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(54) Noise abatement means

(57) Noise abatement shields (2) of light construction and of the kind which consists of spaced outer sides (14) extending upwards from a surface (12), where in the spaces between the outer sides there is provided a core (4) of sound-absorbing material, consisting of elements (6) of solid wood, which comprises an aired outer cladding having elements (14) consisting of spaced, edge-joined boards, and also where the rear sides of which are covered with sound-absorbing material.

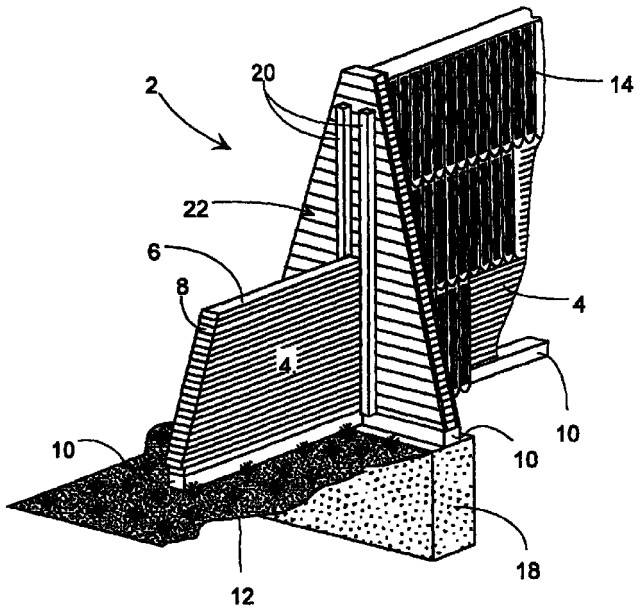

Fig.1

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Description

[0001] The present invention concerns a noise abatement shield of the kind disclosed in the introductory part of claim 1.

[0002] Such noise abatement shields are typically used in residential and town areas for the suppression of undesired noise stemming from traffic, industrial concerns and other noisy activities.

[0003] The known noise abatement shields are typically configured as concrete constructions, steel constructions with plates, or as earthworks possibly with vegetation. Noise abatement shields of wood are also known, comprising filling elements with spaced sides erected between posts, and where layers of noise abating material are disposed in the spaces, for example consisting of mineral wool.

[0004] Such a construction is known from DE-A-3 436 402, which discloses a noise abatement shield with spaced sides consisting of a light construction of wood, and where sheets of mineral wool are placed in the spaces. Said known noise abatement shield is relatively easy to establish, and therefore cheap, in that only ordinary hand tools are required. for its erection. The shield is good namely for the shielding against high-frequency noise, but the shielding ability/the suppression is less good, however, when the noise involved is of a low-frequency of the kind which is emitted from trucks, contractors' plant etc., i.e. noise with a frequency range within the intervals 300 - 700 Hz. In locations where the suppression of noise from trucks etc. is required, use is typically made of concrete or steel constructions which are better suited for the suppression of low-frequency noise, but which also require the use of special equipment and material in their erection, whereby the costs of establishing become considerably higher than in the establishing of the noise abatement shield disclosed in DE-A-3 436 402.

[0005] It is the object of the invention to provide a noise abatement shield of a light and flexible construction, which can be erected with the use of ordinary hand tools, which has low installation costs and is easy to maintain, and which also displays good characteristics where the suppression of low-frequency noise is concerned, namely traffic noise from trucks.

[0006] With the invention it has been realised that this object is achieved by a noise abatement shield of the kind disclosed and characterised in the claims.

[0007] In the configuration of the core of the construction as solid elements of wood which are stacked on top of one another in the formation of a wall, use is made of the relatively high density of the wood in relation to other types of light core material for the suppression/absorption of the energy contained in the sound waves of low-frequency noise. Moreover, by carrying out the planing of at least the facing sides of the individual solid wooden elements/planks, there is achieved a wall without gaps through which noise can otherwise penetrate.

