ABSTRACT
The present invention discloses the structure of the lightweight building materials with sound absorption and isolation character. The structure comprises a plurality of sound-absorbing planks for absorbing sound generated by the surrounding environment, and a plurality of fixing modules fix the sound-absorbing planks on the wall or the predetermined accommodating spaces of the ceilings.
STRUCTURE OF THE LIGHT WEIGHT BUILDING MATERIALS WITH SOUND ABSORPTION AND ISOLATION CHARACTER

FIELD OF INVENTION

[0001] The present invention relates to a building structure with sound absorption structure. More specifically, it relates a structure of the light weight building material with sound absorption effect.

BACKGROUND OF INVENTION

[0002] Generally speaking, human life is always affected by noises anywhere and anytime. More civilized society requests higher quality of life. If staying under noises for long time, human health and mentality will be interrupted. The noises will lead to not only poorer hearing, but also boring mood and ineffective working. Even people will become nervous of noises and expose to the risk of endocrine disruption. Therefore, people should pay much attention to improve the noise problems and the building materials day by day.

[0003] A portion of sound energy absorbed by the sound absorption materials is transferred into heat energy to achieve the purpose of absorption. The sound absorption materials are generally porous type. While the sound waves enter into the pores of the building materials. The structure causes multiple reflections and the sound wave interacts with the surfaces of the materials having absorption character, and then the sound energy will mostly be consumed by transferring into heat energy to reduce the sound energy through the materials.

[0004] Generally, in the engineering of manufacturing the building materials with absorption character for decreasing noises, the method has some disadvantages as follows. (1) It is inconvenient to perform in construction sites, and difficult to transport by machines. (2) The dusts with powders are excessively higher and the surrounding environments are easily polluted by the powders. (3) The treated surfaces will become untidy and irregular after the spray-on operation. (4) The treated surfaces will peel off when dank. (5) The treated surfaces are hard to clear after the spray-on operation. (6) After the dusts attaching to the surfaces, the efficiency of sound absorption will lower and the dusts will be hard to clear. (7) All operations should be ceased before the spray-on operation is performed in construction sites.

[0005] Moreover, the absorption materials are generally the steel plates or cement and asbestos plates with higher rigidity, higher isolation performance. The isolation materials are tightly arranged and the spaces are formed to isolate from the sound source. Those materials with isolation character are amounted in asismatic rubbers with wider thickness between frames, such as beams, in order to avoid the sound fluctuations from transmitting within the materials.

[0006] However, the mounting engineering amounts and mounting components become much numerous because the asismatic rubbers for fluctuated isolation and steel plates for sound isolation are necessary to those frames. Therefore, these isolated structures have larger size in volume and occupy wider space, but it is difficult to dimension to fit the spaces with various sizes.

[0007] As above-mentioned description, the present invention provides a structure of light weight building material with absorption and isolation character to overcome these disadvantages.

SUMMARY

[0008] Herein, the present invention will describe some preferred embodiments. However, it is appreciated that the present invention can extensively perform in other embodiments expect for these detailed descriptions. The scope of the present invention is not limited to these embodiments and should be accorded the following claims.

[0009] One purpose of the present invention is to provide a structure of the light weight building material with sound absorption and isolation character for absorbing and isolating the sounds around the environment. The structure is used to overcome the problems of echoes and reverberations in broad places to improve the sound qualities.

[0010] Another purpose of the present invention is to provide a structure of the light weight building material with sound absorption and isolation character for reducing the weights of the materials.

[0011] Yet another purpose of the present invention is to provide a structure of the light weight building material with sound absorption and isolation character to allow the building easily to be mass production and dimension.

[0012] Still another purpose of the present invention is to provide a structure of the light weight building material with sound absorption and isolation character having fireproof function after mounting.

[0013] The present invention discloses a structure of the light weight building materials with sound absorption and isolation character, comprising a plurality of sound-absorbing planks for absorbing sound, and a plurality of fixing modules fix the sound-absorbing planks on the wall or predetermined accommodating spaces of the ceiling. The sizes of the plurality of sound-absorbing planks are various with the predetermined accommodating spaces between the wall and the ceiling of a building and the plurality of sound-absorbing planks are configured on walls or ceilings by the plurality of fixing modules.

[0014] The sound-absorbing planks include a panel, a grid plate and fillers. The materials of the grid plate include paper. The pores on the grid plate are hollow and thorough. The panel is combined with the grid plate and the fillers are filled into the panel or the grid plate to form the sound-absorbing planks.

