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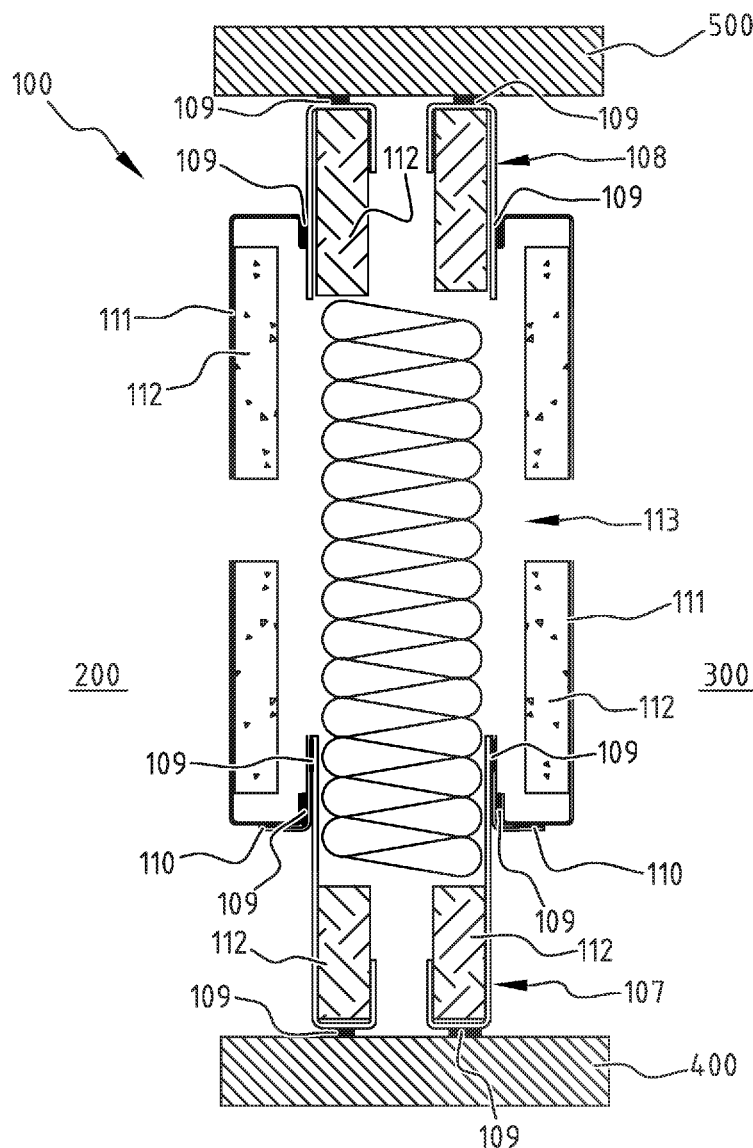
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(2013.01)(21) Appl. No.: **16/620,434**(57) **ABSTRACT**(22) PCT Filed: **May 30, 2018**(86) PCT No.: **PCT/NL2018/050351**

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Partition wall for partitioning a space in a building accessible to people into a first and a second space, comprising a first wall panel and a second wall panel arranged close to, opposite and parallel to the first wall panel, wherein the first and second wall panels bound respectively the first and the second space, wherein the first and second wall panels are disposed structurally clear of each other.