[0008] With the view to accommodating the decomposition of the solid wooden elements, and here namely the lowermost side edge of the core facing against the terrain/the under layer, the lowermost planks placed on top of each other in each bay of the core can consist of naturally impregnated kinds of wood, as disclosed in claim 3 and 4. Said types of wood have proved to have a lifetime in contact with moist earth of up to 50 years. In comparison, ordinary fir has a lifetime of up towards 20 years, all depending on the degree of maintenance.

[0009] With the core of solid wood elements with an aired cladding of wood, i.e. as disclosed in claims 5-10, use is made of the wood's excellent characteristics with regard to sound suppression. The relatively heavy core in combination with outer-side cladding results in a considerable suppression of noise within the relevant frequency range, in that the sound waves penetrate into the space between the outer cladding and the core, where the oscillations abates by suppression in between the wood surfaces. The cladding also results in protection against the climate of the solid wood elements/planks which comprise the core.

[0010] As disclosed in claim 9, it is precisely by configuring the noise abatement shield so that the outer cladding elements have spaces between the individual elements that the above-mentioned effect is increased, in that there is achieved a combination of a heavy core and a "soft" absorbing surface which arises in that the sound waves can penetrate in through the spaces, whereby a greater amount of "sound energy" penetrates into the space in between the cladding and the core, where the sound waves abate by suppression by the wood surfaces. This also results in a breaking of the sound waves, and the sound energy reflected from the noise abatement shield according to the invention is considerably reduced.

[0011] A further improvement of the noise abatement effect of the noise shield according to the invention is achieved by cladding of the inner sides of the outer cladding with a sound- absorbing material as disclosed in claims 11 and 12. The sound-absorbing material will to a high degree contribute towards keeping the sound energy inside the space between the core and the outer cladding until the sound waves have abated.

[0012] Laboratory measurements of the noise-reducing effect of noise abatement shields according to the invention show a reduction factor of approx. 40 dB within the relevant frequency range. The laboratory measurements of the noise-reducing effect of the noise abatement shield according to the invention have also shown that there is a connection between the frequency of the noise, the breadth of the spacing between the elements and the cladding wood, and the effect of the noise abatement. The intervals disclosed in claim 10 shall thus be considered to be valid for example embodiments especially in connection with the suppression of low-frequency noise.

[0013] The noise shields are constructed with a number of solid wooden elements consisting, for example, of planks of Scandinavian fir stacked one by one on top of each other and nailed or glued together, dimensioned in such a way that the core becomes self-supporting. It is hereby achieved that the core can be supported on point fundaments, which makes the noise abatement cheap, since the establishing of line fundaments for supporting the core will be expensive to carry out, and make a possible necessary moving of the noise abatement shield impossible.

[0014] As disclosed in claims 15 and 16, the core is stabilised in the transverse direction by columns which comprise retaining means between which the core is placed, but to which the core is not otherwise fastened. It is hereby achieved that the core of solid wooden elements can freely expand and contract, all depending on the contents of moisture in the wood. Moreover, the columns can with advantage be constructed as disclosed in the claims 17-23.

[0015] As disclosed in claim 17, the columns can with advantage consist of stacked, solid wood elements in the same way as the construction of the core, and where the solid wood elements are anchored to the point fundaments which support the core, as disclosed in claim 22. The columns thus come to appear as transverse walls in relation to the orientation of the core, which contributes to a further abatement of noise, in that sound waves which extend along with the shield are broken by the existence of the columns. Furthermore, by covering the columns with cladding elements as disclosed in claim 23, an increase in the noise-suppressing effect of the columns is achieved, and at the same time the core of solid wood elements is protected against the weather.

[0016] With the view to accommodating the decomposition of the solid wooden elements in the columns, and here namely the lowermost elements which form the side edge of the core facing towards the terrain/the fundament, the lowermost of the planks laid on one another in each bay of the core can consist of naturally impregnated types of wood, as disclosed in claim 3 and 4. Said wood types have proved to have a lifetime in contact with moist earth of up to 50 years. In comparison, ordinary fir has a lifetime of up to 20 years, all depending on the degree of maintenance.

