



- (51) **International Patent Classification:**
E04C 3/07 (2006.01) *E04B 2/74* (2006.01)
- (21) **International Application Number:**
PCT/GB2011/052138
- (22) **International Filing Date:**
3 November 2011 (03.11.2011)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
1105383.2 30 March 2011 (30.03.2011) GB
- (71) **Applicant (for all designated States except US):** **LA-FARGE PLASTERBOARD** [GB/GB]; Marsh Lane, East-on-in-Gordano, Bristol BS20 0NF (GB).
- (72) **Inventors; and**
- (75) **Inventors/Applicants (for US only):** **SOULHAT, Julien** [FR/FR]; 3 Place Grand Paradis, F-84000 Avignon (FR). **SHADDICK, Mark** [GB/GB]; 22 Walnut Walk, Bishopsworth, Bristol BS13 7RH (GB). **WATKINS, Andrew** [GB/GB]; 13 Kenilworth Close, Keynsham, Bristol BS31 2PB (GB). **VIAL, Emmanuel** [FR/FR]; 3 rue Gaston Boissier, F-30900 Nîmes (FR). **DEMANET, Cyrille** [FR/FR];

4 Impasse Vercors, F-84000 Avignon (FR). **ARESE, Roger** [FR/FR]; 3 résidence les Aubépines, F-84800 Isle sur la Sorgue (FR).

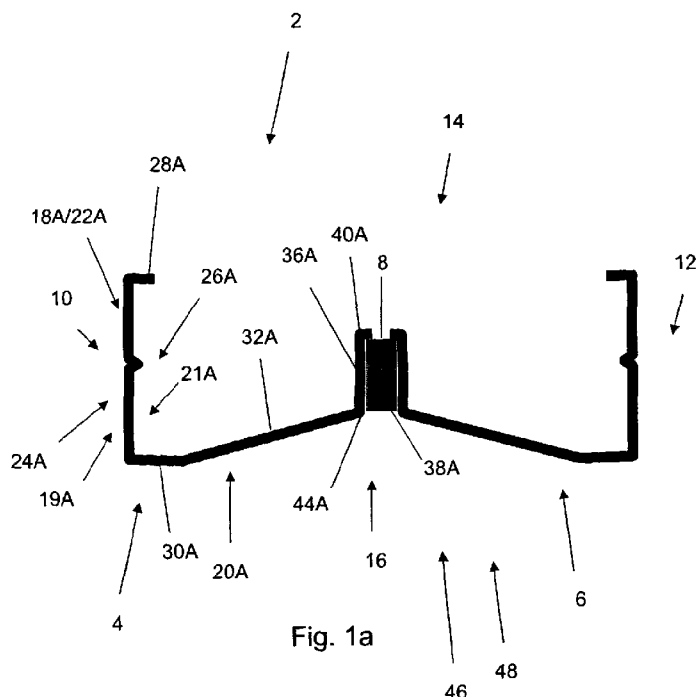
(74) **Agents:** **BUMKE, Jakob** et al.; Keltie, Fleet Place House, 2 Fleet Place, London EC4M 7ET (GB).

(81) **Designated States (unless otherwise indicated, for every kind of national protection available):** AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) **Designated States (unless otherwise indicated, for every kind of regional protection available):** ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK,

[Continued on next page]

(54) **Title:** IMPROVEMENTS RELATING TO CONSTRUCTION



(57) **Abstract:** A spacer support for a stud wall structure, the spacer support comprising: panel supports having first and second lateral boundaries; and a bridge member extending between the panel supports, the bridge member comprising bridge portions each extending from a lateral boundary of an associated one of the panel supports, the bridge portions being connected and separated by a decoupler at connecting faces of the bridge portions that are fastened to the decoupler, wherein the bridge portions each comprise a laterally inward-angled section to position their connecting faces laterally in-board of the first and second lateral boundaries of the panel supports.



SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, —
GW, ML, MR, NE, SN, TD, TG).

*before the expiration of the time limit for amending the
claims and to be republished in the event of receipt of
amendments (Rule 48.2(h))*

Published:

— *with international search report (Art. 21(3))*

Improvements relating to construction

This invention relates to supports for use in construction. In particular, though not exclusively, the invention relates to spacer supports for use in frame construction.

5

Frame construction is a common building technique for the fabrication of so-called stud wall structures, which are especially useful as internal walls of buildings, e.g. partitions, but may also be used externally. Frame construction involves fastening sheets of walling material, such as plasterboard, to supports. A stud, also referred to as a post, upright or
10 scantling, is an example of such a support. Furthermore, other supports, such as braces, are used in frame construction to hold or strengthen stud-type supports within the wall structure.

In its simplest form, frame construction involves fastening a sheet of walling material to
15 either side of a row of supports (e.g. studs) to form a 'single stud' wall. An air gap between the sheets of walling material provides a degree of acoustic (sound) isolation. Acoustic isolation is an important consideration in frame construction. It is hence common practice, particularly in partitioning, to use two rows of parallel supports (e.g. studs) and to fasten a single sheet of walling material to the outside faces of each of the
20 paired supports. This creates an enlarged air gap within the resulting 'twin stud' wall, providing better low frequency acoustic insulation.

However, in both 'single stud' and 'twin stud' walls, supports have been found, undesirably, to act as acoustic bridges due to support-borne transmission of sound
25 waves. This is a particular problem in 'single stud' walls but also occurs in 'twin stud' walls, where some form of brace (support) is generally fastened between parallel supports to provide adequate strength. As such a brace provides a stiff connection between supports, it provides an acoustic bridge, reducing overall acoustic isolating performance. Compared to 'single stud' construction, 'twin stud' construction also suffers
30 from increased cost of materials and installation time.

In summary, although supports act as spacers in frame construction to provide isolating or insulating gaps, they themselves are often acoustic bridges, particularly when monolithic or made of metal.

35

Attempts have been made to overcome this problem. EP1513989 A1 discloses a wall stud comprising two opposing sidewalls interconnected by a spanning web including a curved member having at least one row of elongate slots formed therein along a longitudinal axis thereof.

5

EP 1705 305 A2 discloses generally C-shaped members for use in steel framed buildings, formed from thermally conductive components which have a gap therebetween, which is spanned with a thermally insulating, high strength, reinforced polymer.

10

Nevertheless, providing good a level of acoustic isolation and/or thermal insulation at low cost, and without excessive installation time, remains a need in the prior art, particularly where high structural stability is desired. It is an object of the invention to address this and/or at least one other problem associated with the prior art.

15

The invention embraces advantageous spacer supports for stud wall structures of the type comprising panel supports and a bridge member extending between the panel supports, wherein the bridge member comprises bridge portions connected and separated by a decoupler.

20

From a first aspect, the invention resides in a spacer support for a stud wall structure, the spacer support comprising: panel supports having first and second lateral boundaries; and a bridge member extending between the panel supports, the bridge member comprising bridge portions each extending from a lateral boundary of an associated one of the panel supports, the bridge portions being connected and separated by a decoupler at connecting faces of the bridge portions that are fastened to the decoupler, wherein the bridge portions comprise a laterally inward-angled section to position their connecting faces laterally inboard of the first and second lateral boundaries of the panel supports.

25

The bridge member extends between the panel supports generally along a depth axis which is orthogonal to lateral and longitudinal axes of the spacer support. The lateral and longitudinal axes are also orthogonal to each other.

30

By separating the bridge portions of the bridge member, the decoupler mitigates acoustic coupling between the panel supports, thereby providing acoustic insulation. Likewise, the

35

decoupler mitigates thermal coupling between the panel supports. The term “mitigate” as used herein ideally also embraces prevention.

5 The positioning of the connecting faces laterally inboard by the inward-angled sections of the bridge portions enhances the structural stability to the spacer support. By inboard positioning is meant that the connecting faces do not extend beyond, and preferably do not intersect, the lateral boundaries of the panel supports. This may conveniently be verified in an end view or cross section of the panel support (see e.g. Figure 1 described below).

10

Inboard positioning of the connecting faces of the bridge portions leads to a compact structure that, whilst being easy to manufacture and providing economy of space, can reduce strain at the connecting faces fastened to the decoupler and hence limit bending forces acting on the decoupler. In other words, inboard positioning of the decoupler
15 allows a more efficient balance of the load on the decoupler when compression or weight is applied to the panel supports. Thus, in contrast to EP 1705 305 A2, which focuses on a high-strength, reinforced polymer to span its gap and counteract bending, the approach of the present invention is to stabilise forces on the decoupler, and the spacer support as a whole, by advantageous arrangement of the bridge portions.

