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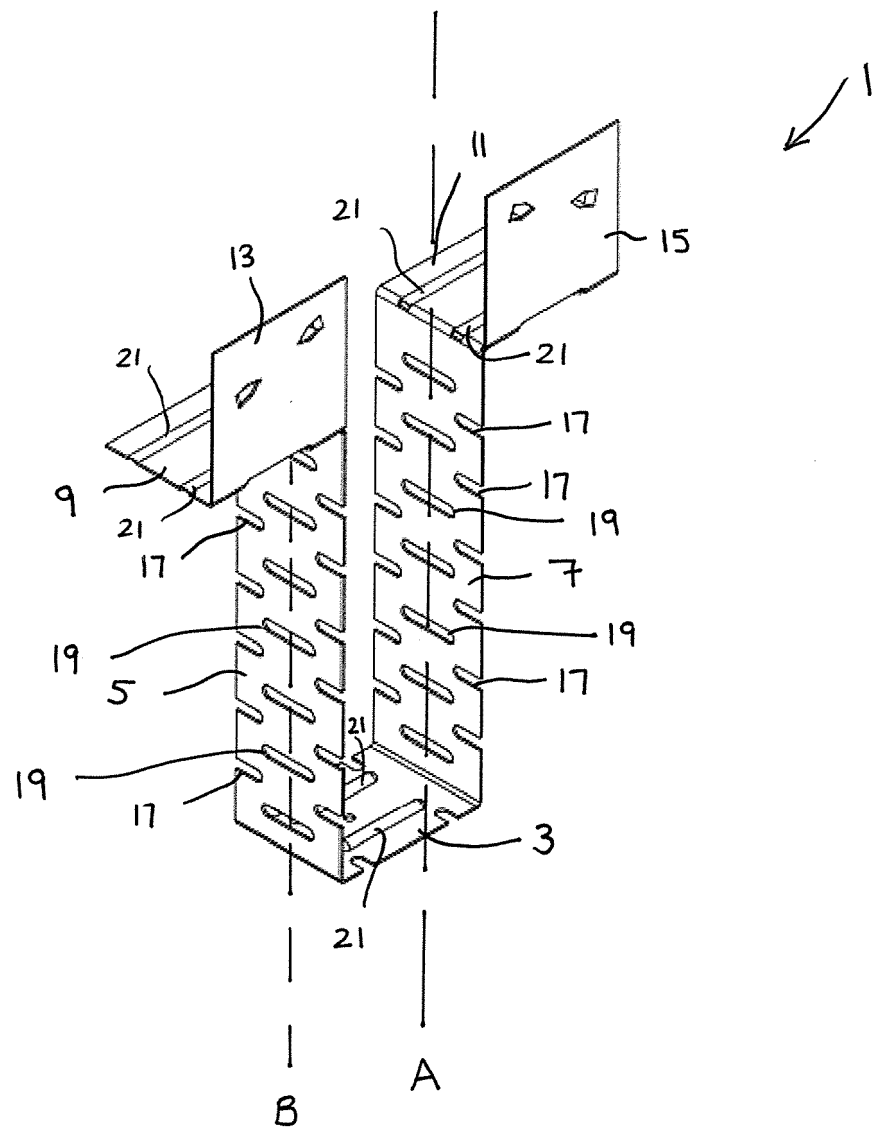


