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(54) Soundproofing panel for acoustic barriers

(57) A soundproofing panel (1) for acoustic barriers, which is defined exclusively by a sheet (2) preferably, though not exclusively, made of metal, and having, on one of the two lateral surfaces, a number of longitudinal sound-breaking fins (3) parallel to and facing one another, and each for breaking the front (F) of the incident sound wave; the longitudinal sound-breaking fins (3) having a T-shaped section, and being equally spaced along the whole lateral surface (2a) of the sheet (2) to define a number of open gaps (4) for preventing propagation of the incident sound wave; each gap (4) possibly housing an insert (9) of soundproofing and/or sound-absorbing material; and the back of each gap (4) possibly having drawings (11) with the concavity selectively facing inwards or outwards of the gap (4) to vary the total volume of each gap (4) on the soundproofing panel (1) as required.

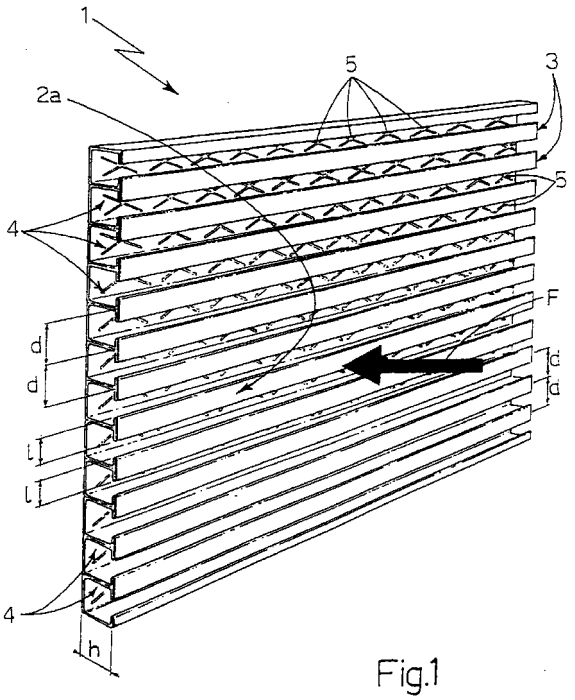

Fig.1

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Description

[0001] The present invention relates to a soundproofing panel for acoustic barriers.

[0002] In particular, the present invention relates to a panel for acoustic barriers used to prevent the propagation of pollutant sound waves in open spaces, to which application the following description refers purely by way of example.

[0003] As is known, the propagation of pollutant sound waves in open spaces - such as along motorways or railways, around building sites or factories - is currently prevented using acoustic barriers comprising a number of sound-absorbing and/or soundproofing panels placed adjacent to one another on supporting frames to form a substantially vertical wall surrounding, normally seamlessly, the pollutant sound source.

[0004] Currently used sound-absorbing and/or soundproofing panels are rectangular, and are defined by a parallelepiped-shaped outer box shell normally made of zinc plated, painted sheet metal and filled with glass wool or similar. The outer box shell is formed by fitting together two half-shells, and mainly provides for soundproofing, while the filler material mainly provides for sound absorption.

[0005] The main drawback of currently used sound-absorbing and/or soundproofing panels is their inability to adapt, or rather be "tuned", to the characteristics, i.e. the frequency spectrum, of the incident sound wave, so as to maximize shielding capacity. The characteristics of the pollutant sound wave, in fact, vary according to the pollutant sound source (moving vehicles and trains, machinery, etc.), whereas the curve representing attenuation of the incident sound wave as a function of the frequency of the sound-absorbing and/or soundproofing panel is of a given fixed shape (continuous line in Figure 3).

[0006] It is an object of the present invention to provide a panel for acoustic barriers, designed to eliminate the aforementioned drawbacks.

[0007] According to the present invention, there is provided a panel for acoustic barriers, characterized by being defined exclusively by a sheet having, on one of the two lateral surfaces, a number of longitudinal sound-breaking fins parallel to and facing one another, and each for breaking the front of the incident sound wave.

[0008] A non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a schematic view in perspective of a soundproofing panel for acoustic barriers, in accordance with the teachings of the present invention;

Figure 2 shows a larger-scale detail of Figure 1;

Figure 3 shows a number of frequency versus attenuation curves obtainable using the Figure 1 soundproofing panel;

Figures 4 and 5 show views in perspective of two variations of the Figure 1 soundproofing panel.

