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(54) **BALANCE BOARD AND FLEXIBLE MATTRESS**

(57) A balance board is provided, the balance board is flatly laid on one or more spring modules, multiple springs are arranged to define the one or more spring modules, upper ends of the multiple springs are configured to swing in a lateral direction, the balance board comprises multiple monoboards shaped in strips, and the multiple monoboards shaped in strips are connected by a flexible material. A balance board configured to make up gaps between springs at upper ends of the springs and a flexible mattress comprising the balance board, an elastic module, and the like are provided. The flexible mattress does not need a thick sponge or other layers interfering with the springs; cotton, linen, or felt can be simply laid on the balance board.

EP 4 458 220 A1

## Description

### RELATED APPLICATION

**[0001]** This application claims priority to Chinese patent application 202310496452.2, filed on May 5, 2023. Chinese patent application 202310496452.2 is incorporated herein by reference.

### FIELD OF THE DISCLOSURE

**[0002]** The present disclosure relates to a flexible mattress, and in particular relates to a flexible mattress comprising springs.

### BACKGROUND OF THE DISCLOSURE

**[0003]** The flexible mattress is a common product in daily life, such as Simmons , etc. Springs are commonly used as components of the flexible mattress, and the flexible mattress needs dozens of the springs. In order to install and fix the springs, in existing techniques, upper ends and lower ends of the springs are respectively connected together. As another option, the lower ends of the springs are fixed on a base plate, and the upper ends of the springs are not connected. However, a thick sponge with a large rigidity is laid on the springs, so that a local pressure is widely dispersed to the springs, the springs in the flexible mattress as an integral structure is subjected to force, and elasticity of each of the springs will not be reflected. Therefore, an integrity of the flexible mattress is good, but the flexible mattress will not deform according to a shape of the human body to provide comfortable elasticity. When the upper ends of the springs are not connected, the springs are configured to independently or relatively independently provide elasticity. The springs will inevitably have a large gap, a body of the user cannot be supported, and a comfort for the user will decrease.

### BRIEF SUMMARY OF THE DISCLOSURE

**[0004]** An objective of the present disclosure is to provide a balance board configured to make up gaps between springs at upper ends of the springs and a flexible mattress comprising the balance board, an elastic module, and the like to solve the deficiencies of the existing techniques.

**[0005]** A first technical solution of the present disclosure is as follows.

**[0006]** A balance board, the balance board is flatly laid on one or more spring modules, multiple springs are arranged to define the one or more spring modules, upper ends of the multiple springs are configured to swing in a lateral direction, the balance board comprises multiple monoboards shaped in strips, and the multiple monoboards shaped in strips are connected by a flexible material.

**[0007]** In a preferred embodiment, upper ends of the multiple springs are not connected together (i.e., are separated).

**[0008]** In a preferred embodiment, the multiple monoboards shaped in strips are divided into a large section and a small section according to a number of the one or more spring modules.

**[0009]** In a preferred embodiment, lengths of the multiple monoboards shaped in strips correspond to a width of the one or more spring modules or a length of the one or more spring modules.

**[0010]** In a preferred embodiment, springs of the one or more spring modules are tapered springs.

**[0011]** In a preferred embodiment, the multiple monoboards shaped in strips are totally or partially connected in a length direction by the flexible fabrics. For example, the multiple monoboards shaped in strips are connected at intervals.

**[0012]** In a preferred embodiment, a radius of the springs is 40-60 mm, and a thickness of the multiple monoboards shaped in strips is 1-2 mm.

**[0013]** In a preferred embodiment, widths of the multiple monoboards shaped in strips range from 20% to 400% of a radius of the springs.

**[0014]** In a preferred embodiment, the multiple springs of the one or more spring modules are wrapped in the flexible material, and the flexible material of a same row of the multiple springs is laterally connected (e.g., in an X axial direction).

**[0015]** In a preferred embodiment, widths of the multiple monoboards shaped in strips are 10-80 mm. Preferably, the widths of the multiple monoboards shaped in strips are 30-60 mm.

**[0016]** In a preferred embodiment, the flexible material is flexible fabrics.

**[0017]** In a preferred embodiment, the multiple monoboards shaped in strips are totally or partially connected in a length direction by the flexible fabrics.

**[0018]** In a preferred embodiment, the multiple monoboards shaped in strips comprise multiple through holes, an upper fabric and a lower fabric of fabric material are bonded together at the multiple through holes, and the upper fabric and the lower fabric are connected by ultrasonic welding.

**[0019]** In a preferred embodiment, a center of the multiple monoboards shaped in strips comprises row holes in a width direction of the multiple monoboards shaped in strips, and the balance board is configured to be folded in the width direction of the multiple monoboards shaped in strips.

**[0020]** A second technical solution of the present disclosure is as follows.

**[0021]** A balance board, the balance board is flatly laid on one or more spring modules, multiple springs are arranged to define the one or more spring modules, upper ends of the multiple springs are configured to swing in a lateral direction, the balance board comprises multiple monoboards, the multiple monoboards are wrapped by

flexible fabrics and are connected in a width direction and a length direction of the multiple monoboards to define the balance board, a size of each of the multiple monoboards corresponds to a top surface of an individual spring of the multiple springs to substantially cover the top surface of the individual spring, the balance board corresponds to a top surface of the one or more spring modules.

**[0022]** In a preferred embodiment, upper ends of the multiple springs are not connected together (i.e., are separated).

**[0023]** In a preferred embodiment, shapes of the multiple monoboards are rectangular or square.

**[0024]** A third technical solution of the present disclosure is as follows.

**[0025]** A balance board, the balance board is flatly laid on one or more spring modules, multiple springs are arranged to define the one or more spring modules, upper ends of the multiple springs are configured to swing in a lateral direction, multiple monoboards shaped in strips are assembled to define the balance board, the multiple monoboards shaped in strips comprise grooves or holes corresponding to locations of the multiple springs, tops of the multiple springs are disposed in the grooves or the holes to enable the multiple monoboards shaped in strips to be positioned, and the balance board corresponds to a top surface of the one or more spring modules.

**[0026]** In a preferred embodiment, upper ends of the multiple springs are not connected together (i.e., are separated).

**[0027]** A fourth technical solution of the present disclosure is as follows.

**[0028]** A flexible mattress comprises one or more spring modules and the balance board, the balance board is laid on a top surface of the one or more spring modules, and springs in the one or more spring modules are configured to swing in a lateral direction. A fixing pull rope or a fastener are added to an outer periphery of the balance board to connect the balance board to a lower end of the one or more spring modules.

**[0029]** In a preferred embodiment, a fixing pull rope or a fastener is added to an outer periphery of the balance board to connect the balance board to a lower end of the one or more spring modules.

**[0030]** In a preferred embodiment, the balance board is configure to be snapped or connected to a lower side of the flexible cushion, and a fixing pull rope or a fastener is added to an outer periphery of the flexible cushion to connect the flexible cushion to a lower end of the one or more spring modules to form the flexible mattress.

**[0031]** A fifth technical solution of the present disclosure is as follows.

**[0032]** A flexible mattress comprises the one or more spring modules, the balance board, and a flexible cushion disposed on the balance board, the balance board is laid on a top surface of the one or more spring modules, the flexible cushion is laid on the balance board, and springs in the one or more spring modules are configured to swing in a lateral direction.

**[0033]** Different materials and thickness of the balance board can be selected based on a size of a gap of adj acent springs. A quilted fabric cover can be added to the flexible mattress to cover the spring module and the balance board, so that the flexible mattress is more beautiful. The flexible mattress does not need a thick sponge or other layers obstructing with the springs; cotton, linen, or felt can be simply laid on the balance board.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0034]**

Fig. 1 illustrates an exploded view of a flexible mattress of the present disclosure;

Fig. 2 illustrates a structure of a balance board of Embodiment 1;

Fig. 3 illustrates a first connection between monoboards of Embodiment 1;

Fig. 4 illustrates an enlarged view of a part A of Fig. 3;

Fig. 5A illustrates a front view of folding of the balance board, and Fig. 5B illustrates a top view of the stacking;

Fig. 6 illustrates a second connection between the monoboards of Embodiment 1;

Fig. 7 illustrates a cover area between the monoboards and a spring module of Embodiment 1;

Fig. 8 illustrates a structure of a balance board of Embodiment 2;

Fig. 9 illustrates a structure of a monoboard shaped in a long strip of Embodiment 3;

Fig. 10 illustrates an exploded view of a balance board of Embodiment 3;

Fig. 11 illustrates row holes at a center and in a width of the monoboard of Embodiment 3;

Fig. 12 illustrates a folding of the balance board of Embodiment 3;

Fig. 13 illustrates a correspondence relationship between the balance board and a spring module of Embodiment 3;

Fig. 14 illustrates a structure of a balance board of Embodiment 4;

Fig. 15 illustrates a correspondence relationship between the balance board and a spring module of Embodiment 4;

Fig. 16A illustrate a front view of a balance board of Embodiment 5, and Fig. 16B illustrates a side view of the balance board of Embodiment 5;

Fig. 17 illustrates a perspective view of the balance board of Embodiment 5;

Fig. 18A illustrate a first side view of folding of the balance board of Embodiment 5, Fig. 18B illustrates a front view of the folding of balance board of Embodiment 5, and Fig. 18C illustrates a second side view of the folding of the balance board of Embodiment 5;

Fig. 19 illustrates a correspondence relationship be-

tween a monoboard shaped as a long strip and a spring module of Embodiment 5;

Fig. 20 illustrates a correspondence relationship between the balance board and the spring module of Embodiment 5; and

Fig. 21 illustrates an exploded view of a structure of a flexible mattress of Embodiment 6.

