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(54) **BUILDING ELEMENTS MADE OF TRAPEZOID CORRUGATED THIN SHEET PLATES**

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ELEMENTS DE CONSTRUCTION CONSTITUES DE TOLE BAC ACIER FINE

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Description

SPECIFICATION

[0001] Sheet formed building elements, used in framings of joists/walls carry loads in most cases just in one main direction. By the present invention framings of joists/walls carry loads in two major directions. This is achieved with the aid of building elements (A) for forming of framing of joists or walls according to appended claim 1. Each building element (A) consists of trapezoid thin sheet here called profile plate (1) completed by wooden bars (2), see figure 1a. As an alternative the wooden bars (2) may be replaced by some other corresponding material. In this application the wooden bars (2) or when these are replaced for the purpose by some other corresponding material, are called connectors (D).

[0002] The main object of the connectors (D) is partly to connect layer material (3) (alternatively bars (4), alternatively boards (5) or combinations of these, see figure 5d) with the profile plates (1) to form frames such that load support is achieved at loads perpendicular to the main direction of the profile plates, and partly to strengthen the profile plates (1) in their stiff direction. In figures 1b, 1c, 2b, 2c and 4b, 4c the connectors (D) consist of metal bars (2') respectively metal plates (2'') in the place of wooden bars (2).

[0003] The connectors (D) are joined to the trapezoid corrugated thin sheet (1) at the outer side (10) of its flanges and coinciding with its entire length. The objects of the building elements (A) are to form a support for fastening of layer material (3) according to figure 5b, alternatively bars (4) according to figure 5c, alternatively boards (5) according to figure 5a or in combination of these (3, 4, 5) e.g. according to figure 5d to form a frame for taking up loads perpendicular to the longitudinal direction of the profile plates (1), see figures 4a, 4b, 4c, at the same time as loads are taken up in the longitudinal direction of the profile plates (1) strengthened by the connectors (D). This means that framings of joists/walls formed as mentioned above, carry by frame action perpendicular to the longitudinal direction of the profile plates at the same time as loads are carried along the strengthened profile plates (1). In this way, there is achieved load support in two main directions perpendicular to each other when the framings of joists/walls are supported at four sides.

[0004] A four side support of framings of joists/walls with two main directions as mentioned above make spans compared to corresponding single-spanned framings of joists/walls may be increased at the same load. Thus the competitive ability may be improved.

[0005] The dimensions of the connectors (D), the layer materials (3) alternatively the bars (4), alternatively the boards (5) and the profile plates (1) are adapted to each other such that the load support in the two main directions will be as optimal as possible in view of the load of the framings of joists/walls and the spans in the two main

directions.

[0006] The profile plates (1) are either existing thin sheet profiles at the market or specially manufactured trapezoid corrugated thin profiles especially adapted to the purpose.

[0007] The connectors (D) also increase the design height in both main directions which contributes to increased load support. If the connection of the building elements (A) and layer materials (3) (alternatively bars (4) alternatively boards (5)) is performed at the building place when forming the framings of joists, the building elements (A) should be supported in the mounting in order to further increase cooperation and load support.

[0008] The connectors (D) are joined to the profile plates (1) by aid of glue and/or screws, alternatively nails, alternatively rivets, alternatively welding. The layer materials (3), alternatively bars (4), alternatively boards (5) are joined in turn with the outer sides (11) of the building elements (A) by glue and/or screws, alternatively nails, alternatively rivets, alternatively welding.

[0009] The length of the building element (A) in the longitudinal direction of the profile plates is adapted to the size of the room alternatively the height of the apartment or to the distance between the supports in this direction.

[0010] The joining (B) of the longitudinal joints of the profile plates, see figure 2a-c, is in principle performed in the same way as when laying a roof exclusively with these profile plates (1) but tensile- pressure- and shear forces shall be transferred to load support perpendicular to the longitudinal direction of the profile plates (1). The building elements (A) next to the supports, see figures 4a-c, are adapted to these supports. The central portions (C) of the profile plates next to supports have here been shown as drawn with load from above according to figures. Figure 3 shows several connected (B) building elements (A) for the span equal to $n \times a$.

