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(54) **Soundproofing panel made of FRP (Fiber-Reinforced Polymer) composite with a sound-absorbing surface characterized by parallel longitudinal strips**

Schallabsorbierendes Paneel aus Faser-verstärktem Polymer mit einer parallel angeordnete Streifen aufweisenden, Schallabsorbierenden Oberfläche

Panneau d'isolation acoustique de composition polymère renforcé de fibres avec surface insonorisante en lames parallèles

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- **PATENT ABSTRACTS OF JAPAN vol. 015, no. 035 (M-1074), 28 January 1991 (1991-01-28) & JP 02 274906 A (FURUKAWA ELECTRIC CO LTD:THE), 9 November 1990 (1990-11-09)**

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Description

[0001] The present invention concerns fixed installations for absorbing noise and noise pollution coming from road and/or railway traffic and particularly it concerns a new soundproofing box panel made of FRP composite.

[0002] Along major communication routes, where the railway or road traffic is intense, a considerable amount of noise is generated, giving rise to excessive noise pollution levels. People living in the vicinity of such major traffic routes are consequently affected by noise to such a degree that they may even suffer severe consequences to their hearing or nervous system.

[0003] Various devices and systems have been studied and manufactured to reduce and absorb traffic noise, such as the well-known embankments constructed alongside traffic routes. Such embankments do not provide adequate protection from noise, however, they occupy a wide stretch of land on either side of the road or railway line, and their construction involves the use of costly machinery.

[0004] Some types of modular panel, generally made of metal and/or plastic and containing sound-absorbing material, are also well known. Such panels are relatively easy to install, but do not always meet the needs, particularly as concerns durability.

[0005] DE 37 26 361 A discloses a soundproofing panel as set forth in the preamble of claim 1. The known box structure is made up of a metal frame both sides of which are partially covered by wooden rods having a semicircular cross section.

[0006] It is an object of the invention to provide a soundproofing panel that avoids the above mentioned drawbacks of the prior art. It should not only absorb efficiently the sound waves generated by vehicles in transit without reflecting them back towards the source of the noise, and without transmitting them to the other side of the panel, but it should also have a better weather resistance compared with wooden rods and it should be easy to be mounted.

[0007] These and other aims are achieved by the new soundproofing panel as characterized in claim 1.

[0008] The rods or staves according to the invention present the advantages to be not only weatherproof but also rigid, lightweight and easy to be mounted.

[0009] The characteristics of the new soundproofing panel will be better understood by the description that follows, with reference to the attached drawing, as an illustrative and not restrictive example.

[0010] Figure 1 shows an axonometric projection of the new panel with a partial cross-section, while figure 2 shows a cross-section of it.

[0011] The new soundproofing panel comprises a box structure (S1, S2), a layer of sound-absorbing material (F), spacers (D), and parallel staves (T).

[0012] The box structure (S1, S2) is constituted by a profiled element (S1), substantially comprising a rear wall (S1a) with two folded edges (S1b) and two generically

flat closing elements (S2) situated at either end (S1) so as to obtain a generic parallelepiped lacking one main face.

[0013] The profiled element (S1) preferably has its three faces (S1a,S1b) with a particular shaping; to be precise, the main face (S1a) is generically corrugated so as to make the profiled element more sturdy, while the two edges (S1b) have concave and/or convex ribbing to allow for the proper coupling of several adjacent profiled elements, or soundproofing panels.

[0014] The right- and left-hand closing elements (S2) are each composed of a flat part having the same shape as the cross-section of the profiled element (S1), complete with rims lying adjacent to the sides of said profiled element (S1). Moreover, each of the two closing elements (S2) has one or more holes (S2f) to allow for the run-off of any water accumulated inside the soundproofing panel due to condensation or infiltration.

[0015] On the open face of the box structure (S1, S2) there are staves (T), comprising bands or strips suitable for partially closing this face of the box structure (S1, S2).