[0015] The fixing modules include a plurality of long reinforcing frames, a plurality of suspenders and a plurality of fasteners. The plurality of long reinforcing frames is used to fasten the adjacent long reinforcing frames with various shapes.

[0016] The fasteners include but not limited to screws. The adjacent long reinforcing frames with various shapes can be fastened by the screws and allow the sound-absorbing planks to fasten on the walls.

[0017] The long reinforcing frames with various shapes include a plurality of holes, so that the screws are used to fasten the sound-absorbing planks on walls.
The suspenders can be used to connect with the long reinforcing frames having various shapes to mount within the predetermined accommodating spaces of a ceiling.

The present invention discloses a structure of the lightweight building materials with sound absorption and isolation character, comprising a plurality of sound-absorbing planks for absorbing sound surrounding environment and a plurality of fixing modules for connecting and fixing/configuring the sound-absorbing planks on walls or predetermined accommodating spaces of ceilings. The sizes of the plurality of sound-absorbing planks are various with the predetermined accommodating spaces between walls and ceilings of a building and the plurality of sound-absorbing planks are configured on walls or ceilings by the plurality of fixing modules.

The sound-absorbing planks include a panel, a grid plate and fillers. The materials of the grid plate include plastic and wood. The pores on the grid plate are hollow and thorough. The panel is combined with the grid plate, and the fillers are filled into the panel or the grid plate to form the sound-absorbing planks.

The fixing modules include a plurality of long reinforcing frames, a plurality of suspenders and a plurality of fasteners. The plurality of long reinforcing frames is used to fasten the adjacent long reinforcing frames with various shapes.

The fasteners include but not limited to screws. The adjacent long reinforcing frames with various shapes can be fastened by the screws and allow the sound-absorbing planks to fasten on the walls.

The long reinforcing frames with various shapes include a plurality of holes, so that the screws are used to fasten the sound-absorbing planks on walls.

The suspenders can be used to connect with the long reinforcing frames with various shapes to mount within the predetermined accommodating spaces of ceiling.

FIG. 6 illustrates a diagram of the fixing module fastened the adjacent sound-absorbing planks on the wall and below the ceiling according to the present invention.

FIG. 7 illustrates a diagram of the fixing module fastened the adjacent sound-absorbing planks below the ceiling according to the present invention.

FIG. 8a-8e illustrate diagrams of the long reinforcing frames with various shapes according to the present invention.

The present invention discloses a structure of lightweight building material with absorption and isolation character, and describes as follows. Referring now to the following description wherein the description is for the purpose of illustrating the preferred embodiments of the present invention only, and not for the purpose of limiting the same.

FIG. 1 illustrates a diagram of a structure of the lightweight building materials with sound absorption and isolation character according to the present invention. The structure 10 includes a plurality of sound-absorbing planks 11 and a plurality of fixing modules 12, 13, 14 and 15. The term “sound-absorbing plank” refers to a plank that is used to absorb and/or isolation the sound. Thus, the sound absorbing planks 11 have the capability to absorb the sound generated by the surrounding environment. Referring to FIGS. 2 and 3, the sound-absorbing planks 20 include a panel 21, a grid plate 21 and fillers 22, the fillers 22 can be filled into the grid plate 21 or the panel 23. The sound absorbing plank 20 comprises the panel 23 combined with the grid plate 21.

In one preferred embodiment, the material of the panel 23 comprise aluminum plate, stainless steel plate, iron plate with zinc coated thereon and plastic plate. The panel 23 is configured with square shape and has a plurality of holes formed thereon, wherein the panel 23 is coated by powder baking varnish.

In one preferred embodiment, the material of the grid plate 21 includes paper. Through holes are formed on the grid plate 21. For examples, the grid plate 21 includes a plurality of pores with various forms including squared, rhombus and wavy and so on. In other preferred embodiment, the sizes of the plurality of pores are in the range between about 3 cm to 6 cm.

In one preferred embodiment, the material of the grid plate 21 includes plastic and wood.

In another preferred embodiment, the grid plate 23 is coated by powder baking varnish and a plurality of pores is provided. The powder baking varnish is used to enhance the character of isolation capability of the sound-absorbing planks, and the pores are employed to absorb and isolate the noise through the fillers.