Figure 1a

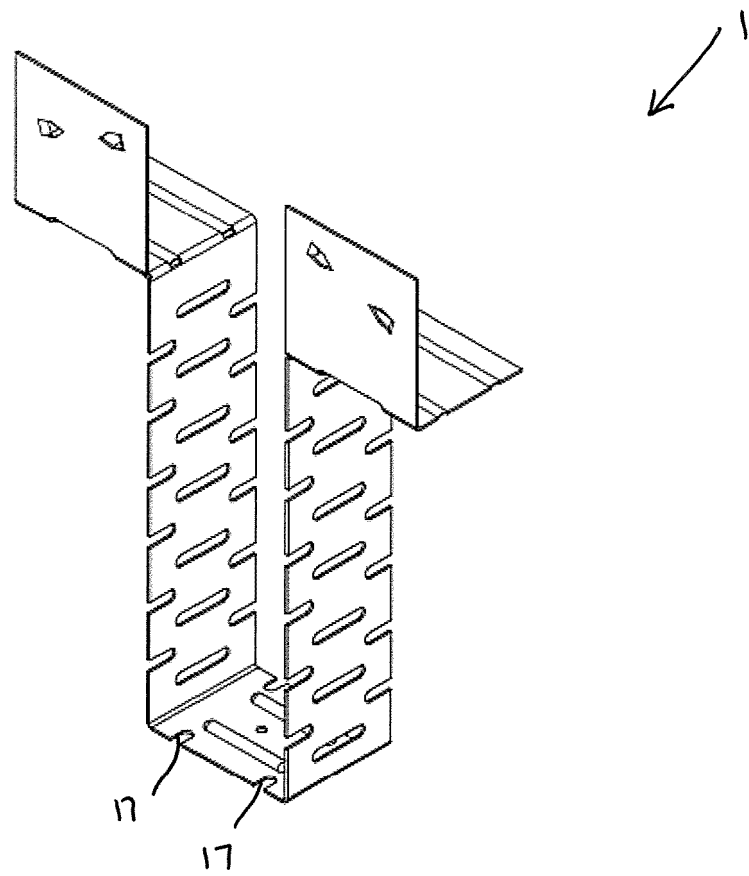


Figure 1c

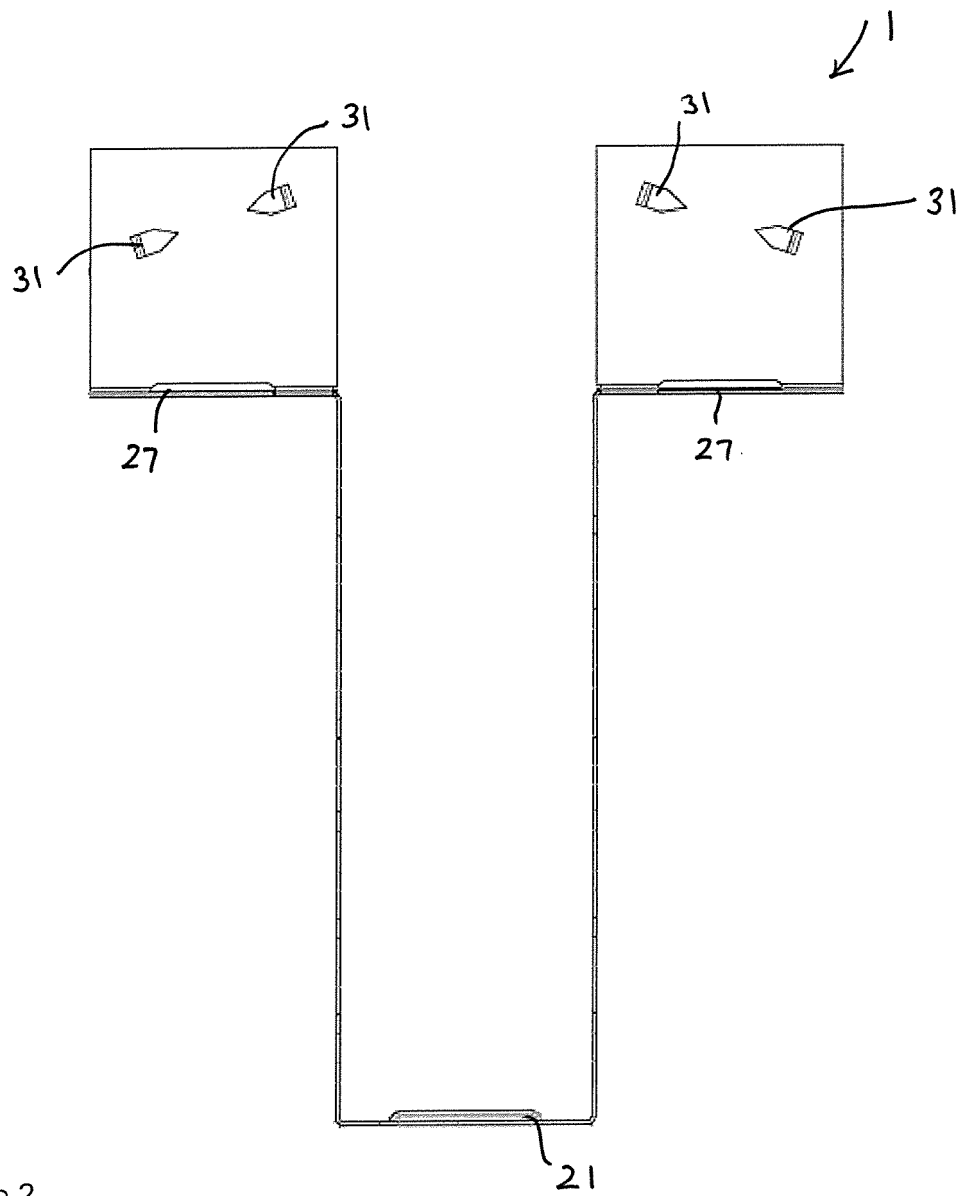


Figure 2

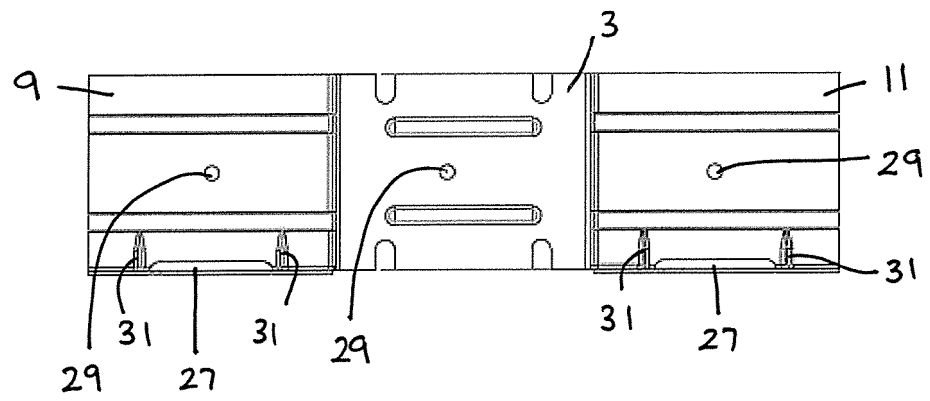


