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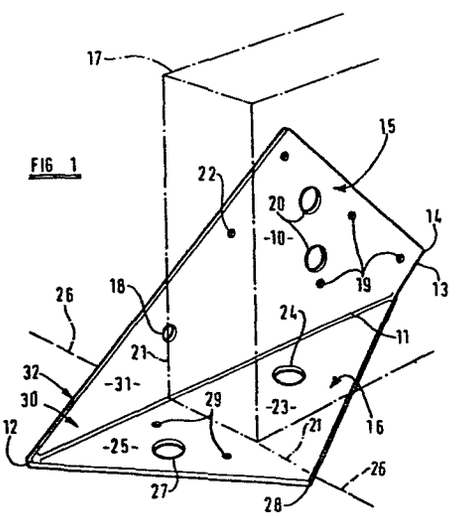
(54) **A joist support for use in building and a building structure including such a support.**

(57) A joist support for use in building and a building structure including such a support are described. The joist support is a generally rectangular metal member (10) which has a single oblique fold extending from one corner. The fold (11) divides the member into flanges (15 and 16), the flange (15) abutting the side of a joist (17) in use and the other flange (16) affording a bearing portion (25) to rest on a supporting structure (26). The bearing portion (25) is widest at the edge of the supporting structure (26) which roughly coincides with the end (21) of the joist to avoid localised overloading of the supporting structure. The fold (11) forms a rigid spine throughout the joist support, to distribute the load of the joist across the width of the supporting structure (26). Hence low density lightweight blocks can be used for the supporting structure with reduced risk of crushing. A range of joist sizes can be accommodated using one size of support because only one side face of the joist is located against the flange (15), which also provides lateral restraint in combination with an upright (31) extending into the masonry.

FIG 1



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Title: "A Joist Support for use in building and a building structure including such a support"

Description of Invention

This invention relates to a joist support for use in building, and to a building structure including such a support.

Where the context allows, the expression "joist" includes all forms of structural timber element such as roof trusses for example as well as the timbers conventionally referred to as joists and intended to support floors and ceilings.

In the past, it was the practice to build joists directly into masonry as the walls of a building were being constructed but this is generally unacceptable today for various reasons. For example, the timber of which joists are made tends to rot, particularly where it projects into a relatively wet environment, for example into the cavity of a cavity wall. Secondly, a timber extending through a layer of masonry provides a fire bridge which may enable fire to penetrate through a wall. Thirdly, repair and alteration work is extremely difficult if not impossible where joists are built directly into masonry because it is necessary for a joist to be longer than the gap between a pair of existing walls into which it is to be inserted.

These difficulties and drawbacks have been overcome or reduced by the use of metal joist hangers. These have proved very satisfactory when used correctly in suitable applications. However, there are some applications for which conventional joist hangers are unsuitable. Use in these situations may be dangerous and is certainly unsatisfactory.

For example, there is increasing use of very lightweight thermally insulating building materials, particularly in the inner leaf of an external cavity wall. Such building materials are much softer than the more traditionally brick or breeze block, and there is a considerable danger that the lightweight block will crumble and the joist will become unsafe if a conventional joist hanger is used. This problem is caused by the fact that the conventional joist is approximately 50 millimetres wide and the conventional joist hanger has about the same width so that the load is very strongly concentrated on a 50 millimetre length of the front top edge of a relatively soft block.

Furthermore, conventional joist hangers are assembled from a plurality of parts, often by welding. They therefore tend to be costly because of the number of tools, jigs and manufacturing operations involved and they also require to be inspected very thoroughly after manufacture to ensure that the welds are satisfactory.

It is an object of the present invention to provide a new or improved joist support for use in building which overcomes or reduces the above mentioned disadvantages.

According to the invention there is provided a joist support for use in building, for securing a joist (as hereinbefore defined) to a supporting structure (as hereinafter defined) the joist support comprising a sheet metal member having a fold extending completely across it to form a rigid spine which divides the member into a pair of generally planar mutually perpendicular flanges; one of the flanges including a fixing portion having fixing means for securing an end portion of the joist to the member; the other flange comprising a bearing portion adapted to bear on the supporting structure; location means being provided on said one or said other flange for

locating the end of the joist at a position such that a substantial part of the member projects beyond the end of the joist, the bearing portion of said other flange being located wholly within said projecting part and the rigid spine extending throughout at least a major part of both the fixing portion and the bearing portion and being aligned, in use, along an elongate edge of the joist.