[0009] Number 1 in Figures 1 and 2 indicates as a whole a soundproofing panel particularly suitable for forming acoustic barriers for preventing the propagation of pollutant sound waves in preferably, though not necessarily, open spaces.

[0010] Soundproofing panel 1 is defined by a sheet 2 having, on one of the two lateral surfaces, a number of longitudinal sound-breaking fins 3 parallel to and facing one another, and each for breaking the front F of the incident sound wave.

[0011] In the example shown, sheet 2 is made of metal, such as steel or aluminium, possibly painted and/or zinc plated to withstand atmospheric agents, but may obviously also be made of plastic material or similar.

[0012] Longitudinal sound-breaking fins 3 are T-shaped in section and equally spaced over the whole of lateral surface 2a of sheet 2 to define a number of open gaps 4 for preventing propagation of the incident sound wave, in the same way as currently marketed double glazing. Being located side by side and full of air, in fact, gaps 4 define a layer of air, which simultaneously provides for soundproofing and sound absorption, in the same way as the layer of air trapped between the two panes of glass of a double-glazed window. Gaps 4 also act as sound boxes by more effectively attenuating a given sound frequency spectrum depending on the geometric dimensions of gaps 4.

[0013] With reference to Figure 2, in the example shown, sheet 2 has a fretted profile, so that longitudinal sound-breaking fins 3 are defined by the stiffening ribs of sheet 2, and sheet 2 may thus be obtained directly by subjecting a flat rolled section to a succession of rolling, die-forming operations or similar production process.

[0014] Finally, sheet 2 preferably, though not necessarily, comprises a number of stiffening drawings 5, which are X-shaped in the example shown, are equally spaced along the back of gaps 4, and provide for increasing the structural rigidity of sheet 2 and the soundproofing capacity of panel 1 by raising the natural resonance frequency of sheet 2. Obviously, the dimensions and distribution of drawings 5 may vary to adjust the natural resonance frequency of sheet 2 as required.

[0015] In the Figure 4 variation, soundproofing panel 1 also comprises a number of inserts 9 made of soundproofing and/or sound-absorbing material, and each housed inside a respective gap 4 on the panel. Inserts 9 extend the full length of respective gaps 4, may vary in thickness according to their position on soundproofing panel 1, and are all preferably, though not necessarily, made of the same soundproofing and/or sound-absorbing material.

[0016] In the example shown, each insert 9 is retained inside respective gap 4 by a retaining grille 10 inserted inside gap 4, directly over insert 9. Each grille

on soundproofing panel 1 is obviously fitted between the two longitudinal sound-breaking fins 3 defining respective gap 4, to prevent insert 9 from falling out when soundproofing panel 2 is set up.

[0017] In the Figure 5 variation, sheet 2 of soundproofing panel 1 also comprises a number of preferably, though not necessarily, semispherical auxiliary drawings 11 appropriately distributed along the back of gaps 4. The concavity of each drawing 11 may selectively face inwards or outwards of soundproofing panel 1, i.e. inwards or outwards of respective gap 4, so as to vary the total volume of each gap 4 of soundproofing panel 1 as required. The number, depth, shape and arrangement of auxiliary drawings 11 may obviously vary inside each gap 4.

[0018] The above solution provides for adjusting, at the production stage of soundproofing panel 1, the attenuation characteristic of each gap 4 on soundproofing panel 1 independently of the others. As stated, each gap 4 acts as a sound box for more effectively attenuating a given sound frequency spectrum, depending on the geometric dimensions, i.e. volume, of gap 4.

[0019] Operation of soundproofing panel 1 is easily deducible from the foregoing description with no further explanation required.

[0020] It should be pointed out, however, that tests have shown that, by appropriately varying the distance d between adjacent longitudinal sound-breaking fins 3, the height h of longitudinal sound-breaking fins 3, and the width 1 of the heads of longitudinal sound-breaking fins 3, the attenuation curve of soundproofing panel 1 can be adjusted as a function of frequency, so as to "tune" the response of the panel to the characteristics of the incident sound wave.

