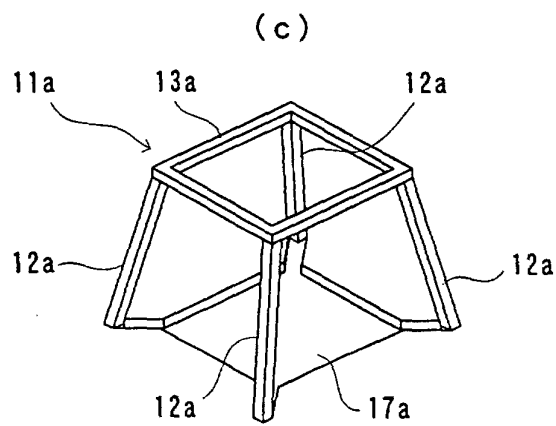
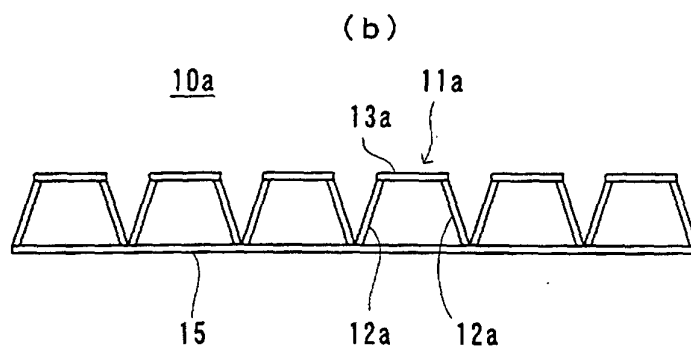
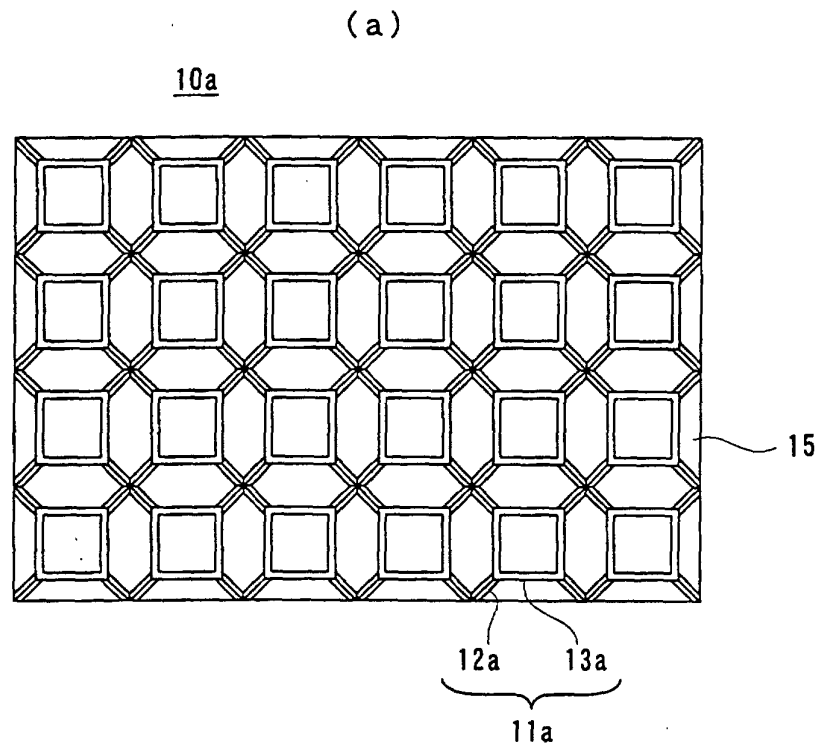
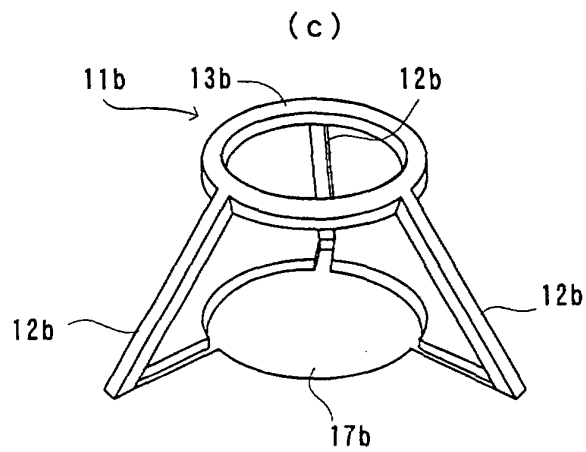
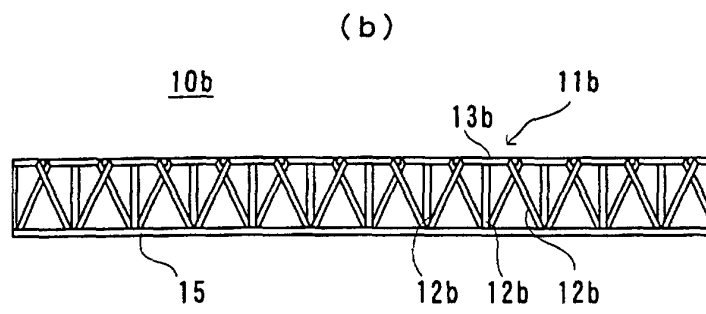
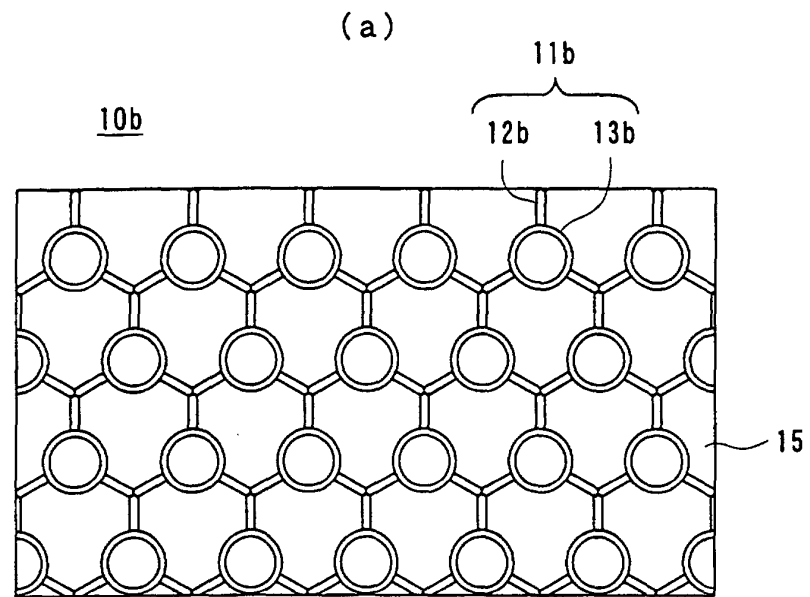


