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(54) **Fire resistant sandwich panel**

Feuerbeständiges Sandwich-Paneel

Panneau à structure sandwich résistant au feu

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(56) References cited:
EP-A- 0 240 161
FR-A- 2 332 391

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Description

The present invention relates to a sandwich wall system panel.

Conventionally such panels are formed with an insulating core sandwiched between first and second metal skins. The insulating core often takes the form of a foamed compound but other insulating cores comprise fibrous material such as sold under the trade mark ROCKWOOL.

Sometimes it is necessary to provide such sandwich panels so that they are of a fire resistant nature and in these circumstances the ROCKWOOL cores are to be preferred because of their inherent fire resistance.

The opposite edge portions of the panels are usually provided with a tongue and groove arrangement to enable adjacent panels to be interconnected. To provide adequate rigidity, at least one of the opposite edge portions is usually provided with a continuous connecting profile or member extending between the first and second skins. However, a problem associated with such panels is that the connecting profile can form a heat bridge diminishing the insulating effect of the core. In order that a satisfactory level of thermal insulation be attained, the choice of material for the connecting profile is limited. In a structure, for example as illustrated in EP-A-324282, a rim portion, usually formed as an aluminium extrusion, is associated with and extends along one longitudinal edge of each of the first and second metal skins, the rim portions facing one another, with the free ends of the rim portions extending in parallel spaced relation to one another to define a central joining tongue flanked by a pair of channels and extending from the longitudinal edge of the panel, a pair of spaced parallel legs formed by marginal portions of the first and second skins and projecting beyond the core at the opposite longitudinal edge of the panel. The legs are spaced apart to form a groove to receive the tongue of an adjacent similar panel, the legs then being accommodated within the channels of the adjacent panel and at least one rigid connector is inserted between the rim portions to connect the tongue forming free ends to prevent movement of the rim portions towards and away from one another.

One of the problems of providing a satisfactory fire resistant panel is that when the fire reaches a particular intensity, the temperature may be such as to melt the metal skin on the fire side of the panel. If aluminium rim portions are used, then these too will melt and the whole panel will disintegrate. Consideration has been given to forming the connector portions of steel, but such connector portions are of somewhat complicated profile and are substantially impossible to manufacture on an economic basis.

It is now proposed, according to the present invention, to provide a sandwich wall system panel comprising an insulating core sandwiched between a first metal skin adhered to one face of the core and a second metal skin adhered to the opposite face of the core, a pair of separate elongate metal joining members, connected to the first and second skin, respectively, and extending in parallel spaced relation to define a central joining tongue flanked by a pair of channels and extending along a longitudinal edge of the panel, connecting means connecting said separate elongate metal joining members, a pair of spaced parallel legs formed by marginal portions of the first and second skin and projecting from an opposite longitudinal edge of the panel, said legs being spaced to form a groove which is capable of receiving the central joining tongue of an adjacent panel, said legs being capable of being accommodated within a pair of channels of the adjacent panel, characterised in that said pair of separate elongate metal joining members are formed of steel, in that said connecting means comprise a first connector connecting respective web portions of said elongate metal joining members and a second connector connecting respective free edges of said elongate metal joining members, and in that the first and second connectors are formed of expanded sheet steel, a steel grid or perforated steel sheet.

Because the connectors are formed of a material, in particular expanded sheet steel, which has adequate strength but a relatively small cross-section heat bridge path, the integrity of the insulating core can be retained and this can act as a true barrier to the fire on one side of the panel even should the metal skin facing the fire be melted away. The melting point of steel is significantly higher than that of aluminium, hence there is little risk of the joining members or the connectors melting. The ROCKWOOL core will act as an adequate fire screen for a considerable period thereby giving adequate time for personnel on the side of the panel remote from the fire readily to escape.