[0017] As disclosed in claim 24 and 25 respectively, both the core and the columns are provided with a covering lists, which means that moisture does not penetrate into the planks of the core, but remains on the outer side of the cladding wood elements. The core is hereby provided with effective protection, and this can thus be built up of untreated types of wood which do not necessarily need to have great resistance to the weather, such as dried Scandinavian fir, as disclosed in claim 26. On the other hand, as disclosed in claim 27, use is made of an outer cladding consisting of Siberian larch wood, which is a wood type which has proved to be particularly weather resistant, even in untreated state. It must be noted that said types of wood are mentioned merely as example embodiments, in that this combination meets demands concerning durability and low-cost construction.

[0018] On the whole, with the invention there is disclosed a particularly effective noise abatement shield which is light in construction and fulfils the demands regarding flexibility, which can be erected with the use of ordinary hand tools and which is easy to maintain.

[0019] In the following, the invention is explained in more detail with reference to the drawing, where

fig. 1 is a perspective view of a section of a noise abatement shield according to the invention,
fig. 2 is a plan view of a noise abatement shield according to the invention,
fig. 3 is a detail cross-sectional view at the point fundament of the noise abatement shield shown in fig. 1,
fig. 4 is a detail view of the covering of the core at the top, and
fig. 5 is a detail section of the covering of the tops of the columns.

[0020] Fig. 1 is a perspective view of a section of an embodiment of the noise abatement shield 2 according to the invention around a column, showing the shield respectively with and without outer cladding.

[0021] The noise abatement shield 2 comprises a core 4 built up of glued-together planks 6, e.g. of Scandinavian fir, and where at least the facing sides 8 of the planks are planed so that the sides of the planks lie up against each other. As indicated in black, the lowermost planks 10 at the side of the core 4 facing against the under layer 12 consist of a type of wood other than Scandinavian fir, e.g. a naturally impregnated wood type which, for example, can consist of Robinie.

[0022] The core 4 is covered with elements 14 of cladding wood consisting of edge-mounted sawn boards, which as shown in fig. 2 are secured on the outside of a spacing list 16 which is fastened to the core 4. The elements 14 can with advantage consist of Siberian larch wood, which has proved to be durable and particularly resistant to influences of the weather.

[0023] The elements 14 are disposed with spaces (not shown) in order to achieve a better sound absorption. As indicated in fig. 2, the sides 15 of the elements 14 facing towards the core 4 are covered with at least one layer of sound-absorbing material 17, for example a geo-textile. There is hereby achieved a better retention and suppression of the light energy which penetrates into the cavity between the outer cladding 14 and the core 4. Laboratory tests have shown that when spacing of 12 mm between the elements 14 is selected, a suppression of low-frequency noise (within 300 - 700 Hz) of 40 dB is achieved, which is a relatively large suppression in relation to the known noise abatement shields of

light construction.

[0024] At the ends, the core 4 rests on a point fundament 18, typically of cast concrete. The core is self-supporting, in that the planks in the core are glued or nailed together, dimensioned so that the core is self-supporting.

[0025] The core 4 is stabilised laterally by retaining means 20 consisting of battens which are fastened directly on columns 22 extending up from the fundament, and which are anchored to the fundament 18 by securing means 24 (cf. fig. 3). The retaining means 20 consist preferably of Siberian larch wood.

[0026] The columns 22 consist of a core 26 which consists of planks 28, e.g. of Scandinavian fir, where the sides 30 of the planks facing one another are planed. The planks 28, which can sometimes be nailed or glued together (depending on the construction of the point fundament), are arranged parallel with the point fundament 18 and are oriented in a substantially transverse manner to the core 4. The columns 22 are covered with elements 32 of cladding wood, typically boards of Siberian larch which are assembled with a tongue-and-groove joint and nailed directly on to the core 26.

[0027] In the shown embodiment, the securing elements 24 consist of a U-iron frame which surrounds the ends of the planks 28, where at the point fundament 18 the U-iron frame comprises fish-plates 25 with holes (not shown) for fastening to the point fundament, e.g. by bolts moulded into the fundament or by anchors 27.

