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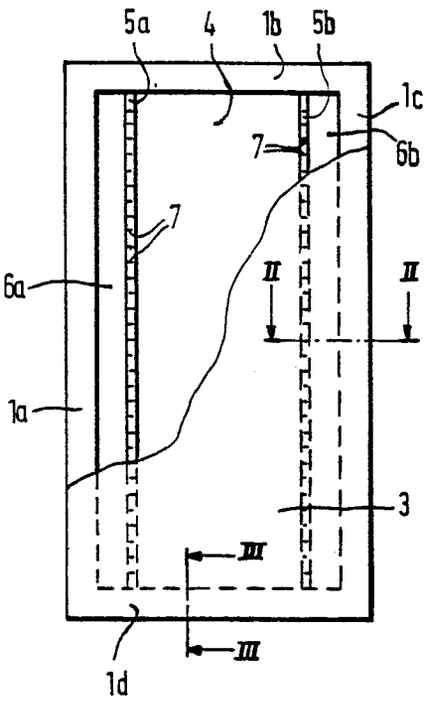
(54) A sound-damping wall element having a frame and at least two panels.

(57) A sound-damping wall element having a frame (1a-d) and at least two panels (2, 3) connected to the frame in such a manner that there is produced an inner space (4) that is sealed off from the surroundings and which is bounded on the one hand by the inner surfaces of the panels and on the other hand by an inner circumferential surface of the frame extending from one panel to the other. Spaced apart from the inner circumferential surface of the frame, and inwardly relatively thereto, there is provided along at least a part of its circumferential length, a surface (5a, b) extending from one panel to the other and forming part of an element. Said element has at least one opening (7) that connects the sealed inner space on one side of the element to that on the other side. The arrangement is such that there is formed between frame and element a space (6a, b) which, together with the opening or openings in the element, functions as a sound-damping resonator.

FIG 1



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A sound-damping wall element having a frame and at least two panels

This invention relates to a sound-damping wall element having a frame and at least two panels connected to the frame in such a manner that there is produced an inner space that is sealed off from the surroundings and which is bounded on the one hand by the inner surfaces of the panels and on the other hand by an inner circumferential surface of the frame extending from one panel to the other.

A wall element of this kind is known from Dutch patent application 83.00212, in which the frame is hollow and functions as a resonator body connected through a slit to the space between the two panels. This construction is especially suitable for windows whose panels consist of glass panes and whose frame is made e.g. from aluminum or a similar material suitable for a hollow construction. Naturally, this sound-damping construction is also suitable for other types of wall elements, such as fixed panels and doors, in which case, however, the special frame construction may result in complications or may be too expensive.

It is an object of the present invention to provide an effective sound-damping for a wall element of the above described type, and having a solid frame, in a simple and comparatively inexpensive manner.

This is achieved, according to the present invention, in that spaced apart from the inner circumferential surface of the frame, and inwardly relatively thereto, there is provided along at least a part of its circumferential length, a surface extending from the one panel to the other and forming part of an element having at least one opening that connects the sealed inner space on one side of the element to that on the other side in such a manner that there is formed between frame and element a space which, together with the opening or openings in the element, functions as a sound-damping resonator. Owing to these features, there is provided by very simple means and in a manner similar to that of the prior art, a sound-damping arrangement in the form of a resonator, in spite of the presence of a solid frame. On the one hand, this is possible by using the inner side of the panel walls for forming the resonator space, which is mostly not desirable in case the panels are glass panes, and on the other hand owing to the absence of flanges extending from the frame into the inner space and, in the known construction, forming part of the resonator, but which would now form undesirable walls extending into the resonator. An additional advantage is that the element which has to be coupled to the frame or has to be contiguous therewith at the ends of the resonator space, means a further stiffening and reinforcement of the frame itself, an advantage which is therefore additionally obtained automatically.

A good resonator effect requires a given length of the access opening and/or slit which, like the volume of the resonator space, is tuned to the main frequency to be damped. This length can be obtained in a simple manner when according to a further embodiment of the present invention, the element, in panel surface direction, has a width that corresponds with the required length for the access opening of the resonator. The element is preferably provided with a plurality of bores serving as access openings for a Helmholtz resonator, since this has an optimum damping efficiency. This can be realized in a very simple manner when, according to a further preferred embodiment of the present invention, the element consists of at least one slat, e.g. of wood. A slit resonator can then be obtained by means of two slats or one slitted slat, or, as stated above, a preferred Helmholtz resonator by providing a plurality of bores in a slat.