Preferably an inturned bead is associated with and extends along one longitudinal edge of each of said first and second metal skins, said inturned beads facing one another and extending in parallel spaced relation to one another. Advantageously the two separate elongate steel joining members are generally U-shaped, each including a short arm engaged in the associated inturned bead of the first or second skin, and a longer arm, the longer arms extending in parallel spaced relation to form said tongue.

The associated inturned bead of the first and second skins may simply be of U-shaped configuration, but in a preferred construction preferably includes one or more inwardly directed projections engageable with the short arm of the U-shaped steel joining members more firmly to retain these joining members in place.

The insulating core is preferably also provided within the tongue and is engaged between the first and second connectors, thereby to provide a greater insulating effect. With regard to the groove formed on the opposite side of the panel, the insulation preferably has two portions extending inwardly of the spaced parallel legs, the inner sides of these portions then defining the groove to receive the tongue of the adjacent similar panel.

The term "steel" is to be read herein as covering any high melting point metal.

In order that the present invention may more readily be understood, the following description is given, merely by way of example, reference being made to the accompanying drawings in which:-

Figure 1 is a schematic perspective view of the junction between two panels according to the present invention;

Figure 2 is a similar view showing the two joining members secured together by first and second connectors;

Figure 3 shows alternative shapes of the inturned rims of the panel of Figure 1; and

Figure 4 is a schematic fragmentary section showing the support of two adjacent panels.

Referring first to Figure 1, the drawing illustrates a portion of two adjacent panels 10,12, according to the present invention. The panels will be substantially identical and comprise a first metal skin 14 on one face and a second metal skin 16 on the other face, the skins being adhesively bonded to an insulating core 18 formed of ROCKWOOL. The right hand edge of panel 10 is indicated as having an inturned bead 20 and the skin 16 having inturned bead 22.

The opposite edges of the panels, that is to say the edge illustrated on the left of the panel 12 in Figure 1, is such that the skins 14,16 are provided with a pair of spaced parallel legs 24,26. On this edge of the panel the insulating core 18 preferably includes two portions 28,30 extending inwardly of the spaced parallel legs 24,26 and defining therebetween a groove 32.

The right hand edge of the panel 14 is shown as being provided with two joining members 34,36 which are illustrated more clearly in Figure 2. These two joining members are each of a U-shaped configuration having a shorter arm 38, a web portion 40 and a longer arm 42 having an inturned flange 44 at its free edge. It will be noted that the shorter arms 38 are each provided with a cranked flange portion 46.

The two joining members 34,36 are connected to one another by a first expanded metal connector 48 spot welded to the web portions 40 and a second connector 50 spot welded to the flanges 44. As illustrated in Figure 1, a further ROCKWOOL insulating core portion 52 is positioned between the longer arms 42 and the connectors 48,50. It will be seen in Figure 1 that the cranked flange portions 46 are engaged in the inturned beads 20,22 to retain the joining members 34,36 in place. Figure 3 shows two forms of the inturned bead. In the upper part the inturned bead is a simple U-shaped member, as illustrated in Figure 1. In the lower part of Figure 3 the inturned bead has an inturned projection or projections 54 which can engage to the left, as seen in Figure 1, on the cranked flange 46 more firmly to hold the shorter arm 38 in place. The longer arms 42, flanges 44, connector 50 and core portion 52 form a tongue 33 engageable in groove 32, the tongue being flanked by channels 35,37 into which the legs 24,26 and the core portions 28,30 extend.

The joining members 34,36 can be roll formed readily from sheet steel which has a far higher melting point than the aluminium of the skins 14,16. The connectors 48,50 are also formed of steel and as shown are formed of expanded sheet steel which is made by the conventional expanded metal technique. As alternatives the connectors 48,50 could be formed of perforated sheet steel or a steel grid. Which ever method is used, the connectors provide an adequate connection between the members 34,36 but provide a relatively small cross-sectional area for the passage of heat. The connectors 48,50, therefore, will not provide a significant heat bridge so there will be little tendency for the skins on the remote side from any fire to be raised to a sufficiently elevated temperature for them to melt.