[0016] The staves (T) are arranged parallel to each other in one or more rows and their length and distance between centers are such that they cover from 20% to 80%, but preferably 40%, of the area of the open side of the box structure (S1, S2).

[0017] These staves (T) are arranged preferably parallel to the length of the profiled element (S1).

[0018] The staves (T) have a T-shaped cross-section in which the horizontal part of the T forms an arch and the vertical part is wider at the bottom end. The staves (T) are preferably arranged alternately, i.e. so that each staff (T) has its cross section inverted with respect to the two staves (T) on either side.

[0019] Tongues (S2o) may be provided or created on the profiled element (S1) or on the closing elements (S2) for the purpose of retaining the staves (T) and keeping them correctly oriented.

[0020] The cavity formed between the profiled element (S1), the closing elements (S2) and the staves (T) is occupied by a layer of soundproofing material (F), preferably made of rock wool or glass wool.

[0021] This cavity also contains spacers (D) composed of generically flat elements having three sides shaped exactly like the cross-section of the profiled element (S1) and the fourth side shaped with tongues (Do) suitable for holding the staves (T) and keeping them correctly spaced.

[0022] The new panel, constructed as described above, is installed along the railway and/or road traffic route, orienting the side of the panel fitted with the staves (T) towards the source of the noise and juxtaposing the panels so that the concave and/or convex ribbing of each panel fits exactly into the convex and/or concave ribbing of the panels above and below.

[0023] The panels can be arranged with the staves (T) oriented at any angle, horizontal or vertical.

[0024] The new panel, constructed as described

above, prevents the propagation of noise, absorbing the sound waves instead of reflecting them back towards the source of the sound, and it does not collect any water due to condensation or rainfall.

[0025] Therefore, with reference to the above description and to the attached drawings, the following claims are put forth.

Claims

1. Soundproofing panel comprising a parallelepiped box structure (S1, S2) filled with a layer of sound absorbing material (F), wherein the side of the box structure intended to face the source of noise is open and partially covered with rods or staves (T), **characterized in that** the box structure (S1, S2) is of fiber reinforced polymer (FRP) and that said rods or staves (T) have a T-shaped cross section made up of an arched horizontal part and a vertical part projecting from the arched horizontal part, wherein said vertical part is wider at its free end.
2. Soundproofing panel according to claim 1, wherein the staves (T) are arranged alternately such that each stave (T) has its cross section inverted with respect to the two staves (T) on either side of it.
3. Soundproofing panel according to any of the preceding claims, wherein the rods or staves (T) are placed in one or more rows to cover from 20% to 80% of the surface area.
4. Soundproofing panel according to claim 3, wherein the parallel staves (T) lying side-by-side cover 40% of the surface area.
5. Soundproofing panel according to any of the preceding claims, wherein generically rectangular spacers (D) are mounted inside the box structure (S1, S2) having one side shaped to form tongues (Do) for retaining the staves (T) in a correct distance between them.
6. Soundproofing panel according to any of the preceding claims, wherein tongues (S2o) are provided or created on the box structure (S1, S2) for holding the staves (T) and maintaining their correct orientation.
7. Soundproofing panel according to any of the preceding claims, wherein the underside of the box structure (S1, S2) is provided with a channel or hole (S2f) to allow outflow of water accumulated in the box structure due to condensation or infiltration.