[0028] As will appear from fig. 4, which is a cross-sectional view of a section of the core 4 at the top of a column 22, the top of the core is provided with a covering list 34 with a roof-shaped profile, the sides of which also comprise sloping webs 36 with free ends which terminate outside the outer side edges 38 of the cladding wood elements 14. The core 4 is hereby protected against the ingress of moisture stemming from rainfall. The covering list 34 and its webs 36 can with advantage consist of Siberian larch wood.

[0029] As will also appear from fig. 4, the core of the columns is also provided with a covering list 40 which, as will appear from fig. 5, which is a cross-sectional view of the covering list 40, has a roof-shaped profile. The breadth of the covering list 40 is adapted so that its sides terminate outside the outer sides of the column cladding elements 32.

[0030] The construction of the noise abatement shield, where the self-supporting core 4 rests on point fundaments 18, and where the core 4 with cladding 14 is stabilised by clamping in between the retaining means 20, but not otherwise anchored to the columns 22, results in the core 4 being able to expand in the height direction, depending on humidity and temperature, while at the same time the planks 6 in the core are protected against moisture stemming from rainfall. The section 10 of naturally impregnated wood at the foot of the core also results in great durability, even though this wood comes into direct contact with the under layer/ the earth 12.

[0031] With the invention, there is thus disclosed a noise abatement shield 2 which is of light construction, which is particularly effective in the absorption of low-frequency noise, and which can be built by ordinary workmen with ordinary hand tools.

Claims

1. Noise abatement shield (2) of the kind which consists of spaced outer sides (14) extending upwards from a surface (12), where in the spaces between the outer sides there is provided a core (4) of sound-absorbing material, **characterised** in that the core (4) consists of elements (6) of solid wood.

2. Noise abatement shield (2) according to claim 1, **characterised** in that the elements (6) of solid wood consist of nailed-together or glued-together planks, of which at least the sides (8) facing each other are planed.

3. Noise abatement shield (2) according to claim 1 or 2, **characterised** in that the side of the core (4) facing towards the surface (12) comprises a section (10) where the elements of solid wood consist of planks of naturally impregnated types of wood..

4. Noise abatement shield (2) according to any of the claims 1-3, **characterised** in that the planks (10) of naturally impregnated wood consist of Robinie.

5. Noise abatement shield (2) according to any of the claims 1-4, **characterised** in that between the core (4) of elements (6) of solid wood and the outer sides, on the core there is fastened a spacing list (16) on which the outer sides (14) are secured.

6. Noise abatement shield (2) according to any of the claims 1-5, **characterised** in that the outer sides (14) consist of an aired covering of wood, preferably consisting of elements (14) of cladding wood disposed edge-to-edge..

7. Noise abatement shield (2) according to claim 6, where the elements (14) of cladding wood consist of boards.

8. Noise abatement shield (2) according to claim 6 or 7, **characterised** in that the elements (14) disposed edge-to-edge are saw-cut.

9. Noise abatement shield (2) according to any of the claims 6-8, **characterised** in that the edge-to-edge elements of cladding wood (14) are arranged with a mutual spacing/distance between the elements.

10. Noise abatement shield (2) according to claim 9,

characterised in that spacing/distance piece has a breadth within the interval 3-20 mm, typically 5-18 mm and preferably 8-14 mm.

11. Noise abatement shield (2) according to any of the claims 1-10, **characterised** in that the sides (15) of the outer sides (14) facing towards the core are covered with at least one layer of sound-absorbing material (17).

12. Noise abatement shield (2) according to claim 11, **characterised** in that the sound-absorbing material (17) consists of a geo-textile, e.g. Fibertext.

13. Noise abatement shield (2) according to any of the claims 1-12, **characterised** in that the core (4) of elements of solid wood (6) is self-supporting, and at the ends is supported by point fundaments (18).

14. Noise abatement shield (2) according to any of the claims 1-13, **characterised** in the core (4) of elements of solid wood (6) is stabilised by clamping in between columns (22) extending upwards from the point fundaments (18).

15. Noise abatement shield (2) according to claim 14, **characterised** in that the core (4) is placed between retaining means (20) secured to the columns (22).