## DETAILED DESCRIPTION OF THE EMBODIMENTS

Embodiment 1

**[0035]** Referring to Figs. 1-7, a flexible mattress of this embodiment comprises a spring module 1, a balance board 2, and a quilted fabric cover 3 (or a flexible cushion 3). Springs 10 of the spring module 1 are tapered springs. Lower ends of the tapered springs are fixed on a base plate, and upper ends of the tapered springs are not connected to each other (i.e., are separated) and can swing. The balance board 2 comprises monoboards 4 shaped in strips (e.g., monoboards 4 shaped in long strips) and fabrics 5, and the fabrics 5 couple the monoboards 4 to form a whole piece. The fabrics can be two clothes 50, and a size of the fabrics 5 corresponds to a size of the flexible mattress. The two clothes 50 are stacked and sewn together at intervals in a width direction of the two clothes 50, and widths of the intervals are the same as widths of the monoboards 4 shaped in long strips. A sewing between the two clothes 50 are shown Figs. 3 and 4. The two clothes 50 are totally sewn in a width direction of the two clothes 50, and the monoboards 4 shaped in long strips are inserted into a cloth sleeve 51 between two adjacent intervals of the intervals to form the balanced board 2 as an integral part. As another option, referring to Fig. 6, the two clothes 50 are partly sewn in the width direction to define partial sewings 52, and the monoboards 4 shaped in long strips are similarly inserted into the cloth sleeve 51 between two adjacent intervals of the intervals to enable intervals between of the monoboards 4 to be joined together by the two clothes 50 to form the balanced board 2 as an integral part. Referring to Fig. 7, a width of the balance board is equivalent to a width of a single row of the springs 10 of the spring module 1.

Embodiment 2

**[0036]** This embodiment differs from Embodiment 1 in that a width of the monoboards 4 shaped in long strips is greater than the width of the single row of the springs 10 in the spring module 1. Referring to Fig. 8, in this embodiment, the width of the monoboards 4 shaped in long strips is a width of two rows of the springs 10.

Embodiment 3

**[0037]** Referring to Figs. 9-13, this embodiment differs from Embodiment 1 in that the monoboards 4 shaped in long strips comprises multiple through holes 41, and the fabrics 5 comprises an upper fabric 54 and a lower fabric 53. The upper fabric 54 and the lower fabric 53 are bonded together at the through holes 41. By way of example, and the upper fabric 54 and the lower fabric 53 can be welded by ultrasonic welding. Preferably, referring to Figs. 10 and 11, a row of small holes 42 can be disposed on a center of the monoboards 4 shaped in long strips in a width direction of the monoboards 4 shaped in long strips to enable the balance board 2 to be folded in the width direction of the monoboards 4 shaped in long strips, as shown in Fig. 12. Referring to Fig. 13, a single section of the balance board correspondingly covers corresponding springs of the tapered springs of the spring module 1.

Embodiment 4

**[0038]** Referring to Figs. 14 and 15, the balance board 2 of this embodiment comprises rectangular boards (including square boards) 7 connected by flexible fabrics 5 in length and width directions of the balance board 2. A size of one of the rectangular boards 7 corresponds to a top surface of an individual spring of the springs 10 in the spring module 1. The one of the rectangular boards 7 can cover a top surface of the individual spring. As another option, the size of the one of the rectangular boards 7 can be equal to or slightly smaller than an area of the top surface of the individual spring. The rectangular boards 7 are preferably square, and the balance board 2 formed by combining the rectangular boards 7 corresponds to a top surface of the spring module 1.

Embodiment 5

**[0039]** Referring to Figs. 16-20, the balance board 2 of this embodiment is assembled by the monoboards 4 shaped in long strips. This embodiment differs from Embodiment 1 in that the monoboards 4 shaped in long strips are not coupled to each other. The monoboards 4 shaped in long strips comprise grooves or holes 43 corresponding to locations of the springs 10, and tops of the springs 10 are disposed in the grooves or holes 43 to enable the monoboards 4 shaped in long strips to be positioned.

Embodiment 6

**[0040]** Referring to Fig. 21, this embodiment is a flexible mattress comprising a spring module 1, a balance board 2, and a quilted fabric cover 3 (or a flexible cushion 3). The balance board 2 comprises multiple monoboards 4 shaped in long strips, and the multiple monoboards 4 shaped in long strips are coupled to form the balance board 2 by fabrics in a length direction of the multiple monoboards 4 shaped in long strips. Two to three of the multiple monoboards 4 shaped in long strips cover a row of springs 10 in the spring module 1. The balance board 2 comprises a rim 21 (i.e., a first fastener), and the rim

21 can be snapped to a lower end of the spring module 1.

**[0041]** A fixing pull rope or a second fastener 31 is added to an outer periphery of the flexible cushion 3 to connect the flexible cushion 3 to a lower end of the one or more spring modules 1 to form the flexible mattress.

**[0042]** An arrangement of the spring module 1 and the balance board 2 of Embodiments 1-6 do not limit the balance board 2 and the flexible mattress thereof of the present disclosure. The spring module 1 can be assembled through other arrangements of the springs 10 by a person of skill in the art, and the balance board 2 is not only limited to the specific shape of Embodiments 1-6. It is intended that the scope of the present disclosure should also cover the balance board 2 being disposed on the spring module 1 to improve gaps of the spring module 1 and the spring module 1 prepared by various methods.

**[0043]** The invention may be summarized as follows:

1. A balance board (2), characterized in that:

the balance board (2) is flatly laid on one or more spring modules (1),
multiple springs (10) are arranged to define the one or more spring modules (1),
upper ends of the multiple springs (10) are configured to swing in a lateral direction,
the balance board (2) comprises multiple monoboards (4) shaped in strips, and
the multiple monoboards (4) shaped in strips are connected by a flexible material (5).

2. The balance board (2) according to item 1, characterized in that: the balance board (2) covers the one or more spring modules (1).

3. The balance board (2) according to item 1 and/or 2, characterized in that: upper ends of the multiple springs (10) are not connected together.

4. The balance board (2) according to any one or more of items 1 to 3, characterized in that:

lengths of the multiple monoboards (4) shaped in strips correspond to a width of the one or more spring modules (1) or a length of the one or more spring modules (1), and
the multiple springs (10) of the one or more spring modules (1) are tapered springs.

5. The balance board (2) according to any one or more of items 1 to 4, characterized in that: the flexible material (5) is flexible fabrics.

6. The balance board (2) according to item 5, characterized in that: the multiple monoboards (4) shaped in strips are totally or partially connected in a length direction by the flexible fabrics.

7. The balance board (2) according to any one or more of items 1 to 6, characterized in that:

the multiple monoboards (4) shaped in strips comprise multiple through holes (41),
an upper fabric (54) and a lower fabric (53) of the flexible material (5) are bonded together at the multiple through holes (41), and
the upper fabric (54) and the lower fabric (53) are connected by ultrasonic welding.

8. The balance board (2) according to any one or more of items 1 to 7, characterized in that:

a center of the multiple monoboards (4) shaped in strips comprises row holes (42) in a width direction of the multiple monoboards (4) shaped in strips, and
the balance board (2) is configured to be folded in the width direction of the multiple monoboards (4) shaped in strips.

9. The balance board (2) according to any one or more of items 1 to 8, characterized in that:

the multiple springs (10) of the one or more spring modules (1) are wrapped in the flexible material (5), and
the flexible material (5) of a same row of the multiple springs (10) is laterally connected.

10. A balance board (2), characterized in that:

the balance board (2) is flatly laid on one or more spring modules (1),
multiple springs (10) are arranged to define the one or more spring modules (1),
upper ends of the multiple springs (10) are configured to swing in a lateral direction,
the balance board (2) comprises multiple monoboards (7),
the multiple monoboards (7) are wrapped by flexible fabrics (5) and are connected in a width direction and a length direction of the multiple monoboards (7) to define the balance board (2),
a size of each of the multiple monoboards (7) corresponds to a top surface of an individual spring of the multiple springs (10) to substantially cover the top surface of the individual spring, and
the balance board (2) corresponds to a top surface of the one or more spring modules (1).

11. A balance board (2), characterized in that:

the balance board (2) is flatly laid on one or more spring modules (1),
multiple springs (10) are arranged to define the one or more spring modules (1),
upper ends of the multiple springs (10) are configured to swing in a lateral direction,

multiple monoboards (4) shaped in strips are assembled to define the balance board (2),
the multiple monoboards (4) shaped in strips comprise grooves or holes (43) corresponding to locations of the multiple springs (10),
tops of the multiple springs (10) are disposed in the grooves or the holes (43) to enable the multiple monoboards (10) shaped in strips to be positioned, and
the balance board (2) corresponds to a top surface of the one or more spring modules (1).

12. A flexible mattress, it comprises:

the one or more spring modules (1), in particular, of any one or more of items 1-11,
the balance board (2) of any one or more of items 1-11, and
a flexible cushion (3) disposed on the balance board (2), characterized in that:

the balance board (2) is laid on a top surface of the one or more spring modules (1),
the flexible cushion (3) is laid on the balance board (2), and
springs (10) in the one or more spring modules (1) are configured to swing in a lateral direction.

13. The flexible mattress according to item 12, characterized in that: a fixing pull rope or a fastener (21) is added to an outer periphery of the balance board (2) to connect the balance board (2) to a lower end of the one or more spring modules (1).
14. The flexible mattress according to item 12 and/or 13, characterized in that:

the balance board (2) is configured to be snapped or connected to a lower side of the flexible cushion (3), and
a fixing pull rope or a fastener (31) is added to an outer periphery of the flexible cushion (3) to connect the flexible cushion (3) to a lower end of the one or more spring modules (1) to form the flexible mattress.

15. The balance board (2) according to any one or more of items 1 to 11, characterized in that: upper ends of the multiple springs (10) are not connected together.

**[0044]** The invention may also be summarized as follows: A balance board is provided, the balance board is flatly laid on one or more spring modules, multiple springs are arranged to define the one or more spring modules, upper ends of the multiple springs are configured to swing in a lateral direction, the balance board comprises multiple monoboards shaped in strips, and the multiple monoboards shaped in strips are connected by a flexible material. A balance board configured to make up gaps between springs at upper ends of the springs and a flexible mattress comprising the balance board, an elastic module, and the like are provided. The flexible mattress does not need a thick sponge or other layers interfering with the springs; cotton, linen, or felt can be simply laid on the balance board.