[0011] Framings of joists/walls formed from the building elements (A) have hole chambers (6), see figures 4a-c, which when needed are used for installation of e.g. sewage tubes, water tubes or electrical lines. Some of these installations are advantageously placed in the building elements when these are manufactured whilst other installation details are mounted at the building place. The hole chambers (6) are also utilized for filling in order to improve sound insulation, fire insulation and heat insulation.

[0012] The building elements (A) are easily transported and may be put in piles according to figure 6, which means, that great amounts (large area) of building elements may be transported and stored.

[0013] Known construction elements from the documents mentioned below do not primarily have the ability to form frames for taking up loads perpendicular to the longitudinal direction of the profile plates at the same time as taking up loads primarily also occurs along the longitudinal direction of the profile plates. The building elements (A) for which patent is applied for, according to

figures 1a, 1b, 1c, 1d for forming of framings of joists/walls with primary taking up loads in two perpendicular main directions with a four side support are thus regarded as unique.

[0014] Documents referred to are patents No:

US4346544A
DE3723527A1
EP1074670A2

[0015] Further advantages and features of the invention will be obvious from the following detailed descriptions, reference being made to the enclosed drawings, at which

figure 1a

shows the principle for the design of the present invention, building elements (A) consisting of trapezoid corrugated profile plate (1) and wooden bars (2) joined with the profile plate (1) placed at the outside (10) of the flanges and coinciding with complete longitudinal direction,

figure 1b

shows the principle for the design of the present invention, building elements (A), but here the wooden bars (2) according to figure 1a are replaced by another material, in this case metal bars (2') with the same function as that of the wooden bars (2),

figure 1c

shows the principle for the design of the present invention, building element (A), but here the wooden bars (2) according to figure 1a are replaced by another material, in this case metal plates (2''),

figure 1d

shows the principle for the design of the present invention, building element (A), but here the wooden bars (2) according to figure 1a are kept in the lower part, but have been replaced in the upper portion by another material, in this case metal plates (2''),

figure 2a

shows the connection of two building elements (A) where the connection (B) in the longitudinal direction of the profile plates (1) is carried out in principle in the same way as when covering a roof exclusively with profile plates (1),

figures 2b-c

shows the connection (B) of two building elements (A) according to the principle shown in figure 2a,

figure 3

shows several joined (B) building elements (A) intended for the span $n \times a$,

figure 4a

shows the principle for building of framing of joists when loaded from above or walls at horizontal load where the joined (B) building elements (A) are connected to boards (5) alternatively bars (4) alternatively layers (3) to form frames for loads perpendicular to the longitudinal direction of the profile plates

(1) and where the central portions (C) of the outer central plates next to the support is shown as drawn when loaded from above according to the figure, figure 4b

shows in the same way as figure 4a the design of framing of joists or walls, but here the wooden bars (2) have been replaced by metal bars (2') and the boards (5) by layers (3),

figure 4c

shows in the same way as figure 4a the design of framing of joists or walls, but here the wooden bars (2) have been replaced by metal plates (2'') and the boards (5) are replaced by layers (3) which may as well be metal plates,

figure 5a

shows as an example how boards (5) are fastened to the upper and lower sides (outer sides) of the connected (B) building elements (A) in order to form frames perpendicular to the longitudinal direction of the profile plates (1),

figure 5b

shows as an example how layers (3) from wood or metal or other material are fastened to the upper and lower sides (outer sides) of the connected (B) building elements (A) in order to form frames perpendicular to the longitudinal direction of the profile plates (1),

figure 5c

shows as an example how wooden bars (4) are fastened to the upper and lower sides (outer sides) of the connected (B) building elements (A) in order to form frames perpendicular to the longitudinal direction of the profile plates (1),

figure 5d

shows as an example how boards (5) are fastened to the upper side and wooden bars (4) are fastened to the lower side of the connected (B) building elements (A) in order to form frames perpendicular to the longitudinal direction of the profile plates (1),

figure 5e

shows as an example how layers (3) are fastened to the upper side and wooden bars (4) are fastened to the lower side of the connected (B) building elements (A) in order to form frames perpendicular to the longitudinal direction of the profile plates (1),

figure 6

shows how building elements (4) have been put in each other to form a pile to make transport and storing efficient.