It will be appreciated that the steel construction of the joining members 34,36 and the connectors 48,50 will withstand excess temperatures quite adequately and will maintain the integrity of the structure even though one of the skins should be melted away. The ROCKWOOL core will be fire resistant and it will be retained in place by the assembly comprising the joining members and the connectors.

Figure 4 illustrates very schematically how panels of the invention are mounted. A support member 60 extends vertically and has associated with it, for each panel, a bracket 62 held to the support member 60 by a screw 64. An arm 66 of the bracket extends into the space formed between the inturned bead 22 of the panel 10 and the leg 26 of the panel 12. The arm 66 thus retains the panels 10,12 against the support 60.

A sealing member 68 is engaged between the bead 20 and the leg 24 on the far side of the panels.

Claims

1. A sandwich wall system panel (10, 12) comprising an insulating core (18) sandwiched between a first metal skin (14) adhered to one face of the core and a second metal skin (16) adhered to the opposite face of the core, a pair of separate elongate metal joining members (34, 36), connected to the first and second skin, respectively, and extending in parallel spaced relation to define a central joining tongue (33) flanked by a pair of channels (35, 37) and extending along a longitudinal edge of the panel, connecting means (48, 50) connecting said separate elongate metal joining members (34, 36), a pair of spaced parallel legs (24, 26) formed by marginal portions of the first and second skin (14, 16) and projecting from an opposite longitudinal edge of the panel, said legs being spaced to form a groove (32) which is capable of receiving the central joining

tongue of an adjacent panel, said legs being capable of being accommodated within a pair of channels of the adjacent panel, characterised in that said pair of separate elongate metal joining members (34, 36) are formed of steel, in that said connecting means (48, 50) comprise a first connector (48) connecting respective web portions (40) of said elongate metal joining members (34, 36) and a second connector (50) connecting respective free edges (44) of said elongate metal joining members (34, 36), and in that the first and second connectors (48, 50) are formed of expanded sheet steel, a steel grid or perforated steel sheet.

2. A panel according to claim 1, characterised in that an inturned bead (20, 22) is associated with and extends along one longitudinal edge of each of said first and second metal skins (14, 16), said inturned beads facing one another and extending in parallel spaced relation to one another.

3. A panel according to claim 2, characterised in that the pair of separate elongate steel joining members (34, 36) are generally U-shaped, each including a short arm (38) and a longer arm (42) extending in parallel spaced relation from said web portion (40), the longer arms forming said tongue (33).

4. A panel according to claim 3, characterised in that the associated inturned bead (20, 22) is of U-shaped configuration.

5. A panel according to claim 3, characterised in that the inturned bead (20, 22) includes one or more inwardly directed projections (54) engagable with the short arm (38) of the elongate steel joining members (34, 36).

6. A panel according to any preceding claim, characterised in that a further core portion (52) is also provided within the tongue (33) and is engaged between the first and second connectors (48, 50).

7. A panel according to any preceding claim, characterised in that the insulation core (18) has two portions (28, 30) extending between the spaced parallel legs (24, 26), the inner sides of these two portions then defining the groove (32) to receive the tongue (33) of the adjacent panel.

Patentansprüche

1. Wandsystem-Verbundplatte (10,12), ausgestattet mit

   - einem Isolierkern (18), der zwischen einer auf einer Seite dieses Kerns haftend befestigten ersten Metallhaut (14) und einer auf der gegenüberliegenden Seite dieses Kerns haftend befestigten zweiten Metallhaut (16) angeordnet ist;

   - einem Paar separater, langgestreckter metallischer Anschlußelemente (34,36), die an der ersten bzw. zweiten Metallhaut so angebracht werden, daß sie in einem Abstand zueinander parallel verlaufen und entlang der Längskante der Platte eine mittig sitzende Anschlußfeder (33) bilden, die von einem Paar langgestreckter Vertiefungen (35,37) gesäumt wird;