FIG. 2



F I F. 3

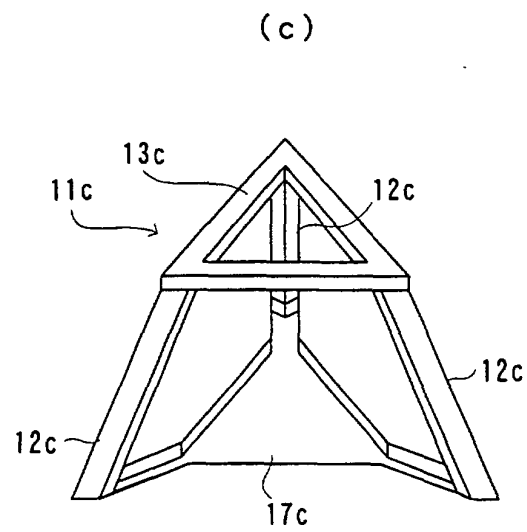
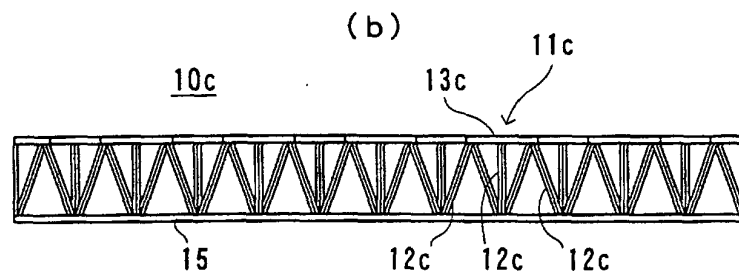
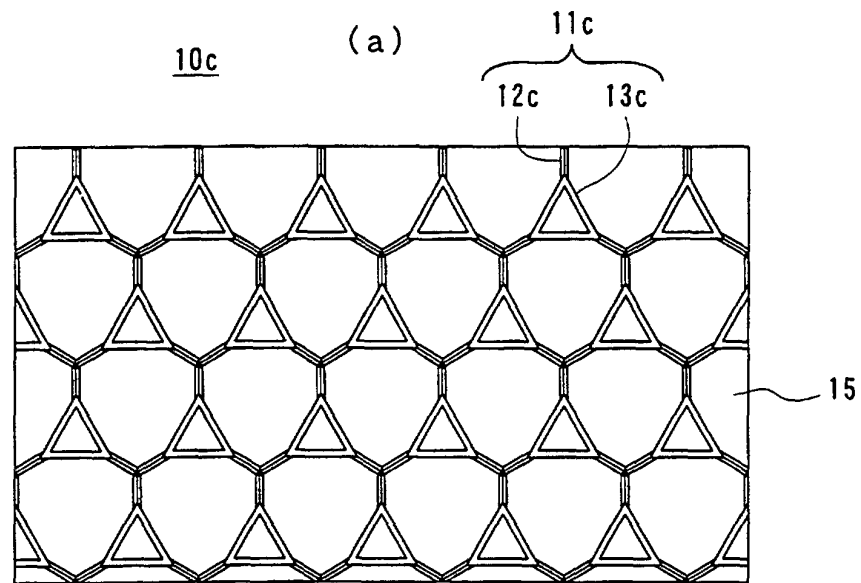


FIG. 4

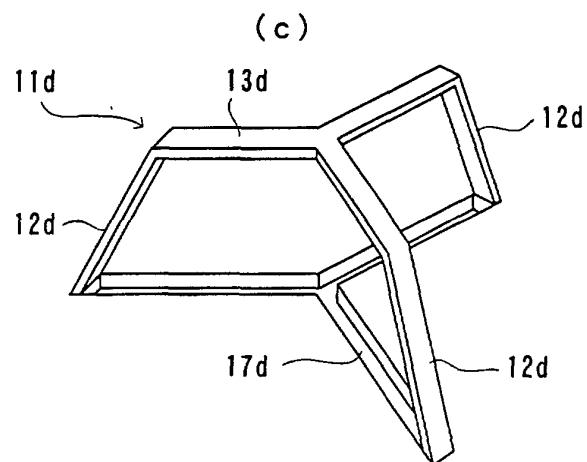
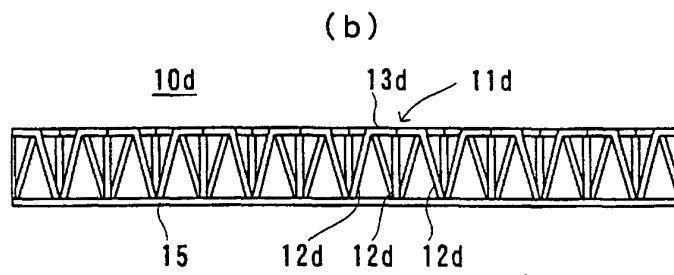
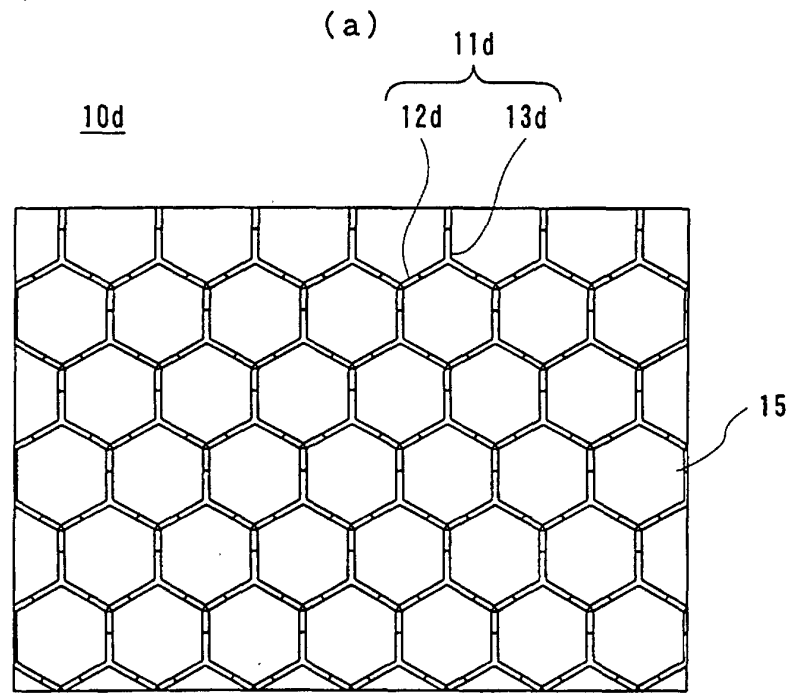