Claims

1. Building elements (A) for forming of framing of joists or walls consisting of trapezoid corrugated thin sheet plates (1) connectable by connectors (D) placed at the outer side (10) of flanges of the profiled plates (1) and coinciding with their whole lengths, **charac-**

- terized in that said building elements (A) are provided with connectors (D) joined at the outer facing side (10) of the flanges of the trapezoid corrugated thin sheet plates (1), whereby said connectors (D) consist of wooden bars (2) alternatively metal bars (2') alternatively metal plates (2'') or some other like means, which connectors (D) are joined to the trapezoid corrugated thin sheet plates (1) by aid of glue and/or screws alternatively nails, alternatively rivets, alternatively welding, whereby said building elements (A) can be joined at their outer sides (11) through said connectors (D) with layer materials (3) alternatively bars (4) alternatively boards (5) or in combination of these (3, 4, 5) to form frames perpendicular to the longitudinal direction of the profiled plates (1) for supporting loads in this direction and at the same time support loads in the longitudinal direction strengthened by the connectors (D) occurring at load of framing of joists or walls designed as mentioned above when these are supported at four sides.
2. Building elements (A) according to claim 1, **characterized in that** said connectors (D) placed and connected to the outer sides (10) of trapezoid corrugated profile plates (1) give increased design height, increased bending resistance and increased bending stiffness when building framings of joists and walls in the two supporting main directions as mentioned in claim 1.
3. Building elements (A) according to claim 1 or 2, **characterized in that** they are joinable longitudinally in principle in the same way as laying exclusively of trapezoid corrugated sheet plates (1) in order to transfer pressure, tensile, and shear forces.
4. Building elements (A) according to claims 1 - 3, **characterized in that** their trapezoid corrugated thin sheet plates (1) consist of already existing plate profiles or trapezoid corrugated profile plates (1) manufactured especially for this purpose.
5. Building elements (A) according to claims 1 - 4, **characterized in that** framings of joists/walls formed from said building elements (A) have hole cambers (6), which when needed may be utilized for lines and/or filling for improving sound insulation, fire insulation and heat insulation in the completed framing of joists/walls.
6. Building elements (A) according to claims 1 - 5, **characterized in that**, said building elements (A), when needed, are put into each other in a pile during transportation and storage.

Patentansprüche

1. Bauteile (A) zum Bilden eines Tragwerks oder von Wänden, die aus gewellten, dünnen Trapezblechen (1) bestehen, die durch Steckverbinder (D) verbunden werden können, die an der äußeren Seite (10) von Flanschen von Profilplatten (1) platziert werden können und damit in ihrer gesamten Länge übereinstimmen, **dadurch gekennzeichnet, dass** die Bauteile (A) mit Steckverbindern (D) bereitgestellt sind, die an der nach außen weisenden Seite (10) der Flansche der gewellten, dünnen Trapezbleche (1) zusammengefügt sind, wobei die Steckverbinder (D) aus Holzstangen (2), alternativ Metallstangen (2'), alternativ Metallplatten (2'') oder ähnlichen Mitteln bestehen, wobei die Steckverbinder (D) mit den gewellten, dünnen Trapezblechen (1) mithilfe von Klebstoff und/oder Schrauben, alternativ Nägeln, alternativ Nieten, alternativ durch Schweißen zusammengefügt sind, wodurch die Bauelemente (A) an ihren Außenseiten (11) durch die Steckverbinder (D) mit Schichtmaterialien (3), alternativ Stangen (4), alternativ Platten (5) oder einer Kombination (3, 4, 5) zum Bilden von Rahmen zusammengefügt werden können, die senkrecht zur Längsrichtung der Profilplatten (1) zum Abstützen von Lasten in dieser Richtung verlaufen und gleichzeitig Lasten in Längsrichtung abstützen, die von den Steckverbindern (D) verstärkt werden und die beim Belasten des Tragwerks oder der Wände auftreten, die wie oben ausgestaltet sind, wenn diese an vier Seiten abgestützt sind.
2. Bauteile (A) nach Anspruch 1, **dadurch gekennzeichnet, dass** die Steckverbinder (D), die an den äußeren Seiten (10) der gewellten Trapezprofilplatten (1) angeordnet und damit verbunden sind, eine gesteigerte Ausgestaltungshöhe, gesteigerte Biegebeständigkeit und gesteigerte Biegesteifigkeit beim Bauen von Tragwerken und Wänden in den zwei abstützenden Hauptrichtungen nach Anspruch 1 ergeben.
3. Bauteile (A) nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** sie längs im Prinzip auf die gleiche Weise zusammengefügt werden können, wie beim exklusiven Verlegen von gewellten Trapezblechen (1), um Druck-, Zug- und Scherkräfte zu übertragen.
4. Bauelemente (A) nach einem der Ansprüche 1 bis 3, **dadurch gekennzeichnet, dass** die gewellten, dünnen Trapezbleche (1) aus bereits vorhandenen Plattenprofilen oder gewellten Trapezprofilplatten (1) bestehen, die speziell für diesen Zweck hergestellt wurden.
5. Bauelemente (A) nach einem der Ansprüche 1 bis 4, **dadurch gekennzeichnet, dass** die Tragwer-