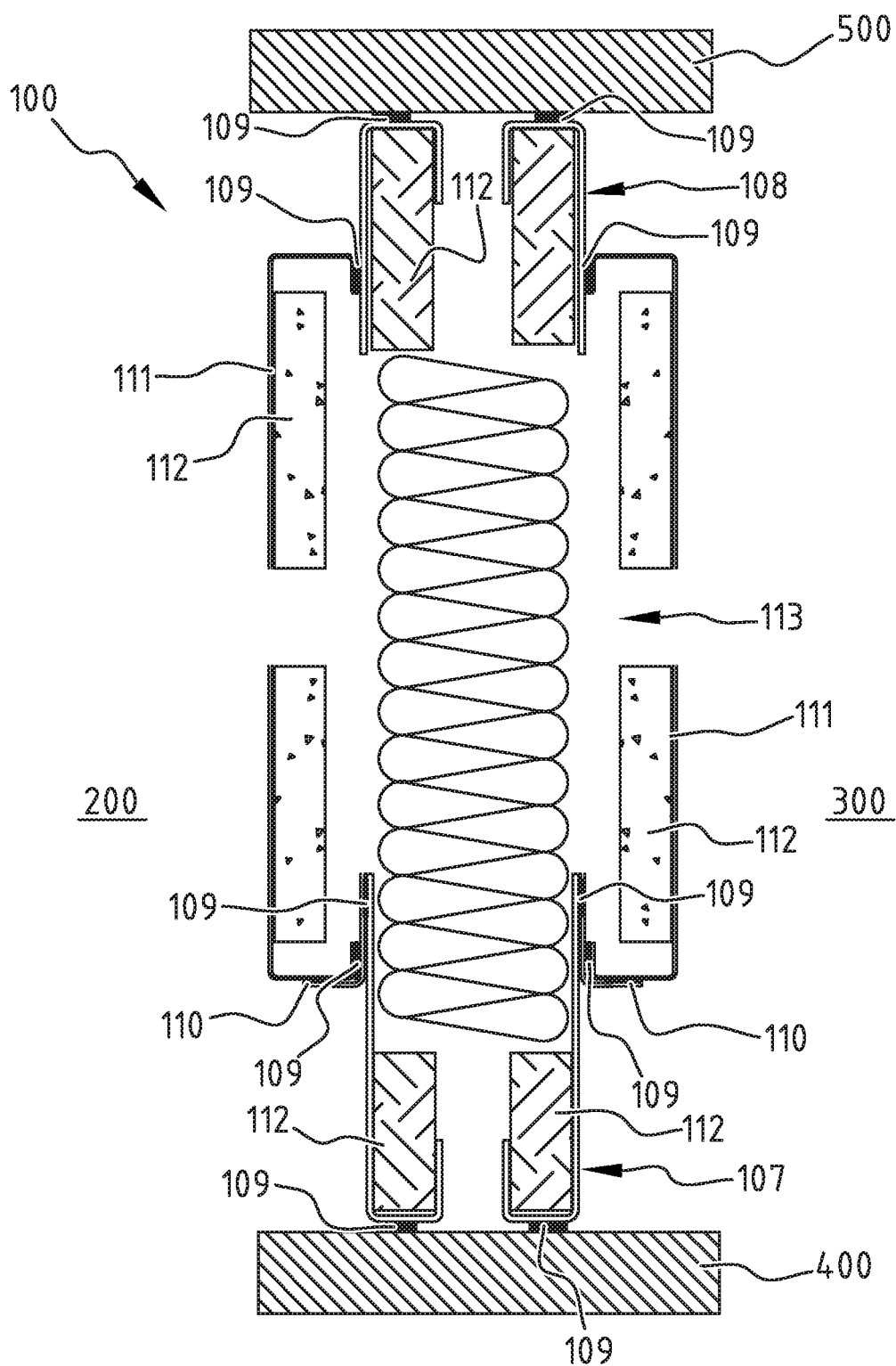


FIG. 1

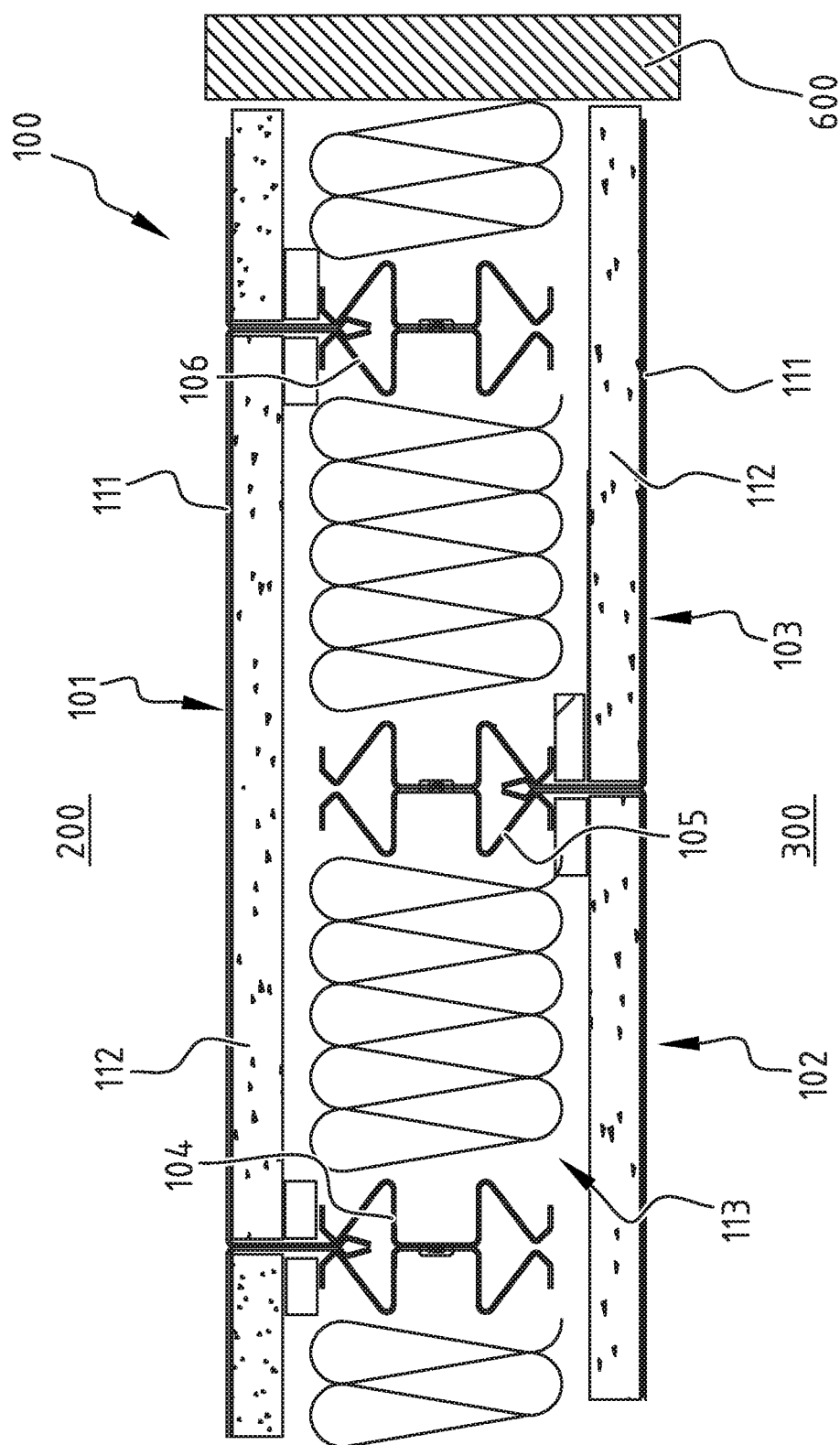


FIG. 2

PARTITION WALL

[0001] The present invention relates to a partition wall for partitioning a space in a building accessible to people into a first and a second space, comprising a first wall panel and a second wall panel arranged close to, opposite and parallel to the first wall panel, wherein the first and second wall panels bound respectively the first and the second space.

[0002] Known partition walls are used in various kinds of interior construction, for example in office buildings, airports, hospitals, industrial estates, public institutions, schools, hotels, cinemas and retail establishments. For reasons including privacy and limiting inconvenience, insulation of the space partitioned by the partition wall is of great importance in many of the above stated applications. For this purpose, wall panels of known partition walls take for instance a non-transparent form. Measures are generally also taken to keep sound in or out of the partitioned space.

[0003] It is however difficult to obtain a high degree of sound insulation over a large frequency range.

