

PANEL FOR MAINTAINING HIGH PRESSURE STRENGTH AT ANY POINT

BACKGROUND OF THE INVENTION

5 Field of the Invention

The present invention relates to a high-strength panel for use as flooring in a clean facility, such as a semiconductor clean room, and, more particularly, to a high-strength panel which comprises

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: rim ribs formed along the rim of the panel; a main reinforcing rib defining a plurality of lattice sections; auxiliary reinforcing ribs arranged in a respective one of the
15 lattice sections to provide the entirety of the panel with a supporting force for effectively increasing the strength of the panel resistant to a concentrated load; and circular recesses formed in the lower surface of the panel and surrounded by circular ribs, respectively, thereby effectively
20 supporting vertical and eccentric loads applied to the entirety of the panel while preventing the downwardly applied load from being concentrated at a specific location of the panel by distributing the load throughout the panel.

25 Description of the Related Art

As is well known to those skilled in the art, a clean room in which a variety of special experimental and production equipment is mounted, for example, a production room for highly integrated circuits such as semiconductors, and a genetic engineering laboratory, has a double flooring system. The double flooring system is constructed to have a predetermined height so that it is able to uniformly distribute the load of the variety of special equipment while effectively absorbing and removing exterior dust particles, fine particulates, etc., thereby preventing generation of cracks or depressions even if the load is concentrated on a specific location of the double flooring system.

When the double flooring system is used at certain locations where the permeation of cold air or the overheating of the flooring system by heat produced from special machinery must be prevented or at places requiring an adjustment in the temperature and humidity of the room and an absorption and removal of dust particles, fine particulates, etc., the double flooring system may include a porous panel which possesses a number of fine pores. An underside of the porous panel forms a floor having a supporting structure. Since a variety of exhaust devices and cable equipment is mounted underneath the floor, the floor, as the bottom surface of a semiconductor clean room, must be spaced apart from the ground by a certain constant height.

In consideration of the size of the exhaust devices and cable equipment and other various conditions, the installation height of the floor must have variability.

Figs. 1 and 2 illustrate the structure of a conventional bottom panel for use in a clean room.

As shown in Figs. 1 and 2, the conventional bottom panel 2 comprises: a rim portion 202 along the rim of a lower surface thereof, the rim portion 202 having a plurality of rectangular recesses; and a plurality of square lattice sections 204 defined inside the rim portion 202.

The conventional bottom panel 2 further comprises a main reinforcing rib 206, which serves as a partition between the lattice sections 204. As shown in Fig. 2, the main reinforcing rib 206 has a predetermined height, and a plurality of circular recesses 208 is vertically and horizontally formed at the bottom surface of the panel 2 sectionalized by the main reinforcing rib 206. The respective circular recesses 208 adjacent to one another are interconnected by vertical and horizontal bars 210 so that octagonal recesses 212 are defined in spaces therebetween.

The conventional bottom panel having the above described configuration, however, has a problem in that the bottom panel is easily warped or damaged by shock or vibration when a variety of heavy equipment is directly disposed on an upper surface of the bottom panel.

Specifically, if the bottom panel is exposed to vertical load transmitted from the heavy equipment to the upper surface thereof and eccentric load when the equipment is gathered at a specific location on the panel, the vertical and eccentric loads tend to be concentrated on the circular recesses 208, and the circular recess connecting bars 210 and the octagonal recesses 212 between the respective adjacent circular recesses 208.

Due to the fact that each lattice section 204, defined by the main reinforcing rib 206, has relatively large vertical and horizontal lengths and the plurality of circular recesses 208 is distributed in the lattice section 204, if the vertical load and lateral eccentric load are transmitted to the center of the lattice section 204, the circular recesses 208 and the octagonal recesses 212, located at the center of the lattice section 204, are incapable of withstanding such load, causing generation of damage and cracks.

SUMMARY OF THE INVENTION

Therefore, the present invention has been made in view of the above problems, and it is an object of the present invention to provide a high-strength panel which comprises: rim ribs to support the entirety of the panel; a main reinforcing rib located in a space defined by the rim ribs to

divide the space into a plurality of lattice sections; and a plurality of auxiliary reinforcing ribs arranged to divide a respective one of the lattice sections into 4 rows and 4 columns, thereby achieving an enhancement of supporting force resistant to vertical and eccentric loads and preventing a degradation of the supporting force at a specific location of the panel.

It is another object of the present invention to provide a high-strength panel in which auxiliary reinforcing ribs are arranged in a respective one of lattice sections defined by a main reinforcing rib to divide the lattice section into sixteen sub-sections and each sub-section is formed at a lower surface thereof with diagonally aligned circular recesses in a 2 X 2 array, each circular recess being surrounded by a circular rib, thereby achieving an enhancement in load supporting force.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a bottom view of a conventional panel;

Fig. 2 is an enlarged perspective view illustrating a

fraction of the conventional panel of Fig. 1;

Fig. 3 is a bottom view of a high-strength panel according to an embodiment of the present invention;

Fig. 4 is an enlarged perspective view illustrating a
5 fraction of the high-strength panel of Fig. 3;

Fig. 5 is a plan view of Fig. 4;

Fig. 6 is a sectional view of the high-strength panel according to the embodiment of the present invention;

Fig. 7 is an enlarged view of Fig. 3; and

10 Fig. 8 is a sectional view taken along the line A-A of Fig. 7.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

15 Now, a preferred embodiment of the present invention will be explained with reference to the accompanying drawings.

Fig. 3 is a bottom view of a high-strength panel according to an embodiment of the present invention. Fig. 4 is an enlarged perspective view illustrating a fraction of the
20 high-strength panel of Fig. 3. Fig. 5 is a plan view of Fig. 4.