**Claims**

**1.** A balance board (2), **characterized in that**:

the balance board (2) is configured to be flatly laid on one or more spring modules (1),
wherein multiple springs (10) are arranged to define the one or more spring modules (1),
wherein upper ends of the multiple springs (10) are configured to swing in a lateral direction, and
wherein
the balance board (2) comprises multiple monoboards (4) shaped in strips, and
the multiple monoboards (4) shaped in strips are connected by a flexible material (5).

**2.** The balance board (2) according to claim 1, **characterized in that**: the balance board (2) is configured to cover the one or more spring modules (1).

**3.** The balance board (2) according to claim 1 and/or 2, **characterized in that**: upper ends of the multiple springs (10) are not connected together.

**4.** The balance board (2) according to any one or more of claims 1 to 3, **characterized in that**:

lengths of the multiple monoboards (4) shaped in strips correspond to a width of the one or more spring modules (1) or a length of the one or more spring modules (1), and
the multiple springs (10) of the one or more spring modules (1) are tapered springs.

**5.** The balance board (2) according to any one or more of claims 1 to 4, **characterized in that**: the flexible material (5) is flexible fabrics.

**6.** The balance board (2) according to claim 5, **characterized in that**: the multiple monoboards (4) shaped in strips are totally or partially connected in a length direction by the flexible fabrics.

**7.** The balance board (2) according to any one or more of claims 1 to 6, **characterized in that**:

the multiple monoboards (4) shaped in strips comprise multiple through holes (41),

an upper fabric (54) and a lower fabric (53) of the flexible material (5) are bonded together at the multiple through holes (41), and
the upper fabric (54) and the lower fabric (53) are connected by ultrasonic welding.

**8.** The balance board (2) according to any one or more of claims 1 to 7, **characterized in that**:

a center of the multiple monoboards (4) shaped in strips comprises row holes (42) in a width direction of the multiple monoboards (4) shaped in strips, and
the balance board (2) is configured to be folded in the width direction of the multiple monoboards (4) shaped in strips.

**9.** The balance board (2) according to any one or more of claims 1 to 8, **characterized in that**:

the multiple springs (10) of the one or more spring modules (1) are wrapped in the flexible material (5), and
the flexible material (5) of a same row of the multiple springs (10) is laterally connected.

**10.** A balance board (2), **characterized in that**:

the balance board (2) is configured to be flatly laid on one or more spring modules (1),
wherein multiple springs (10) are arranged to define the one or more spring modules (1),
wherein upper ends of the multiple springs (10) are configured to swing in a lateral direction, and wherein
the balance board (2) comprises multiple monoboards (7),
the multiple monoboards (7) are wrapped by flexible fabrics (5) and are connected in a width direction and a length direction of the multiple monoboards (7) to define the balance board (2),
a size of each of the multiple monoboards (7) corresponds to a top surface of an individual spring of the multiple springs (10) to be configured to substantially cover the top surface of the individual spring, and
the balance board (2) corresponds to a top surface of the one or more spring modules (1).

**11.** A balance board (2), **characterized in that**:

the balance board (2) is configured to be flatly laid on one or more spring modules (1),
multiple springs (10) are arranged to define the one or more spring modules (1),
upper ends of the multiple springs (10) are configured to swing in a lateral direction,
multiple monoboards (4) shaped in strips are assembled to define the balance board (2),
the multiple monoboards (4) shaped in strips comprise grooves or holes (43) corresponding to locations of the multiple springs (10),
the multiple monoboards are configured to receive tops of the multiple springs (10) which are disposed in the grooves or the holes (43) to enable the multiple monoboards (10) shaped in strips to be positioned, and
the balance board (2) corresponds to a top surface of the one or more spring modules (1).

**12.** A flexible mattress, it comprises:

the one or more spring modules (1), in particular, of any one or more of claims 1-11,
the balance board (2) of any one or more of claims 1-11, and
a flexible cushion (3) disposed on the balance board (2), **characterized in that**:

the balance board (2) is laid on a top surface of the one or more spring modules (1),
the flexible cushion (3) is laid on the balance board (2), and
springs (10) in the one or more spring modules (1) are configured to swing in a lateral direction.

**13.** The flexible mattress according to claim 12, **characterized in that**: a fixing pull rope or a fastener (21) is added to an outer periphery of the balance board (2) to connect the balance board (2) to a lower end of the one or more spring modules (1).

**14.** The flexible mattress according to claim 12 and/or 13, **characterized in that**:

the balance board (2) is configured to be snapped or connected to a lower side of the flexible cushion (3), and
a fixing pull rope or a fastener (31) is added to an outer periphery of the flexible cushion (3) to connect the flexible cushion (3) to a lower end of the one or more spring modules (1) to form the flexible mattress.

**15.** The balance board (2) according to any one or more of claims 1 to 11, **characterized in that**: upper ends of the multiple springs (10) are not connected together.