Patentansprüche

1. Schallabsorbierende Wand, bestehend aus einer parallelepipedförmigen Kastenstruktur (S1, S2), die mit einer Schicht aus schallschluckendem Material (F) gefüllt ist, wobei diejenige Seite der Kastenstruktur, die dazu bestimmt ist, der Schallquelle zugeneigt zu sein, offen und teilweise durch Stäbe oder Dauben (T) abgedeckt ist, **dadurch gekennzeichnet, dass** die Kastenstruktur (S1, S2) aus einem faserverstärkten Polymer (FRP) besteht und dass die Stäbe oder Dauben (T) einen T-förmigen Querschnitt mit einem bogenförmigen Horizontalteil und einem davon abstehenden Vertikalteil haben, wobei der Vertikalteil ein verbreitertes Ende hat.
2. Schallabsorbierende Wand nach Anspruch 1, **dadurch gekennzeichnet, dass** die Dauben (T) alternierend angeordnet sind derart, dass der Querschnitt jeder Daube (T) relativ zu demjenigen der beiden benachbarten Dauben (T) umgedreht ist.
3. Schallabsorbierende Wand nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, daß** die Stäbe oder Dauben (T) in einer oder mehreren Reihen angeordnet sind, so dass sie zwischen 20 % und 80 % des Oberflächenbereichs abdecken.
4. Schallabsorbierende Wand nach Anspruch 3, **dadurch gekennzeichnet, dass** die nebeneinanderliegenden, parallelen Dauben (T) 40 % des Oberflächenbereiches abdecken.
5. Schallabsorbierende Wand nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** in der Kastenstruktur (S1, S2) im wesentlichen rechteckige Abstandselement (D) angebracht sind, von denen eine Seite Zungen (Do) hat, die die Dauben (T) auf einem exakten Abstand zueinander halten.
6. Schallabsorbierende Wand nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** in der Kastenstruktur (S1, S2) Zungen (S2o) vorgesehen oder ausgebildet sind, die die Dauben (T) halten und ihre korrekte Ausrichtung sichern.
7. Schallabsorbierende Wand nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der Boden der Kastenstruktur (S1, S2) einen Kanal oder eine Öffnung (S2f) für den Abfluß von Wasser hat, das sich aufgrund von Kondensation oder Eindringen in der Kastenstruktur angesammelt hat.

Revendications

1. Paroi d'isolation acoustique comprenant une structure de caisson parallélépipédique (S1, S2) remplie d'une couche de matière absorbant le son, le côté de la structure de caisson destiné à faire face à la source sonore étant ouvert et partiellement couvert par des barres ou douelles (T), **caractérisée par le fait que** la structure de caisson (S1, S2) consiste en une matière polymère renforcée par des fibres (FRP) et que les barres ou douelles (T) ont une section en forme de T avec une partie horizontale arquée et une partie verticale y faisant saillie, ladite partie verticale ayant une extrémité élargie.

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2. Paroi d'isolation acoustique selon la revendication 1, **caractérisée par le fait que** les douelles (T) sont placées en position alternée de sorte que la section de chaque douelle (T) est inversée par rapport à la section des deux douelles (T) voisines.

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3. Paroi d'isolation acoustique selon une des revendications précédentes, **caractérisée par le fait que** les barres ou douelles (T) sont placées en une ou plusieurs lignes de sorte que qu'elles couvrent de 20 % à 80 % de la surface.

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4. Paroi d'isolation acoustique selon la revendication 3, **caractérisée par le fait que** les douelles (T) parallèles placées l'une à côté de l'autre couvrent 40 % de la surface.

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5. Paroi d'isolation acoustique selon une des revendications précédentes, **caractérisée par le fait que** dans la structure de caisson (S1, S2) sont montés des éléments écarteurs (D) de forme essentiellement rectangulaire dont un bord est muni de langues (Do) lesquelles tiennent les douelles (T) à une distance correcte entre elles.

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6. Paroi d'isolation acoustique selon une des revendications précédentes, **caractérisée par le fait que** dans la structure de caisson (S1, S2) sont prévues ou formées des langues (S20) pour maintenir les douelles (T) dans leur orientation correcte.

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7. Paroi d'isolation acoustique selon une des revendications précédentes, **caractérisée par le fait que** dans le fond de la structure de caisson (S1, S2) est prévu un canal ou orifice (S2f) pour l'écoulement de l'eau accumulée dans la structure de caisson par condensation ou par pénétration.