[0021] The dimensions and distribution of longitudinal sound-breaking fins 3, in fact, determine the dimensions of gaps 4, which, acting as sound boxes, provide for more effectively attenuating a given sound frequency spectrum. Figure 3 shows, as a function of frequency, the attenuation curve $A_0(f)$ of a conventional panel (continuous line), and the attenuation curves $A_1(f)$, $A_2(f)$, $A_3(f)$ of three different geometric configurations of soundproofing panel 1 (dash lines).

[0022] In the event soundproofing panel 1 is equipped with inserts 9, attenuation curve A(f) may obviously also be adjusted using different soundproofing and/or sound-absorbing materials for inserts 9.

[0023] The advantages of soundproofing panel 1 will be clear from the foregoing description: it is now possible to produce acoustic barriers specially designed to attenuate the sound waves generated by specific pollutant sound sources. This may obviously also be achieved using adjacent soundproofing panels 1 with appropriately differing attenuation curves.

[0024] A further advantage of soundproofing panel 1 as described and illustrated above lies in it being much cheaper to produce than currently used panels, by having no sound-absorbing filler material.

[0025] Clearly, changes may be made to acoustic barrier soundproofing panel 1 as described and illustrated herein without, however, departing from the scope of the present invention.

Claims

1. A soundproofing panel (1) for acoustic barriers, characterized by being defined exclusively by a sheet (2) having, on one of the two lateral surfaces, a number of longitudinal sound-breaking fins (3) parallel to and facing one another, and each for breaking the front of the incident sound wave.

2. A soundproofing panel as claimed in Claim 1, characterized in that said longitudinal sound-breaking fins (3) are distributed along the whole lateral surface (2a) of the sheet (2) so as to define a number of open, side by side gaps (4) preventing propagation of the incident sound wave.

3. A soundproofing panel as claimed in Claim 2, characterized in that said longitudinal sound-breaking fins (3) have a T-shaped section.

4. A soundproofing panel as claimed in any one of the foregoing Claims, characterized in that said sheet (2) has a fretted profile, so that said longitudinal sound-breaking fins (3) are defined by the stiffening ribs of the sheet (2).

5. A soundproofing panel as claimed in any one of the foregoing Claims, characterized in that said sheet (2) comprises a number of stiffening drawings (5) distributed along the back of said gaps (4).

6. A soundproofing panel as claimed in Claim 5, characterized in that the dimensions and the distribution of said stiffening drawings (5) on the sheet (2) may vary so as to adjust the natural resonance frequency of said sheet (2).

7. A soundproofing panel as claimed in any one of the foregoing Claims, characterized in that said sheet (2) is obtained directly by subjecting a flat rolled section to a succession of rolling operations.

8. A soundproofing panel as claimed in any one of the foregoing Claims, characterized in that the dimensions of said longitudinal sound-breaking fins (3) and the distribution of said longitudinal sound-breaking fins (3) on the lateral surface (2a) of said sheet (2) may vary to adapt the attenuation curve of said panel (1) to the characteristics of the incident sound wave.

9. A soundproofing panel as claimed in any one of the foregoing Claims, characterized in that said sheet

(2) is made of metal.

10. A soundproofing panel as claimed in any one of the foregoing Claims, characterized by comprising a number of inserts (9) made of soundproofing and/or sound-absorbing material, and each housed inside a respective gap (4) on said panel.

11. A soundproofing panel as claimed in Claim 10, characterized by comprising a number of retaining grilles (10), each inserted inside a respective gap (4), directly over the corresponding insert (9), so as to retain the insert (9) inside said gap (4).

12. A soundproofing panel as claimed in any one of the foregoing Claims, characterized in that said sheet (2) comprises a number of auxiliary drawings (11) appropriately distributed at the back of said gaps (4); the concavity of each of said auxiliary drawings (11) selectively facing inwards or outwards of the corresponding gap (4) to adjust the total volume of each gap (4) on the soundproofing panel (1) as required.

13. A soundproofing panel as claimed in Claim 12, characterized in that the number, depth, shape and distribution of said auxiliary drawings (11) may vary inside each gap (4) on said soundproofing panel (1).