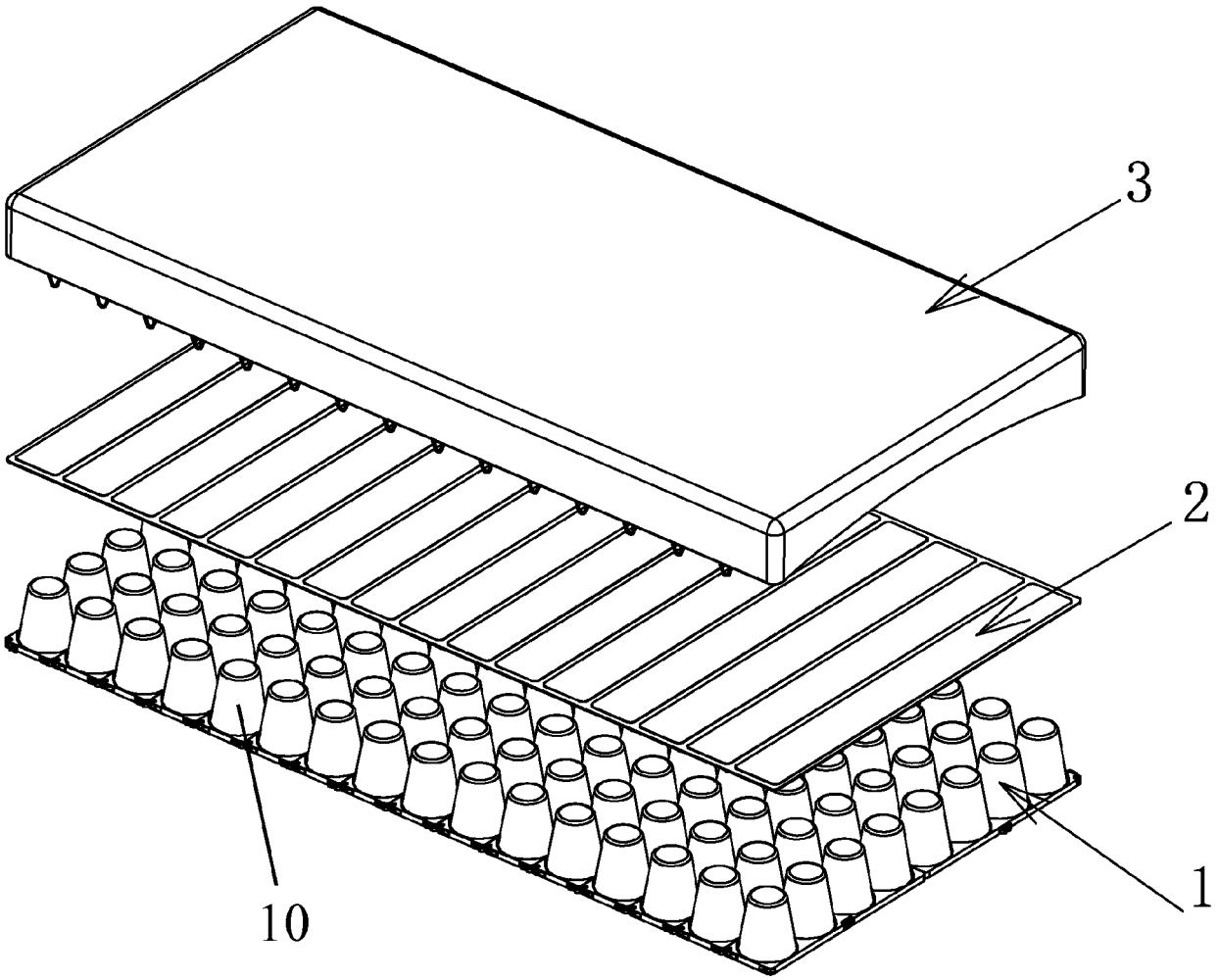


Fig. 1

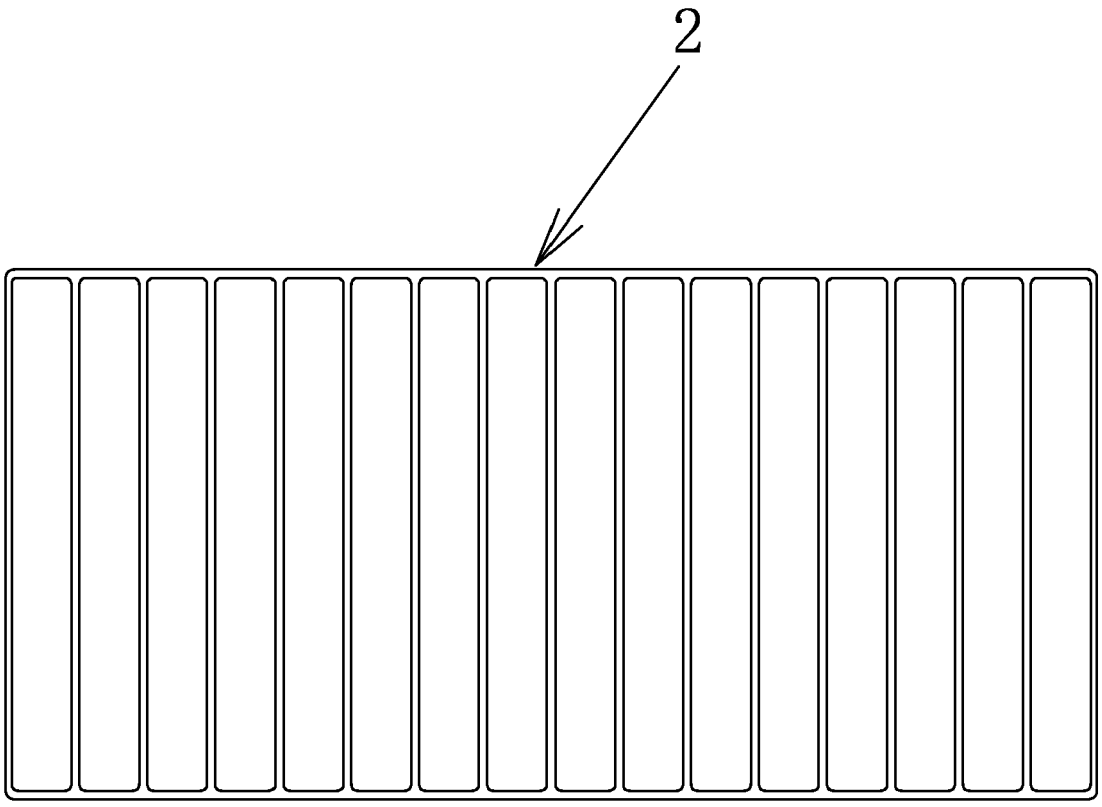


Fig. 2

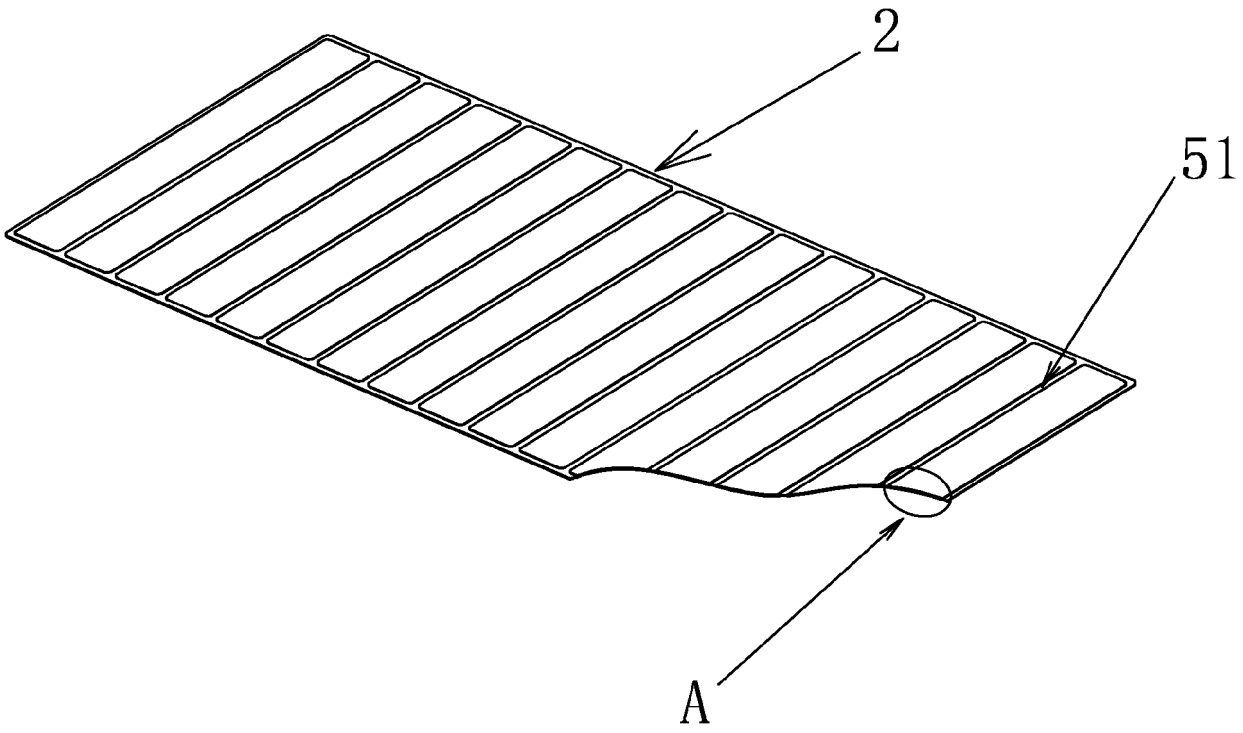


Fig. 3

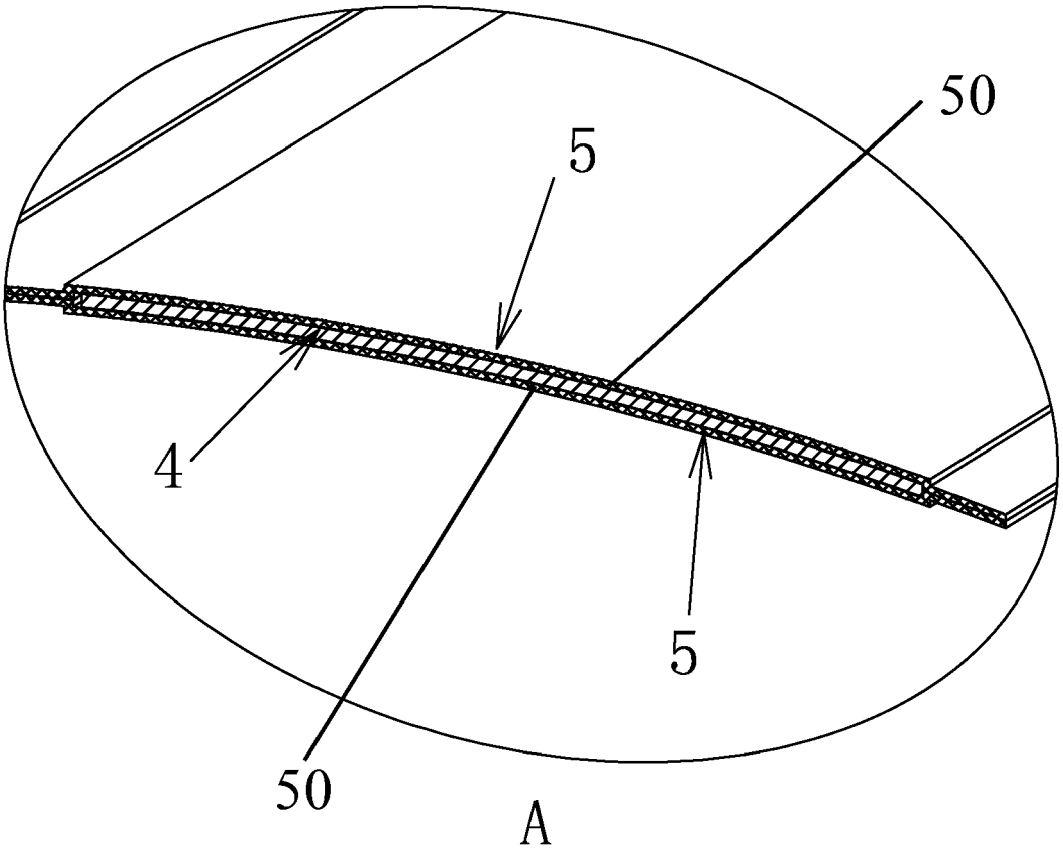


Fig. 4

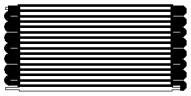

Fig. 5A