20

Due to its insulating properties and structural rigidity, the spacer support is of particular value in external walls, e.g. load-bearing external walls.

25 The decoupler may act as an acoustic decoupler, i.e. mitigate the transmission of sound between the bridge portions, in any effective manner. The intensity or amplitude of sound and vibrations is typically diminished by attenuation, i.e. absorption, reflection and/or scattering.

30 The decoupler disrupts support-borne transmission of sound and vibration by acting as a discontinuity in the bridge member, between the bridge portions. To further enhance acoustic attenuation, the decoupler may advantageously have a damping ratio ζ (C/C_c) of at least 0.2, preferably at least 0.3. Preferably, and typically, the damping ratio of the decoupler may be higher than the damping ratio of the bridge portions. ζ may be determined by logarithmic decrement, as described for example in ISO 4664-2:2006.

35

The decoupler may act as a thermal decoupler, i.e. mitigate the transfer of heat between the bridge portions, in any effective manner. The transfer of heat may be mitigated by counteracting or slowing one or more of conduction, convection and radiation.

- 5 Conduction has been found to be the prime cause of thermal bridging in spacer supports. The decoupler disrupts support-borne conduction of heat by acting as a discontinuity in the bridge member, between the bridge portions. To counteract conduction of heat, the decoupler may advantageously have a thermal conductivity of at most $0.2 \text{ W/(K}\cdot\text{m)}$, more preferably at most $0.15 \text{ W/(K}\cdot\text{m)}$ or at most $0.1 \text{ W/(K}\cdot\text{m)}$, ideally at most $0.01 \text{ W/(K}\cdot\text{m)}$.
- 10 The minimum thermal conductivity of the decoupler may be as low as possible, for example $0.01 \text{ W/(K}\cdot\text{m)}$ or $0.001 \text{ W/(K}\cdot\text{m)}$. Preferably, and typically, the thermal conductivity of the decoupler may be lower than the thermal conductivity of the bridge portions. For example, to drastically reduce heat loss due to cold bridges, the thermal resistance of the decoupler may be at least five times higher than the thermal resistance
- 15 of each bridge portion.

- The decoupler may preferably be load-bearing, i.e. be capable of supporting weight in addition to its own. For example, the decoupler may advantageously be capable of supporting the weight of one or more of the panel supports and bridge portions. The
- 20 decoupler may provide at least a majority of the shear resistance and/or pull out resistance of the connection between the bridge portions.

- To ensure a high degree of acoustic and/or thermal insulation between the panel supports, the bridge portions may preferably be connected via the decoupler such that
- 25 support-borne sound transmitted, and/or heat conducted, from a first panel support to a second panel support must pass through the decoupler. For maximum insulation, the bridge portions may be connected solely via the decoupler.

- For a good compromise between connective stiffness and acoustic attenuation or
- 30 damping, the decoupler may advantageously have a Young Modulus measured according to ASTM E111-04 (2010) in the range of from 2 MPa to 50 MPa, preferably 10 MPa to 15 MPa. The Poisson's ratio of the decoupler measured according to ASTM E132-04 (2010) may advantageously be in the range of from 0.45 to 0.50, preferably 0.48 to 0.50, most preferably 0.49 to 0.50.

To lend strength to the spacer support, the transversal shear resistance of the decoupler measured according to EN 14869-2:2004 may preferably be at least 300 N/m, whilst its tensile resistance may preferably be at least 500 N/m. Advantageously, the auto-ignition temperature of the decoupler may be at least 200 °C.

5

The decoupler may comprise any suitable material, for example material having one or more of the preferred properties listed above. Advantageously, the decoupler may comprise or consist of a polymeric material, preferably a rubber. The decoupler may comprise a composite material, for example a laminate. Conveniently, the decoupler may
10 comprise an acoustic isolation tape, which may preferably be rubber-based, i.e. comprise at least one rubber layer. Alternatively, the decoupler may, for example comprise or be selected from one or more of a polymeric glue, a silicon sealant, an intumescent sealant, and a medium viscosity paste containing acrylic emulsion, inert fillers and fungicide.

15 Advantageously, the decoupler may be fire retardant. Thus the decoupler may preferably comprise an intumescent material, i.e. a material that swells as a result of heat exposure, thus increasing in volume, and decreasing in density. The decoupler and the spacer support as a whole may preferably comply with fire resistance standards e.g. BS 5588, when tested to BS 476: Part 21, 22 or 23.

20

The decoupler may be fastened to the bridge portions with the help of an adhesive. The adhesive may be of any known type and may contribute to decoupling. Accordingly, the adhesive may optionally form part of the decoupler. In one embodiment the decoupler comprises a rubber-based acoustic isolation tape having layers of adhesive on opposed
25 faces.

The decoupler may have a lateral width, a longitudinal length and a depth separating the bridge portions. Advantageously, the width of the decoupler may be greater than its depth. The length of the decoupler may preferably be greater than the width and the
30 depth. Conveniently, the decoupler may be generally oblong or block-shaped.

The decoupler may be intermittent, i.e. comprise one or more gaps. Alternatively, the decoupler may be continuous.

35 The panel supports and/or bridge portions may preferably comprise a web, for example of cold rolled metal such as steel. The web may preferably have a thickness in the range

of from 0.3 to 2 mm, e.g. in the range of from 0.4 to 1.5 mm, preferably in the range of from 0.5 to 1 mm. Conveniently, each panel support and an associated bridge portion may be integral. This can greatly facilitate manufacturing of the panel supports and bridge portion. For example, each panel support and associated bridge portion may be
5 formed of a single web of cold rolled metal, such as steel. To enhance stiffness and facilitate location of the spacer support, the or each panel support may comprise a groove or other locating or stiffening formation. The or each panel support may also comprise a, preferably integral, formation, such as a terminating shoulder, arranged to assist location of the decoupler.

10

Preferably, the spacer support may comprise two (first and second) panel supports and associated first and second bridge portions.

15

The panel supports may each comprise an outer face arranged to support walling material, with the bridge portions and decoupler bridging a gap between the outer faces. The connecting faces of the bridge members may be fastened to the decoupler for example with an adhesive as described above. The panel supports, outer faces and connecting faces may each comprise first and second lateral sides or boundaries defining their width and first and second longitudinal sides or boundaries defining their
20 length. However, it will be appreciated that the spacer support may be used in any orientation and that the terms "lateral", "longitudinal", "depth" and the like wherever used herein are non-limiting in relation to overall orientation of the spacer support.

25

Advantageously, the outer faces of the panel supports may be substantially parallel to each other. Similarly, the connecting faces of the bridge portions may be substantially parallel to each other and/or substantially parallel to one or more of the outer faces. "Substantially parallel" may encompass, for example, a deviation in orientation from parallel of less than 15 degrees, preferably less than 10 degrees, most preferably less than 5 or even less than 2 degrees. A substantially parallel orientation of the faces helps,
30 in synergy with the inboard position of the connecting faces, further to reduce shear strain on the decoupler, and thus enhances the stability of the support. Ideally, the faces may be arranged to be parallel to each other.

35

For stability and economy of space, the bridge portions are arranged such that the connecting faces of the bridge portions lie laterally inboard of the first and second lateral boundaries or sides of the panel supports. Likewise, the decoupler may preferably lie

wholly laterally inboard of the first and second lateral boundaries or sides of the panel supports. Most preferably at least a part (ideally the lateral centre) of the connecting faces and/or the decoupler may lie laterally central within the spacer support, i.e. be equidistant from first and second lateral boundaries of the panel supports.

5

The bridge portions extend from a lateral boundary, end or side of an associated panel support. For effective spacing, each bridge portion may comprise an orthogonal section, substantially perpendicular relative to its associated outer face. As aforesaid, to position their connecting faces laterally inboard of the first and second lateral boundaries of the panel supports, the bridge portions comprise a laterally inward-angled section. Preferably, the bridge portions may each comprise an orthogonal section extending from the lateral boundary or side of the panel support associated with the bridge portion, with the inward-angled section extending from the orthogonal section. The spacer support may preferably be generally W-shaped in cross-section, with an inboard section of the spacer support lying between first and second panel supports.