[0004] The invention has for its object to increase the sound insulation value of partition walls.

[0005] The present invention provides for this purpose a partition wall of the type stated in the preamble with the special feature that the first and second wall panels are disposed structurally clear of each other. This prevents transmission of vibrations, for instance in the form of sound, through the partition wall from the first space to the second space and vice versa. In other words, such a disposition of the wall panels absorbs such vibrations and therefore has a sound-insulating effect. The disposition of the wall panels thus ensures that the wall panels are acoustically uncoupled, whereby sound produced in the first and/or second space is absorbed to a very great extent by the partition wall, whereby the sound can only be heard to a very reduced extent in respectively the second and/or first space. Surprisingly, the partition wall according to the present invention has a weighted sound reduction index (R_w , value) of at least 62 dB in a measurement in accordance with ISO standard 717-1:2013. The partition wall preferably further comprises a first vertical wall post and a second vertical wall post arranged adjacently thereof, wherein each vertical wall post is configured for mounting a wall panel on sides thereof directed toward the first and second space, wherein the first wall panel is arranged only on the first vertical wall post and the second wall panel only on the second vertical wall post. More preferably, the partition wall further comprises a third vertical wall post successively arranged adjacently of the first and second vertical wall posts and configured for mounting a wall panel on sides thereof directed toward the first and second space, wherein the first wall panel is arranged only on the first and the third vertical wall post.

[0006] According to a preferred embodiment, the partition wall further comprises a horizontal lower post to be mounted on a floor and a horizontal upper post to be mounted on a ceiling, wherein the wall panels are arranged between the upper post and the lower post, and wherein a strip of resilient material is arranged between the floor and the lower post and/or the ceiling and the upper post. Such a strip of resilient material ensures that gaps between the floor and the lower post and/or the ceiling and the upper post are sealed, which increases the weighted sound reduction index (R_w , value) in accordance with ISO 717-1:2013.

[0007] According to a preferred embodiment, the partition wall further comprises a connecting profile between the

lower post and the wall panels and/or the upper post and the wall panels, wherein a strip of resilient material is arranged respectively between the lower post, the connecting profile and/or the wall panels and/or between the upper post, the connecting profile and/or the wall panels. The distance between the connecting profile and the lower post and/or the upper post is herein in particular adjustable. This makes it easily possible to compensate for unevenness in the floor or ceiling (for example in the case of a floor or ceiling which is not level), while the height of the lower post or upper post can be made as small as possible. Such a strip of resilient material between the connecting profile and respectively the lower post and/or the upper post ensures that gaps between the lower post, the connecting profile and/or the wall panels and/or between the upper post, the connecting profile and/or the wall panels are sealed, which increases the weighted sound reduction index (R_w , value) in accordance with ISO 717-1:2013.

[0008] According to a preferred embodiment, the lower post and/or the upper post is provided with a vibration-damping material. Vibrations/sounds of lower frequencies, preferably in the frequency range of 5 to 500 Hz, are hereby damped further so that transmission of these vibrations from the first space to the second space and vice versa is further prevented.

[0009] According to a preferred embodiment, at least one of the first and second wall panels comprises an outer layer directed toward respectively the first and second space and, connected thereto, an inner layer directed away from respectively the first and second space, wherein the outer layer and the inner layer are mutually connected via a vibration-damping material. The outer layer and the inner layer are preferably connected to each other over their whole surface via the vibration-damping material. With a vibration-damping material arranged in such a manner it is possible to achieve a substantially high degree of sound absorption in the low frequency range, which is also referred to as sound deadening. This once again increases said weighted sound reduction index (R_w , value) in accordance with ISO 717-1:2013. The vibration-damping material preferably comprises a resilient material. More preferably, the resilient material comprises a resilient glue. Still more preferably, the resilient glue comprises an adhesive comprising polyvinyl acetate and/or an acrylic sealant.