Figure 3

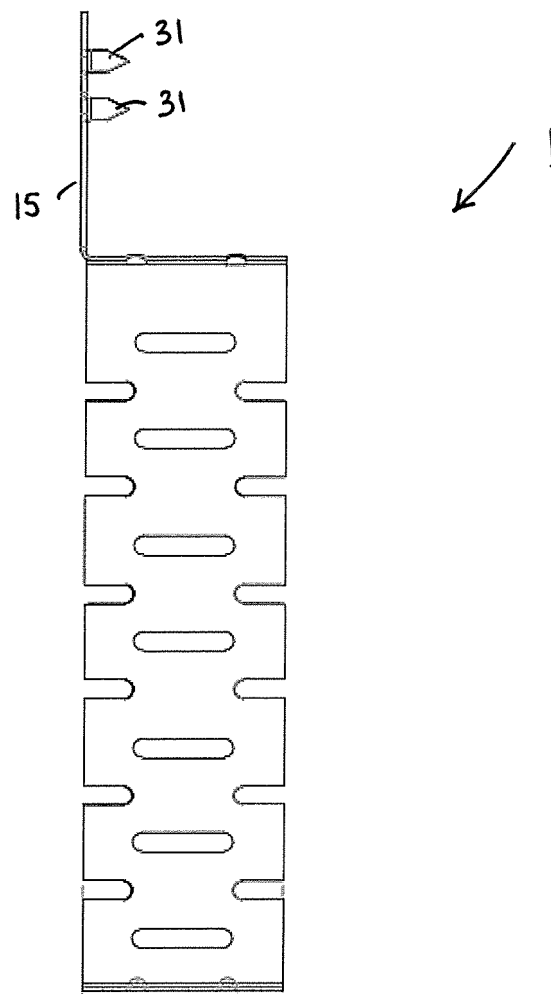


Figure 4

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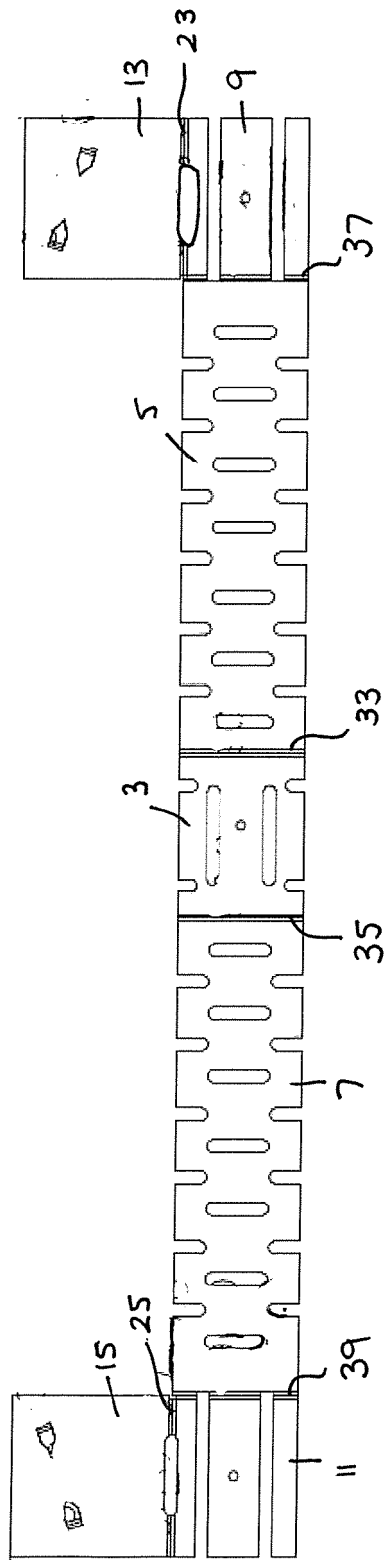