ke/Wände, die aus den Bauteilen (A) gebildet werden, Lochwölbungen (6) aufweisen, die bei Bedarf für Linien und/oder zum Füllen zum Verbessern der Schalldämpfung, Brandisolierung und Wärmedämmung im fertiggestellten Tragwerk/Wänden benutzt werden können.

6. Bauteile (A) nach einem der Ansprüche 1 bis 5, **dadurch gekennzeichnet, dass** die Bauteile (A) bei Bedarf während des Transports und der Lagerung als ein Stapel ineinander gesetzt werden können.

Revendications

1. Éléments de construction (A) pour former la charpente de solives ou de murs constitués de fines tôles d'acier ondulées trapézoïdales (1) connectables par des connecteurs (D) placés sur le côté extérieur (10) des ailes des tôles profilées (1) et présentant des longueurs totales correspondantes, **caractérisés en ce que** lesdits éléments de construction (A) sont pourvus de connecteurs (D) joints au niveau du côté orienté vers l'extérieur (10) des ailes des fines tôles d'acier ondulées trapézoïdales (1), dans lesquels lesdits connecteurs (D) sont constitués de barres de bois (2), alternativement de barres de métal (2') alternativement de plaques de métal (2'') ou de tous autres moyens analogues, lesdits connecteurs (D) étant joints aux fines tôles d'acier ondulées trapézoïdales (1) en utilisant de la colle et/ou des vis, alternativement des clous, alternativement des rivets, alternativement un soudage, dans lesquels lesdits éléments de construction (A) peuvent être joints au niveau de leurs côtés extérieurs (11) à travers lesdits connecteurs (D) avec des matériaux en couches (3), alternativement des barres (4), alternativement des planches (5) ou une combinaison de ceux-ci (3, 4, 5) pour former des cadres perpendiculaires à la direction longitudinale des tôles profilées (1) afin de supporter des charges dans la direction longitudinale renforcée par les connecteurs (D) qui se produisent à la mise en charge de la charpente de solives ou de murs conçue selon la manière décrite ci-dessus lorsque ceux-ci sont supportés à leur quatre côtés.