In one embodiment, the decoupler is substantially equidistant from the panel supports. However, advantageously, to assist so-called boxing of a plurality of spacer supports, the decoupler may alternatively be offset towards one of the panel supports. Preferably, the spacer support may comprise first and second bridge portions, with the first bridge portion bridging a greater distance than the second bridge portion.

The spacer support may preferably be a stud. The spacer support may preferably have a depth, measured between outer surfaces of the panel supports, of 50 mm or more, preferably 70 mm or more, 80 mm or more, or 90 mm or 100 mm, 150 mm, or even 200 mm or more. A greater depth helps to enhance isolation and insulation. The advantages of the spacer support may however be particularly noticeable or valuable when deployed with a low depth. The depth may, for example be 300 mm or less, or 200 mm or less, or preferably 100 mm or less, or even 80 mm or less. The spacer support can thus provide acoustic and/or thermal decoupling in a space-efficient manner.

The invention also embraces a stud wall structure comprising a spacer support as described anywhere herein. Preferably the spacer support may define a gap formed between first and second panels of walling material of the stud wall structure, the walling material being supported by, e.g. affixed to, first and second panel supports of the spacer support. The gap defined by the stud wall structure may advantageously comprise

isolating or insulating material. The stud wall structure may for example be an internal or external wall or façade system and may be load-bearing.

Preferably, the spacer support may be adapted for convenient assembly, e.g. domestically or on a construction site. Thus, from a second aspect, the invention resides in a set for assembling one or more spacer supports, the set comprising: a plurality of webs, each of said webs defining a panel support having first and second lateral boundaries and a bridge portion extending from a lateral boundary of the panel support, the bridge portion having a connecting face and a laterally inward-angled section to position the connecting face laterally inboard of the first and second lateral boundaries of the panel support; and a decoupler co-operable with the webs to connect and separate the bridge portions by fastening to the connecting faces.

To aid storage and transportation, the set may comprise first and second substantially identical webs that are provided in stacked form. Conveniently, the decoupler may comprise an isolation tape comprising a polymeric, e.g. rubber layer having adhesive on opposed faces (e.g. a peelable two-sided-self-adhesive rubber tape).

From a third aspect, the invention resides in a method of making a spacer support, the method comprising: forming or providing each of a plurality of webs into a panel support having first and second lateral boundaries and an integral bridge portion extending from a lateral boundary of the panel support, the bridge portion having a connecting face and a laterally inward-angled section to position the connecting face laterally inboard of the first and second lateral boundaries of the panel support; and fastening a decoupler to the connecting faces of the bridge portions to connect and separate the bridge portions and form a spacer support.

The invention also extends to the use of a spacer support as described anywhere herein to support and space apart first and second panels of walling material.

From a fourth aspect, the invention resides in a method of decoupling first and second panel supports, the method comprising: spacing the panel supports to form a gap; and bridging the gap between the panel supports via a decoupler positioned laterally inboard of the panel supports to connect and separate the first and second panel supports. The decoupler and panel supports may preferably be as described anywhere herein. The gap may preferably be bridged by a bridge member as described anywhere herein.

Where context permits, preferred features of each aspect of the invention may be as described in connection with any of the other aspects. Other advantages of the invention will be apparent to the skilled person from the following description of exemplary
5 embodiments of the invention.

In order that this invention may be more readily understood, reference will now be made, by way of example, to the accompanying drawings, which are not to scale and in which:

10 Figure 1a is a schematic sectional view of a spacer support according to a first exemplary embodiment of the invention;

 Figure 1b is a perspective view of a segment of the spacer support of Figure 1a;

15 Figure 1c is a top view of a segment of the spacer support of Figures 1a and 1b;

 Figure 2a is a schematic sectional view of a first web of the spacer support of Figures 1a to 1c;

20 Figure 2b is a schematic sectional view of a second web of the spacer support of Figures 1a to 1c;

 Figure 2c is a schematic sectional view of a decoupler of the spacer support of Figures 1a to 1c;

25 Figure 3a is a sectional view of a spacer support according to a second exemplary embodiment of the invention;

 Figure 3b is a perspective view of a segment of the spacer support of Figure 3a;

30 Figure 4a is a sectional view of two spacer supports according to the second embodiment of the invention in a boxed configuration;

 Figure 4b is a perspective view of a segment of the boxed spacer supports of
35 Figure 4a;

Figure 5 is a sectional view of a partition comprising spacer supports according to the first embodiment of the invention;

Figure 6 is a sectional view of a first external wall configuration comprising prior art spacer supports; and

Figure 7 is a sectional view of a second external wall configuration comprising spacer supports according to an exemplary embodiment of the invention.

Referring to Figures 1a to 1c, in a first embodiment of the invention, a spacer support in the form of a stud 2, comprises first and second steel webs 4, 6 (hot dipped galvanised, EN 10327:2004 compliant), connected and separated by an acoustic and thermal decoupler in the form of an acoustic isolation tape 8.

The isolation tape 8 provides enhanced acoustic and thermal isolation or decoupling along a depth of the stud 2, between a distal end 10 and a proximal end 12 thereof. The stud 2, along with its parts, also has first and second lateral boundaries or sides 14, 16 defining a width, and, as is best seen in Figure 1b, a longitudinal length (about 3 metres).

The steel webs 4, 6, having a thickness of approximately 0.52 mm, have been cold rolled into panel supports by passing them through a series of contoured rollers.

With reference to Figure 2a, the first web 4 comprises an outer portion 18A representing a first panel support with opposed faces 19A, 21A, and a bridge portion 20A extending distally from the outer portion 18A. The outer portion 18A of the first web 4 acts as a proximal wall 22A of the stud 2 and presents a proximal outer face 24A for supporting proximal walling material (not shown in the Figures). In use of the stud, walling material such as plasterboard can be fastened to the outer portion 18A for example with the help of self tapping or self drilling screws.

To enhance stiffness and facilitate location of the stud 2, the outer portion 18A of the first web 4 comprises a laterally central, acutely angled groove 26A formed in the distal direction X. For the same reasons, the outer portion 18A also comprises a distally extending terminating shoulder 28A at its first lateral side 14.

The bridge portion 20A of the first web extends distally from the second lateral side 16 of the outer portion 18A. The bridge portion 20A comprises a first section 30A that is generally perpendicular to the outer face 24A and a second section 32A that is angled laterally inwardly from the first section 30A. The inwardly angled section 32A comprises a plurality of longitudinal slots 34 visible in the view of Figure 1c, and merges, via a kink 44A, into an inner section 36A having a connecting face 38A that is substantially parallel to the outer face 24A of the outer portion 18A. Referring again to Figure 2a, the inner section 36A of the bridge portion has a distally extending terminating shoulder 40A to enhance stiffness and facilitate location of the bridge portion 20A with respect to the isolation tape 8, which is fastened to the connecting face 38A as will be described. The bridge portion 20A, with all its sections 30A, 32A, 36A, is an integral part of the first web 4, as is the outer portion 18A.

Referring now to Figure 2b, the second web of the stud is a mirror image of the first web. Indeed, the second web is identical to the first web except for its orientation. Thus, save for a reversal in orientation with respect to the proximal and distal directions, Y, X, the description of the first web also applies to the second web.

The bridge portion 20B of the second web 6 extends proximally from its outer portion 18B, which represents a second panel support with opposed faces 19B, 21B and acts as a distal wall 22B of the stud, presenting a distal outer face 24B for supporting distal walling material. The groove 26B in the outer portion 18B of the second web 6 is formed in the proximal direction Y. The terminating shoulder 28B of the outer portion 18B of the second web also extends proximally, as does the terminating shoulder 40B of its inner section 36B. As in the first web, the inner section 36B comprises a connecting face 38B and is linked to the outer portion 18B by a laterally inwardly angled section 32B comprising slots 34, joined via a kink 44B to a generally perpendicular section 30B.

Referring again to Figures 1a to 1c, the acoustic isolation tape 8 acting as the decoupler is fastened to the connecting faces 38A, 38B of the inner sections 36A, 36B of both bridge portions 20A, 20B, thereby connecting the first and second webs 4, 6. The isolation tape 8 is generally oblong or block shaped, i.e. rectangular in cross-section, and connects the webs such that their connecting faces 38A, 38B, and also the outer faces 24A, 24B that form the proximal and distal walls 18A, 18B of the stud 2, are all parallel to each other.