   - Verbindungsmitteln (48,50), die diese separaten, langgestreckten metallischen Anschlußelemente (34, 36) miteinander verbinden;

   - einem Paar in einem Abstand zueinander parallel verlaufender Schenkel (24,26), die von Kantenbereichen der ersten und zweiten Metallhaut (14,16) gebildet werden und an einem gegenüberliegenden Längsrand der Platte so vorstehen, daß der Zwischenraum zwischen diesen Schenkeln eine Nut (32) bildet, welche die mittige Verbindungsfeder einer angrenzenden Platte aufzunehmen geeignet ist, wobei die Schenkel selbst wiederum in einem Paar langgestreckter Vertiefungen der angrenzenden Platte Platz finden;

   dadurch gekennzeichnet, daß das Paar separater, langgestreckter metallischer Anschlußelemente (34,36) aus Stahl besteht, daß die Verbindungsmittel (48,50) ein erstes Verbindungsteil (48), das entsprechende Stegteile (40) der langgestreckten metallischen Anschlußelemente (34,36) verbindet, sowie ferner ein zweites Verbindungsteil (50) umfaßt, das entsprechende freie Ränder (44) der langgestreckten metallischen Anschlußelemente (34, 36) verbindet, und daß es sich bei diesen ersten und zweiten Verbindungsteilen um Streckmetallteile aus Stahlblech handelt.

2. Platte gemäß Anspruch 1, **dadurch gekennzeichnet, daß** entlang einer Längskante der ersten und zweiten Metallhäute (14,16) jeweils eine einwärts gerichtete Randsicke (20, 22) verläuft, wobei diese einwärts gerichteten Randsicken einander gegenüberliegen und in einem Abstand zueinander parallel verlaufen.

3. Platte gemäß Anspruch 2, **dadurch gekennzeichnet, daß** es sich bei dem Paar separater, langgestreckter Anschlußelemente (34,36) aus Stahl um im wesentlichen U-förmige Körper handelt, die jeweils einen kurzen Schenkel (38) und einen länge-

ren Schenkel (42) aufweisen, welche in einem Abstand zueinander parallel von dem Stegteil (40) abstehen, wobei die längeren Schenkel die genannte Nut (33) bilden.

4. Platte gemäß Anspruch 3, **dadurch gekennzeichnet, daß** auch die jeweilige einwärts gerichtete Randsicke (20, 22) einen U-förmigen Querschnitt aufweist.

5. Platte gemäß Anspruch 3, **dadurch gekennzeichnet, daß** die einwärts gerichtete Randsicke (20,22) eine oder mehrere nach innen weisende Vorsprünge (54) aufweist, die sich an dem kurzen Schenkel (38) der langgestreckten stählernen Anschlußelemente (34,36) zur Anlage bringen lassen.

6. Platte gemäß einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, daß** innerhalb des Federteils (33) ein weiteres Kernstück (52) untergebracht ist, das zwischen dem ersten und zweiten Verbindungsteil (48,50) sitzt.

7. Platte gemäß einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, daß** der Isolierkern (18) zwei Teile (28,30) aufweist, die sich zwischen den im Abstand zueinander parallel verlaufenden Schenkeln (24,26) erstrecken, wobei die Innenseiten dieser beiden Teile die Nut (32) zur Aufnahme des Federteils (33) der angrenzenden Platte bilden.