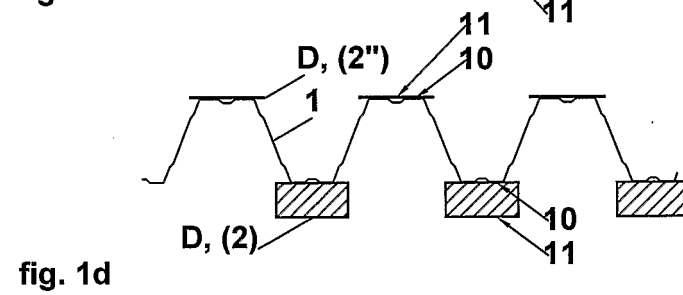
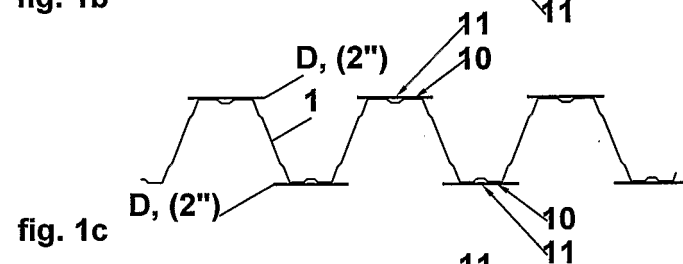
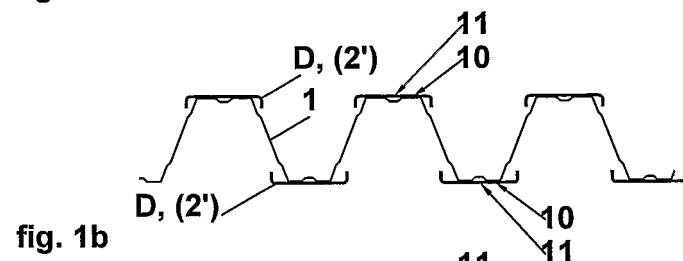
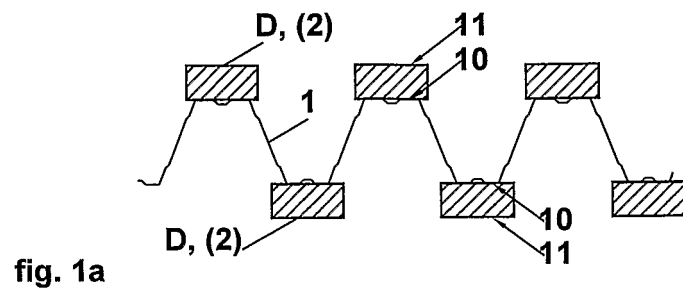
2. Éléments de construction (A) selon la revendication 1, **caractérisés en ce que** lesdits connecteurs (D) placés et connectés sur les côtés extérieurs (10) des tôles d'acier ondulées trapézoïdales (1) apportent une hauteur de conception accrue, une résistance à la flexion accrue et une rigidité au pliage accrue lors de la construction de charpentes de solives et de murs dans les deux directions de support principales, comme cela est mentionné dans la revendication 1.

3. Éléments de construction (A) selon la revendication 1 ou 2, **caractérisés en ce qu'ils** sont joignables de façon longitudinale en principe de la même manière qu'en cas de pose exclusivement de tôles d'acier ondulées trapézoïdales (1) dans le but de transférer des forces de pression, de traction et de cisaillement.

4. Éléments de construction (A) selon les revendications 1 à 3, **caractérisés en ce que** leurs fines tôles d'acier ondulées trapézoïdales (1) sont constituées de profils de tôle ou de profils de tôles ondulées trapézoïdales déjà existants (1) fabriqués spécialement à cette fin.

5. Éléments de construction (A) selon les revendications 1 à 4, **caractérisés en ce que** charpentes de solives/murs formées à partir desdits éléments de construction (A) présentent des chambres perforées (6) qui, lorsque cela s'avère nécessaire, peuvent être utilisées pour des câbles et/ou un rembourrage pour améliorer l'isolation acoustique, l'isolation ignifuge et l'isolation thermique dans la charpente de solives/murs terminée.

6. Éléments de construction (A) selon les revendications 1 à 5, **caractérisés en ce que** lesdits éléments de construction (A), lorsque cela s'avère nécessaire, sont agencés mutuellement en une pile pendant le transport et le stockage.