Since the first and second webs are mirror images, their connection by the acoustic tape 8 results in a generally C-shaped cross section seen in Figure 1a, albeit that the inwardly angled sections 32A, 32B cause the connecting faces 38A, 38B and isolation tape 8 to lie inboard of the lateral boundaries or sides 14, 16 of the outer faces 24A, 24B of the webs 4, 6, thus leading to a W-shaped cross section. Indeed a part of the connecting faces 38A, 38B and of acoustic tape 8 lies laterally centrally within the stud 2. In this embodiment, the connecting faces 38A, 38B and the isolating tape 8 are substantially equidistant from the outer portions 18A, 18B and outer faces 24A, 24B of the webs 4, 6.

As will be apparent from the above description, the bridge portions 20A, 20B of the webs 4, 6 combine with the isolating tape 8 to form a bridge member 46 that extends between the outer portions 18A, 18B of the webs 4, 6. The bridge member 46 thus bridges a gap 48 formed between the outer faces 24A, 24B of the webs 4, 6.

The stud 2 of this embodiment has a lateral width of approximately 35 mm, which corresponds to the width of the outer portions 18A, 18B and faces 24A, 24B of the webs 4, 6 between first and second lateral boundaries or sides 14, 16. The depth of the stud, measured from outer face 24A to outer face 24B, is approximately 90 mm, with the first and second webs 4, 6, and in particular the bridge portions 20A, 20B, contributing approximately 42 mm each.

Referring to Figure 2C, the isolation tape 8 comprises a core of black rubber 42 having a depth of approximately 6 mm and a lateral width of 15 mm. The tape 8 is a double-faced adhesive resilient tape made from medium density natural rubber coil complying with ASTM Spec of 1056 RO12-1A2. First and second faces 50A, 50B of the tape 8 bear a thin layer of adhesive 52A, 52B (e.g. less than 0.5 mm).

The isolation tape 8, including the adhesive, has a transversal shear resistance of at least 300 N/m, a tensile shear resistance of at least 500 N/m, a Young Modulus of 100 MPa, a Poisson's ratio of 0.49 and a viscous damping ratio of 0.05.

The acoustic attenuation coefficients of the isolation tape in the audible frequency range (20 to 20,000 hertz) are higher than corresponding attenuation coefficient of the steel webs. Furthermore, by virtue of its rubber content, the isolation tape also has a lower thermal conductivity than the steel webs.

The isolation tape 8 is load-bearing in the sense that it is capable of supporting weight in addition to its own, namely that of the steel webs 4, 6, as shown in Figure 1a to 1c. The isolation tape 8 provides a majority of the shear resistance and/or pull out resistance of the connection between the webs 4, 6. Indeed, the bridge portions 20A, 20B are connected solely via the isolation tape 8. All support-borne sound transmitted, and/or heat conducted, from one web to the other must hence pass through the isolation tape 8. Therefore, the stud 2 of the first embodiment of the invention provides excellent thermal and acoustic isolation between its proximal and distal walls 10, 12.

The physical properties of the isolation tape 8 are such that it is able to provide a suitably strong connection between the webs 4, 6 even without being longitudinally continuous. The isolation tape is longitudinally continuous in this embodiment, but could alternatively be intermittent, i.e. comprise a plurality of strips sections separated longitudinally by air gaps between the connecting faces 36A, 36B of the bridge portions.

To assemble the stud of the first embodiment, the isolation tape 8 is first fastened to the connecting face 36A of the first web 4 with the adhesive layer 52A on its first face 50A. Thereafter, the connecting face 36B of the second web 6 is fastened to the isolation tape 8 with the adhesive 52B on the second face 50B of the tape 8.

Referring to Figures 3a and 3b, in a second embodiment of the invention, a spacer support in the form of a further stud 102, comprises first and second steel webs 104, 106 (hot dipped galvanised EN 10327:2004 compliant), connected and separated by an acoustic and thermal decoupler in the form of an acoustic isolation tape 108.

The parts and construction of the stud of the second embodiment of the invention are identical to those of the stud of the first embodiment of the invention, with like reference numerals indicated for like parts in Figures 3a and 3b (increased by 100), save that the second web 106 of the stud comprises an extended bridge portion 120B. Specifically, the inwardly angled section 132B of the bridge portion is longer in the proximal direction Y, causing the connecting faces 138A, 138B and isolating tape 108 to be offset towards the proximal wall 122A of the stud 102. For all other aspects of the structure of the stud 102 of the second embodiment, reference is made to the foregoing description of the stud 2 of the first embodiment.

Whilst the stud 2 of the first embodiment has a symmetrical cross-section, the stud 102 according to the second embodiment is asymmetrical. Referring now to Figures 4a and 4b, the asymmetric structure of the stud 102 of the second embodiment is of particular benefit since it conveniently allows for boxing of two studs 102Q, 102R to double the strength of the provided support.

To box first and second studs 102Q, 102R of the second embodiment, they are brought together with the proximal wall 122A of one stud 102Q overlying the distal wall 122B of the other stud 102R and vice versa. The outer portion 118A of the first web 104 of the first stud 102Q overlies the outer portion 118B of the second web 106 of the second stud 102R, whilst the outer portion 118A of the first web 104 of the second stud 102R overlies the outer portion 118B of the second web 106 of the first stud 102Q. The grooves 126A, 126B and terminal shoulders 128A, 128B of the outer portions 118A, 118B of the webs 104, 106 assist in locating the studs 102Q, 102R with respect to each other.

Referring still to Figures 4a and 4b, in the boxed configuration 158, the bridge portions 120A, 120B of the studs 102Q, 102R lie at opposed lateral ends 214, 216 of the boxed stud. The connecting isolation tapes 108 lie inboard of the lateral sides 114, 116 of the studs 102Q, 102R but, on account of the asymmetric structure of the studs 102Q, 102R (i.e. the offset of the tape 108Q, 108R and connecting faces 138A, 138B towards the proximal wall 122A of their studs) both have room within the gap 148 bridged by the bridge member 146.

Notably, since the bridge members 146 of the studs 102Q, 102R, which are separated by the isolation tapes 108, form the only links between the walls 122A, 122B of the boxed studs 102Q, 102R, all support-borne sound transmitted, and/or heat conducted, from one wall of the boxed stud to the other must pass through isolation tape 108. Therefore, the stud 102 of the second embodiment of the invention provides excellent thermal and acoustic isolation, not only between its proximal and distal walls 122A, 122B, but also when combined with an identical stud 102 in a boxed configuration 158.

Example 1

Referring now to Figure 5, to test acoustic isolation performance of the stud 2 of the first embodiment, a 3m high and 3.2m wide partition having a partition surface of 9.8 m² was installed in an acoustically isolated cell using four studs 2 according to the first

embodiment of the invention. The walling material was 15 mm deep Lafarge GTEC LaDura plasterboard (16.0 kg/m²) and the gap between the plasterboard 60 was filled with 50 mm deep mineral wool 62 having a density of 1.1 kg/m.

- 5 A measurement of airborne sound insulation was made in accordance with BS EN ISO 140-3:1995. The partition divided the cell into a source room 64 and a receiving room 66. A sound level was applied in the source room in the range of frequencies from 50 to 5000 Hz and sound in the receiving room was measured. The difference between the applied sound level and the measured sound level was computed in accordance with BS
- 10 EN ISO 717-1:1997, giving a sound insulation index $R_w (C, C_{tr}) = 56 (-3, -10)$ dB, calculated between 100-3150 Hz.

It was hence found that the partition comprising the stud according to the first embodiment of the invention provided an extra 6 db of isolation versus a standard stud

15 and an additional 3 db compared to a prior art monolithic acoustic stud.

Example 2

The thermal performance of a spacer support according to the invention is compared to

20 that of a prior art metal spacer support (without a decoupler), using a 2-D thermal model analysis commercially available under the name BISCO from Physibel.

The analysed prior art metal spacer support comprises a web which has a standard, generally C-shaped cross section with two substantially parallel panel supports, having a

25 lateral width of 50 mm, separated by a substantially orthogonal, monolithic bridge section having a depth of 100 mm. The edges of the panel supports distal from the join to the bridge section comprise an short inward flange substantially parallel to the bridge section. The web is cold rolled steel having a thickness of 1.2 mm.