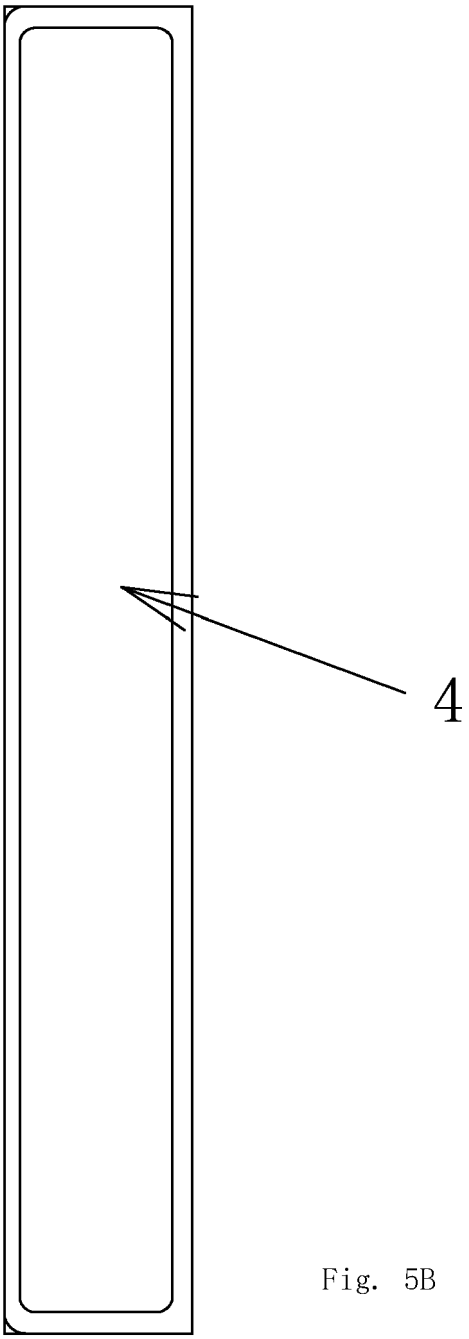


Fig. 5B

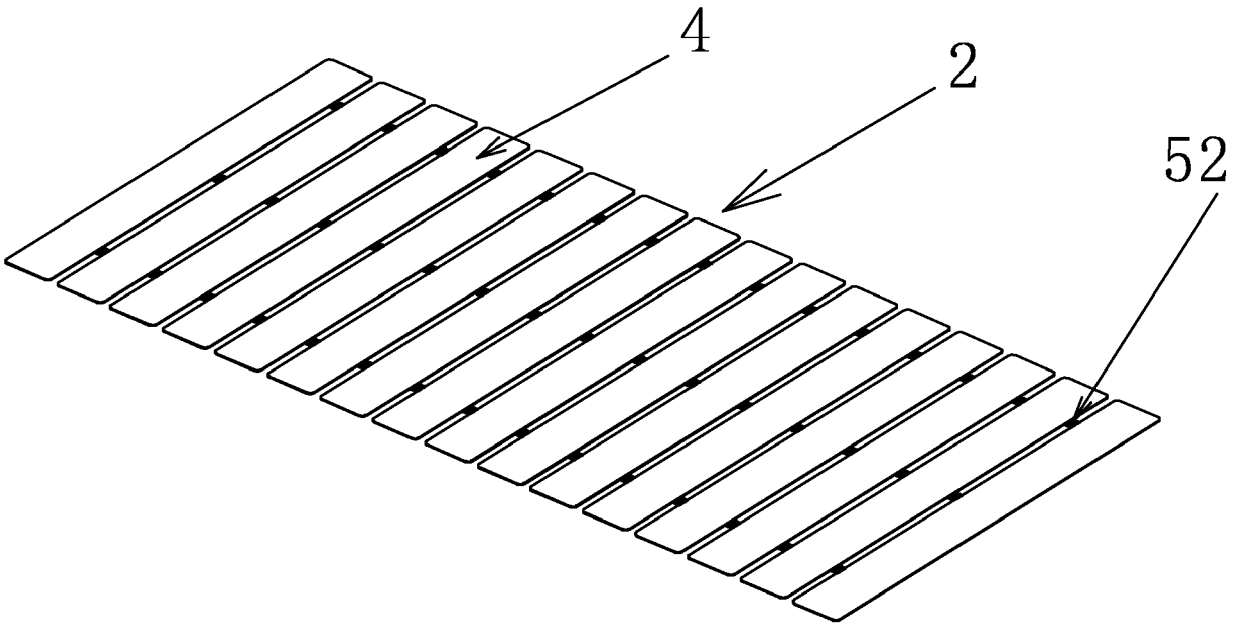


Fig. 6

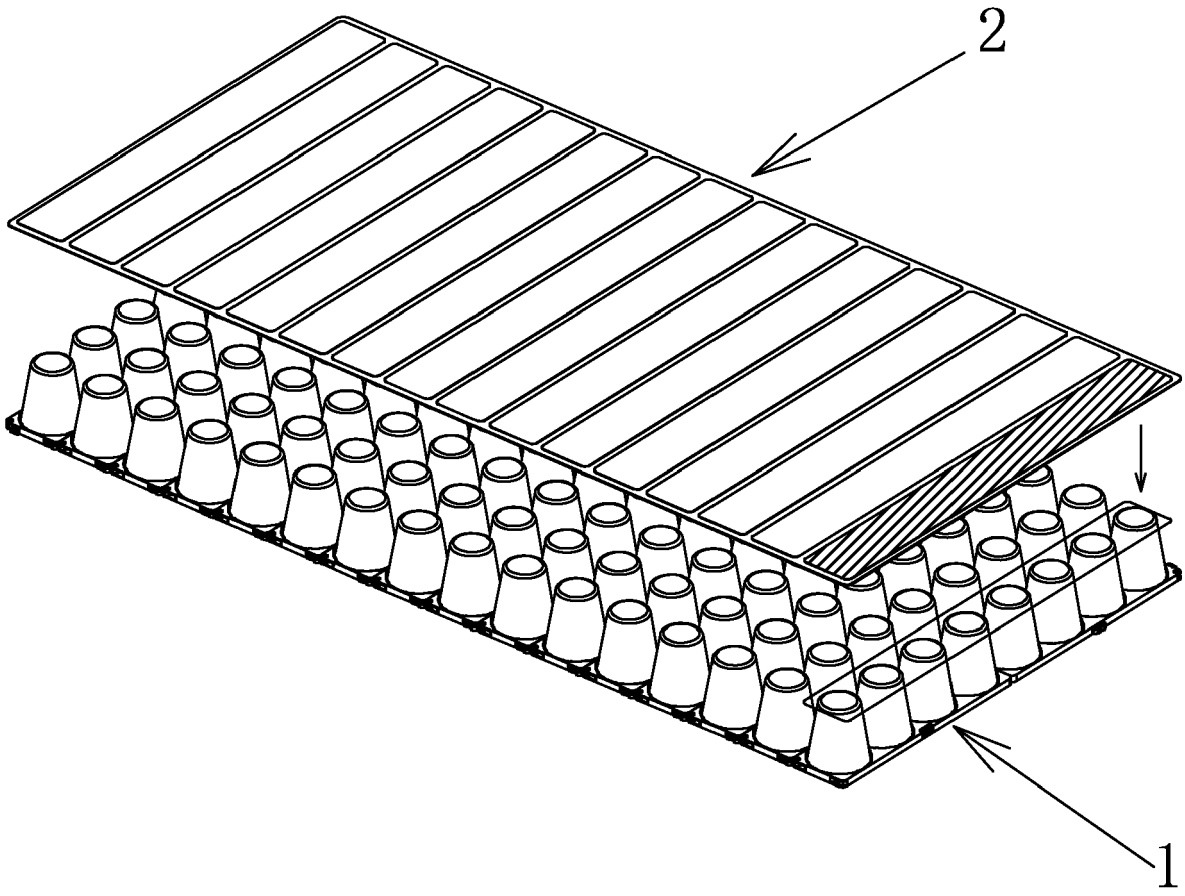


Fig. 7

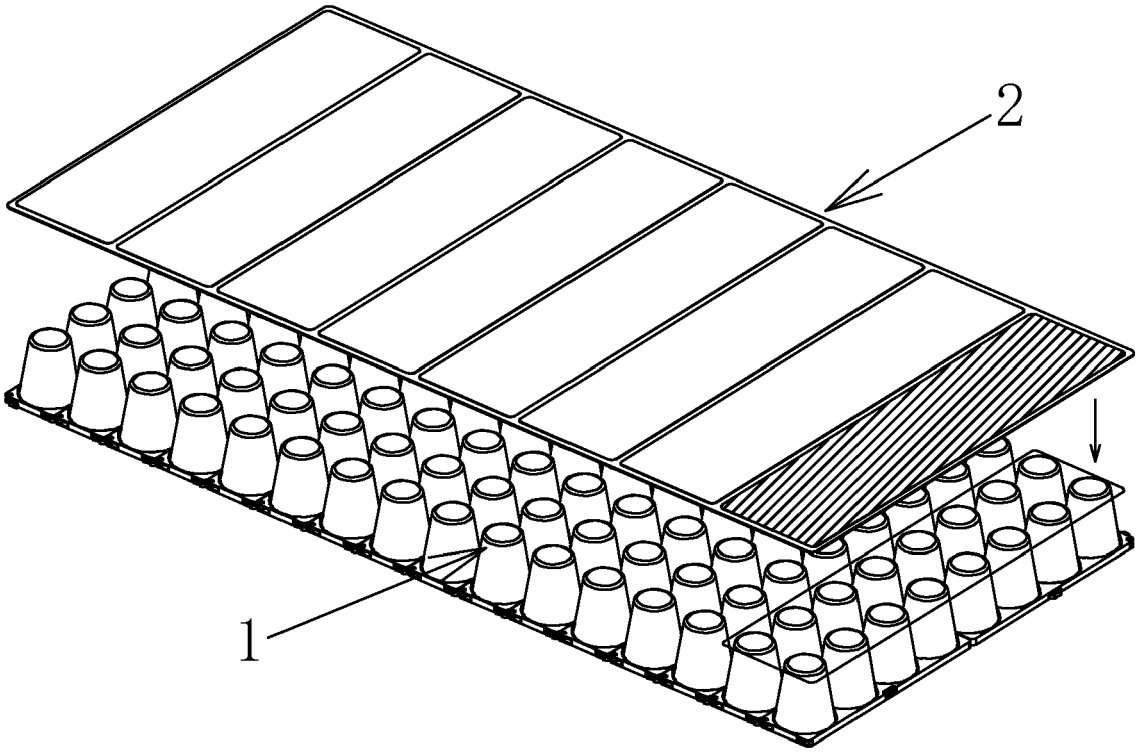


Fig. 8

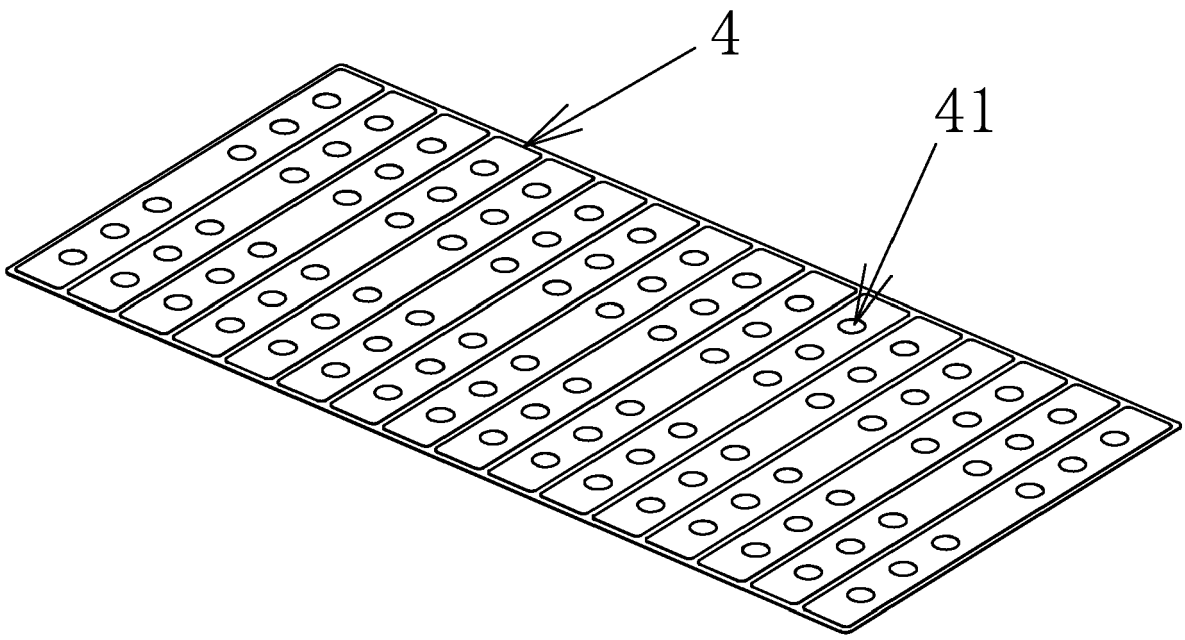


Fig. 9

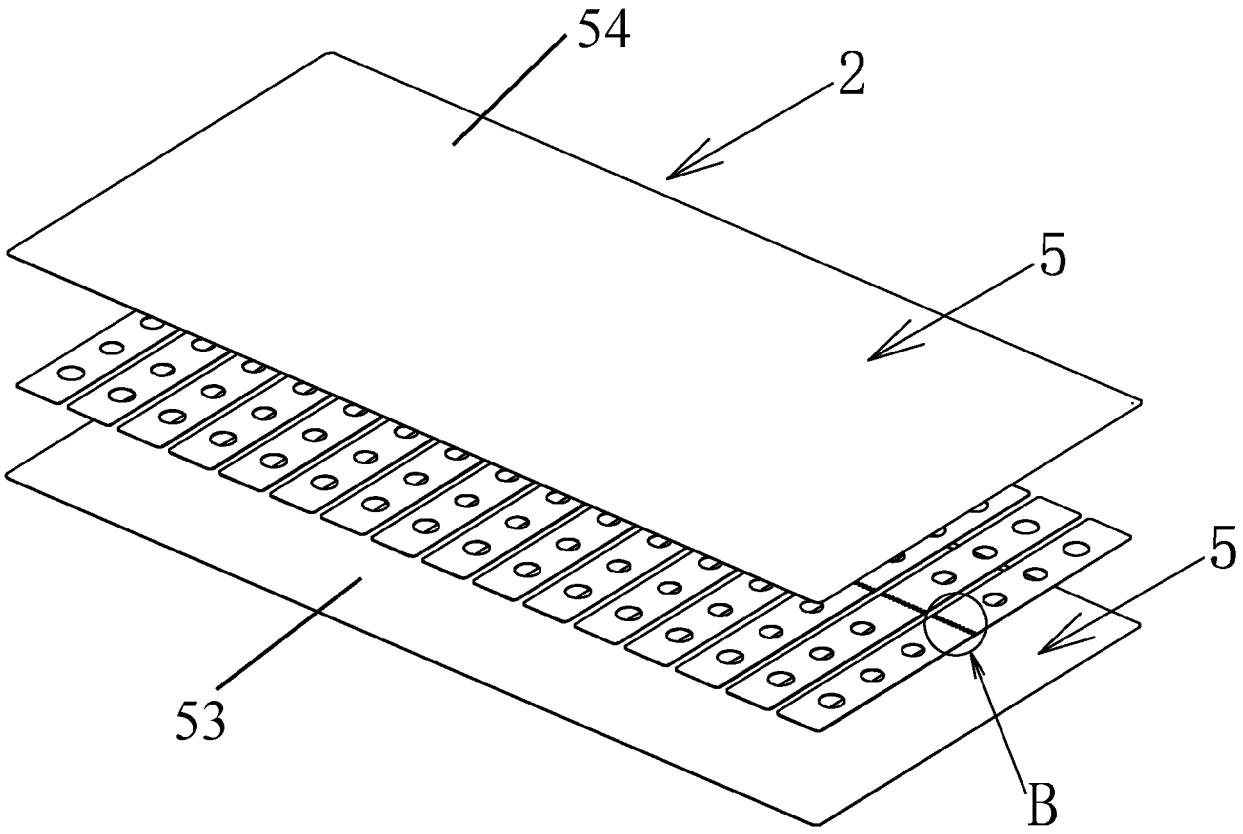