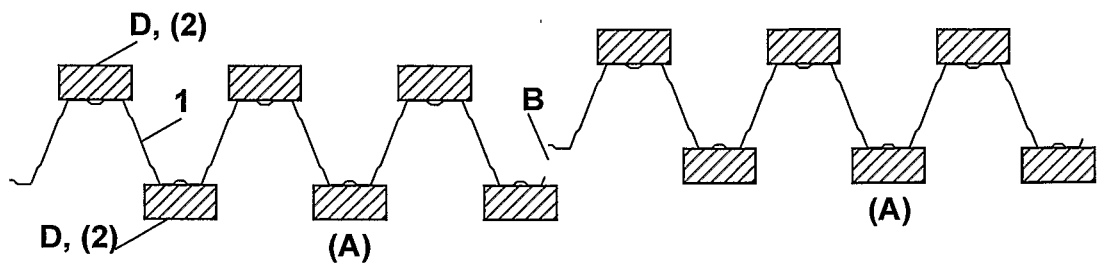


fig. 2a

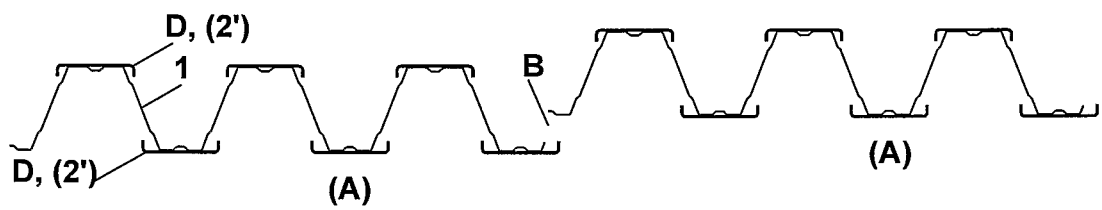


fig. 2b

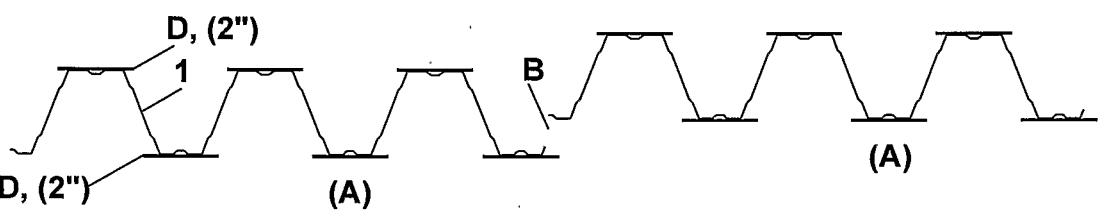


fig. 2c

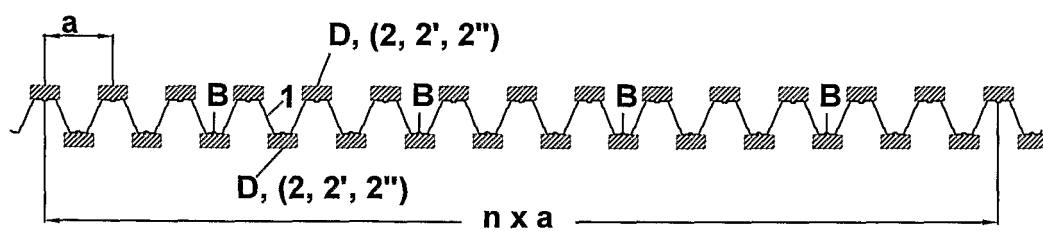


fig. 3

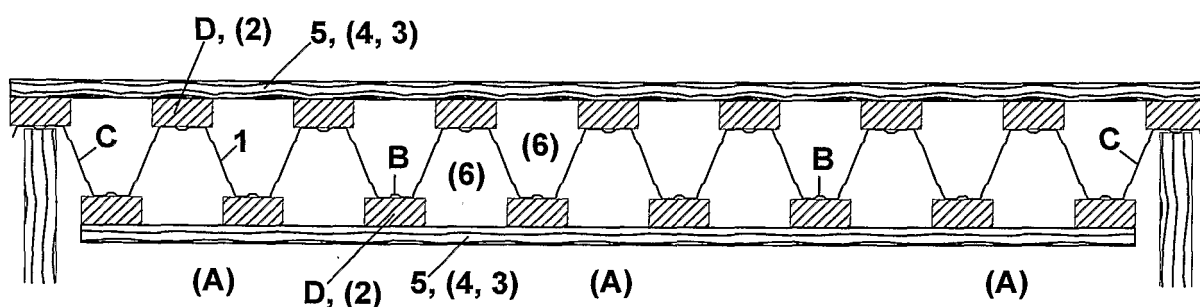