Figure 5

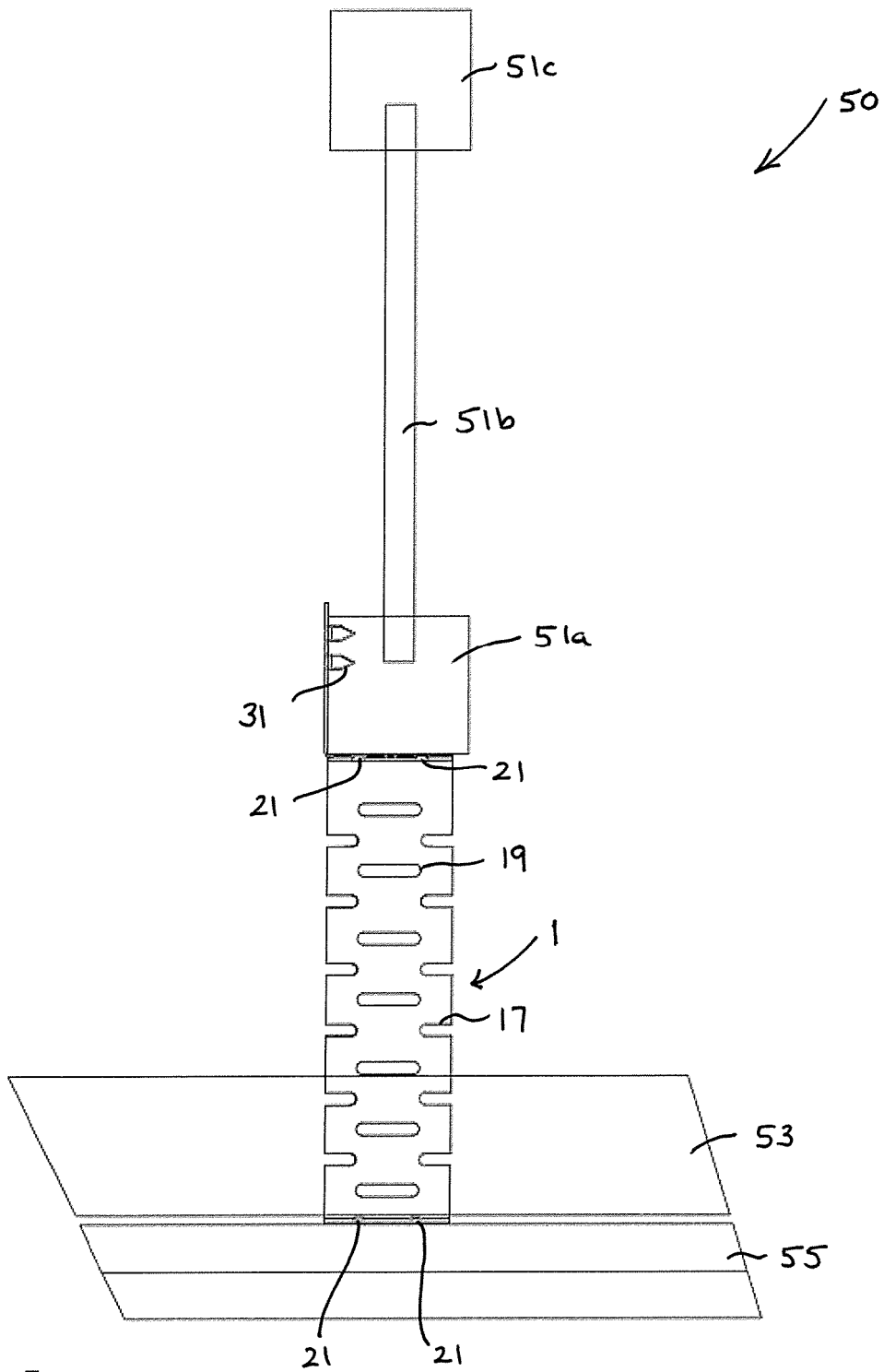


Figure 7

Acoustic Hanger

5 The present invention relates to the reduction of sound transmission through and between structural members used in the building and construction industry. In particular, the invention provides a hanger for connecting structural members and configured to reduce sound transmission through the hanger and also to minimise the points of contact between adjacent structural members in a building.

10

Sound transmission through floors and ceilings on adjacent levels of a multi-storey building is a significant problem particularly in buildings having multiple occupants such as in apartments, for example. Sound is transmitted through joists and hangers in the building by reflection or
15 refraction of the sound waves through the material of the joists and hangers.

It is an aim of the present invention to reduce impact sound transmission between levels in a building utilising a hanger of the present invention.

20

According to a first aspect, the present invention provides a hanger comprising a primary base portion and two side portions upstanding from opposing edges of the primary base portion and being substantially parallel to one another; two secondary base plates for connection to a
25 portion of a floor joist and being substantially parallel to the primary base portion, each secondary base plate depending from an edge of a side portion remote from the primary base portion, characterised in that each side portion comprises a plurality of recesses in each of their opposing longitudinal edges and a plurality of cut-out portions each aligned on the
30 longitudinal central axis of the side portion and each extending

transversely from the longitudinal central axis towards the longitudinal edges of the side portion.

5 The plurality of recesses and cut-out portions in each side portion are arranged such that there is no uninterrupted longitudinal axis of material between the upper edge and the lower edge of the side portion. In other words, the recesses and cut-out portions in each side portion are arranged relative to one another such that there is no continuous longitudinal axis of material between the upper edge and the lower edge of the side portion.

10 Each longitudinal axis of each side portion has one or more recesses and/or cut-out portions aligned thereon. In this way, a volume of the material of the side portion is removed along each longitudinal axis causing a sound wave reaching the removed volume to change direction within the material. Transmission of the sound wave is thereby weakened and the resultant sound dampened.

15 A sound wave reaching the hanger from a floor joist, for example, is not then reflected and refracted through the entirety of the hanger material to a ceiling joist, for example, thereby reducing the sound transmission through the hanger between a floor and ceiling in a building.

20 The hanger is preferably formed from a sheet-like material. More specifically, the hanger is formed of a single piece of sheet-like material.

25 The sheet-like material may be galvanised steel, for example.

In certain embodiments, the centre point of each cut-out portion is aligned on the longitudinal central axis of the side portion.

30

The recesses and the cut-out portions do not merge with one another and are, therefore, separated from one another by a portion of the material of the side portion.

- 5 The plurality of recesses in an edge of a side portion are longitudinally spaced apart from one another along the edge of the side portion.

10 In preferred embodiments, the central transverse axis passing through the centre point of a recess extends substantially perpendicularly to the longitudinal edge of the side portion(s).

15 In certain embodiments, the recesses in one longitudinal edge of a side portion are longitudinally offset from the recesses in the opposing longitudinal edge of the same side portion.

20 The cut-out portions are longitudinally spaced apart from one another along the central longitudinal axis of the, or each, side portion.

25 The cut-out portions extend substantially perpendicularly to the longitudinal edge of the side portion(s). More specifically, in preferred embodiments, the central transverse axis passing through the centre point of a cut-out portion extends substantially perpendicularly to the longitudinal edge of the side portion(s).

30 In preferred embodiments, each cut-out portion in a side portion is longitudinally offset from each and all of the recesses in the same side portion.