16. Noise abatement shield (2) according to claim 15, **characterised** in that the retaining means (20) consist of lists, boards or battens.

17. Noise abatement shield (2) according to any of the claims 14-16, **characterised** in that the columns (22) are built up of solid wooden elements (28), the lengthways direction of which is oriented in a substantially transverse manner to the lengthways axis of the core, and said solid wooden elements (28) are fastened to the point fundaments (18) by anchoring means (24).

18. Noise abatement shield (2) according to claim 17, **characterised** in that the elements (28) of solid wood are placed on the fundaments (18) so that the mid-points of the elements (28) coincide with the mid-points of the fundaments and are oriented in the same direction as the fundaments.

19. Noise abatement shield (2) according to claim 17 or 18, **characterised** in that the length of the elements of solid wood (28) decreases between the foot and the top of the column.

20. Noise abatement shield (2) according to any of the claims 17-19, **characterised** in that the elements (28) of solid wood have a length which corresponds at least to the overall thickness of the core (4) and the breadth of the retaining means (20) between which the core (4) is placed.

21. Noise abatement shield (2) according to any of the claims 17-20, **characterised** in that the elements (28) of solid wood in the column consist of nailed-together or glued-together planks, of which at least the sides (30) facing each other are planed.

22. Noise abatement shield (2) according to claims 17-21, **characterised** in that the anchoring means (24) consist of a U-iron frame having webs between which the elements (28) of solid wood extend, said frame being anchored to the point fundament (18) by securing means (27).

23. Noise abatement shield (2) according to any of the claims 14-22, **characterised** in that the part of the side surfaces of the columns which is lying outside the core (4) and the retaining means (20) for the core, are provided with a cladding (32) of wood, fastened directly on the column surface, said cladding preferably consisting of elements (32) of cladding wood disposed edge-to-edge, preferably assembled by tongue-and-groove joints.

24. Noise abatement shield (2) according to any of the claims 1-23, **characterised** in that the upper edge of the core is provided with a covering list (34) with a roof-shaped profile extending between facing outer side surfaces between two successive columns (22), the sides of said covering list further comprising sloping, outwards-extending webs (36), the freely extending side edges of which terminate outside the front of the outer sides (14).

25. Noise abatement shield (2) according to the claims 14-24, **characterised** in that the tops of the columns are provided with a covering list (4) with a roof-shaped profile, the breadth of which corresponds at least to the breadth of the column and its cladding.

26. Noise abatement shield (2) according to any of the claims 1-25, **characterised** in that the elements (6, 28) of solid wood consist of dried Scandinavian fir.

27. Noise abatement shield according to any of the claims 6-26, **characterised** in that the elements of cladding wood (14, 32), the retaining means (20) and covering lists (40, 34) with webs (36) consist of Siberian larch.