fig. 4a

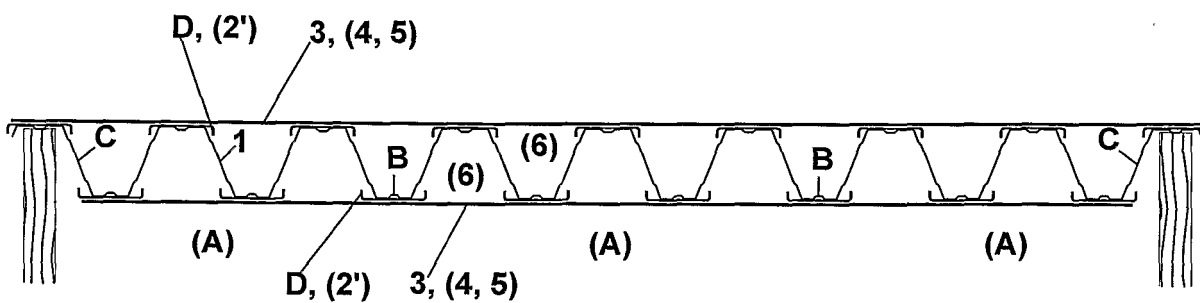


fig. 4b

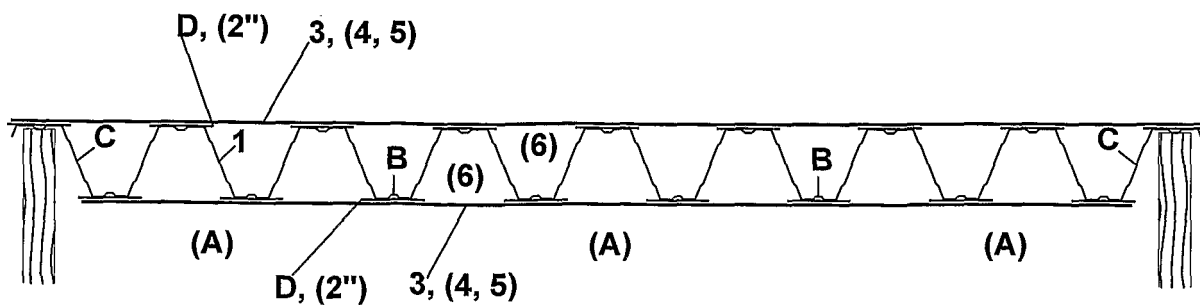


fig. 4c

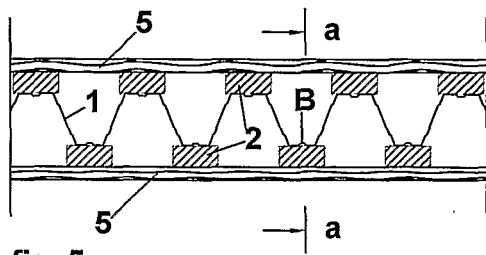


fig. 5a

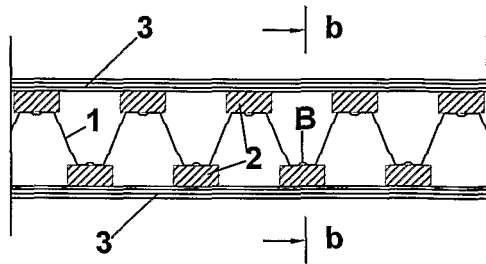
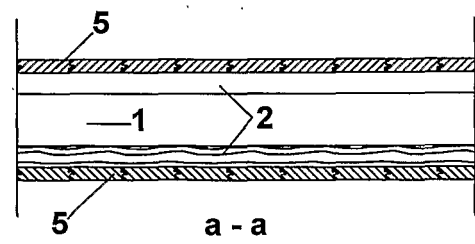