Revendications

1. Panneau à structure sandwich (10, 12) d'un système de parois comprenant une partie centrale isolante (18) placée entre une première peau métallique (14) adhérant à une face de la partie centrale et une seconde peau métallique (16) adhérant à la face opposée de la partie centrale, une paire d'éléments de jonction allongés, séparés, en métal (34, 36), connectés aux première et seconde peaux, respectivement, et s'étendant parallèlement en étant espacés l'un de l'autre pour définir une languette de jonction centrale (33) flanquée par une paire de canaux (35, 37) et s'étendant le long d'un bord longitudinal du panneau, des moyens de connexion (48, 50) reliant lesdits éléments de jonction allongés séparés en métal (34, 36), une paire de branches parallèles espacées l'une de l'autre (24, 26) formées par des parties marginales des première et seconde peaux (14, 16) et en saillie sur un bord longitudinal opposé du panneau, lesdites branches étant espacées pour former une rainure (32) qui est capable de recevoir la languette de jonction centrale d'un panneau contigu, lesdites branches pouvant être reçues à l'intérieur d'une paire de canaux du panneau contigu, caractérisé en ce que ladite paire d'éléments de jonction séparés, allongés, en métal (34, 36) sont constitués d'acier, en ce que lesdits moyens de connexion (48, 50) comprennent un premier connecteur (48) reliant les âmes respectives (40) desdits éléments allongés de jonction en métal (34, 36) et un second connecteur (50) reliant les bords libres respectifs (44) desdits éléments de jonction allongés en métal (34, 36), et en ce que les premier et second connecteurs (48, 50) sont constitués d'une tôle d'acier expansée, d'une grille d'acier ou d'une tôle d'acier perforée.

2. Panneau selon la revendication 1, caractérisé en ce qu'un bourrelet tourné en dedans (20, 22) est associé à et s'étend le long d'un bord longitudinal de chacune desdites première et seconde peaux métalliques (14, 16), lesdits bourrelets tournés en dedans étant en regard l'un de l'autre et s'étendant en relation parallèle en étant espacés l'un de l'autre.

3. Panneau selon la revendication 2, caractérisé en ce que la paire d'éléments de jonction allongés séparés en acier (34, 36) ont la forme générale d'un U, chacun comprenant un bras de courte longueur (38) et un bras de grande longueur (42) s'étendant en relation parallèle en étant espacés à partir de ladite âme (40), les bras de grande longueur constituant ladite languette (33).

4. Panneau selon la revendication 3, caractérisé en ce que le bourrelet tourné en dedans associé (20, 22) à la forme d'un U.

5. Panneau selon la revendication 3, caractérisé en ce que le bourrelet tourné en dedans (20, 22) comprend une ou plusieurs saillies dirigées vers l'intérieur (54) qui peuvent venir en contact avec le bras de courte longueur (38) des éléments allongés de jonction en acier (34, 36).

6. Panneau selon l'une quelconque des revendications précédentes, caractérisé en ce qu'une autre partie centrale (52) est également prévue à l'intérieur de la languette (33) et est engagée entre les premier et second connecteurs (48, 50).

7. Panneau selon l'une quelconque des revendications précédentes, caractérisé en ce que la partie centrale d'isolation (18) comporte deux parties (28, 30) s'étendant entre les branches parallèles espacées (24, 26), les côtés intérieurs de ces deux parties définissant alors la rainure (32) pour recevoir la languette (33) du panneau contigu.