30 Referring to Figures 3a and 3b, the analysed spacer support according to the invention is identical to that of the second exemplary embodiment of the invention described hereinabove, save that, to enable direct comparison with the prior art spacer support, the outer portions of the spacer support 124A, 124B have a lateral width of 50 mm, the bridge portions 120A, 120B and decoupler 108 span a gap between the proximal and

35 distal walling material of 100 mm, and the steel web has a thickness of 1.2 mm.

For the analysis, two prior art spacer supports and two spacer supports according to the invention are incorporated into respective wall configurations: Configuration 1 and Configuration 2. The type of spacer supports incorporated is the sole difference between Configurations 1 and 2.

5

With reference to Figures 6 and 7, an internal wall surface of both Configuration 1 and Configuration 2 comprises a layer of Lafarge "Megadeco" walling material 70 having a thickness of 15 mm. Spacer supports of either the described prior art metal type in Configuration 1 (71, Figure 6) or the of the described type according to the present invention in Configuration 2 (102, Figure 7) span a gap of 100 mm to a layer of Lafarge "Aqua Board" walling material 72, having a thickness of 12 mm. The gap encompassing the space between the walling materials 70, 72 and the studs 71, 102 is completely filled with mineral wool insulation 73. On an external face of the walling material 72 is affixed a layer of insulation material fabricated from one of two materials; (i) expanded polystyrene (EPS) (73, "Variant 1"), or either polyurethane (PUR) or polyisocyanurate (PIR), both of which have the same thermal conductivity (74, "Variant 2"). The depth of the insulation 73, 74 is chosen to be 60 mm, 80 mm, 100 mm or 120 mm. A layer of concrete render 75, having a depth of 5 mm, layered over the external face of the insulating material 73,74, forms the external face of both Configuration 1 and Configuration 2.

20

To assess the thermal performance of the spacer supports, the U-values (thermal transmittance) of Configuration 1 and Configuration 2 are calculated using the BISCO model. The temperature difference across the configurations is 20°C i.e. the temperature is 0°C externally and 20°C internally, and thermal conductivities are assumed to be as set out in Table 1. The thermal conductivity of the decoupler was considered to be lower than 0.01 W/(K·m).

25

Material	Thermal conductivity λ -value (Wm ⁻¹ K ⁻¹)	Thermal Resistance (m ² KW ⁻¹)
Steel	50	
Lafarge Megadeco	0.25	
Lafarge Aqua Bond	0.25	
Render	1.0	
Extruded/Expanded Polystyrene	0.035	
Mineral Wool	0.037	
PUR/PIR	0.025	
Wood	0.17	
Concrete	2.6	

External surface resistance		0.04
Internal surface resistance		0.13

Table 1. Thermal properties of material

The calculated U-values of Configurations 1 and 2 for the various thicknesses of insulation material are shown in Table 2 for the first and second variants, i.e. using EPS as insulation (Variant 1) or PUR/PIR (Variant 2).

Insulation material thickness (mm)	EPS ($\lambda = 0.035$)			PIR/PUR ($\lambda = 0.025$)		
	Spacer 71 Config. 1	Spacer 102 Config. 2	Improvement	Spacer 71 Config. 1	Spacer 102 Config. 2	Improvement
60	0.271	0.213	21.4%	0.227	0.186	18.1%
80	0.234	0.190	18.8%	0.192	0.162	15.6%
100	0.206	0.171	17.0%	0.166	0.143	13.9%
120	0.184	0.156	15.2%	0.146	0.128	12.3%

Table 2. U-values ($W/(m^2K)$)

10

A comparison of the U-values of Configuration 1 and Configuration 2 allows the contribution of the spacer support to the overall thermal insulation performance of the Configurations to be assessed, all other variables being eliminated.

15 The reduction of the calculated U-values when using the spacer support according to the invention, compared to the prior art metal spacer support, is significant, ranging from 12 to 21%, depending on the configuration.

20 The values in Table 2 also demonstrate that the advantageous effect of the spacer support of the invention on U-values is stronger when lighter EPS insulation panels (i.e. low quality insulation panels) are used.

25 According to the calculations, the common threshold value of thermal transmittance of $0.2 W/(m^2K)$ (i.e. the standard for passive house) using 80 mm of EPS insulation, can be achieved by using spacer supports according to the invention but not the prior art metal spacer supports.

Claims

1. A spacer support for a stud wall structure, the spacer support comprising: panel supports having first and second lateral boundaries; and a bridge member extending between the panel supports, the bridge member comprising bridge portions each extending from a lateral boundary of an associated one of the panel supports, the bridge portions being connected and separated by a decoupler at connecting faces of the bridge portions that are fastened to the decoupler, wherein the bridge portions comprise a laterally inward-angled section to position their connecting faces laterally inboard of the first and second lateral boundaries of the panel supports.
2. The spacer support of claim 1, comprising two panel supports and two associated bridge portions each comprising a laterally inward-angled section.
3. The spacer support of claim 1 or claim 2, wherein each panel support and associated bridge portion are integral and comprise a web of cold rolled metal.
4. The spacer support of any preceding claim wherein outer faces of the panel supports are substantially parallel to the connecting faces of the bridge portions.
5. The spacer support of any preceding claim, wherein each bridge portion comprises an orthogonal section that is substantially perpendicular to an outer face of its associated panel support.
6. The spacer support of claim 5, wherein the orthogonal section extends from a lateral boundary of the panel support and the inward-angled section extends from the orthogonal section.
7. The spacer support of any preceding claim, wherein the panel supports each comprise an outer face arranged to support walling material, with the bridge portions and decoupler bridging a gap between the outer faces.
8. The spacer support of any preceding claim, wherein the decoupler comprises a polymeric material.

9. The spacer support of any preceding claim, wherein the decoupler comprises an intumescent material.
10. The spacer support of any preceding claim wherein the decoupler comprises a rubber-based acoustic isolation tape.
11. The spacer support of any preceding claim wherein the decoupler is fastened to the bridge portions with an adhesive.
12. The spacer support of any preceding claim wherein the decoupler has a lateral width, a longitudinal length and a depth separating the bridge portions and wherein the width of the decoupler is greater than its depth.
13. The spacer support of any preceding claim, wherein the decoupler is offset towards one of the panel supports to allow boxing of the spacer support with an identical second spacer support.
14. The spacer support of any preceding claim comprising first and second bridge portions and wherein the first bridge portion bridges a greater distance than the second bridge portion.
15. The spacer support of any of claims 1 to 12, wherein the decoupler is substantially equidistant from the panel supports.
16. A spacer support arrangement comprising first and second spacer supports according to claim 13 or claim 14 in a boxed configuration.
17. A stud wall structure comprising a spacer support or spacer support arrangement according to any preceding claim.
18. A set for assembling one or more spacer supports, the set comprising:
 - a plurality of webs, each of said webs defining a panel support having first and second lateral boundaries and a bridge portion extending from a lateral boundary of the panel support, the bridge portion having a connecting face and a laterally inward-angled section to position the connecting face laterally inboard of the first and second lateral boundaries of the panel support; and

a decoupler co-operable with the webs to connect and separate the bridge portions by fastening to the connecting faces.

19. The set of claim 18 comprising first and second substantially identical webs that are provided in stacked form.

20. The set of claim 18 or claim 19 wherein the decoupler comprises an isolation tape comprising a rubber layer having adhesive on opposed faces.