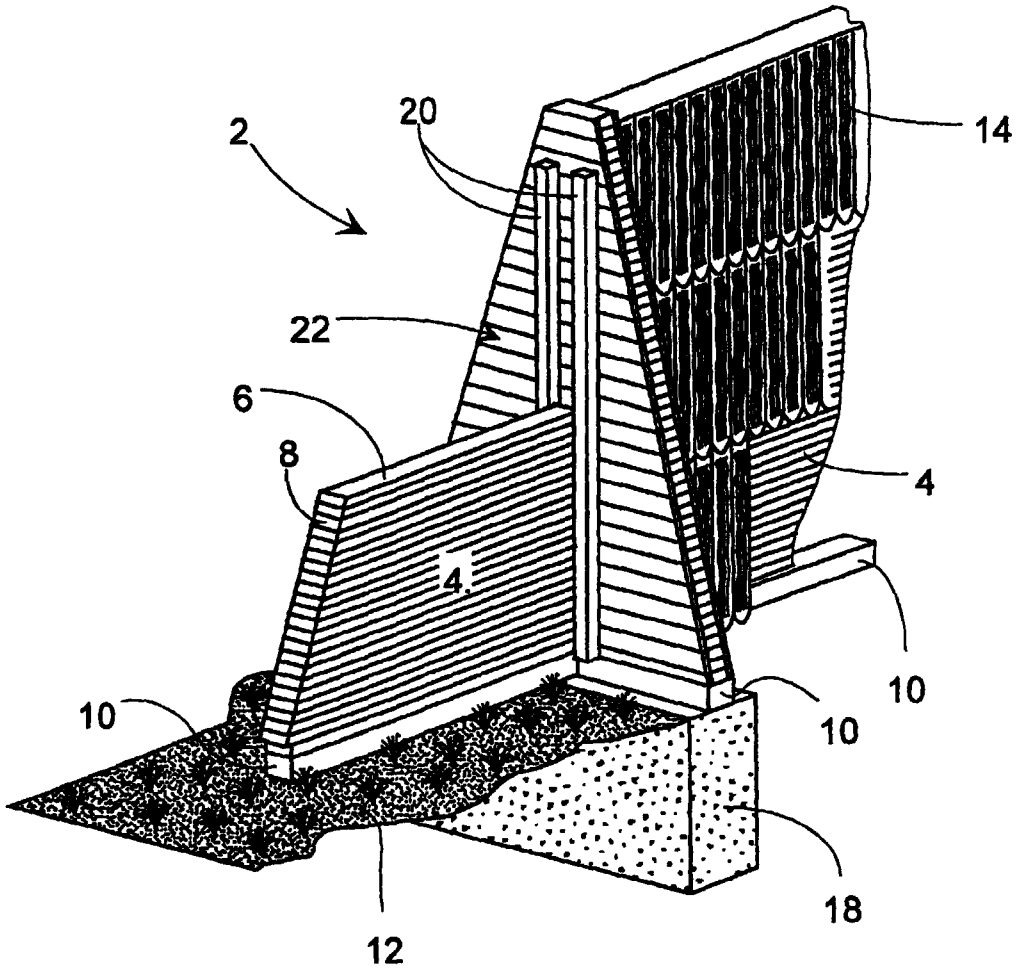

Fig.1

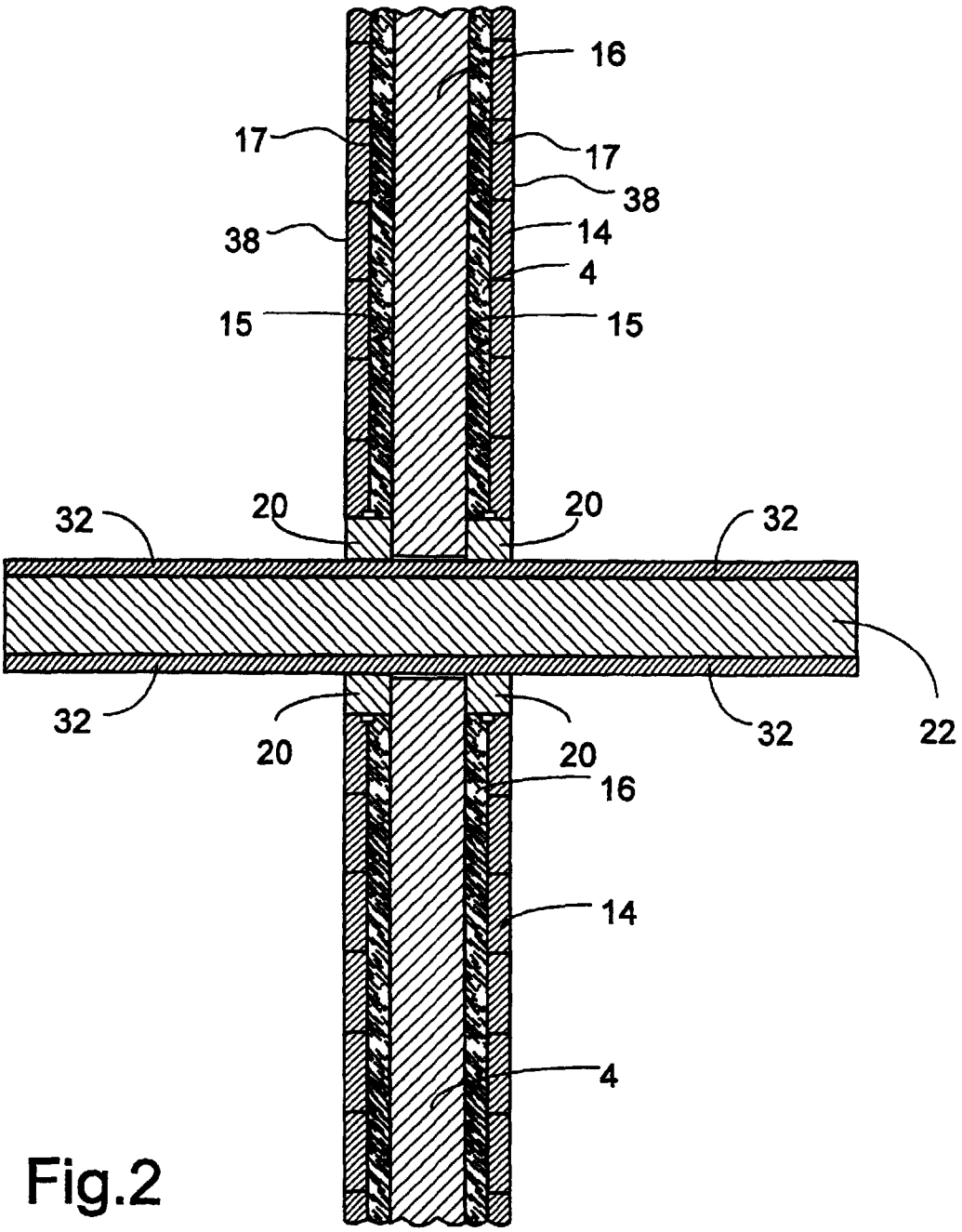

Fig.2

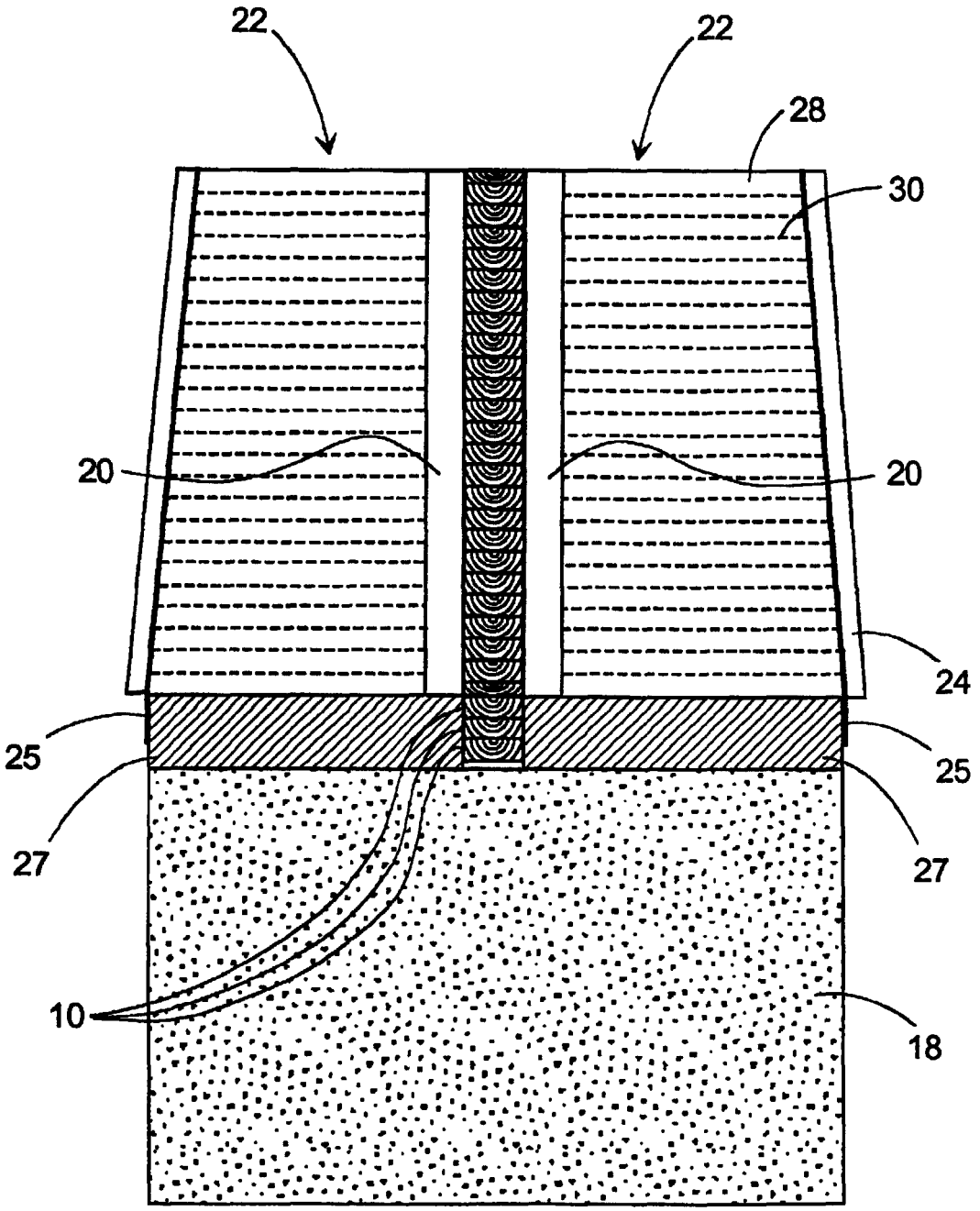

Fig.3

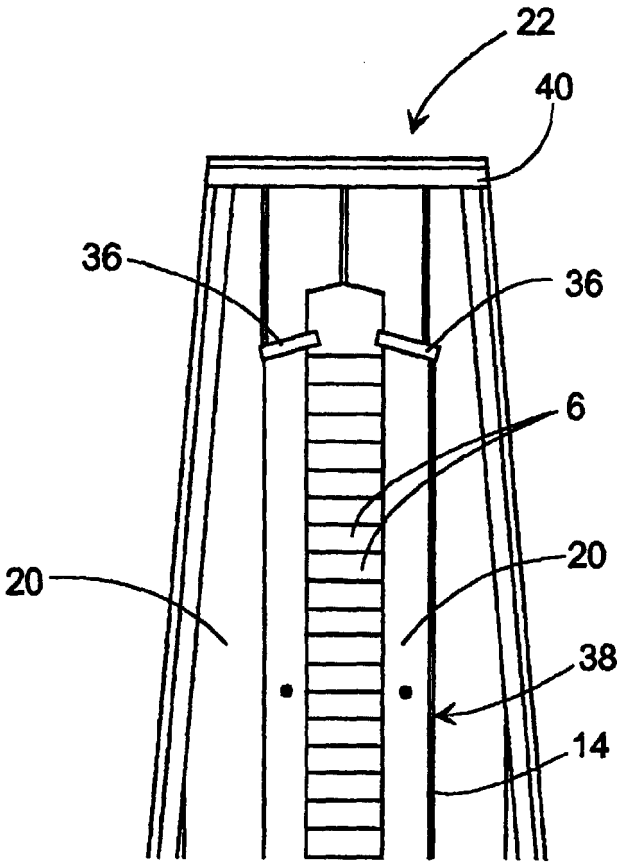

Fig.4

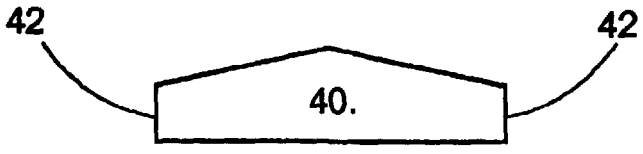

Fig.5

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EUROPEAN SEARCH REPORT

Application Number
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
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X : particularly relevant if taken alone
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EUROPEAN SEARCH REPORT

Application Number
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 00 61 0090

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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