[0010] According to a preferred embodiment, the outer layer is manufactured from metal and the inner layer from fibreboard. A particular advantage of such fibreboards is that they have excellent sound-insulating properties and therefore contribute to the sound-absorbing capacity of the partition wall according to the present invention. They further have excellent fire resistance and impact resistance and they are moreover lightweight, making them eminently suitable as high-grade and lightweight construction material for partition walls.

[0011] According to a further preferred embodiment, a vertically extending inner side of the lower post and/or the upper post is provided with a fibreboard. This prevents transmission of vibrations and sounds via, successively, the floor and lower post and/or the ceiling and upper post in efficient manner. Said fibreboard preferably comprises a gypsum fibre board.

[0012] According to a preferred embodiment, a layer of rock wool is arranged between at least the first and second wall panels. A particular advantage of rock wool is that it is

very fireproof, absorbs the sound and prevents sound vibrations to a great extent. It moreover has a long lifespan, this enhancing the lifespan of the partition wall and the preservation of the sound-insulating properties of the partition wall.

[0013] According to a preferred embodiment, a specific weight of the layer of rock wool is a minimum of 45 kg/m^3 and a thickness of the layer of rock wool lies between 20 and 80 mm, preferably between 35 and 65 mm. The property of rock wool which affects the degree of acoustic insulation is the air throughflow resistance. This is approximately directly proportional to the density of the rock wool. For each 10 kg/m^3 increase of the density of the rock wool, the air throughflow resistance increases by about $10 \text{ kPa}\cdot\text{s/m}^2$. It is not only the pressing, which determines the density of the rock wool, but also the thickness of the rock wool that determines the air throughflow resistance of the rock wool. It has been found that a layer of rock wool with a density of a minimum of 45 kg/m^3 and preferably a thickness of between 35 and 65 mm in particular contributes to an increase of said weighted sound reduction index (R_w value) in accordance with ISO 717-1:2013.

[0014] According to a preferred embodiment, the first and/or the second wall panel is manufactured from its side directed toward respectively the first and/or second space to its side directed away from respectively the first and/or second space from, successively, layers of the following materials: steel, resilient glue, fibreboard, rock wool, fibreboard, resilient glue and steel. This composition of a plurality of porous layers or areas with different densities and different flow resistances provides a thin composite sound damper. What is important in this respect are the boundary layers between the different layers, which create changes in acoustic impedance. Because of the effect of thermal friction, it is mainly higher frequencies which are absorbed in the porous material. This is however not the only aspect of the absorption mechanism according to the present invention. An abrupt change in impedance results at the boundary surface between two materials with different densities or different flow resistances. This results in a phase shift of a sound wave, whereby the sound is damped/absorbed at this location. In contrast to using only porous absorption layers with homogenous or continuously increasing flow resistance, using different transitions and porous materials, each with suitable, different input impedances, makes it possible to achieve a substantially high degree of absorption of sound vibrations with relatively low frequencies, such as vibrations of about 5 to 500 Hz. Such a layer composition, in combination with the wall panels disposed structurally clear of each other, in this way provides for a damping of sound vibrations of both low frequencies, such as vibrations of about 5 to 500 Hz, and high frequencies, such as vibrations of about 0.5 to 5 kHz. This once again increases the weighted sound reduction index (R_w value) in a measurement in accordance with ISO standard 717-1:2013. In other words, a high sound insulation over a large frequency range is achieved by the composition of layers with different densities and flow resistances, as well as the acoustic uncoupling of the wall panels. In other words, the mass-spring system defined by the partition wall according to the present invention is optimized such that a weighted sound reduction index (R_w value) of at least 62 dB in accordance with ISO 717-1:2013 is achieved.

[0015] It is noted that the partition wall according to the present invention also comprises a door in such a partition wall, wherein front and rear, i.e. inner and outer, door panels of the door, i.e. panels directed toward respectively the first and second space, are disposed and embodied in the same way as the above stated wall panels of the partition wall according to the invention and the above stated preferred embodiments thereof. It is noted here that such a door is preferably embodied as a sandwich construction. Such a door preferably comprises, from its side directed toward the first and/or second space toward its side directed away from respectively the first and/or second space, successively, layers manufactured from the following materials: steel, resilient glue, fibreboard, rock wool, fibreboard, resilient glue, steel or steel, resilient glue, steel, rock wool, steel, resilient glue, steel.