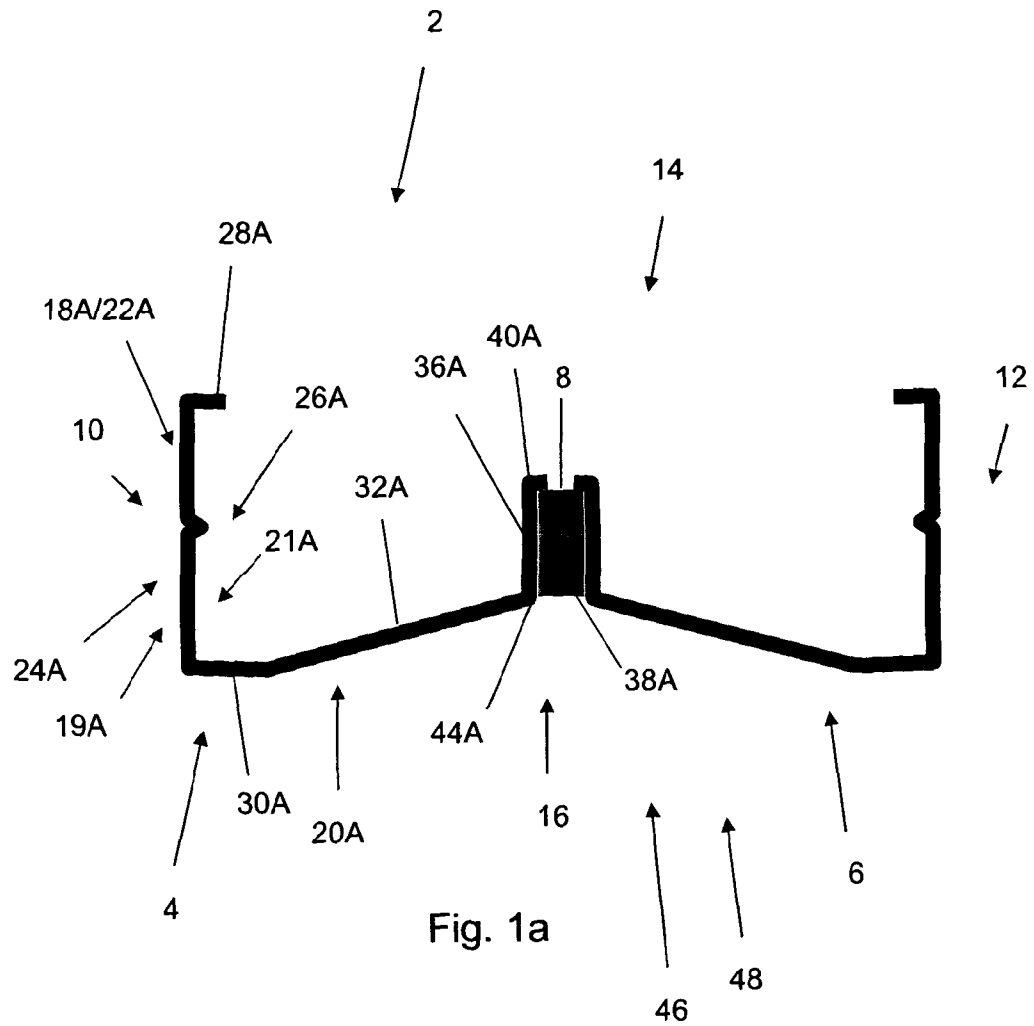
21. A method of making a spacer support, the method comprising:
forming each of a plurality of webs into a panel support having first and second lateral boundaries and an integral bridge portion extending from a lateral boundary of the panel support, the bridge portion having a connecting face and a laterally inward-angled section to position the connecting face laterally inboard of the first and second lateral boundaries of the panel support; and
fastening a decoupler to the connecting faces of the bridge portions to connect and separate the bridge portions and form a spacer support.

22. The method of claim 21, wherein the webs are of steel and are formed by cold rolling.

23. The method of claim 21 or claim 22, comprising fastening the decoupler to the connecting faces adhesively.

24. A method of decoupling first and second panel supports, the method comprising: spacing the panel supports to form a gap; and bridging the gap between the panel supports via a decoupler positioned laterally inboard of the panel supports to connect and separate the first and second panel supports.