Fig. 10

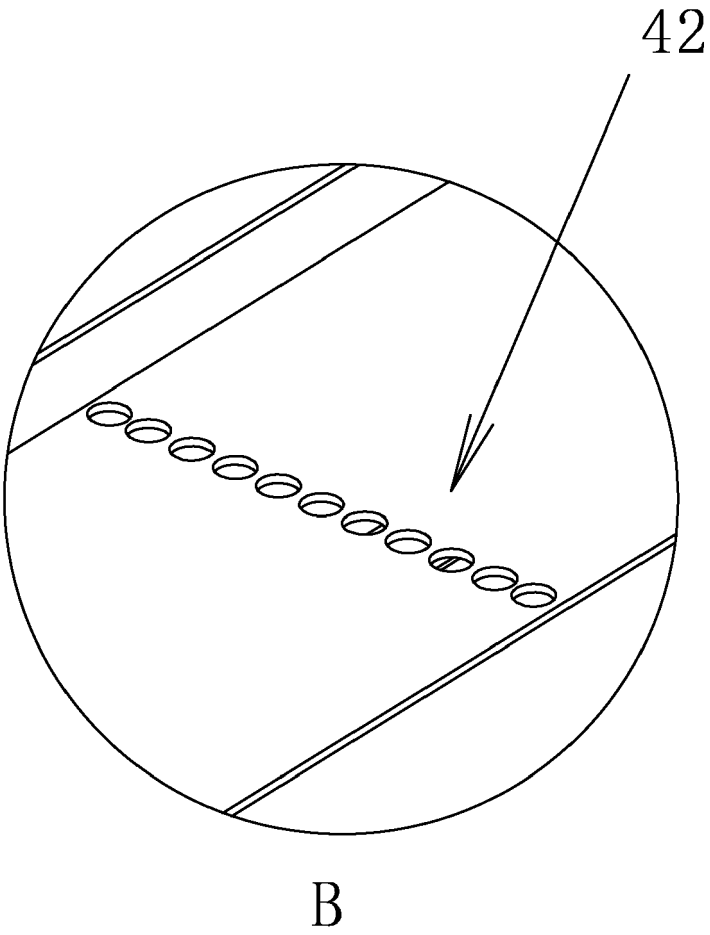


Fig. 11

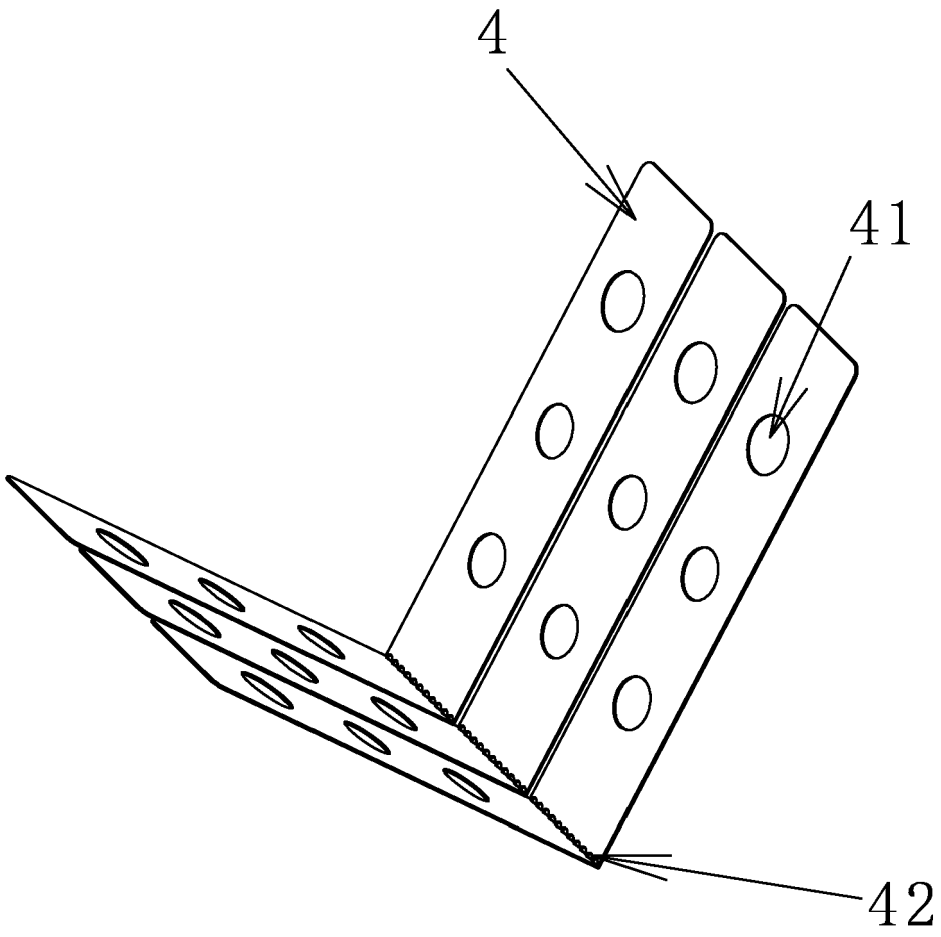


Fig. 12

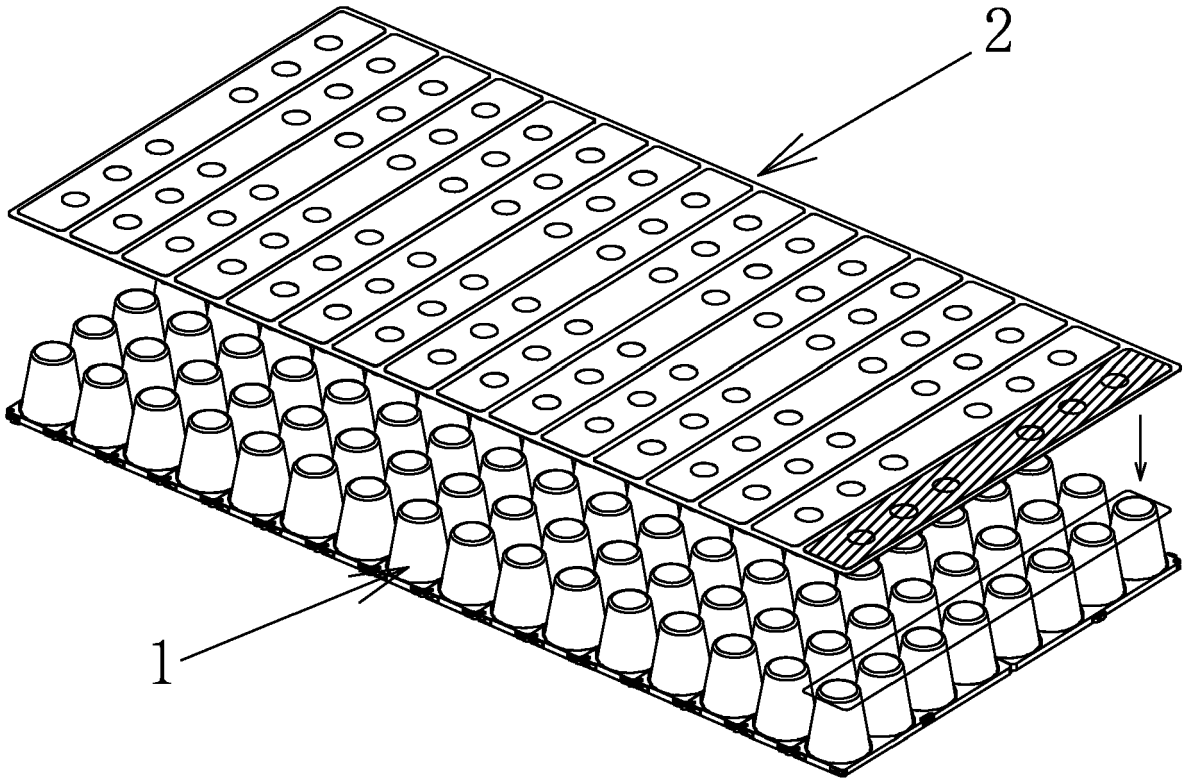


Fig. 13

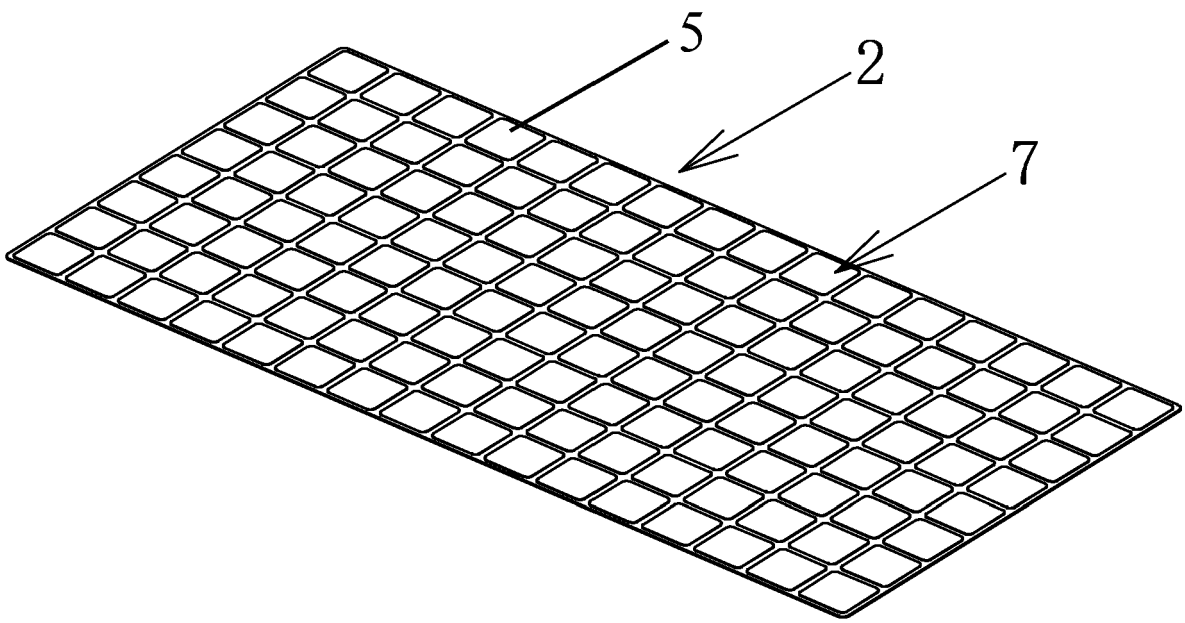


Fig. 14

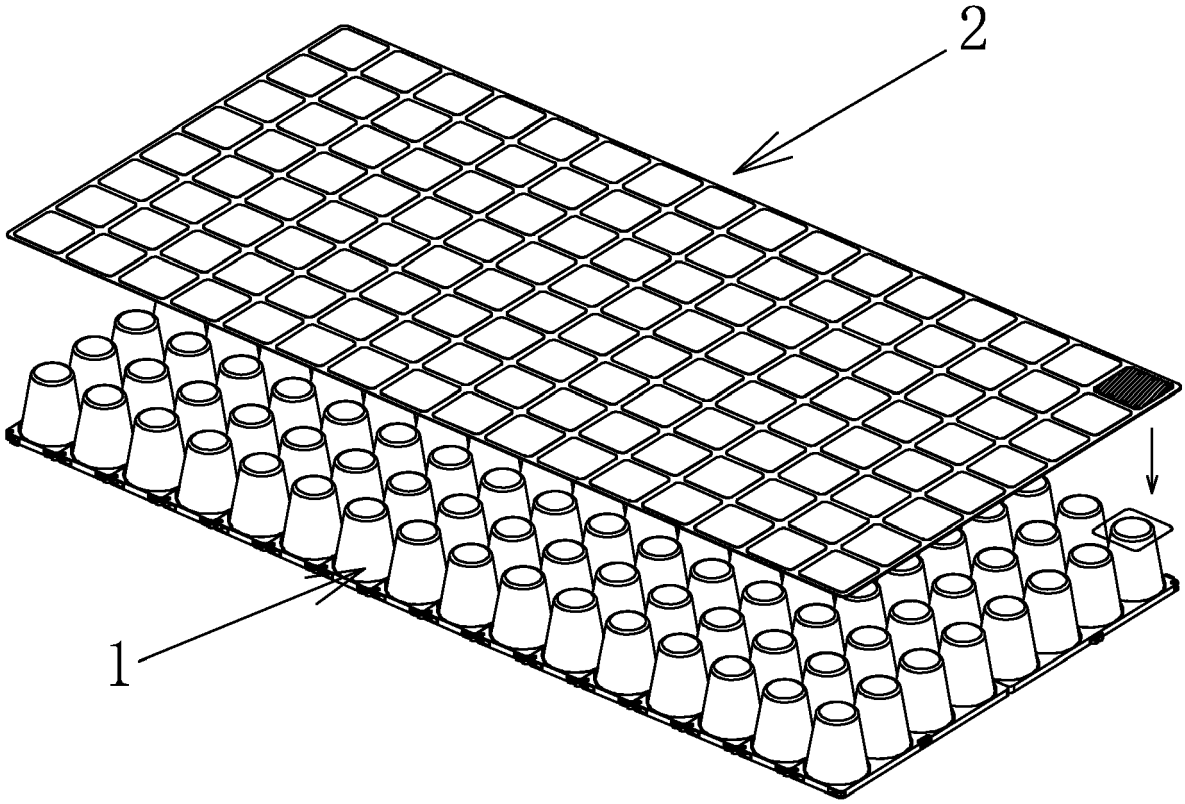