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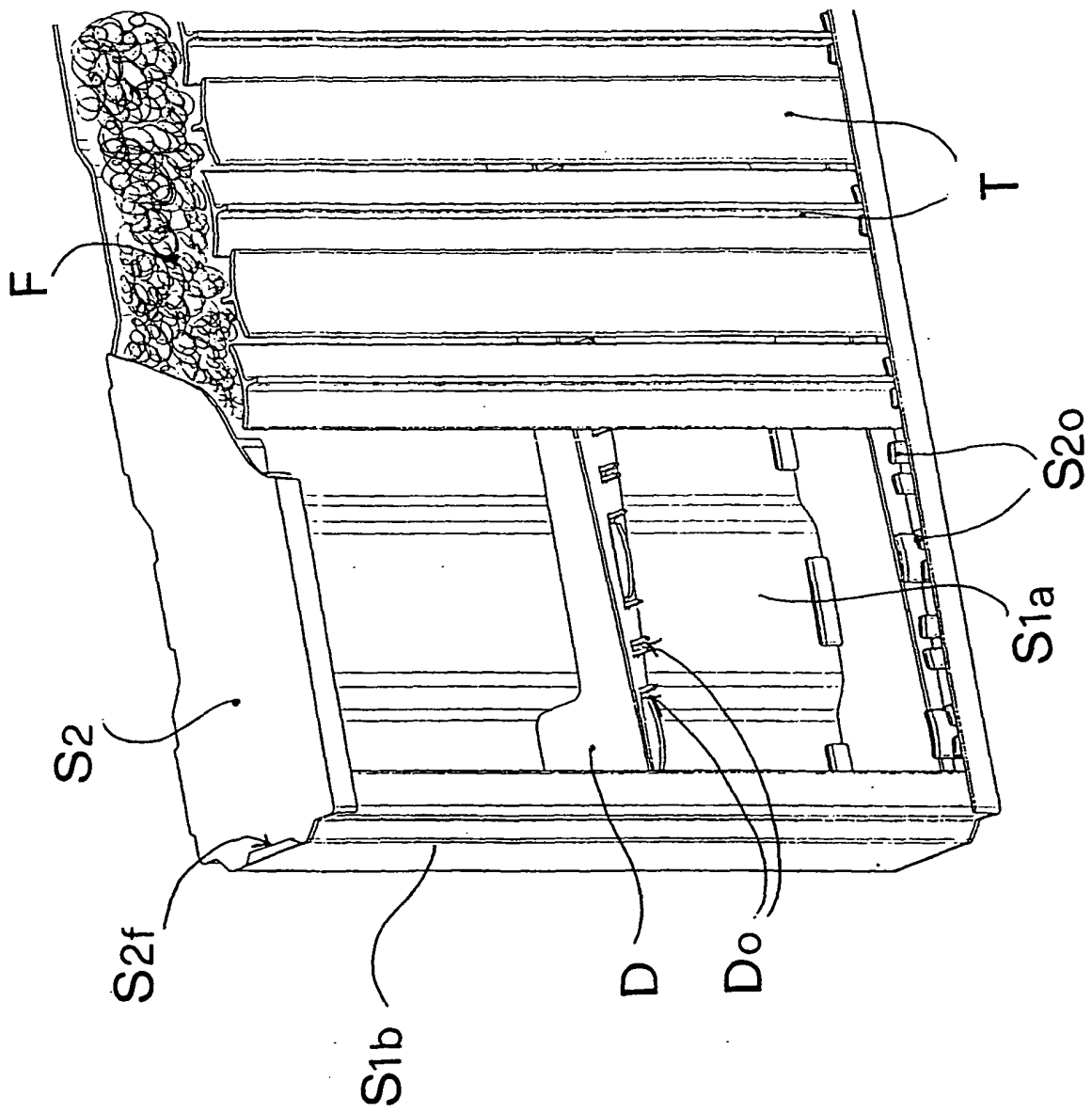