FIG. 5

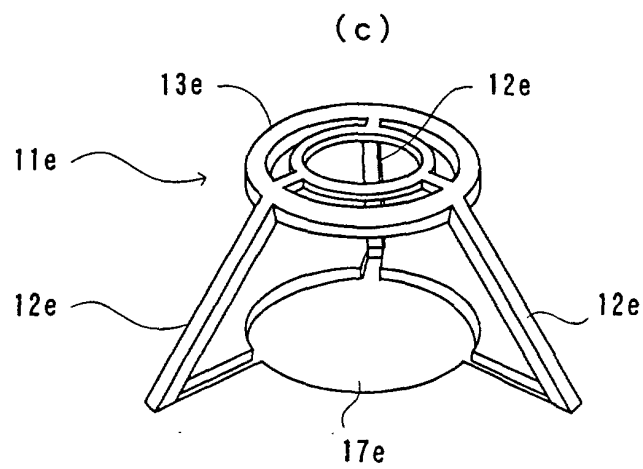
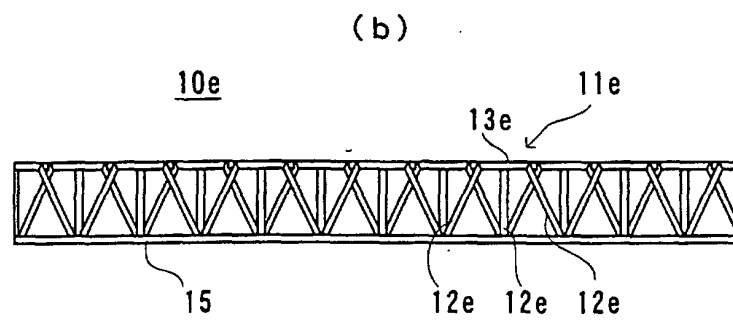
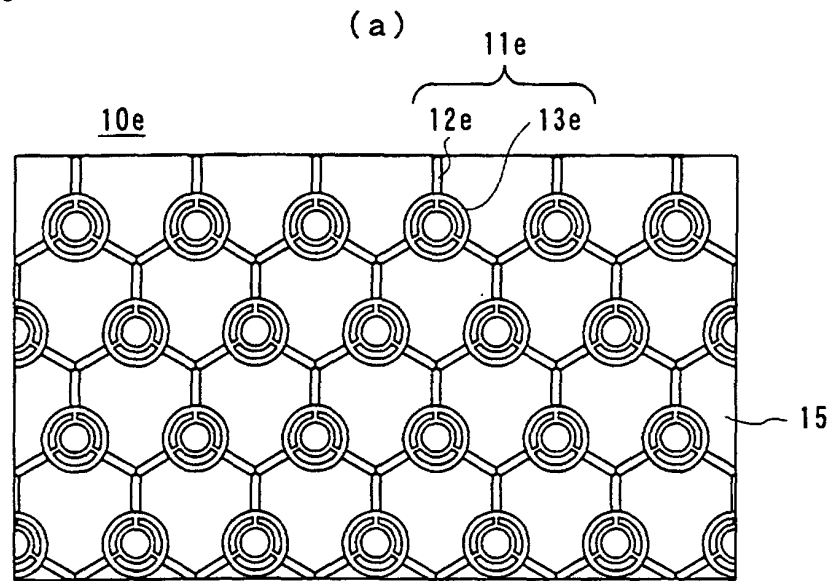


FIG. 6

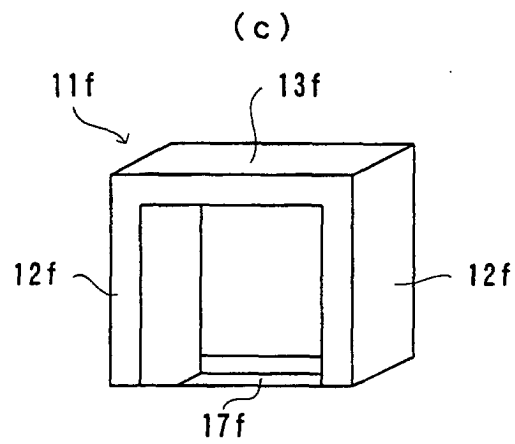
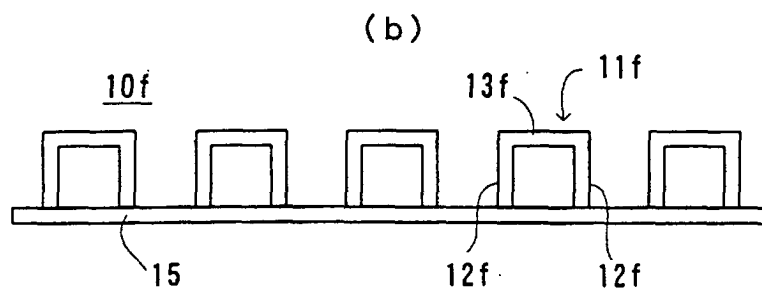
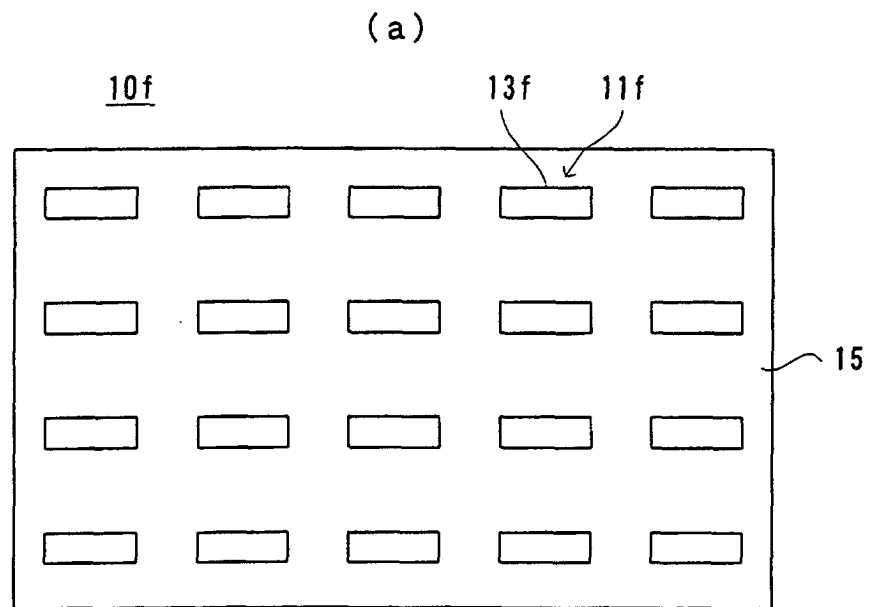