In certain embodiments, a portion of each cut-out portion is spaced apart from at least a portion of at least one adjacent recess on a common longitudinal axis of the side portion. In this way, no continuous path of material exists on any longitudinal axis of the side portion(s) of the hanger between a top edge and a bottom edge of the hanger. In this way, acoustic waves travelling through the hanger must change direction to travel through the material of the hanger which change in direction in turn serves to dampen the acoustic wave as it passes through the hanger.

10 In certain embodiments, a portion of each cut-out portion is spaced apart from at least a portion of at least two adjacent recesses, one on each longitudinal edge of the side portion, on a common longitudinal axis of the side portion between a top edge and a bottom edge of the hanger.

15 It is much preferred that a transverse axis passing through the centre point of a recess and/or cut-out portion and being parallel with the primary base portion does not intersect with any other such transverse axis passing through the centre point of a recess and/or cut-out portion and being parallel with the primary base portion.

20 In preferred embodiments the cut-out portion is a slot through the sheet-like material of the hanger. More specifically, the cut-out portion may be an oblong, circle, square or rectangular opening in the sheet-like material of the hanger.

25 In preferred embodiments a recess is a partial slot through an edge of the sheet-like material of the hanger. More specifically, the recess may be a partial oblong, semi-circle, partial square or partial rectangular opening in the edge of the sheet-like material of the hanger. Even more specifically, each recess is a notch in an edge of a side portion of the hanger.

30

The primary base plate may further comprise one or more reinforcement ribs. Each reinforcement rib may be embossed into the sheet-like material of the primary base plate. More specifically, the reinforcement rib(s) may be a raised portion in the surface of the primary base plate. Alternatively, or in addition, each reinforcement rib may be formed of an additional material connected to the sheet-like material of the primary base plate.

The one or more reinforcement ribs are preferably located between the edges of the primary base plate from which the two side portions are upstanding. More specifically, the one or more reinforcement ribs may extend transversely of the primary base plate between opposing edges thereof.

The reinforcement ribs, if present, strengthen the hanger but also serve to reduce the points of contact between the hanger and a joist to which the hanger is connected. By reducing the points of contact between the hanger and a joist, the sound transfer from the joist to the hanger and *vice versa* is reduced yet further. A joist connected to the hanger will rest upon the reinforcement ribs of the hanger and will, therefore, only be in contact with the reinforcement ribs rather than the entire surface of the primary base plate.

The, or each, secondary base plate may further comprise one or more reinforcement ribs. Each reinforcement rib may be embossed into the sheet-like material of the secondary base plate. More specifically, the reinforcement rib(s) may be a raised portion in the surface of the, or each, secondary base plate. Alternatively, or in addition, each reinforcement rib may be formed of an additional material connected to the sheet-like material of the secondary base plate.

5 The one or more reinforcement ribs are preferably located between opposing edges of the secondary base plate. More specifically, the one or more reinforcement ribs may extend transversely of the secondary base plate.

10 The reinforcement ribs on the secondary base plate(s), if present, strengthen the hanger but also serve to reduce the points of contact between the hanger and a floor joist to which the hanger is connected. By reducing the points of contact between the hanger and the floor joist, the sound transfer from the joist to the hanger and *vice versa* is reduced yet further. In this way, a joist connected to the hanger will rest upon the reinforcement ribs of the hanger and will, therefore, only be in contact with the reinforcement ribs rather than the entire surface of the secondary base plate(s).

20 In much preferred embodiments, each side portion depends from an edge of a secondary base plate. More specifically, each side portion depends from an edge of a secondary base plate at an angle of approximately 90 degrees.

It will be understood that in preferred arrangements, one side portion depends from one secondary base plate.

25 In preferred embodiments, each secondary base plate, a corresponding side portion and the base plate are connected to one another so as to form a Z-shaped cross-section. More specifically, when the hanger is viewed in a front or rear plan view, each secondary base plate extends outwardly from an edge of its corresponding side portion and the side

portions depending from each secondary base plate are connected at their other ends by the primary base plate.

5 The side portions are each upstanding from the primary base portion at an angle of 90 degrees thereto.

10 The hanger may further comprise one or more face fixing plates. More specifically the, or each, face fixing plate may be upstanding from the, or each, secondary base plate at a free edge thereof. Yet more specifically, the, or each, face fixing plate may be upstanding from a free edge of the, or each, secondary base plate perpendicular to the plane of the side wall portion(s). In this way, a joist may be positioned on the upper surface of the, or each, secondary base plate and, where present, the inner surface of the, or each, face fixing plate may be connected to a face of a joist.

15

It is preferred that the, or each, face fixing plate is upstanding from the, or each, secondary base plate at an angle of 90 degrees.

20 The primary and/or secondary base plates may comprise fastener apertures through which a fastener may be located. The fastener may be a screw, a nail or the like.

25 The, or each, face fixing plate may comprise apertures through which fastening means are locatable. The fastening means may include but are not limited to nails, screws, staples or the like. In this way, the face fixing plate may be attached to a face of a floor joist.

30 The, or each, face fixing plate may comprise one or more punch nail holes therein. In this way, the face fixing plate may be attached to a face of a floor joist.

According to a second aspect, the present invention provides a joist assembly comprising a floor joist and a ceiling joist and a hanger connected therebetween; the hanger comprising a primary base portion for connection to the ceiling joist and two side portions upstanding from
5 opposing edges of the primary base portion and being substantially parallel to one another; two secondary base plates for connection to a portion of the floor joist and being substantially parallel to the primary base portion, each secondary base plate depending from an edge of a side portion remote from the primary base portion, characterised in that each
10 side portion comprises a plurality of recesses in each of their opposing longitudinal edges and a plurality of cut-out portions each aligned on the longitudinal central axis of the side portion and each extending transversely from the longitudinal central axis towards the longitudinal edges of the side portion.