[0016] The present invention is further elucidated on the basis of the following figures which show preferred embodiments of the partition wall according to the present invention and are not intended to limit the scope of protection of the invention in any way, wherein:

[0017] FIG. 1 is a cross-sectional side view of an embodiment of the partition wall according to the invention; and

[0018] FIG. 2 is a cross-sectional top view of an embodiment of the partition wall according to the invention.

[0019] FIGS. 1 and 2 show respectively a cross-sectional side view and top view of a partition wall 100 according to the invention for partitioning a space into a first space 200 and a second space 300. Partition wall 100 is placed between a floor 400 and a ceiling 500 and against a wall 600, and consists inter alia of three wall panels 101, 102 and 103, which are mounted on vertical clamping posts 104, 105 and 106. In the shown embodiment wall panels 101, 102 and 103 are steel wall panels, each with a steel outer cladding with a thickness of about 0.8 mm. Wall panels 101, 102 and 103 are arranged on clamping posts 104, 105 and 106 such that wall panel 101 is arranged only on the vertical clamping posts 104 and 106, while wall panels 102 and 103 are not arranged on the vertical clamping posts 104 and 106 and share clamping post 105 in a structural sense. In this way wall panel 101 is disposed structurally clear of wall panels 102 and 103, whereby wall panel 101 is acoustically uncoupled from wall panels 102 and 103. Sound produced in the first space 200 and/or the second space 300 is hereby at least substantially wholly absorbed by partition wall 100. More specifically, the partition wall 100 according to FIGS. 1 and 2 has a weighted sound reduction index (R_w value) of at least 62 dB in a measurement in accordance with ISO standard 717-1:2013.

[0020] Partition wall 100 further comprises a horizontal lower post 107, mounted on floor 400, of steel plate with a thickness of about 1.5 mm and a horizontal upper post 108, mounted on ceiling 500, of steel plate with a thickness of about 1.5 mm, wherein wall panels 101, 102 and 103 are arranged between upper post 108 and lower post 107. A strip of resilient material 109 is further arranged between floor 400 and lower post 107 and between ceiling 500 and upper post 108. Strip 109 of resilient material ensures that gaps between floor 400 and lower post 107 and between ceiling 500 and upper post 108 are sealed, which increases the weighted sound reduction index (R_w value) in accordance with ISO 717-1:2013.

[0021] Partition wall 100 further comprises a connecting profile 110 between lower post 107 and wall panels 101, 102

and 103. A strip of resilient material 109 is also arranged between lower post 107, connecting profile 110 and wall panels 101, 102 and 103 as well as between upper post 108 and wall panels 101, 102 and 103. The distance between connecting profile 110 and lower post 107 is herein in particular adjustable. This makes it easily possible to compensate for unevenness in floor 400, while the height of lower post 107 can be made as small as possible. Such a strip 109 of resilient material between lower post 107, connecting profile 110 and wall panels 101, 102 and 103 as well as between upper post 108 and wall panels 101, 102 and 103 likewise ensures that gaps between lower post 107, connecting profile 110 and wall panels 101, 102 and 103 as well as between upper post 108 and wall panels 101, 102 and 103 are sealed, which increases the weighted sound reduction index (R_w value) in accordance with ISO 717-1:2013.

[0022] Wall panels 101, 102 and 103 further comprise an outer layer 111, for instance of metal, and an inner layer 112 of gypsum fibre board. A particular advantage of such gypsum fibre boards 112 is that they have excellent sound-insulating properties and therefore contribute to the sound-absorbing capacity of partition wall 100. Lower post 107 and upper post 108 are also provided with gypsum fibre material 112. This also prevents transmission of sound vibrations via, successively, floor 400 and lower post 107 and ceiling 500 and upper post 108 in efficient manner.