FIG. 7

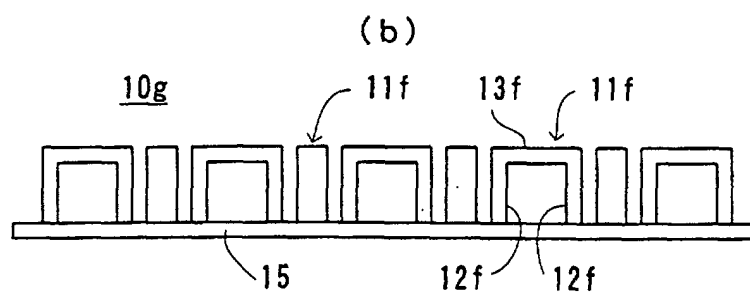
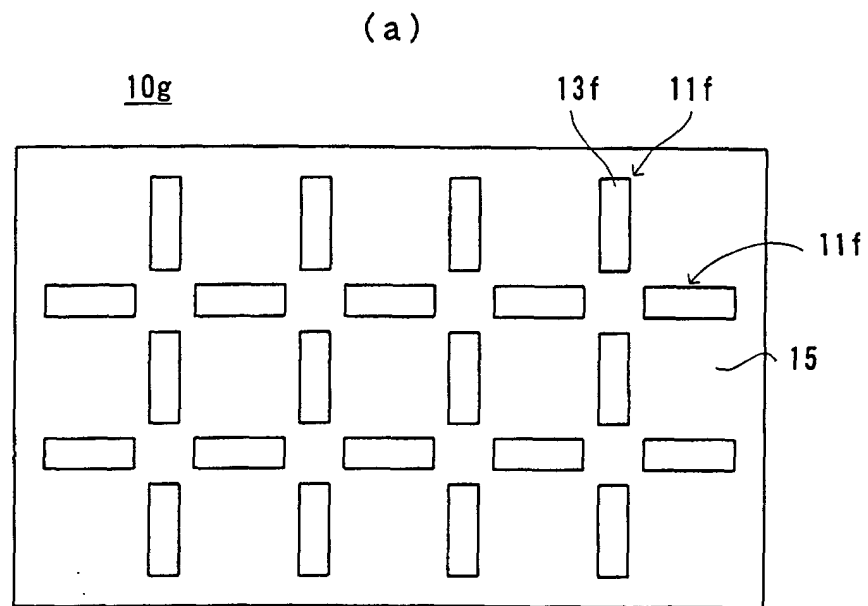