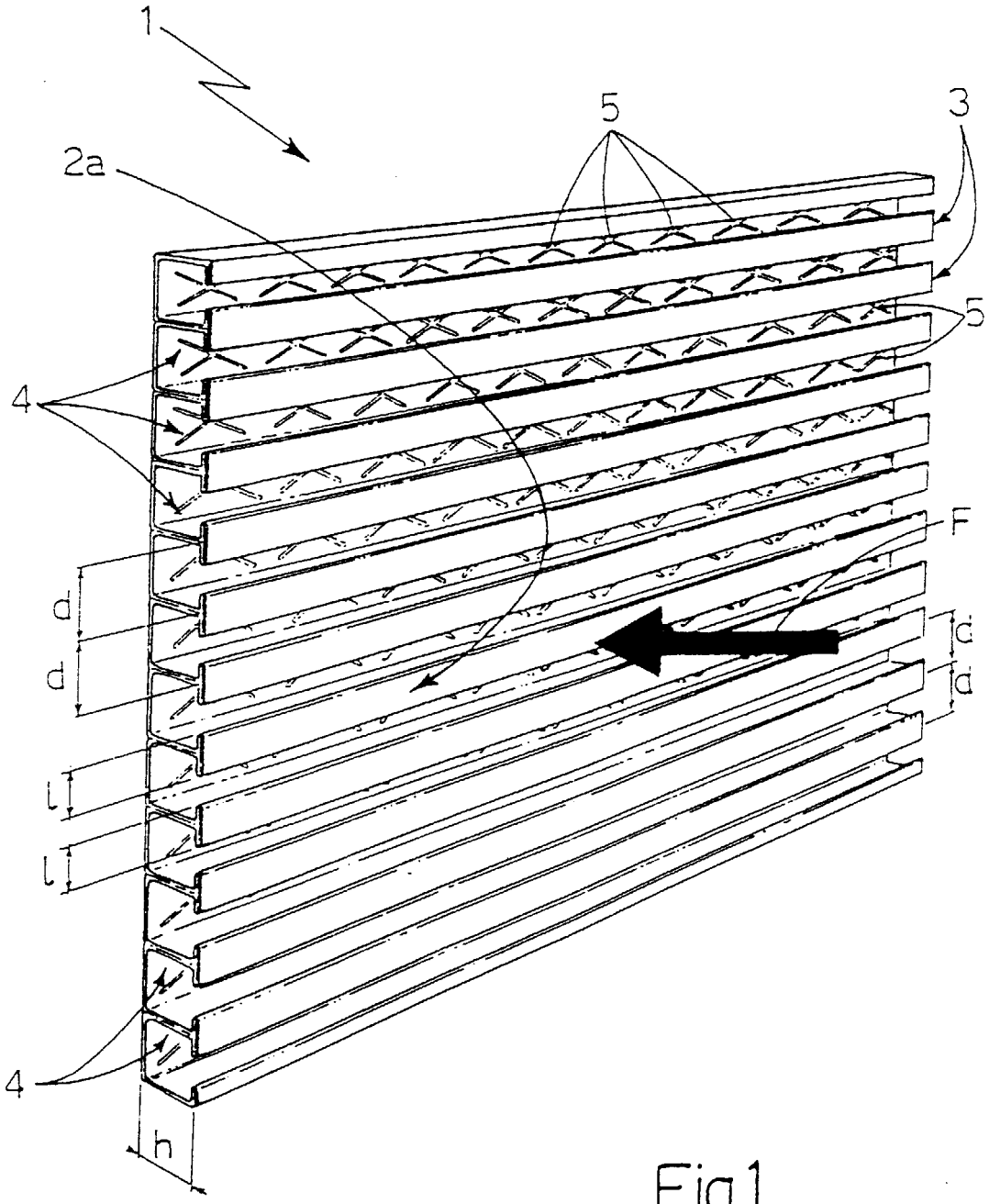

Fig.1