In general, the total inner space of the wall element, minus the portion separated therefrom for forming the resonator, or the remaining inner space, will be many times larger than the resonator space itself, while the diameter of an access opening or the height of an access slit is only a part of the distance between the two panels. As a result, it is possible to provide further sound-insulating and/or fireproof and/or fire-retarding means in the remaining inner space. For instance, it is possible according to a further embodiment of the present invention that the portion of the inner space not forming part of the resonator space accommodates further soundproofing arrangements, such as a glasswool blanket and/or a gypsum cardboard and the like, which fill up said space only partly, with the access opening or openings for the resonator terminating in the non-filled remaining inner space.

The above description has been given with reference to a resonator or the resonator. It stands to reason that several resonators may be provided, each being tuned to a given frequency, i.e. each damping a given frequency optimally. Different resonators may be tuned to different frequencies, or two or more to the same frequency, thus making a wide variety of variant embodiments possible. In the event that a sound-damping wall element is a door with a wooden circumferential frame and door panels mounted thereon, it is preferred that the element consists of two wooden slats extending the full height of the door, each forming a resonator together with a vertical portion of the circumferential frame.

One embodiment of the sound-damping wall

element according to the present invention will now be further described, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a front view of a sound-damping wall element;

Fig. 2 is a cross-sectional view taken on the line II-II of Fig. 1; and

Fig. 3 is a cross-sectional view taken on the line III-III of Fig. 1.

The drawings show a sound-damping wall element composed of a wooden circumferential frame consisting of four frame portions 1a-d on either side of which there is mounted a panel 2, 3, thereby forming an entirely enclosed inner space 4. Panel 2 is partly removed in Fig. 1 to show the interior of the wall element. Parallel to the frame portion 1a, 1c and spaced apart therefrom, there is provided a slat 5a, 5b contiguous at its ends with frame portion 1b and 1d, respectively. There is thus created between frame portion 1a and slat 5a, and frame portion 1c and slat 5d, respectively, a space separated from the inner space 4 and functioning as a resonator space 6a, 6b. Each resonator space is in open communication, through bores 7 in slat 5a, 5b, with the remaining portion of the inner space 4. The total bore area of bores 7, as well as the volume of the resonator space 6a, 6b are tuned to the principal frequency to be damped. The latter defines at the same time the required length of bores 7 and thus the width in panel direction of the slat 5a, 5b.

The remaining portion of the inner space 4 contains further sound-insulating and fire-proofing or fire-retarding means in the form of a gypsum cardboard 8 and a glasswool blanket 9, abutting against panel 3, and panel 2, respectively, so that the portion of the inner space 4 remaining after installation of said means remains in direct contact through bores 7 with the resonator spaces 6a, 6b.

Naturally, many modifications and variants are possible within the scope of the present invention. For instance, in the drawings, the resonator spaces 6a, 6b are both tuned to the same frequency by imparting to them the same volume and the same passage area and length of the access opening. However, resonator space 6a can also be tuned to a different frequency than resonator space 6b by changing the above magnitudes relatively thereto. Besides, resonators that may be tuned to any desired frequency can be installed along the short side of the frame as well. Tuning to a desired frequency is possible by subdividing resonator spaces 6a, 6b into spaces of a given volume; it is likewise possible to shift slat 5a or 5b to the left or to the right. Should the wall panel have such large sizes that additional frame portions are necessary from a viewpoint of strength and stiffness, these can naturally also serve for forming further resonators. Instead of the Helmholtz resonators shown, there may be provided slit resonators by providing longitudinal slits in the slats, instead of bores, or by mounting a slat on each panel in such a manner that the desired slit remains therebetween. A preferred embodiment concerns the provision of the desired length of access opening by selecting the slat width accordingly. Naturally, it is also possible to provide the required length of access opening in a different manner with a thinner element, e.g. by means of nozzles formed integrally therewith in the event of a Helmholtz resonator or integral flanges in the event of a slit resonator.