FIG. 8

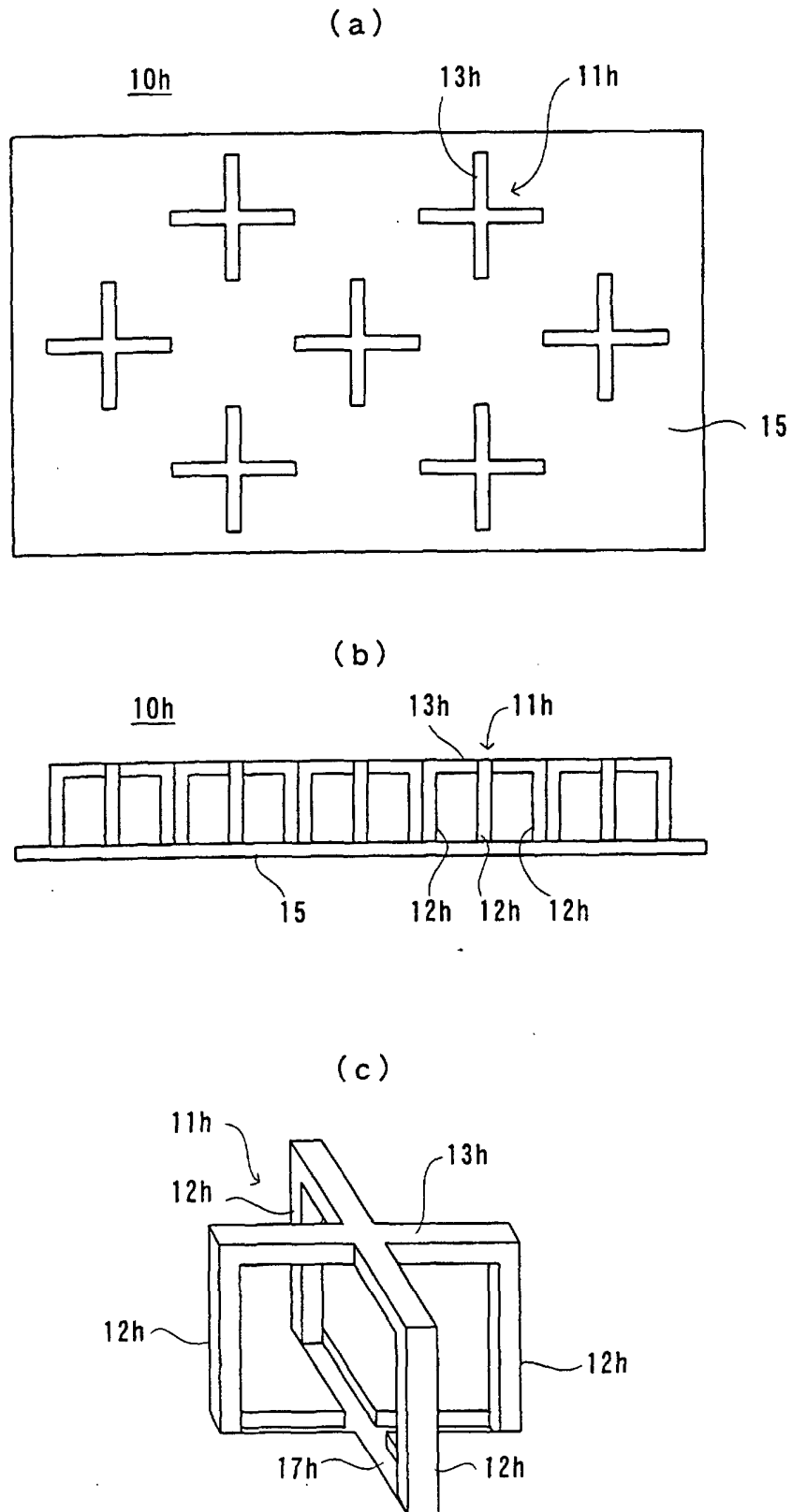


FIG. 9

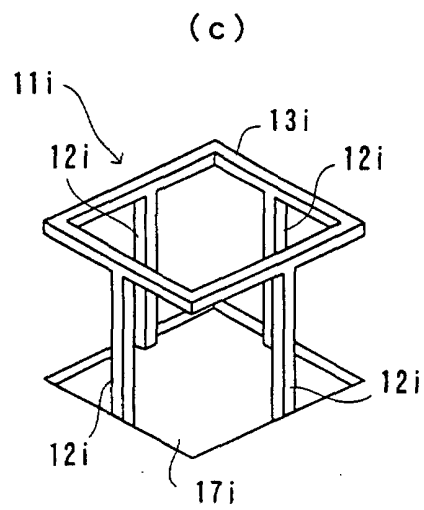
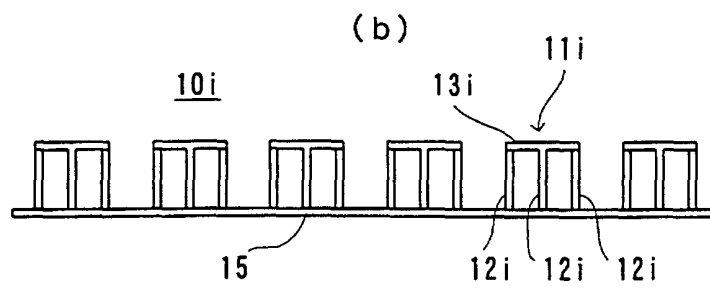
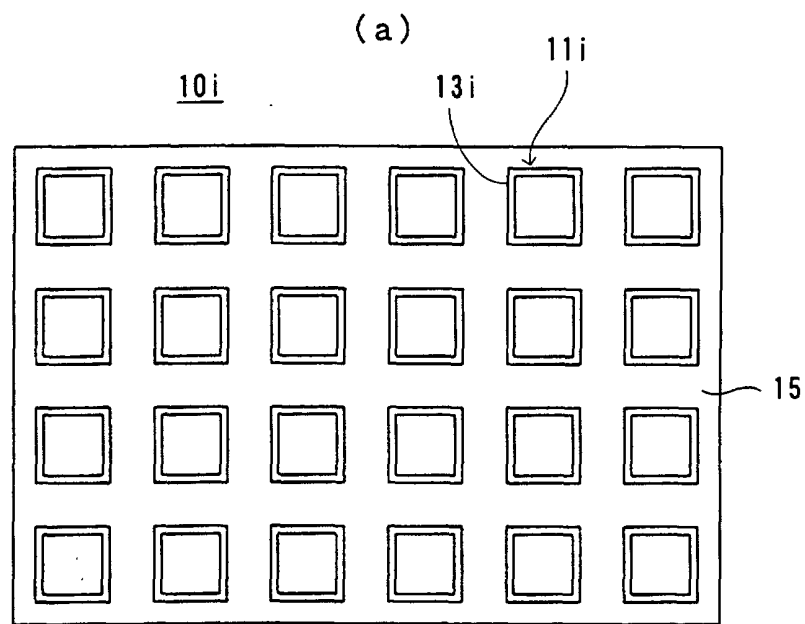