[0023] In addition to the above stated sound damping measures, a layer of rock wool 113 with a thickness of about 60 mm is arranged between wall panel 101 and wall panels 102, 103. In addition to the above stated measures, rock wool 113 provides for a substantial sound reduction, which increases the weighted sound reduction index (R_w value) in accordance with ISO 717-1:2013.

[0024] Finally, sound-damping spacers are placed between inter alia wall panel 101 and clamping posts 104 and 106 as well as between wall panels 102, 103 and clamping post 105, such that the transmission of vibrations from said wall panels 101-103 to the respective clamping posts 104-106 is minimized.

[0025] The present invention is not limited to the shown embodiments but also extends to other embodiments falling within the scope of protection of the appended claims.

1. Partition wall for partitioning a space in a building accessible to people into a first and a second space, comprising:

- a first wall panel; and
 - a second wall panel arranged close to, opposite and parallel to the first wall panel,
- wherein the first and second wall panels bound respectively the first and the second space, and
- wherein the first and second wall panels are disposed structurally clear of each other.

2. Partition wall as claimed in claim 1, further comprising a first vertical wall post and a second vertical wall post arranged adjacently thereof, wherein each vertical wall post is configured for mounting a wall panel on sides thereof directed toward the first and second space, wherein the first wall panel is arranged only on the first vertical wall post and the second wall panel only on the second vertical wall post.

3. Partition wall as claimed in claim 2, further comprising a third vertical wall post successively arranged adjacently of

the first and second vertical wall posts and configured for mounting a wall panel on sides thereof directed toward the first and second space, wherein the first wall panel is arranged only on the first and the third vertical wall post.

4. Partition wall as claimed in claim 1, further comprising a horizontal lower post to be mounted on a floor and a horizontal upper post to be mounted on a ceiling, wherein the wall panels are arranged between the upper post and the lower post, and wherein a strip of resilient material is arranged between the floor and the lower post and/or the ceiling and the upper post.

5. Partition wall as claimed in claim 4, further comprising a connecting profile between the lower post and the wall panels and/or the upper post and the wall panels, wherein a strip of resilient material is arranged respectively between the lower post, the connecting profile and/or the wall panels and/or between the upper post, the connecting profile and/or the wall panels.

6. Partition wall as claimed in claim 4, wherein the lower post and/or the upper post is provided with a vibration-damping material.

7. Partition wall as claimed in claim 1, wherein at least one of the first and second wall panels comprises an outer layer directed toward respectively the first and second space and, connected thereto, an inner layer directed away from respectively the first and second space, wherein the outer layer and the inner layer are mutually connected via a vibration-damping material.

8. Partition wall as claimed in claim 7, wherein the outer layer and the inner layer are connected to each other over their whole surface via the vibration-damping material.

9. Partition wall as claimed in claim 7, wherein the vibration-damping material comprises a resilient material.

10. Partition wall as claimed in claim 9, wherein the resilient material comprises a resilient glue.

11. Partition wall as claimed in claim 10, wherein the resilient glue comprises an adhesive comprising polyvinyl acetate and/or an acrylic sealant.

12. Partition wall as claimed in claim 8, wherein the outer layer is manufactured from metal and the inner layer from fibreboard.

13. Partition wall as claimed in claim 4, wherein a vertically extending inner side of the lower post and/or the upper post is provided with a fibreboard.

14. Partition wall as claimed in claim 13, wherein the fibreboard comprises a gypsum fibre board.

15. Partition wall as claimed in claim 1, wherein a layer of rock wool is arranged between at least the first and second wall panels.

16. Partition wall as claimed in claim 15, wherein a specific weight of the layer of rock wool is a minimum of 45 kg/m³ and a thickness of the layer of rock wool lies between 20 and 80 mm, preferably between 35 and 65 mm.

17. Partition wall as claimed in claim 1, wherein the first and/or the second wall panel is manufactured from its side directed toward respectively the first and/or second space to its side directed away from respectively the first and/or second space from, successively, layers of the following materials: steel, resilient glue, fibreboard, rock wool, fibreboard, resilient glue and steel.

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