For example, the materials of the panel 23 include but not limited to aluminum plate, stained steel plate, iron plate with zinc or plastic plate. Besides, the shape of the panel 23 includes but not limited to a square panel with a plurality of lattice work. The lattice work is used to absorb the noises around the environment through the fillers 22.
Furthermore, FIG. 3 illustrates a diagram of the grid plate 21 filled by the fillers 22. In one embodiment, the filler 22 includes but not limited to the mixture of the spray-on agent and cementing agent, or natural fibers, paper fibers, glass fibers, mineral fibers, rock wool fibers and ceramic fibers combined with cementing agent.

In one embodiment, the fillers 22 include fiber products, such as regeneration of papers, i.e., newspapers, corrugated papers, and magazines. Furthermore, the fireproof agent, repelling agents and anti-insect and anti-mold reagents may be added into the fillers in processes, so that the present invention has the sound absorption, fireproof, anti-insect and environmental protection function.

The fixing modules 12, 13, 14 and 15 include but not limited to a plurality of long reinforcing frames with different shapes, a plurality of suspenders and a plurality of fasteners. In one embodiment, the long reinforcing frames can be mounted on a wall by the fasteners or mounted below a ceiling by the suspenders and the fasteners.

FIG. 4 illustrates a diagram of the fixing module 12 to fasten the sound-absorbing plank 39 on the wall 37 according to the present invention. The shapes of the long reinforcing frames include C-type, rectangular-type, H-type or first trench-type long reinforcing frame 34, 48, 35 and 36, as shown in FIGS. 8a, 8b, and 8d. For instance, the fasteners include but not limited to screws 30, 31 and 32. While the H-type long reinforcing frame 35 is fastened on the wall 37 by screws 30 and 32 through the screw holes, the C-type long reinforcing frame 34 is fastened below the H-type long reinforcing frame 35 and the rectangular-type long reinforcing frame 48 is fastened above the H-type long reinforcing frame 35, respectively. While the first trench-type long reinforcing frame 36 is mounted on the rectangular-type long reinforcing frame 48, the positions of C-type, H-type and rectangular-type long reinforcing frame 34, 35, 36 and 48 can be fixed. The first trench-type long reinforcing frame 36 is fastened to the rectangular-type long reinforcing frame 48 by screw 32 through screw hole, so that the sound-absorbing plank 39 is mounted by the fixing module 12 and is fastened on the wall 37.

The C-type, H-type, rectangular-type and first trench-type long reinforcing frame 34, 35, 48 and 36 are respectively decorated skirting aggregate, frame of decorated aggregate, fixing aggregate and horizontal fixing frame above and below the surface of wall.

In one embodiment, the C-type long reinforcing frame 34 is named due to its cross-section is C-type, as shown in FIG. 8e. The H-type long reinforcing frame 35 is named because its cross-section is H-type and has two fins face to both sides for fastening, as shown in FIG. 8d. The rectangular-type long reinforcing frame 48 is named due to its cross-section is rectangular-type, such as tabular-type, as shown in FIG. 8a. The first trench-type long reinforcing frame 36 is named because its cross-section is rectangular but having a trench formed therein, and two parallel fins on the opposite surface of the main body of the frame, as shown in FIG. 8b.

FIG. 5 illustrates a diagram of the fixing module 13 that is used to fasten the adjacent sound-absorbing planks on the wall 45 according to the present invention. The long reinforcing frames with different shapes include H-type, rectangular-type and first trench-type long reinforcing frame 35, 48 and 36, as shown in FIGS. 8d, 8a and 8b. For example, the fasteners include but not limited to screws 40, 41, 42, and 43. Screws 40 and 41 are fastened on the wall 45 through the screw holes. While the rectangular-type long reinforcing frame 48 is fastened the H-type long reinforcing frame 35 by screw 43, and the first trench-type long reinforcing frame 36 is mounted on the rectangular-type long reinforcing frame 48 by screw 42 through the screw hole. The H-type, rectangular-type and first trench-type long reinforcing frame 35, 48 and 36 are fastened to the frame 35, 48 and 36 on the wall 45 by screws 40, 41, 42 and 43, so that the sound-absorbing planks 46 and 47 are mounted and fastened on the wall 45.

The rectangular-type, H-type and first trench-type long reinforcing frame 35, 48 and 36 are respectively frame of decorated aggregate, fixed aggregate and horizontal fixed frame above and below the surface of wall, and as the decorated aggregate for grid plate.