FIG. 10

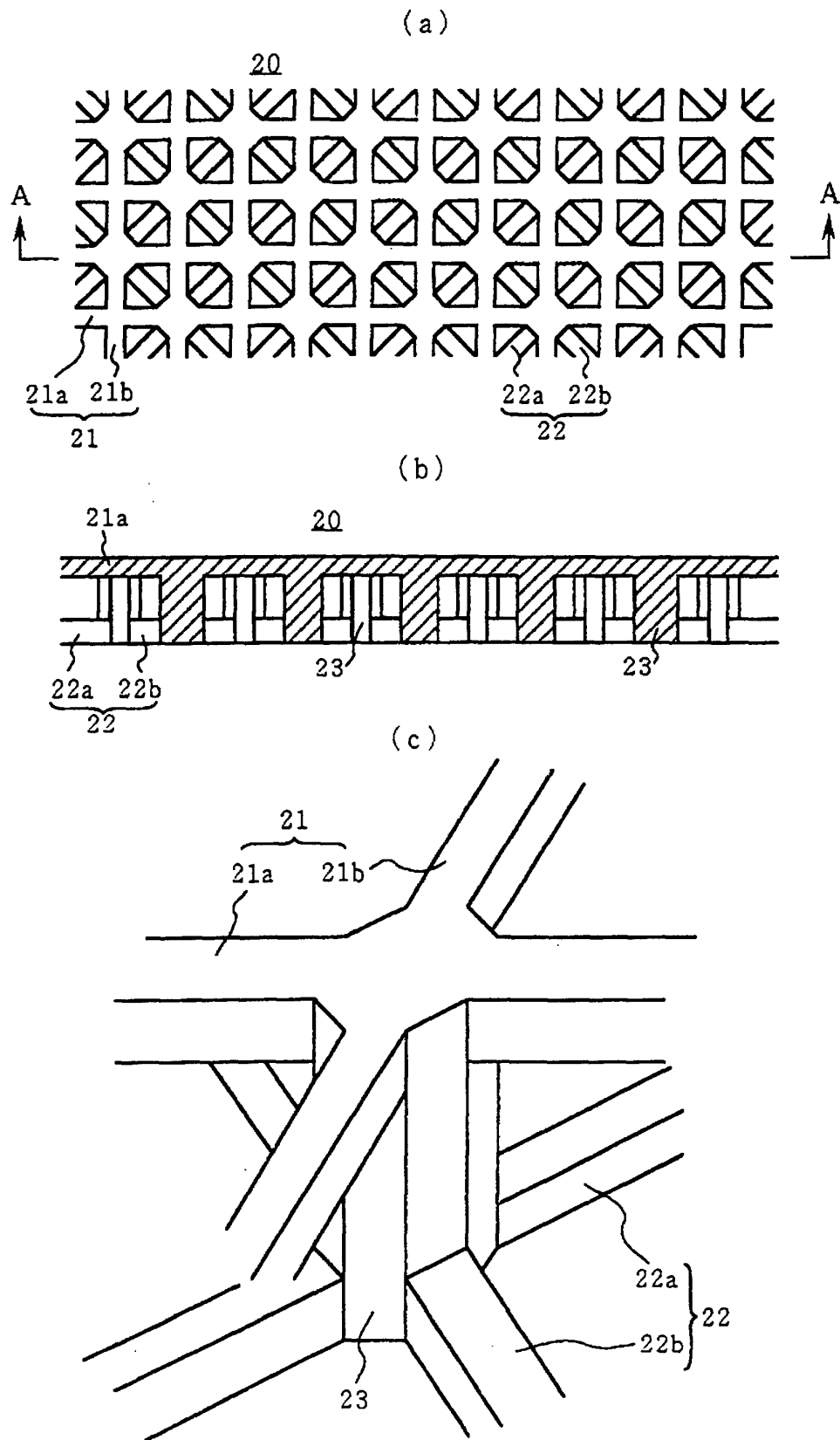


FIG. 11

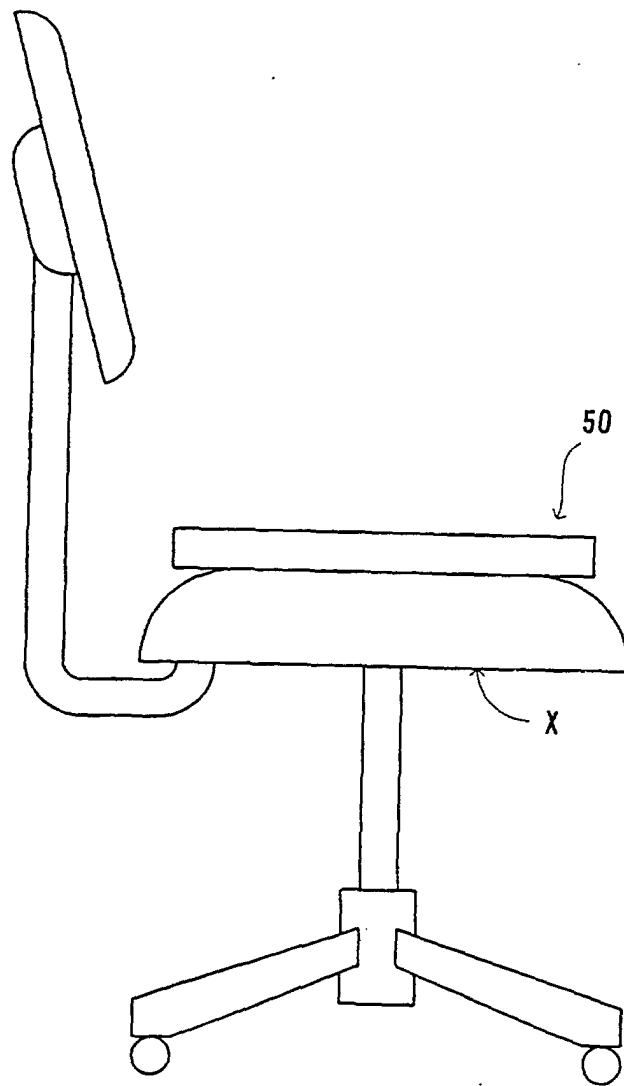
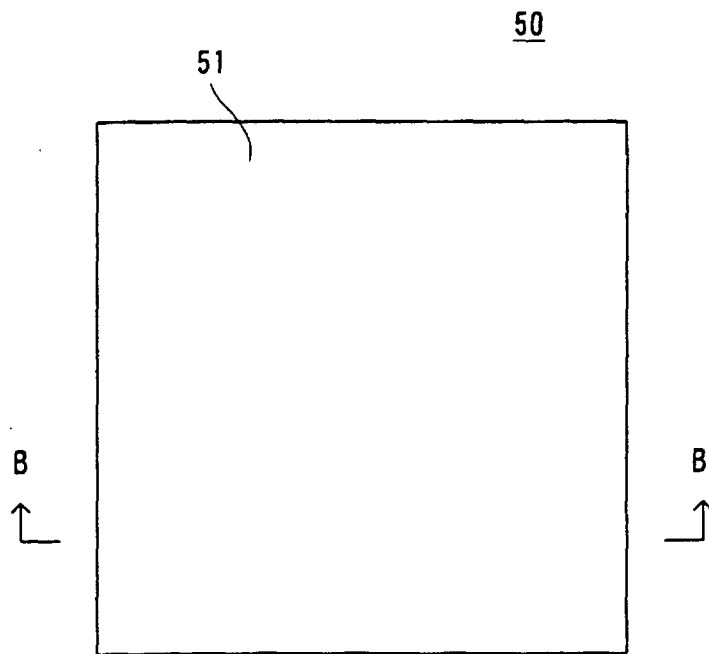


FIG. 12

(a)



(b)