Fig. 1

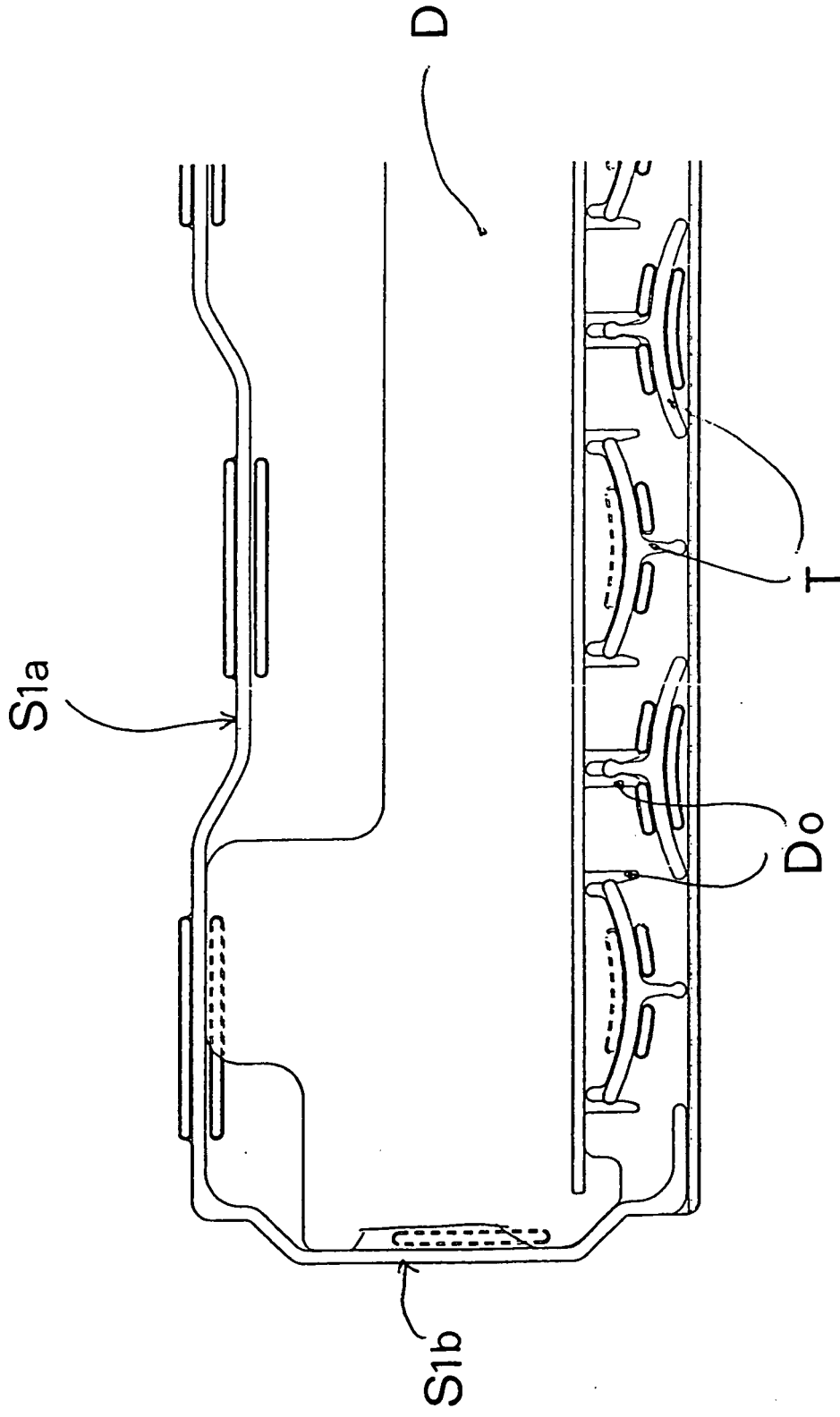


Fig. 2

REFERENCES CITED IN THE DESCRIPTION

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