1/8



2/8

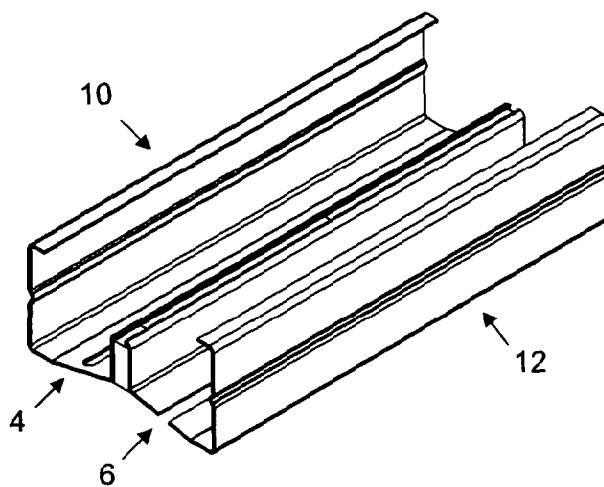


Fig. 1b

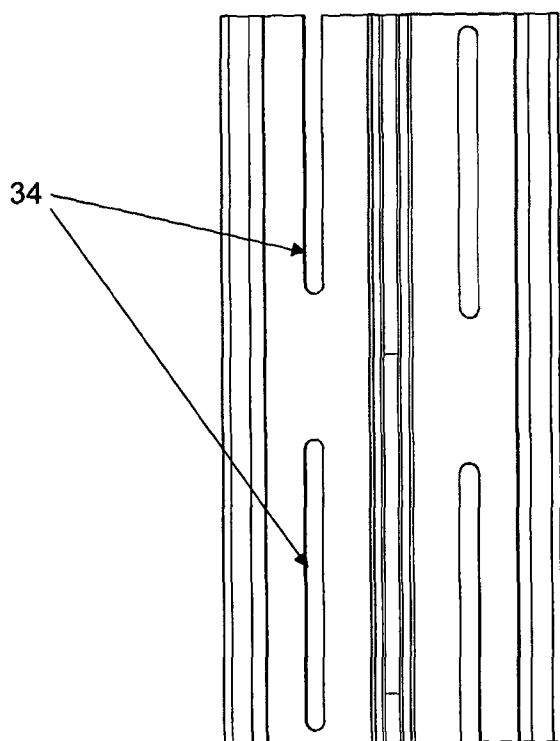
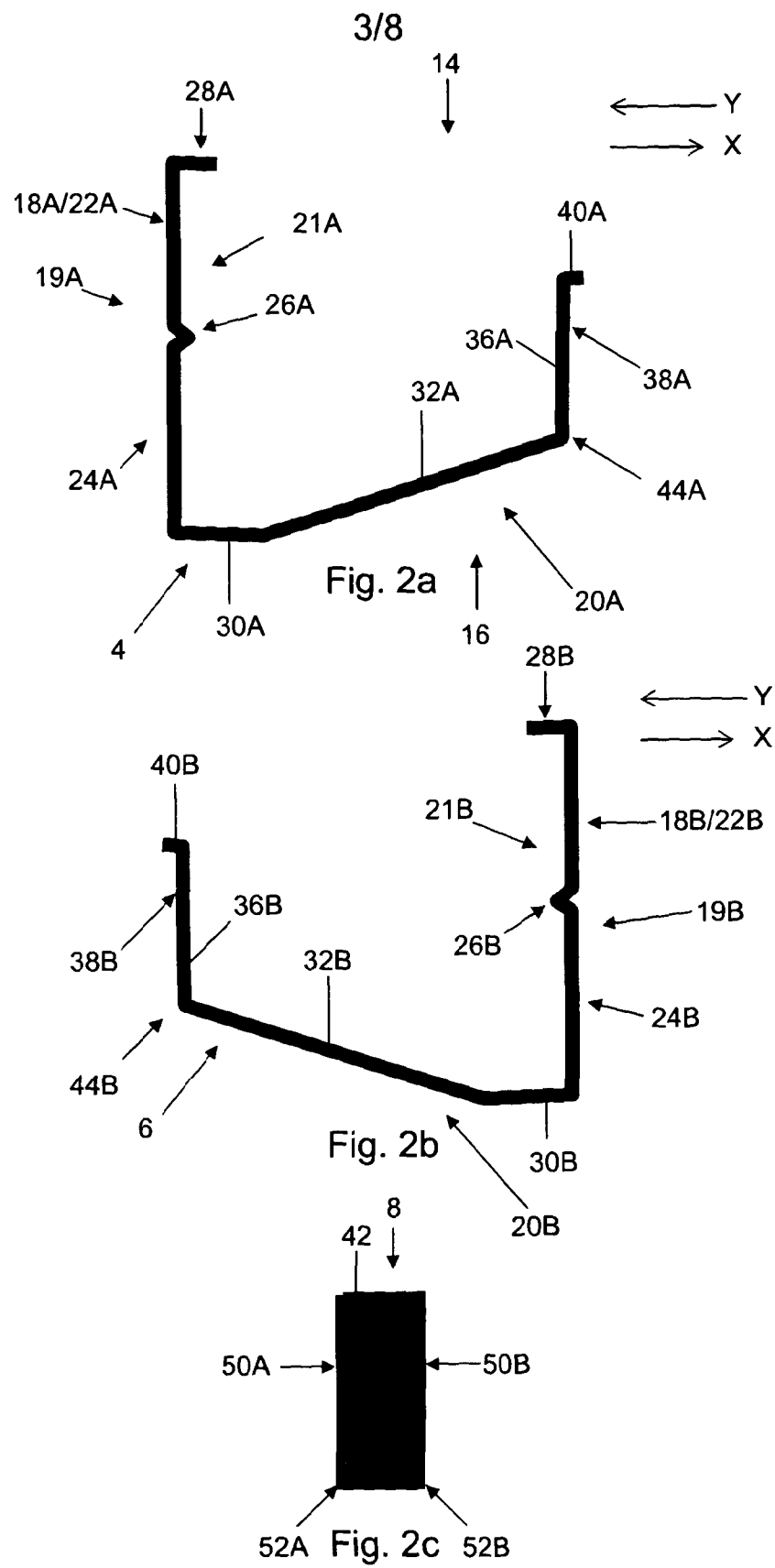
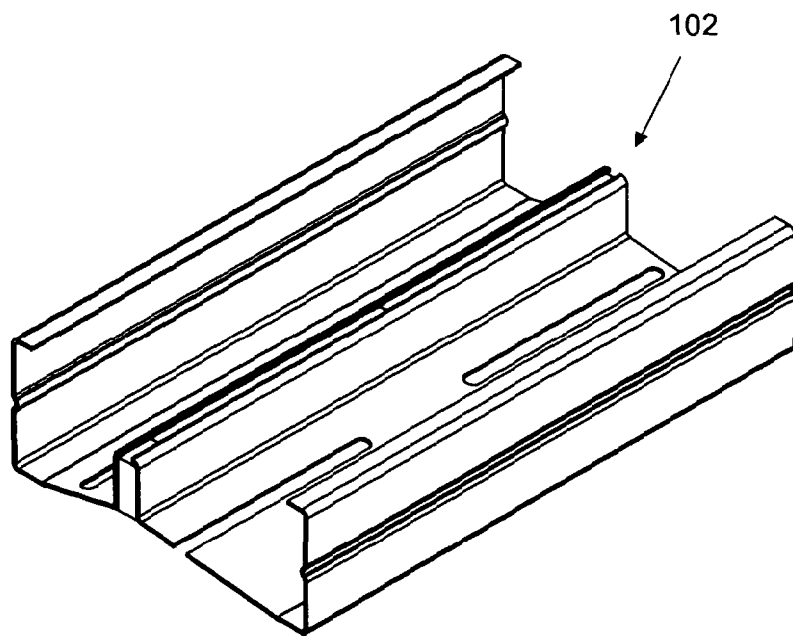
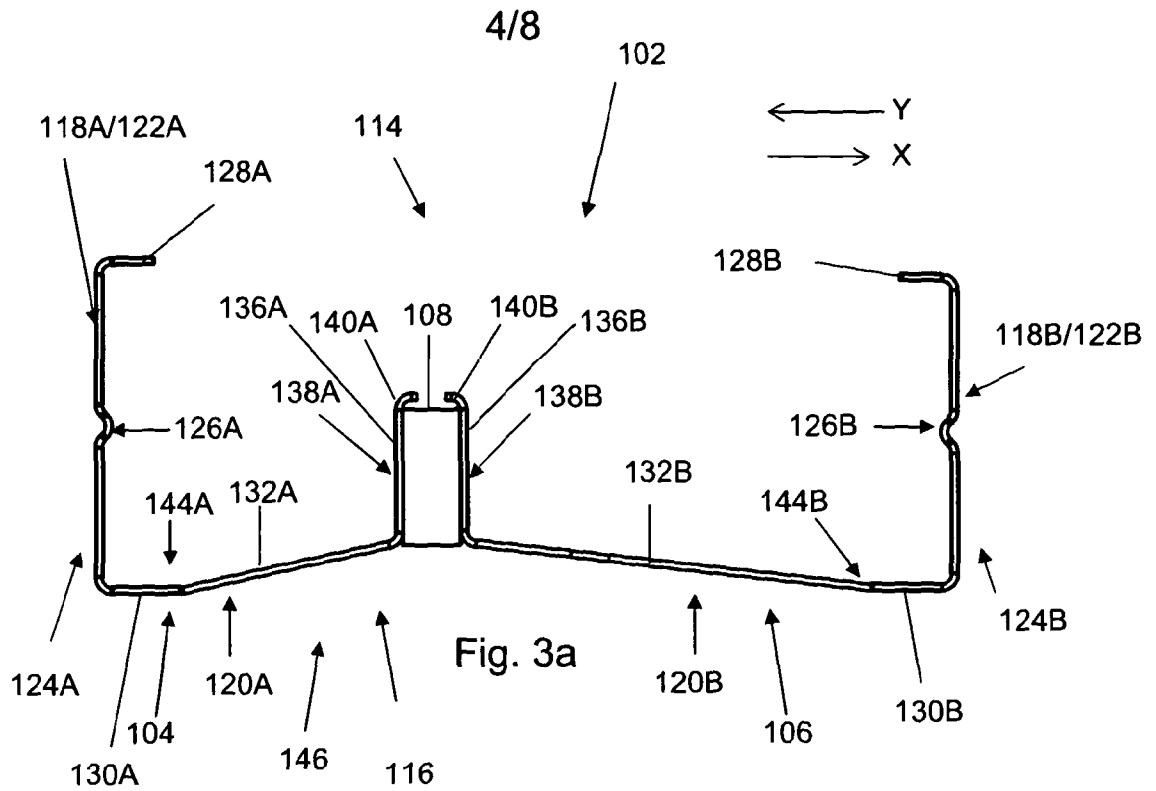
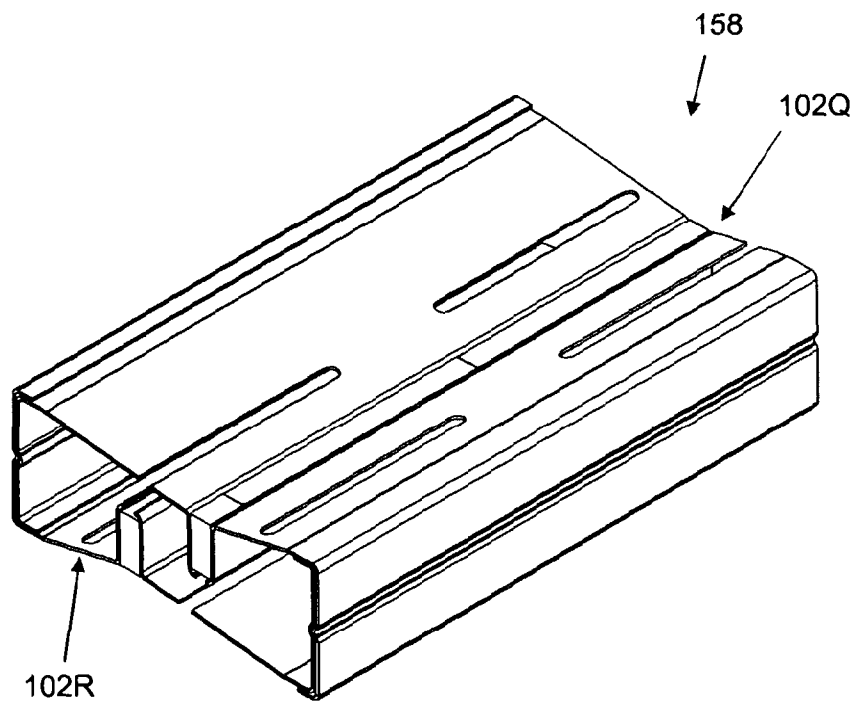
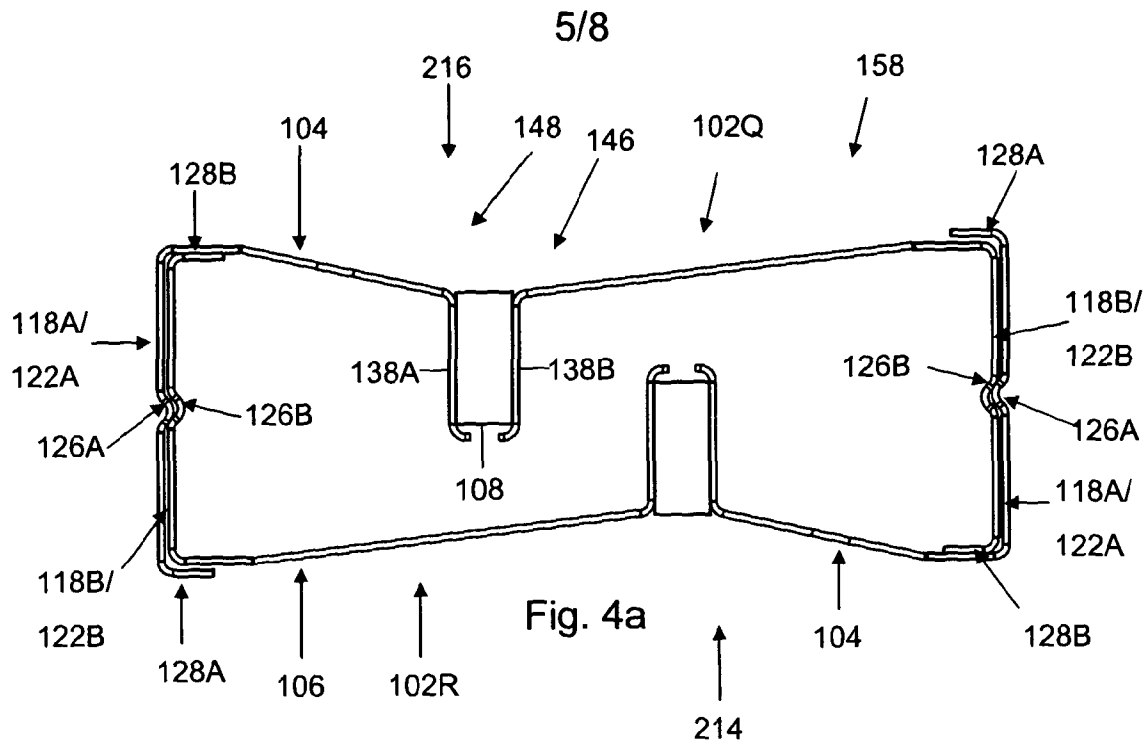