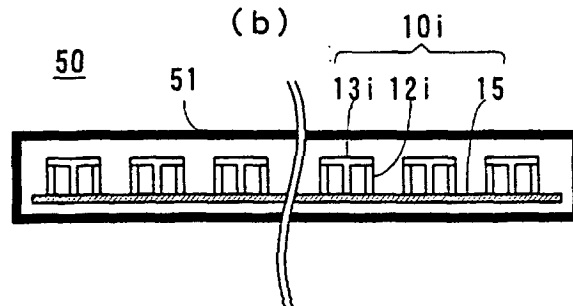


FIG. 13

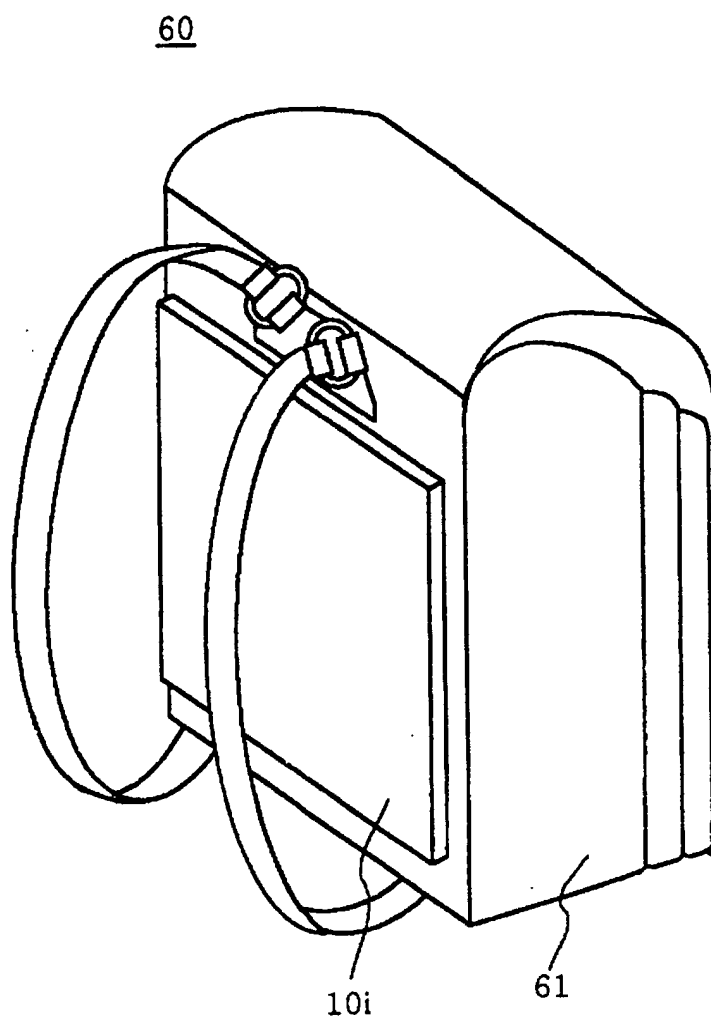
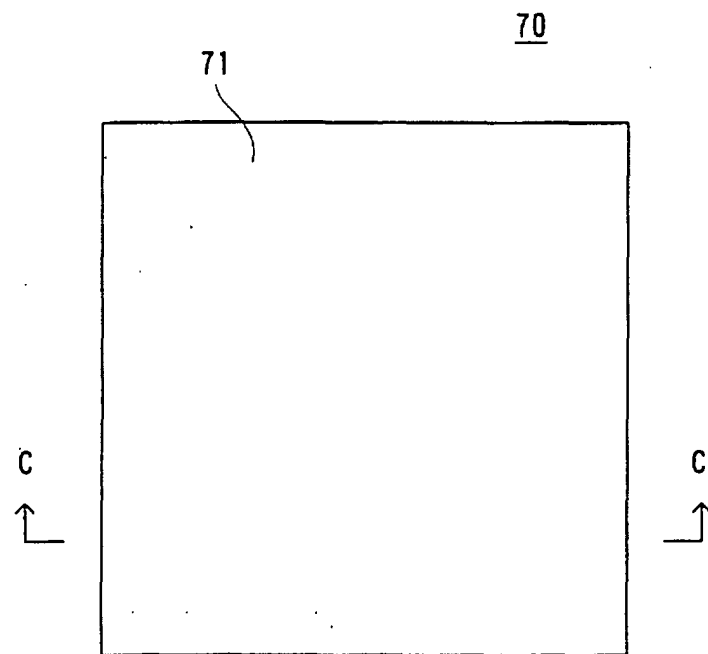


FIG. 14

(a)



(b)