Fig. 15

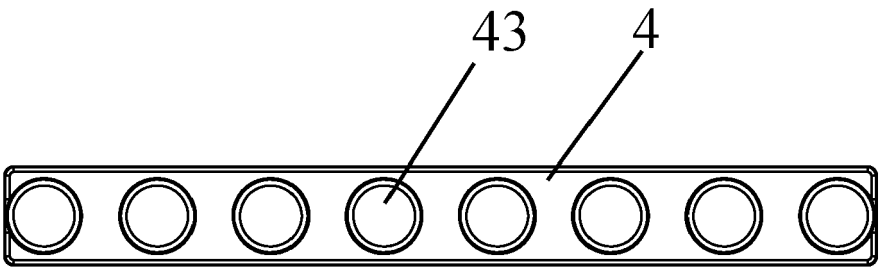


Fig. 16A

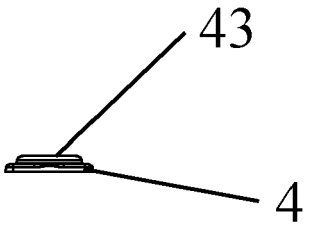


Fig. 16B

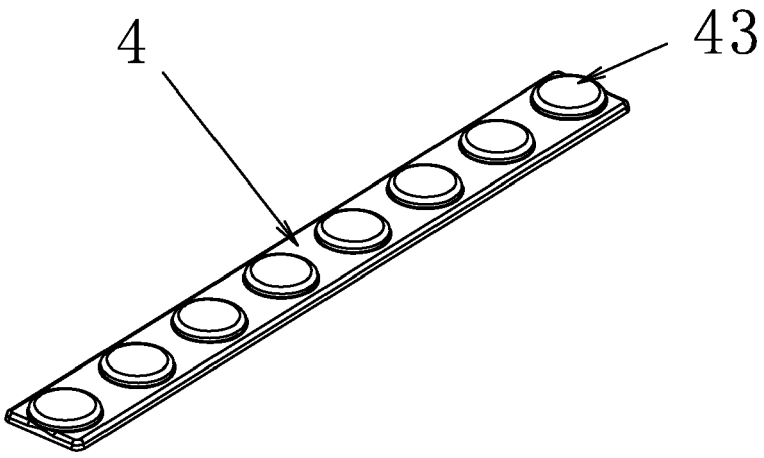


Fig. 17

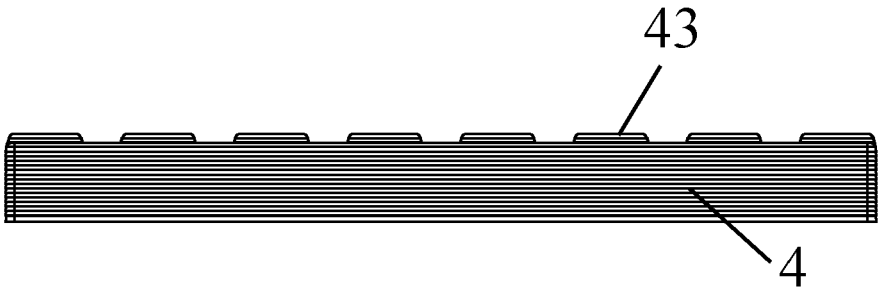


Fig. 18A

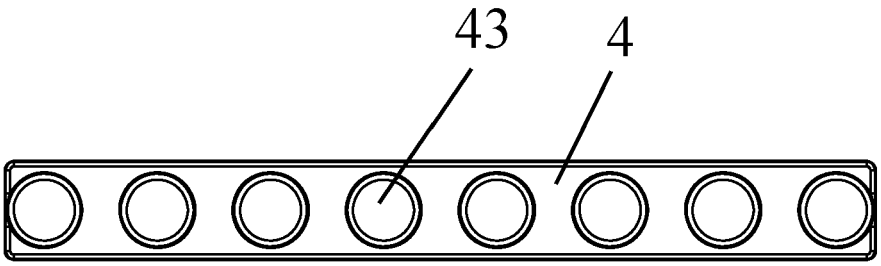