15

Preferably the hanger is according to the first aspect.

In use of the joist assembly, the ceiling joist is located between the side portions of the hanger and rests on the upper surface of the primary base
20 plate. The floor joist is located on the upper surface of the, or each, secondary base plate and, where present, against the inner surface of the, or each, face fixing plate.

When one or more reinforcement ribs are present on the primary base
25 plate and/or on the, or each, second base plate(s), the floor joist and/or the ceiling joist rests on the reinforcement rib(s) and not on the surface of the primary base plate and/or the secondary base plate(s). In this way, the surface area of contact between the hanger and the joist(s) is reduced thereby reducing the sound transmission between the joist(s) and the
30 hanger and *vice versa*.

According to the second aspect of the invention, the joist assembly provides a floor joist and an independent ceiling joist interconnected by a hanger according to the invention. Sound transmission between the floor joist and the independent ceiling joist is reduced by the features of the hanger. By removing portions of the volume of the side portions of the hanger, sound transmission through the joist assembly is reduced. In addition, sound transmission through the assembly may be further reduced by reducing the points of contact between the floor joist and the independent ceiling joist of the joist assembly.

Throughout the description and claims of this specification, the words “comprise” and “contain” and variations of the words, for example “comprising” and “comprises”, means “including but not limited to”, and is not intended to (and does not) exclude other components, integers or steps.

Throughout the description and claims of this specification, the singular encompasses the plural unless the context otherwise requires. In particular, where the indefinite article is used, the specification is to be understood as contemplating plurality as well as singularity, unless the context requires otherwise.

While the terms “upper”, “lower”, “top” and “bottom” are used within the specification, they should be considered as no more than relative, as the hanger of the present invention may be used in any orientation to suit the location of one or more joists.

Embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

5 Figures 1a, 1b, 1c depict perspective views of a hanger according to an embodiment of the first aspect of the invention;

Figure 2 depicts the hanger of Figure 1 in front plan view;

10 Figure 3 is a side elevation of the hanger of Figure 1;

Figure 4 is a top plan view of the hanger of Figure 1;

Figure 5 shows the hanger of Figure 1 is a pre-formed, flat arrangement;

15 Figure 6 is a joist assembly according to an embodiment of the second aspect of the invention; and

Figure 7 shows an end elevation the joist assembly according to Figure 5.

20 While the invention is susceptible to various modifications and alternative forms, specific embodiments thereof are shown by way of example in the drawings and will herein be described in detail. It should be understood that the drawings and detailed description thereto are not intended to limit the invention to the particular form disclosed, but on the contrary, the
25 intention is to cover all modifications, equivalents and alternatives falling within the scope of the invention as defined by the appended claims.

Further, although the invention will be described in terms of specific embodiments, it will be understood that various elements of the specific

embodiments of the invention will be applicable to all embodiments disclosed herein.

5 In the drawings, similar features are denoted by the same reference signs throughout.

Reference is initially made to Figures 1a, 1b and 1c of the drawings which each illustrate a hanger, generally indicated by the reference numeral 1. Hanger 1 is a single piece sheet of galvanised steel having a primary base plate 3 and first and second side portions 5, 7 upstanding at right angles to the primary base plate 3. The first and second side portions 5, 7 are parallel plates of sheet-like material folded from the same piece of material as the primary base plate 3.

15 The side portions 5, 7 are upstanding from opposing edges of the primary base plate 3 and extend longitudinally away from the primary base plate 3. At the ends of the first and second side portions 5, 7 remote from the primary base plate 3 are first and second secondary base plates 9, 11. The first and second secondary base plates 9, 11 depend from the first and the second side portions 5, 7 respectively.

20 The first and second secondary base plates 9, 11 each depend from an edge of their respective side portion (5, 7) at an angle of 90 degrees thereto. Thus, each secondary base plate 9, 11 is parallel to the plane of the primary base plate 3. The first and second secondary base plates 9, 11 depend outwardly of their respective side portion (5, 7) relative to the primary base plate 3.

30 Hanger 1 further comprises first and second face fixing plates 13, 15 upstanding from an edge of the first and the second secondary base

plates (9, 11) respectively at an angle of 90 degrees thereto. The face fixing plates 13, 15 are upstanding from the secondary base plates perpendicular to the planes of the first and second side portions 5, 7.

5 Each side portion 5, 7 has a plurality of recesses 17 longitudinally spaced apart from one another along at least one edge thereof. In the depicted embodiment, the first and the second side portions 5, 7 each have a plurality of recesses longitudinally spaced apart from one another along both opposing edges. The recesses 17 in opposing edges of the same
10 side portion (5 and/or 7) are longitudinally offset from one another such that a transverse axis passing through the centre point of a recess 17 does not intersect with a transverse axis passing through the centre point of a recess 17 in the opposing longitudinal edge of the same side portion 5. Each transverse axis through the centre point of a recess is parallel to
15 the plane of primary base plate 3. The recesses 17 in the depicted embodiment are in the form of notches in the longitudinal edges of the first and the second side portions (5, 7).