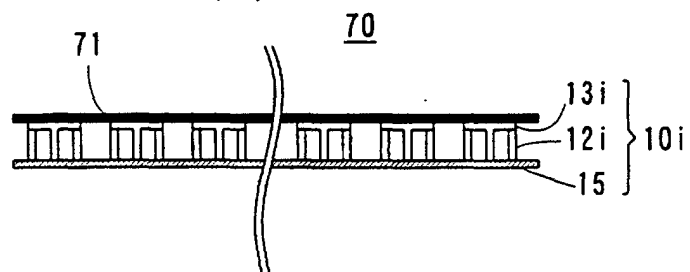


FIG. 15

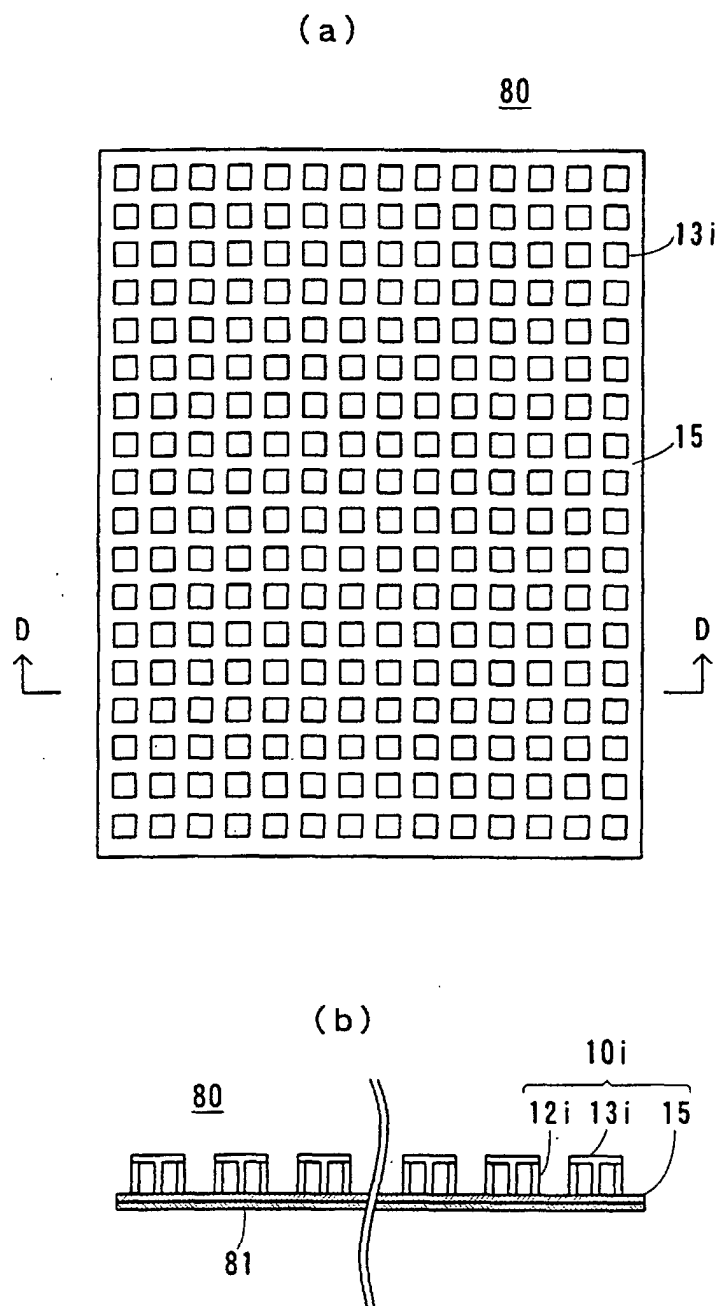


FIG. 16

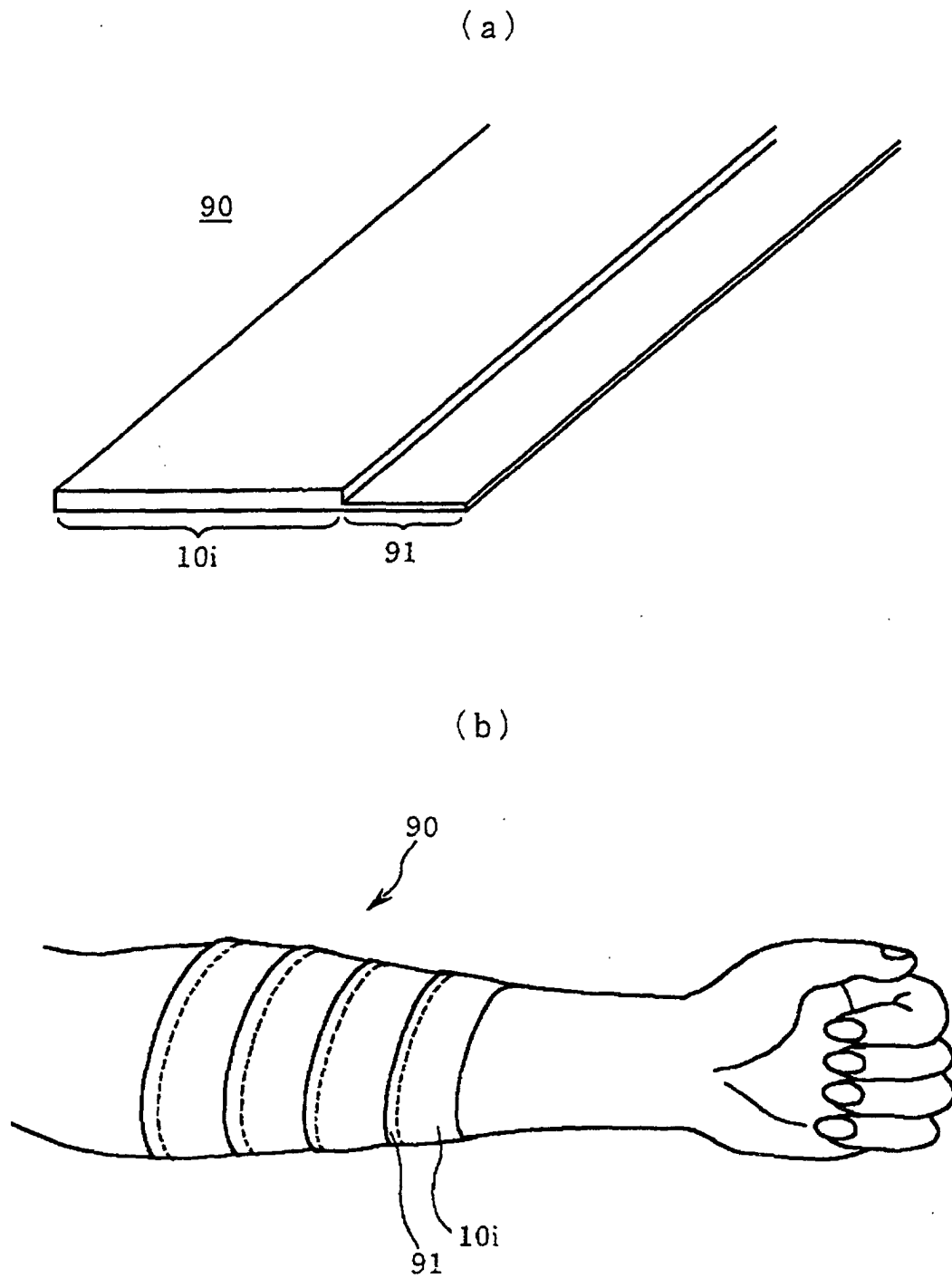


FIG. 17

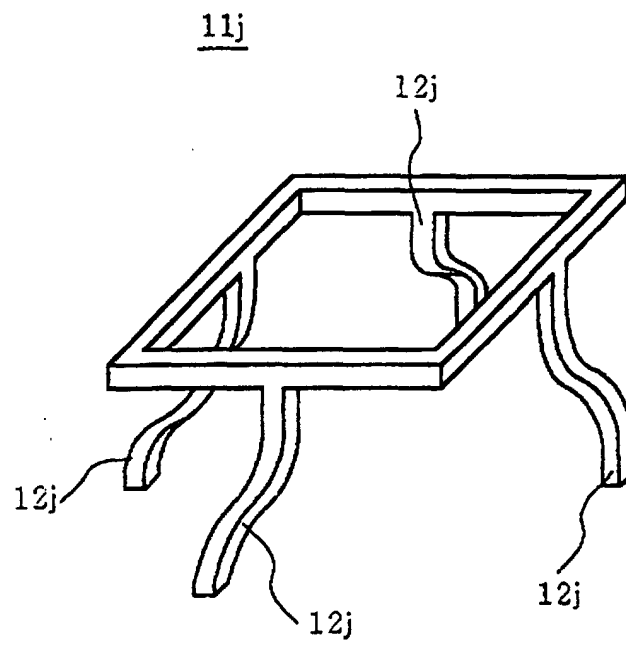
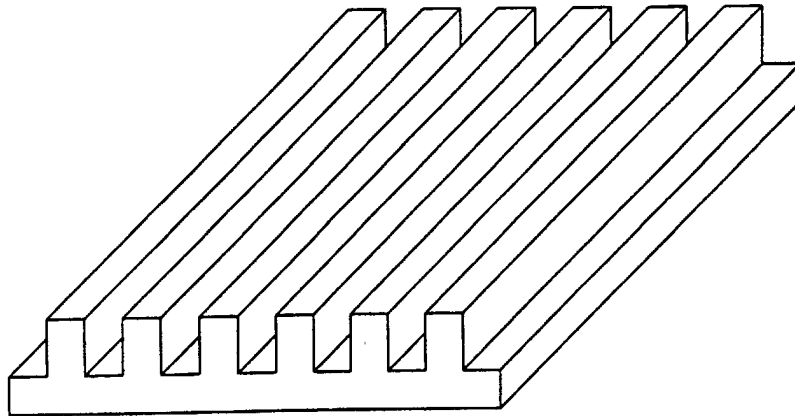


FIG. 18



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP99/05835

A. CLASSIFICATION OF SUBJECT MATTER Int.Cl. ⁷ A47C27/00, H05K7/20		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) Int.Cl. ⁷ A47C27/00, H05K7/20		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Jitsuyo Shinan Koho 1926-1996 Toroku Jitsuyo Shinan Koho 1994-2000 Kokai Jitsuyo Shinan Koho 1971-2000 Jitsuyo Shinan Toroku Koho 1996-2000		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 77850/1978 (Laid-open No.178609/1979) (Hiromi YOSHIDA), 17 December, 1979 (17.12.79), Full text (Family: none)	1-7
A	JP, 57-7728, B2 (Nissan Motor Co., Ltd.), 12 February, 1982 (12.02.82), Full text (Family: none)	1-7
☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 17 January, 1000 (17.01.00)		Date of mailing of the international search report 25 January, 2000 (25.01.00)
Name and mailing address of the ISA/ Japanese Patent Office		Authorized officer
Facsimile No.		Telephone No.

Form PCT/ISA/210 (second sheet) (July 1992)