Claims

1. A sound-damping wall element having a frame and at least two panels connected to the frame in such a manner that there is produced an inner space that is sealed off from the surroundings and which is bounded on the one hand by the inner surfaces of the panels and on the other hand by an inner circumferential surface of the frame extending from one panel to the other, characterized in that spaced apart from the inner circumferential surface of the frame, and inwardly relatively thereto, there is provided along at least a part of its circumferential length, a surface extending from one panel to the other and forming part of an element having at least one opening that connects the sealed inner space on one side of the element to that on the other side in such a manner that there is formed between frame and element a space which, together with the opening or openings in the element, functions as a sound-damping resonator.

2. A sound-damping wall element as claimed in claim 1, characterized in that the element, in panel surface direction, has a width that corresponds with the required length for the access opening of the resonator.

3. A sound-damping wall element as claimed in claim 2, characterized in that the element is provided with a plurality of bores serving as access openings for a Helmholtz resonator.

4. A sound-damping wall element as claimed in any of the preceding claims, characterized in that the element consists of at least one slat, e.g. made from wood.

5. A sound-damping wall element as claimed in any of the preceding claims, characterized in that the portion of the inner space not forming part of the resonator space accommodates further sound-proofing arrangements, such as a glasswool blanket and/or a gypsum cardboard and the like, which

fill up said space only partly, and the access opening or openings for the resonator terminate in the non-filled remaining inner space.

6. A sound-damping wall element as claimed in any of the preceding claims, such as a door having a wooden circumferential frame and door panels mounted thereon, characterized in that the element consists of two wooden slats extending the full height of the door, each forming a resonator together with a vertical portion of the circumferential frame.

FIG 1

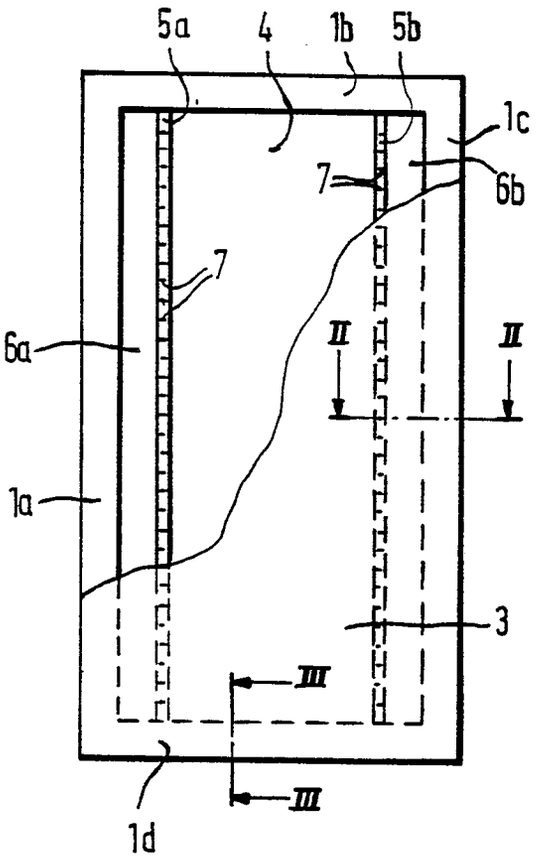
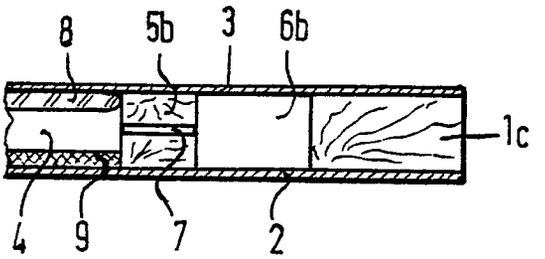


FIG.2



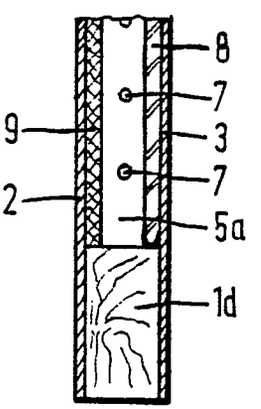


FIG.3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 88 20 1302

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	FR-A-2 284 744 (SAINT-GOBAIN) * Page 4, lines 1-14; figure 2 *	1	E 06 B 5/20
A	DE-A-2 446 858 (RAUCH MÖBELWERKE KG) * Page 7, last paragraph - page 8, paragraph 2; figures 1,2 *	1	
A	AT-B- 344 393 (REINBERG) * Page 2, lines 20-28; figure *	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

E 06 B
E 04 B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	20-09-1988	CLASING M.F.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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