Each side portion 5, 7 has a plurality of cut-out portions 19 longitudinally spaced apart from one another along a central longitudinal axis (B, A) of
20 the side portion 5, 7. Each cut-out portion 19 is in the form of a slot extending from the central longitudinal axis (A, B) of the side portion (5, 7) transversely of the side portion towards the opposing longitudinal side edges of the side portion (5, 7). The cut-out portions 19 and recesses 17
25 on each side portion (5, 7) do not overlap and are spaced apart from one another by a portion of the sheet-like material forming the side portions 5, 7.

A portion of each cut-out portion 19 is spaced apart from at least a portion of at least one adjacent recess 17 on a common longitudinal axis of the side portion (5, 7). Thus, no continuous path of sheet-like material exists on any longitudinal axis of the side portion(s) (5, 7) of the hanger 1 between a top edge and a bottom edge of the side portion (5, 7) of the hanger 1. In this way, acoustic waves travelling through the hanger 1 must change direction to travel through the material of the hanger 1 which change in direction in turn serves to dampen the acoustic wave as it passes through the hanger 1.

In the embodiment shown, a portion of each cut-out portion 19 is spaced apart from a portion of two adjacent recesses in each of the opposing edges of the side portion (5, 7), two on each longitudinal edge of the side portion (5, 7).

A transverse axis passing through the centre point of a recess 17 or cut-out portion 19 is parallel with the primary base portion 3 and does not intersect with any other such transverse axis passing through the centre point of any other recess 17 or cut-out portion 19 of the hanger 1.

The primary base plate 3 further comprises two reinforcement ribs 21. Each reinforcement rib 21 is formed of a raised portion in the surface of the primary base plate 3.

The reinforcement ribs 21 are located between the edges of the primary base plate 3 from which the two side portions 5, 7 are upstanding. More specifically, the reinforcement ribs 21 extend transversely of the primary base plate 3 between opposing edges thereof.

The reinforcement ribs 21 strengthen the hanger 1 but also serve to reduce the points of contact between the hanger 1 and a joist (not shown) to which the hanger 1 may be connected. By reducing the points of contact between the hanger 1 and a joist, the sound transfer from the joist to the hanger and *vice versa* is reduced yet further. A joist connected to the hanger will rest upon the reinforcement ribs 21 of the hanger 1 and will, therefore, only be in contact with the reinforcement ribs 21 rather than the entire surface of the primary base plate 3.

10 The first and the second secondary base plates (9, 11) further comprise two reinforcement ribs 21. Each reinforcement rib 21 is a raised portion in the surface of each secondary base plate 9, 11.

15 The one or more reinforcement ribs are preferably located between opposing edges of the secondary base plate. More specifically, the one or more reinforcement ribs may extend transversely of the secondary base plate.

20 The reinforcement ribs 21 on the secondary base plates strengthen the hanger 1 and also serve to reduce the points of contact between the hanger 1 and a floor joist (not shown) to which the hanger is connected. By reducing the points of contact between the hanger and the floor joist, the sound transfer from the joist to the hanger and *vice versa* is reduced yet further. In this way, a joist connected to the hanger will rest upon the reinforcement ribs of the hanger and will, therefore, only be in contact with the reinforcement ribs rather than the entire surface of the secondary base plate(s).

30 Referring to Figure 1b, the first and second face fixing plates 13, 15 are upstanding from the first and second secondary base plates (9, 11)

respectively at a free edge thereof. Each face fixing plate 13, 15 is upstanding from its secondary base plate (9, 11) at an angle of 90 degrees. Each face fixing plate 13, 15 is bent onto of the plane of the adjacent secondary base plate 9, 11 at a fold line 23, 25. The fold line in the depicted embodiment has a reinforcement rib 27 embossed therein.

As is depicted in each of Figures 1a, 1b and 1c, the primary base plate 3 also has recesses 17 in the form of notches in the free edges of the plate 3. The notches 17 in the primary base plate 3 further serve to dampen sound waves travelling through the hanger 1.

As best shown in Figure 1b and Figure 3, the primary base plate 3 and secondary base plates 9 and 11 comprise fastener apertures 29 through which a fastener may be located. The fastener may be a screw, a nail or the like.

Referring to Figure 2, 3 and 4, the first and second face fixing plates 13 and 15 each comprise two punch nail holes 31 therein. In this way, the face fixing plates 13, 15 may be attached to a face of a floor joist (not shown).

Figure 5 shows the hanger 1 in a pre-formed, flat arrangement. The hanger 1 is formed of a single piece of galvanised steel. Primary base plate 3 is connected to first and second side portions (5, 7) at fold lines 33 and 35 respectively. First side portion 5 is connected to first secondary base plate 9 at fold line 37 and second side portion 7 is connected to second secondary base plate 11 at fold line 39. In the flat arrangement depicted in Figure 5, primary base plate 3, first side portion 5, second side portion 7, first secondary base plate 9 and second secondary base plate

11 are all aligned about a single central longitudinal axis perpendicular to fold lines 33, 35, 37 and 39.

5 First face fixing plate 13 is connected to the first secondary base plate 9 at fold line 23 and second face fixing plate 15 is connected to the second secondary base plate 11 at fold line 25.

10 During formation of the hanger 1, the flat arrangement of Figure 5 is folded about fold lines 33, 35, 37, 39, 23 and 25 such that adjacent plates and/or portions are bent at 90 degrees to one another into the arrangement shown in Figures 1a, 1b, 1c, 2, 3 and 4.

15 Figures 6 and 7 show a joist assembly, generally indicated by the reference numeral 50 comprising a floor joist 51 and an independent ceiling joist 53 together with a hanger 1 connected therebetween. In the depicted embodiment, a plasterboard 55 is fastened through a fastener aperture in the primary base plate 3 of the hanger 1 to the independent ceiling joist 53.