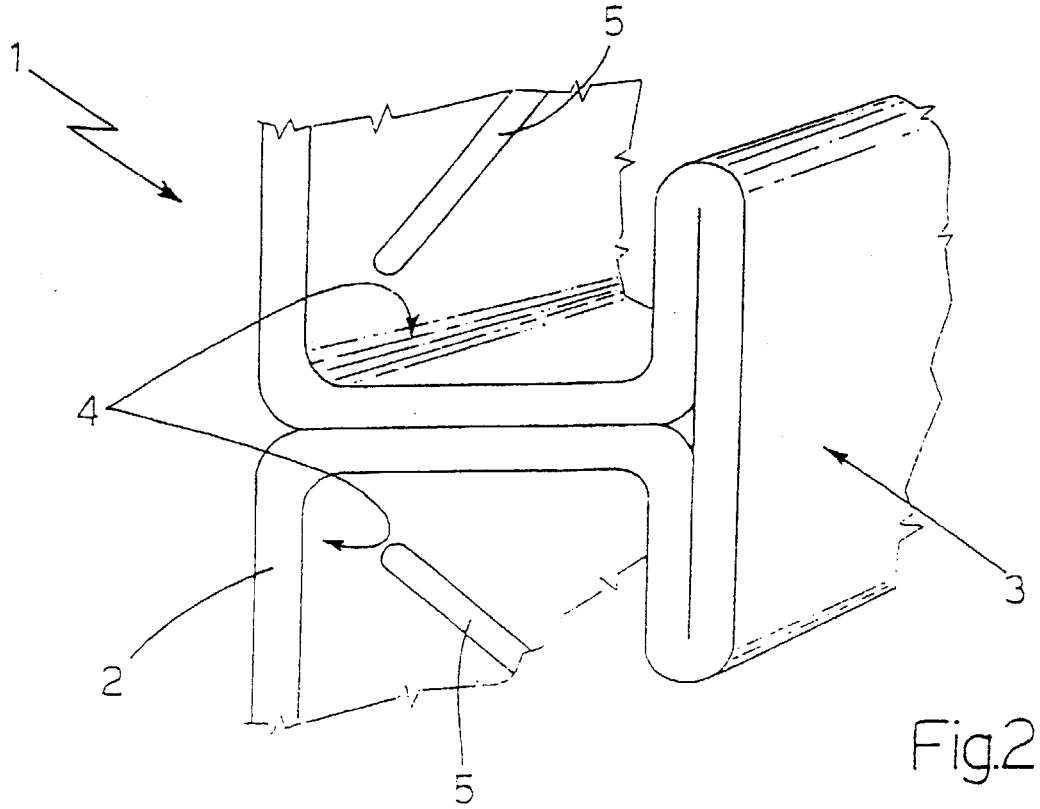

Fig.2

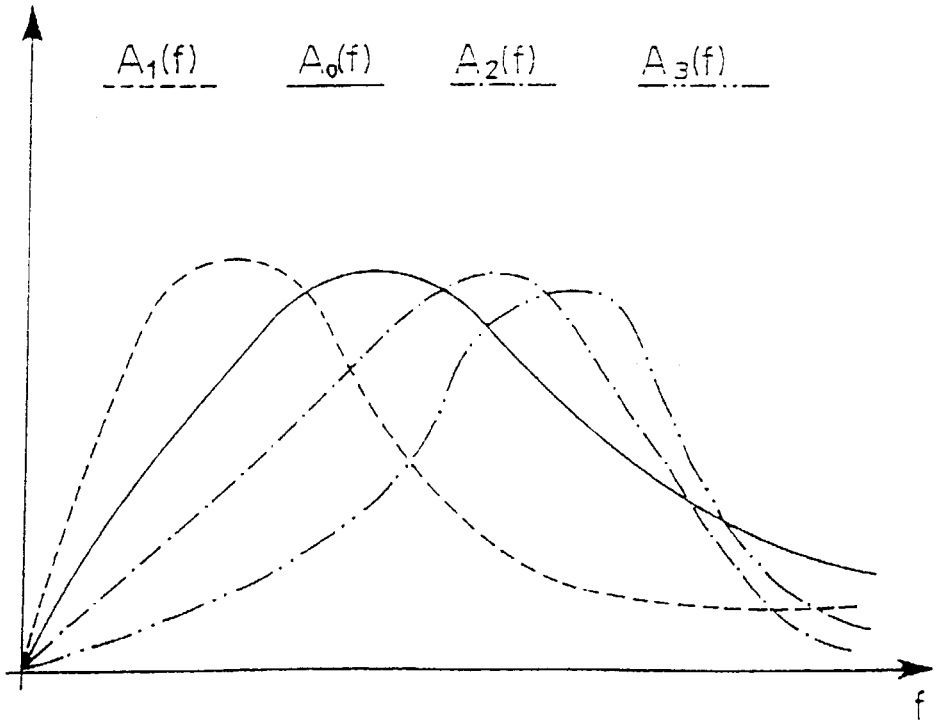