FIG. 6 illustrates a diagram of the fixing module 14 that is used to fasten the adjacent sound-absorbing planks on the wall 49 according to the present invention. The long reinforcing frames with different shapes include H-type, rectangular-type and second trench-type long reinforcing frame 35, 48 and 55 as shown in FIGS. 8d, 8a and 8c. For example, the fasteners include but not limited to screws 50, 51, 52 and 53. The H-type long reinforcing frame 35 is fastened on the wall 49 by screws 50 and 51 through the screw holes, respectively. While the rectangular-type long reinforcing frame 48 is fastened with the H-type long reinforcing frame 35 by screw 52, and the second trench-type long reinforcing frame 55 is mounted on the rectangular-type long reinforcing frame 48 by screw 53. One of the second trench-type long reinforcing frame 55 is fastened to other rectangular-type long reinforcing frame 48 by screw 54. Consequently, the H-type, rectangular-type and second trench-type long reinforcing frame 35, 48 and 55 are fastened to the frame 35, 48 and 55 by screws 50, 51, 52, 53 and 54, and then one end of the sound-absorbing plank is mounted on the wall 49 and other end of the sound-absorbing plank is mounted below the ceiling. Accordingly, the sound-absorbing planks 46 and 47 are mounted and fastened within the predetermined accommodating space of the ceiling.

The second trench-type long reinforcing frame 55 is the decorated skirting aggregate for the surfaces of ceiling and wall. The suspenders 61 are used to connect and fasten, and include but not limited to screws, rivets and the mixture of screw, rivet and fastener.

In one embodiment, the second trench-type long reinforcing frame 55 is formed by the connection of one end of two first trench-type long reinforcing frames 36, and the two frames are perpendicular with each other at 90°, as shown in FIG. 8c. The second trench-type long reinforcing frame 55 has a cross section having two rectangular frames and each of frames having a trench therein, and two parallel fins attached to the rectangular frames, respectively.

FIG. 7 illustrates a diagram of the fixing module 15 for fastening the adjacent sound-absorbing planks below ceilings according to the present invention. The long reinforcing frames with different shapes include rectangular-type and first trench-type long reinforcing frame 48 and 36,
as shown in FIGS. 8a and 8b. For example, the fasteners include but not limited to screw 58. The rectangular-type and first trench-type long reinforcing frame 48 and 36 are fastened by screw 58 through the screw holes, and connected and mounted below the ceiling through the suspender 61. Consequently, the sound-absorbing planks 59 and 60 are mounted and fastened within the predetermined accommodating space of the ceiling.

[0053] In generally, one characteristic of the present invention is to provide a structure of light weight building materials with absorption and isolation character, and the sound-absorbing plank is fastened and mounted on the wall or the predetermined accommodating space of the ceiling by the fixing modules. The sizes of the sound-absorbing planks are various with the sizes of the predetermined accommodating spaces of the ceiling, and the sound-absorbing planks can be assembled and mounted to the wall and the predetermined accommodating space of ceiling by using the fixing modules. Moreover, the present invention can reduce the weights of the building materials, easy to produce and dimension for using, and the structure will be much fine and enhanced. Accordingly, the structure of the light weight building material based on the present invention can apply for various buildings and places, such as various motor rooms, maintenance factories, movie theaters, conference halls, film studios, libraries, transport stations, hospitals, gymnasiums, community centers and so on.

[0054] Moreover, the advantages of the present invention are shown as follows. (1) The structure is easy and convenient to assemble in construction sites and pollution problems are eliminated. (2) The treated surfaces are smooth and colorful. (3) The material is non-dank, easy to peeling off and it is easy for clean. (4) The modular structure can be ordered based on the requirements, and easy to dimension. (5) The spray-on operation can be performed in construction sites without the cease of the operation. (6) The materials have the character of sound absorption and strengthen the performance of sound isolation. (7) The materials can easy to produce and can lower the costs. (8) The present invention can perform in any places for reducing the noises. (9) The building materials based on the present invention are high rigidity, easy assembled, regenerated, fine, fireproof, absorption, anti-insect, heat isolation and environmental protection.

[0055] As will be understood by a person skilled in the art, the foregoing preferred embodiments of the present invention is illustrative of the present invention, rather than limiting the present invention. Having described the invention in connection with a preferred embodiment, modification will suggest itself to those skilled in the art. Thus, the invention is not to be limited by this embodiment. Rather, the invention is intended to cover various modifcations and similar arrangements included within the spirit and scope of the appended claims, the scope of which should be accorded the broadest interpretation so as to encompass all such modifications and similar structures.