20 The floor joist 51 is an I-joist formed of a bottom flange 51a and a top flange 51c spaced apart from one another and connected via web portion 51b. The lower face of bottom flange 51a rests upon reinforcement ribs 21 on the first and second secondary base plates 9 and 11. The front face of the bottom flange 51a is attached to the first and second face fixing
25 plates 13 and 15 by punch nails 31. In this way the hanger 1 is suspended from the bottom flange 51a of the floor I-joist 51 and is fixed thereto by punch nails 31 and by fasteners through the fastener apertures (not shown) in the first and second secondary base plates 9 and 11 into the bottom face of bottom flange 51a.

30

Independent ceiling joist 53 rests upon reinforcement ribs 21 on the primary base plate 3 of hanger 1. Plasterboard 55 is then fastened to the independent ceiling joist 53 through the fastener aperture (not shown) in the primary base plate 3.

5

By reducing the surface area of the joists 51 and 53 in contact with the hanger 1, impact sound transmission from the joists through the hanger is reduced. Further, any sound waves reaching the hanger 1 have no continuous longitudinal path through the hanger 1 as same are interrupted by the recesses 17 and/or cut-out portions 19 in the side portions 3, 5 and the primary base portion 3. By causing the sound waves to change direction to travel through the hanger 1, the sound waves are dampened during their passage through the hanger between the joists 51 and 53.

10

15 Various modifications and improvements may be made to the forgoing without departing from the scope of the present invention as defined by the claims.

20

In a further modification, the hanger may include truss nails integral with the sheet-like material. In this way, the hanger may be attached to a joist with or without additional fasteners being required.

25

By way of example only, the primary base plate may be 51.4mm breadth and 40mm depth. The side portions of the hanger may have a height of 150.2mm. The face fixing plate(s) on the hanger may each be of 50mm breadth and 50mm height. The, or each, secondary base plate may be of 50mm breadth and 40mm depth.

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The hanger is preferably of 151.4mm breadth, 40mm depth and 200.2mm height.

It will be understood that the given dimensions are of one specific embodiment only and may be varied according to the requirements of the hanger.

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Claims

1. A hanger comprising a primary base portion and two side portions
upstanding from opposing edges of the primary base portion and being
substantially parallel to one another; two secondary base plates for
connection to a portion of a floor joist and being substantially parallel to
the primary base portion, each secondary base plate depending from an
edge of a side portion remote from the primary base portion, characterised
in that each side portion comprises a plurality of recesses in each of their
opposing longitudinal edges and a plurality of cut-out portions each
aligned on the longitudinal central axis of the side portion and each
extending transversely from the longitudinal central axis towards the
longitudinal edges of the side portion.
2. A hanger according to claim 1, wherein the plurality of recesses and
cut-out portions in each side portion are arranged such that there is no
uninterrupted longitudinal axis of material between the upper edge and the
lower edge of the side portion.
3. A hanger according to any one of the preceding claims, wherein the
recesses and the cut-out portions are separated from one another by a
portion of the material of the side portion.
4. A hanger according to any one of the preceding claims, wherein the
plurality of recesses in an edge of a side portion are longitudinally spaced
apart from one another along the edge of the side portion.
5. A hanger according to any one of the preceding claims, wherein the
recesses in one longitudinal edge of a side portion are longitudinally offset

from the recesses in the opposing longitudinal edge of the same side portion.

5 6. A hanger according to any one of the preceding claims, wherein the cut-out portions are longitudinally spaced apart from one another along the central longitudinal axis of the, or each, side portion.

10 7. A hanger according to any one of the preceding claims, wherein each cut-out portion in a side portion is longitudinally offset from each and all of the recesses in the same side portion.

15 8. A hanger according to any one of the preceding claims, wherein a portion of each cut-out portion is spaced apart from at least a portion of at least one adjacent recess on a common longitudinal axis of the side portion.

20 9. A hanger according to claim 8, wherein a portion of each cut-out portion is spaced apart from at least a portion of at least two adjacent recesses, one on each longitudinal edge of the side portion, on a common longitudinal axis of the side portion between a top edge and a bottom edge of the hanger.

25 10. A hanger according to any one of the preceding claims, wherein the primary base plate further comprises one or more reinforcement ribs.

11. A hanger according to any one of the preceding claims, wherein the, or each, secondary base plate comprises one or more reinforcement ribs.

30 12. A hanger according to any one of the preceding claims, wherein the hanger further comprises one or more face fixing plates.

13. A joist assembly comprising a floor joist and a ceiling joist and a hanger connected therebetween; the hanger comprising a primary base portion for connection to the ceiling joist and two side portions upstanding from opposing edges of the primary base portion and being substantially parallel to one another; two secondary base plates for connection to a portion of the floor joist and being substantially parallel to the primary base portion, each secondary base plate depending from an edge of a side portion remote from the primary base portion, characterised in that each side portion comprises a plurality of recesses in each of their opposing longitudinal edges and a plurality of cut-out portions each aligned on the longitudinal central axis of the side portion and each extending transversely from the longitudinal central axis towards the longitudinal edges of the side portion.

14. A joist assembly according to claim 13, wherein the hanger is according to any one of claims 1 to 12.

15. A hanger substantially as hereindescribed with reference to the accompanying drawings.

16. A joist assembly substantially as hereindescribed with reference to the accompanying drawings.