Fig.3

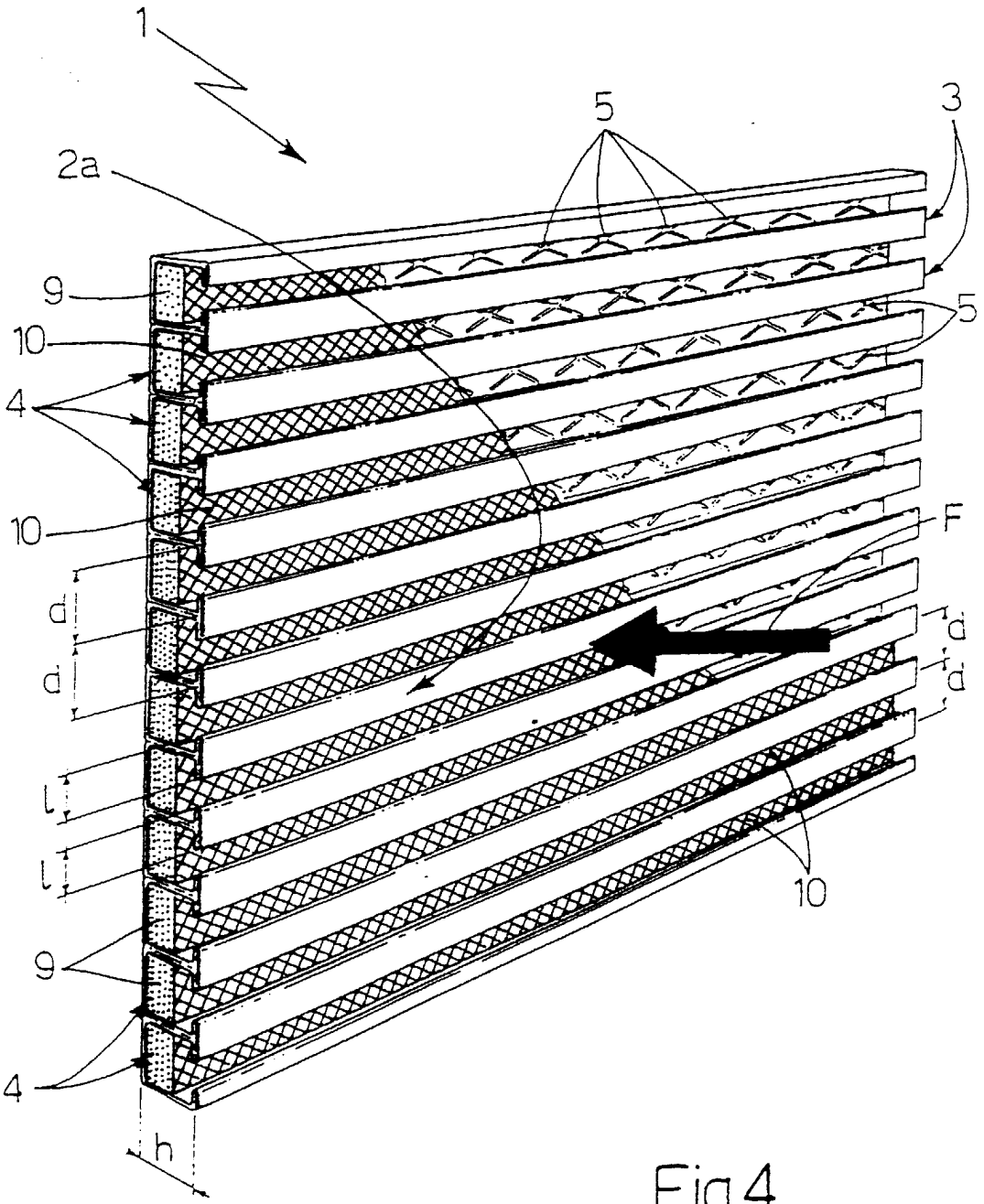