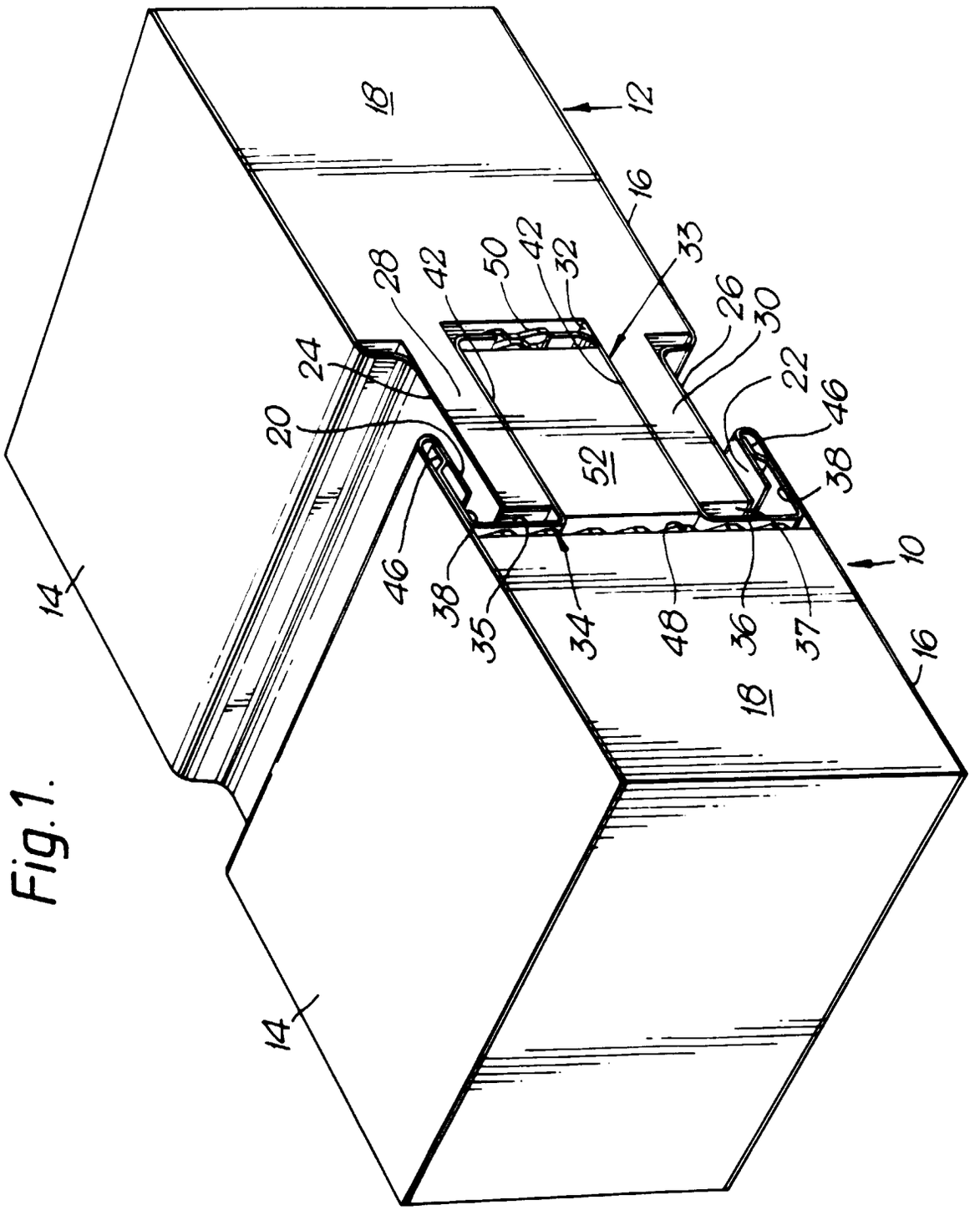
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Fig.1.

Fig. 2.