Fig. 18B

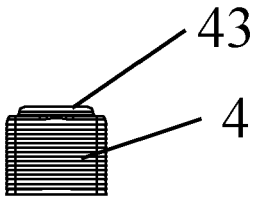


Fig. 18C

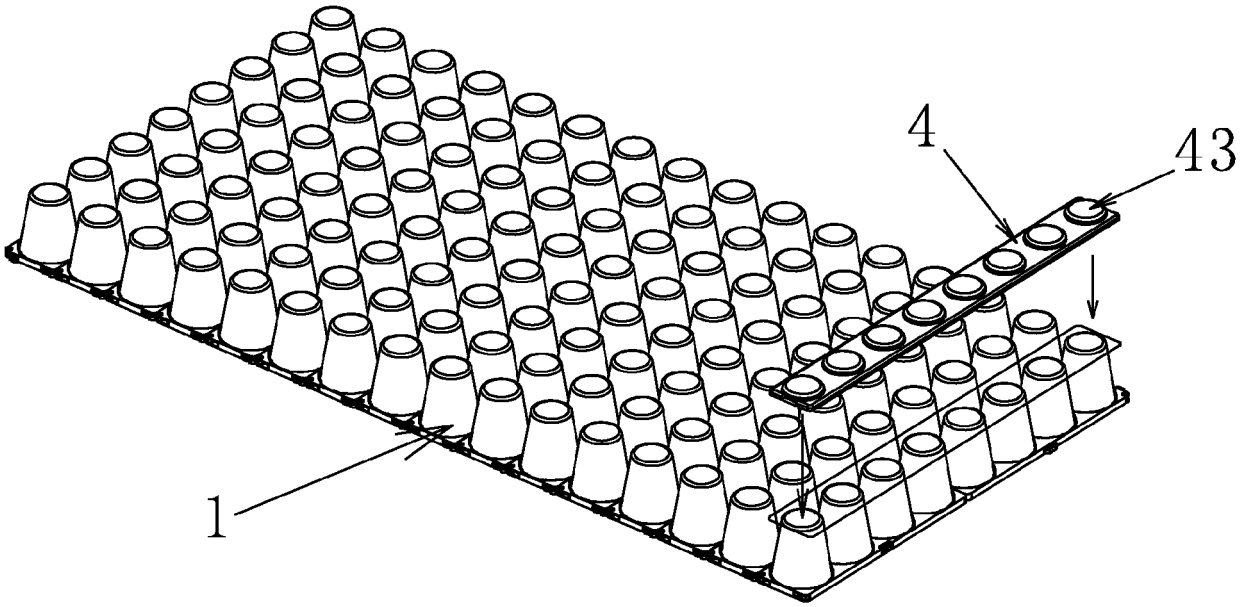


Fig. 19

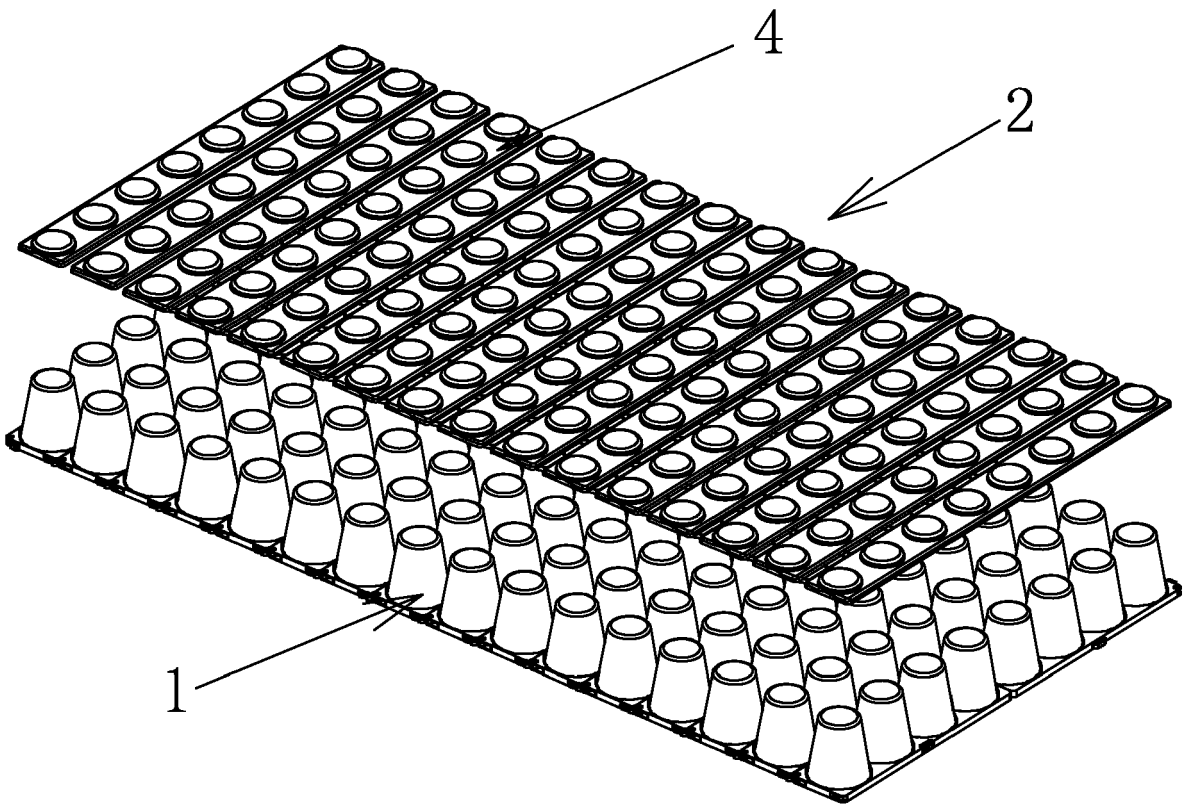


Fig. 20

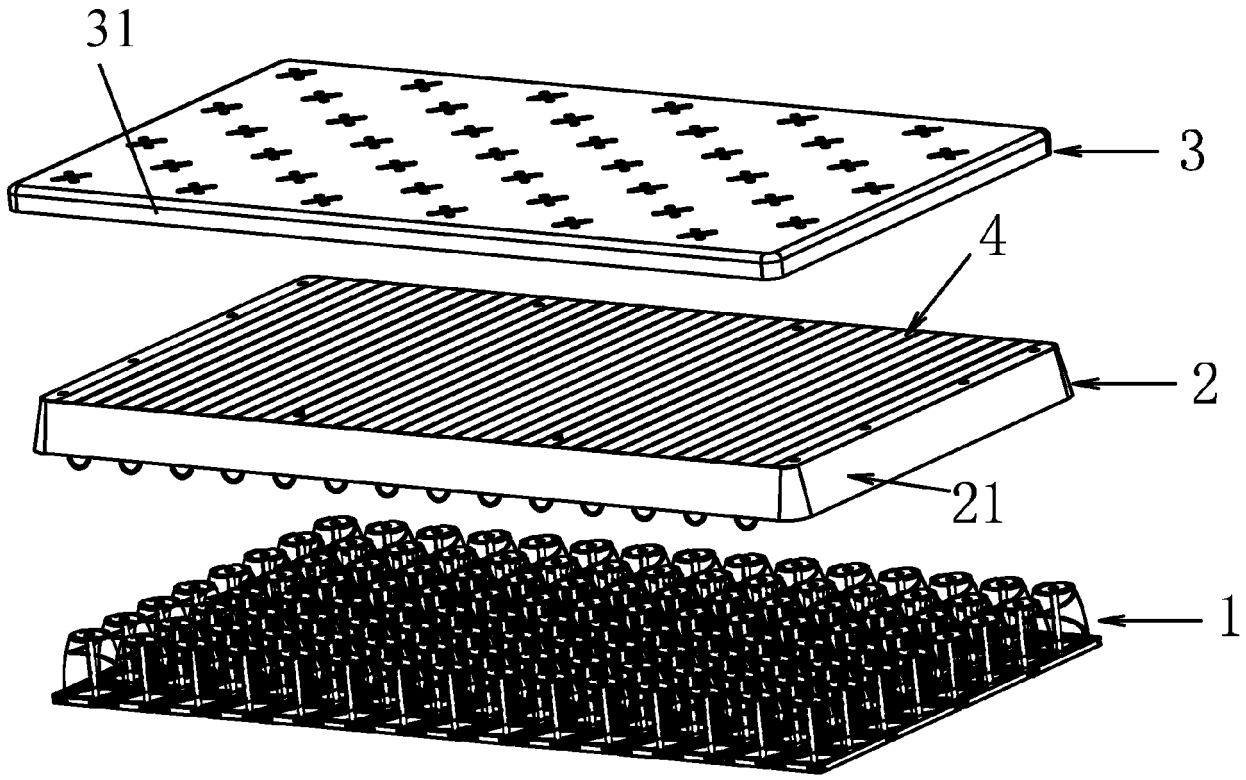


Fig. 21

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