fig. 5b

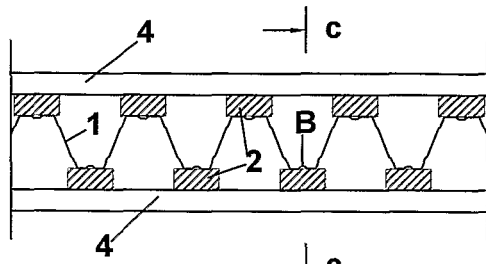
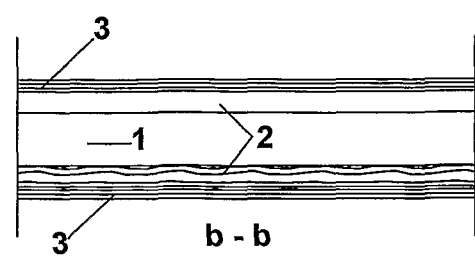


fig. 5c

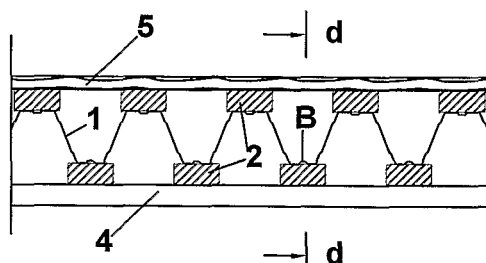
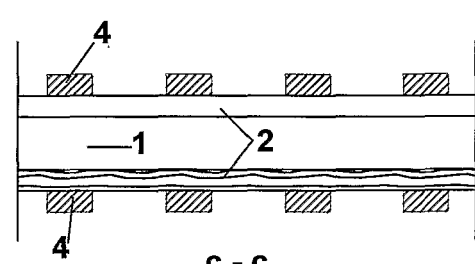


fig. 5d

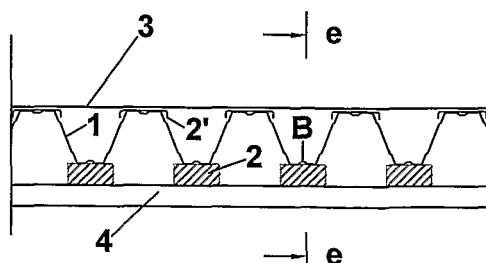
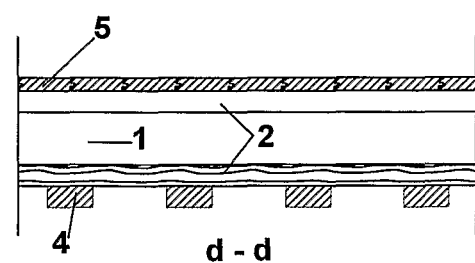
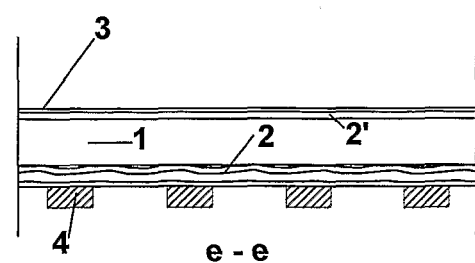


fig. 5e



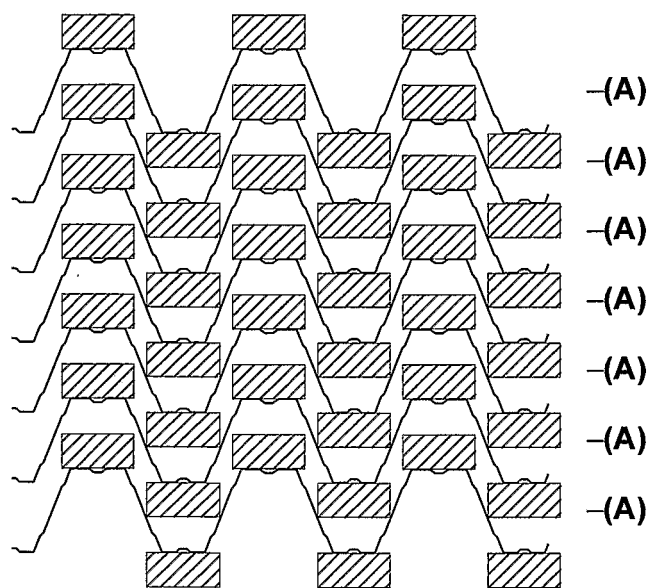


fig. 6

REFERENCES CITED IN THE DESCRIPTION

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