Fig. 6 is a sectional view of the high-strength panel according to the embodiment of the present invention. Fig. 7 is an enlarged view of Fig. 3. Fig. 8 is a sectional view
25 taken along the line A-A of Fig. 7.

Considering the characteristic feature of the high-strength panel 30 according to an embodiment of the present invention with reference to the accompanying drawings, it can be confirmed that rim ribs 316, which form rim portions 302 of the panel 30, are increased in thickness as compared to the conventional panel, and each has a tapered surface.

In the present invention, the rim ribs 316 of the rim portions 302, which support four corners of the panel 30, are reinforced in consideration of the fact that the higher the height of the ribs, the resistance against initial deformation can be increased and that the thicker the thickness of the ribs, a critical strength to sustain a breaking load can be enhanced. Also, the presence of the tapered surface allows the rim ribs 316 to achieve a uniform initial deformation value and breaking strength at any locations thereof.

The present invention is also characterized in that a plurality of auxiliary reinforcing ribs 307 is arranged in respective lattice sections defined by a main reinforcing rib 306. The auxiliary reinforcing ribs 307 have a half height of the main reinforcing rib 306, and are arranged to divide a respective one of the lattice sections into 4 rows and 4 columns. That is, each lattice section defined by the main reinforcing rib 306 is divided into sixteen sub-sections by the auxiliary reinforcing ribs 307.

Each sub-section, defined by the auxiliary reinforcing

ribs 307, is formed at a lower surface thereof with circular recesses 308 in a 2 X 2 array. The circular recesses 308 are diagonally aligned to minimize the area of a recess defined therebetween. Also, each circular recess 308 is surrounded by a circular rib 314. With this configuration, it is possible to enhance a supporting force of the panel 30 resistant to the vertical load and eccentric load, and to prevent a degradation of the supporting force at a specific location of the panel 30.

Therefore, by virtue of the rim ribs 316 and the auxiliary reinforcing ribs 307 inside the main reinforcing rib 306, the panel 30 of the present invention can achieve an enhancement in the supporting force resistant to the vertical and eccentric loads as compared to the conventional panel 2, and can prevent a degradation of the supporting force at a specific location thereof.

Referring to Figs. 7 and 8, the plurality of circular recesses 308, which are surrounded by the respective circular ribs 314, is formed at a bottom layer 310 of each sub-section defined by the respective auxiliary reinforcing ribs 307.

As will be easily understood from Fig. 6, preferably, the height of the auxiliary reinforcing ribs 307 is approximately $\frac{1}{2}$ to $\frac{1}{3}$ of the height of the main reinforcing rib 306.

Such a height of the auxiliary reinforcing ribs 307 is

determined in consideration of the material costs of the entire panel as well as a panel supporting force effective to resist the vertical and eccentric loads. Thus, an excessively high height of the auxiliary reinforcing ribs 307 beyond the
5 above range is economically undesirable because it results in an increase in the price of products.

Meanwhile, in the circular recesses 308 according to the present invention, the thicker the thickness of the circular rib 314 that encloses a respective one of the circular
10 recesses 308, the supporting force resistant to the vertical and eccentric loads can be increased.

As shown in Fig. 7, the circular recesses 308, formed at the lower surface of the high-strength panel 30, are diagonally spaced apart from one another, rather than being
15 vertically and horizontally spaced apart from one another. In this case, the respective adjacent four circular recesses 308 in a 2 X 2 array define a diamond-shaped supporting recess 312 in the center thereof. The diamond-shaped supporting recess 312 is able to more enhance the supporting force while keeping
20 the original shape of the circular recesses 308. Preferably, a diagonal length of the diamond-shaped recess 312 is shorter than a diameter of the circular recess 308.

In the present invention, the rim portions 302 of the supporting panel 30 are centrally formed with a predetermined
25 number of rim lattice sections 303. Each of the rim lattice

sections 303 contains the auxiliary reinforcing ribs 307 which divide the lattice section 303 into four sub-sections.

As is apparent from the above description, the high-strength panel of the present invention is configured such that rim ribs are formed along the rim of the panel and a plurality of auxiliary reinforcing ribs are arranged in a respective one of lattice sections defined by a main reinforcing rib so as to provide the entirety of the panel with a supporting force for effectively increasing the strength of the panel resistant to a concentrated load. Further, according to the present invention, since a plurality of circular recesses is formed at a lower surface of the panel and is surrounded by circular ribs, respectively, it is possible to effectively support vertical and eccentric loads applied to the entirety of the panel while preventing the downwardly applied load from being concentrated at a specific location of the panel by distributing the load throughout the panel.

Although the bottom supporting panel according to the preferred embodiment of the present invention has been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications of the present invention, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

WHAT IS CLAIMED IS:

1. A high-strength panel comprising:

rim ribs formed at respective rim portions of the panel,
each rim rib having a tapered surface at one side surface of the
5 rim rib such that the rim rib has a downwardly-increasing
thickness;

a main reinforcing rib serving as a partition to divide an
interior space defined by the rim portions into a plurality of
square lattice sections;

10 a plurality of auxiliary reinforcing ribs arranged in each
of the square lattice sections to divide the square lattice
section into 4 rows and 4 columns, i.e. into sixteen sub-
sections;

a plurality of circular recesses formed at a bottom layer
15 of each sub-section defined by the auxiliary reinforcing ribs;
and

circular ribs respectively formed around the circular
grooves, to enhance a support force resistant to vertical and
eccentric loads applied to the circular grooves.

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2. The high-strength panel as set forth in claim 1, wherein
the rim portions are centrally formed with a predetermined
number of rim lattice sections, and each rim lattice portion is
divided into four sub-sections by the auxiliary reinforcing
25 ribs.