Fig.4

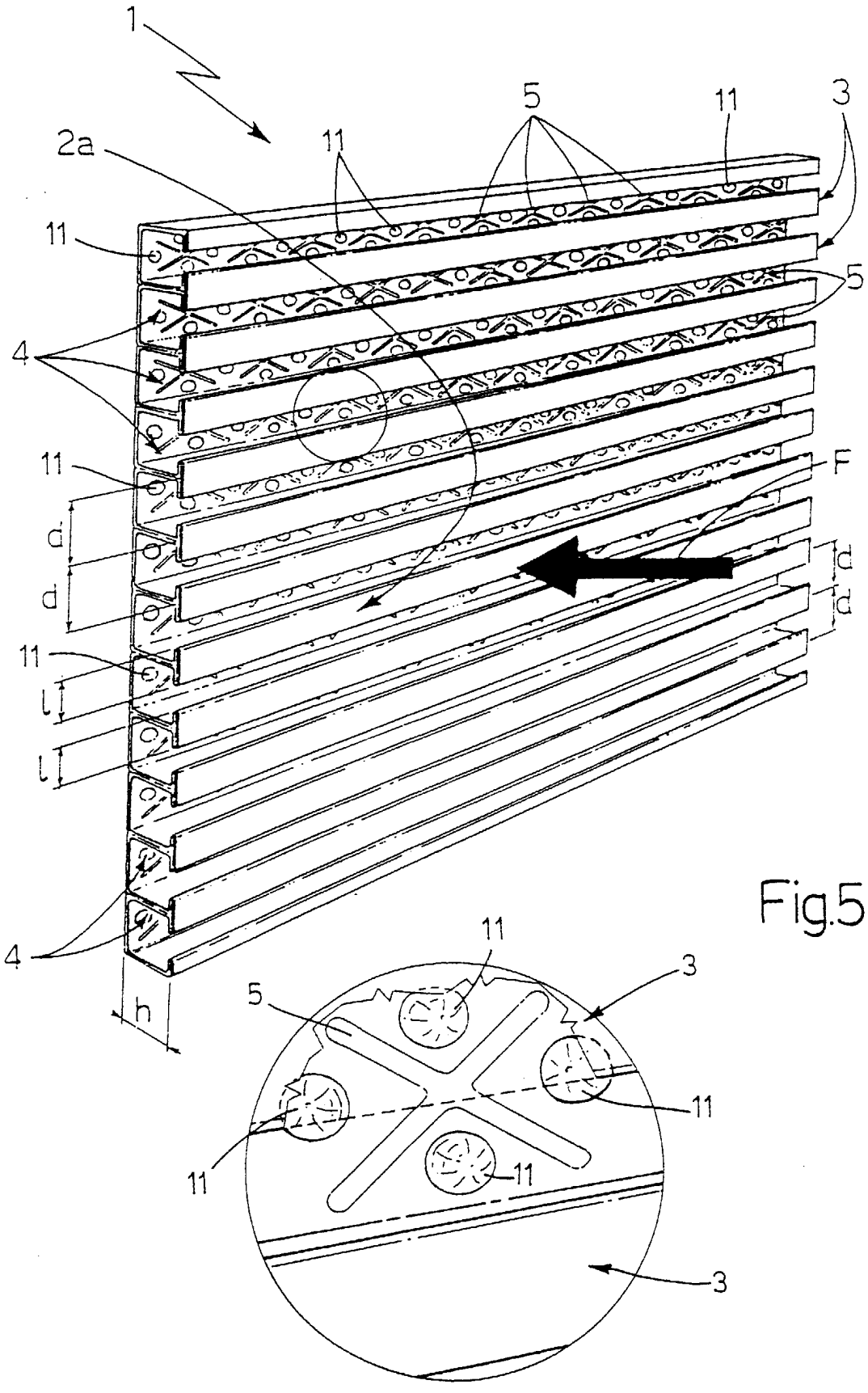

Fig.5