1. A structure of the light weight building materials with sound absorption and isolation character, comprising:
   a plurality of sound-absorbing planks for absorbing sound, said sound-absorbing planks including a panel, a grid plate and fillers, wherein said panel is attached under said grid plate, said fillers being filling into said panel or said grid plate, wherein the material of said grid plate includes at least paper; and
   a plurality of fixing modules for fixing said sound-absorbing planks on walls or predetermined accommodating spaces of ceilings;
   wherein the sizes of said plurality of sound-absorbing planks are various with said accommodating spaces between walls and ceilings of a building, and said plurality of sound-absorbing planks being configured on walls or ceilings by said plurality of fixing modules.

2. The structure of claim 1, wherein the material of said panel is selected from the group consisting of aluminum plate, stainless steel plate, iron plate with zinc coated thereon and plastic plate.

3. The structure of claim 2, wherein said panel is configured with square shape and has a plurality of holes formed thereon, wherein said panel is coated by powder baking varnish.

4. The structure of claim 1, wherein said grid plate includes a plurality of pores with various forms including squared, rhombus or wavy shape.

5. The structure of claim 1, wherein said fillers includes the mixtures of spray-on agent and cementing agent, and ones of natural fibers, paper fibers, glass fibers, mineral fibers, rock wool fibers and ceramic fibers combined with said cementing agent.

6. The structure of claim 1, wherein said fixing modules include a plurality of long reinforcing frames with various shapes, a plurality of suspenders and a plurality of fasteners, wherein said long reinforcing frames can be mounted on a wall by said fasteners or mounted below a ceiling by said suspenders and said fasteners.

7. The structure of claim 6, wherein said fasteners are used to fasten said adjacent long reinforcing frames with various shapes.

8. The structure of claim 6, wherein said fasteners include a plurality of screws to fasten said adjacent long reinforcing frames with various shapes, so as to fasten said sound-absorbing planks on said wall.

9. The structure of claim 6, wherein each of said plurality of long reinforcing frames has a plurality of holes formed thereon, so that said adjacent long reinforcing frames is fixed to said sound-absorbing planks through said holes, and said sound-absorbing planks are allowed to be fastened on walls by said screws.

10. The structure of claim 6, wherein said plurality of suspenders are used to fasten said long reinforcing frames with different shapes for mounting to said sound-absorbing planks of predetermined accommodating spaces of ceilings.

11. A structure of the light weight building materials with sound absorption and isolation character, comprising:
   a plurality of sound-absorbing planks for absorbing sound, said sound-absorbing planks including a panel, a grid plate and fillers, wherein said panel is attached under said grid plate, said fillers being filling into said panel or said grid plate, wherein the material of said grid plate includes at least plastic and wood; and
   a plurality of fixing modules for fixing said sound-absorbing planks on walls or predetermined accommodating spaces of ceilings;
   wherein the sizes of said plurality of sound-absorbing planks are various with said accommodating spaces...
between walls and ceilings of a building, and said plurality of sound-absorbing planks being configured on walls or ceilings by said plurality of fixing modules.

12. The structure of claim 1, wherein the material of said panel is selected from the group consisting of aluminum plate, stainless steel plate, iron plate with zinc coated thereon and plastic plate.

13. The structure of claim 12, wherein said panel is configured with squared shape and has a plurality of holes formed thereon, wherein said panel is coated by powder baking varnish.

14. The structure of claim 1, wherein said grid plate includes a plurality of pores with various forms including squared, rhombus or wavy shape.

15. The structure of claim 1, wherein said fillers include the mixtures of spray-on agent and cementing agent, and ones of natural fibers, paper fibers, glass fibers, mineral fibers, rock wool fibers and ceramic fibers combined with said cementing agent.

16. The structure of claim 1, wherein said fixing modules include a plurality of long reinforcing frames with various shapes, a plurality of suspenders and a plurality of fasteners, wherein said long reinforcing frames can be mounted on a wall by said fasteners or mounted below a ceiling by said suspenders and said fasteners.

17. The structure of claim 16, wherein said fasteners are used to fasten said adjacent long reinforcing frames with various shapes.

18. The structure of claim 16, wherein said fasteners include a plurality of screws to fasten said adjacent long reinforcing frames with various shapes, so as to fasten said sound-absorbing planks are fastened on said wall.

19. The structure of claim 16, wherein each of said plurality of long reinforcing frames has a plurality of holes formed thereon, so that said adjacent long reinforcing frames is fixed to said sound-absorbing planks through said holes, and said sound-absorbing planks are allowed to be fastened on walls by said screws.

20. The structure of claim 16, wherein said plurality of suspenders are used to fasten said long reinforcing frames with different shapes for mounting to said sound-absorbing planks of predetermined accommodating spaces of ceilings.

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