Fig. 1c







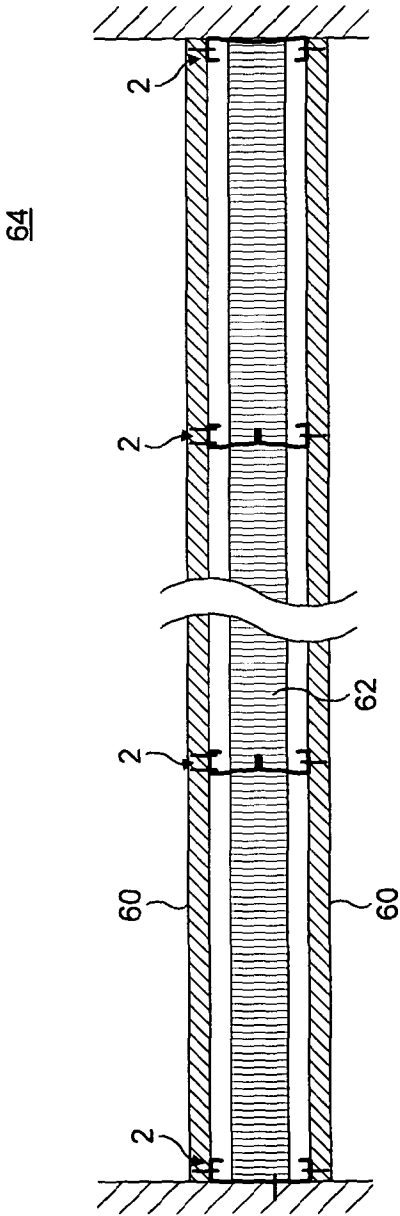


Fig. 5

7/8

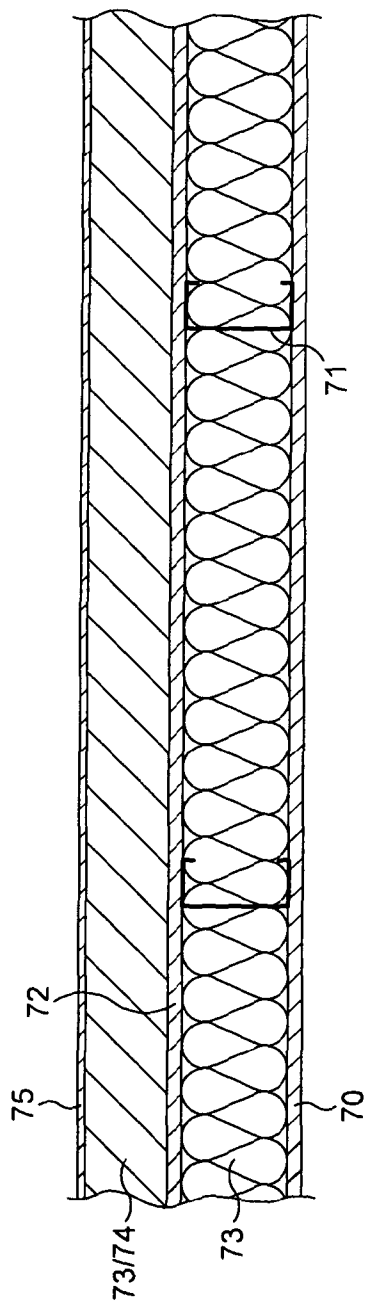


Fig. 6

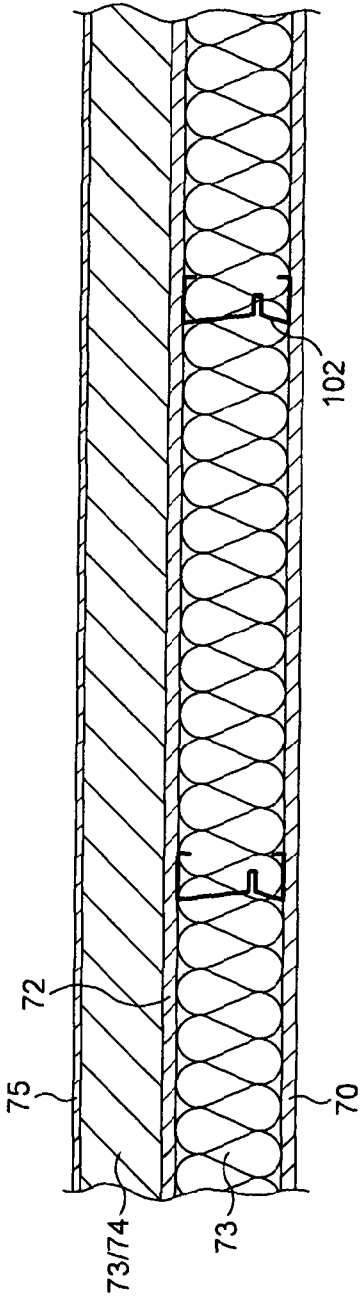


Fig. 7

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2011/052138

A. CLASSIFICATION OF SUBJECT MATTER
INV. E04C3/07 E04B2/74
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
E04C E04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 03/001003 A1 (ISOPAR B.V.) 3 January 2003 (2003-01-03) page 4, line 25 - page 7, line 6; figures 1-4	1-24
X	----- US 6 250 042 B1 (RUDD) 26 June 2001 (2001-06-26)	1-12, 15, 17-19, 21-24
A	column 6, line 46 - column 7, paragraph 1; figures 2-3, 8	13, 14, 16, 20
A	----- US 5 720 144 A (KNUDSON ET AL.) 24 February 1998 (1998-02-24) abstract; figures 12-19 -----	1



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

5 September 2012

Date of mailing of the international search report

12/09/2012

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Righetti, Roberto

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/GB2011/052138

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 03001003	A1	03-01-2003	AT 458099 T 15-03-2010
		CA 2451690 A1	03-01-2003
		DK 1402130 T3	07-06-2010
		EP 1402130 A1	31-03-2004
		NL 1018358 C2	30-12-2002
		US 2004216423 A1	04-11-2004
		WO 03001003 A1	03-01-2003

US 6250042	B1	26-06-2001	US 6250042 B1 26-06-2001
			US 6412248 B1 02-07-2002
			US 6516584 B1 11-02-2003

US 5720144	A	24-02-1998	US 5720144 A 24-02-1998
			US 5860265 A 19-01-1999
			WO 9848138 A1 29-10-1998