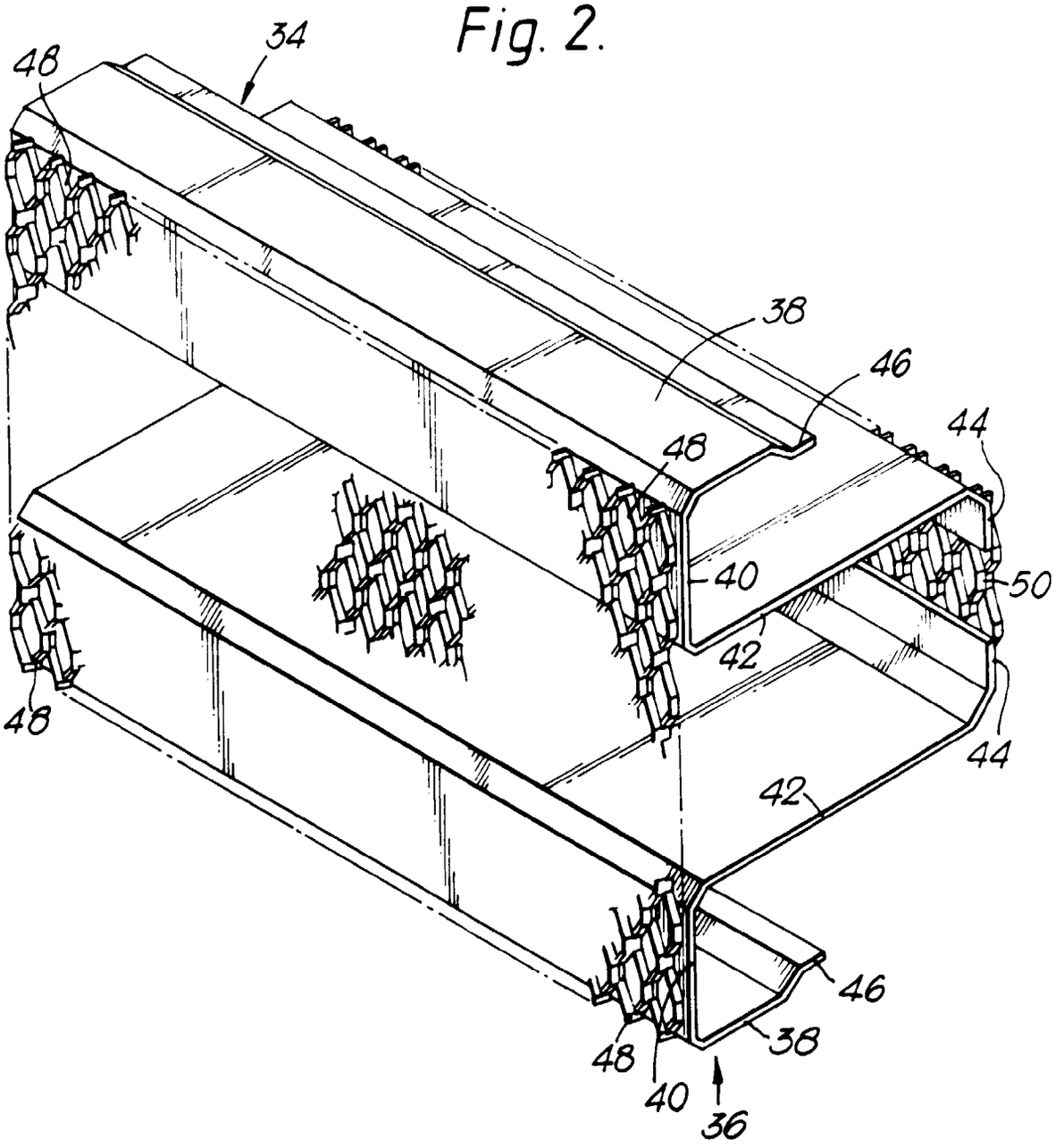

Fig. 3.

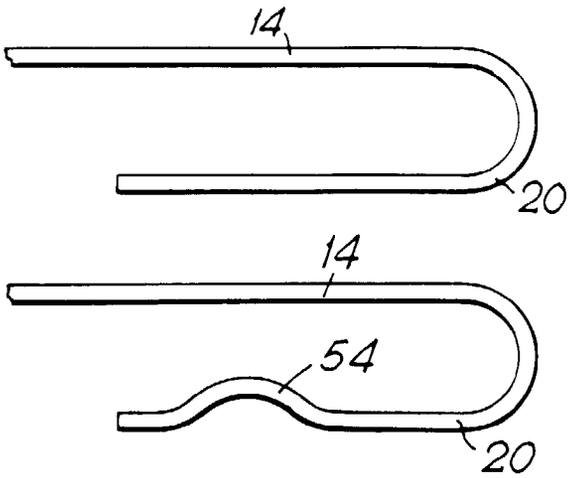

Fig. 4.