Preferably, the location means are disposed on said one flange. They may comprise one or more tongues of metal pressed out of the plane of the flange or one or more apertures through which the end of the joist can be seen.

Said other flange may additionally include a support portion disposed, in use, in supporting relation beneath the end portion of the joist.

The bearing portion of said other flange may have a width, measured from the rigid spine, which is substantially greater than that of the joist, at least at the region thereof adjacent the end of the joist.

One or more keying formations may be provided on the bearing portion. Alternatively or in addition, one or more fastener receiving openings may be provided in the bearing portion.

In a preferred embodiment, the sheet metal member is of slightly elongate generally rectangular form and the fold extends obliquely across the member from one corner, to intersect the longer side of the elongate rectangle adjacent the opposite corner.

The invention also provides a building structure comprising a supporting structure (as hereinafter defined), a joist (as hereinbefore defined), and a joist

support as set out above, securing the joist to the supporting structure.

A "supporting structure" as herein defined may comprise a wall which may be of masonry elements arranged in courses, or may comprise a timber support on which the load formed by a joist, roof truss or other timber member is to be taken.

Where the supporting structure is of masonry, the joist support may be keyed into mortar or the like settable material by one or more keying formations provided on the bearing portion.

It may be preferred to secure the bearing portion of the joist support by means of nailing or bolting, particularly where the supporting structure is made of timber. Suitable fastener openings to receive nails or bolts will then be provided in the bearing portion.

The invention will now be described in more detail by way of example only with reference to the accompanying drawings in which:-

FIGURE 1 is a perspective view of a joist support embodying the invention, showing the position of an end portion of a joist in chain dotted outline;

FIGURE 2 is a diagrammatic side elevation on a smaller scale, showing a joist positioned in a building structure using a pair of joist supports.

Referring to Figure 1 of the drawing the joist support will be seen to comprise a generally rectangular metal member 10 which has a single oblique fold 11, extending from one corner 12 across the member 10 to intersect an elongate edge 13 of the metal member

adjacent the corner 14 opposite the first mentioned corner 12.

The metal member is therefore divided by the fold 11 into one flange 15 which is generally upright in use and another flange 16 which is generally horizontal in use.

The fold 11 can be regarded as a rigid spine extending somewhat diagonally across the metal member 10 and providing a considerable degree of rigidity. The two flanges 15 and 16 are disposed at right angles to each other and, in use, the joist 17 which is outlined in chain dotted lines is placed in abutment with the flanges 15 and 16. The position of the end of the joist is controlled by placing the end of the joist so that it can be seen through a joist locating aperture 18. Alternatively, a tongue or more than one tongue of metal can be pressed out of the member 10 to provide joist locating means equivalent to the aperture 18. The aperture 18 is shown provided on the one flange 15 but could alternatively be provided on the other flange 16.

It will be seen that the remainder of the metal member forms an extension 30 extending from the end of the joist.

The end portion of the joist is positioned so that its end face is located at the aperture 18 and it is then secured to the one flange 15 by suitable fastening means. In the embodiment shown, a number of nail holes 19 are provided, through which nails can be driven into the joist. Additionally, for alternative use, a pair of large diameter bolt holes 20 are also provided. All of these fixing holes are provided in a fixing portion of the one upright flange 15, this fixing portion lying to the right hand side of the chain-dotted line 21 which indicates the end of the joist.

It will be seen that the majority of the nail holes 19 are disposed well to the right of this line 21, so as to comply with the requirements of the relevant standard which requires that the structural fixings should be placed and spaced at such a distance from the end as to prevent splitting or similar degradation of the material. In the case of a timber joist, the main securing nails will be at least twenty times the nail diameter from the end for example. An additional nail hole 22 is provided somewhat closer to the line 21 for added stiffness by reducing the buckling length of the free edge 32 of the extension 30.

Additionally, or alternatively, the free edge 32 of the extension 30 could be stiffened by one or more ribs for example.

The other flange 16 of the member 10 is disposed horizontally in use and includes a support portion 23 which is disposed beneath the end of the joist 17 in use. This may contribute to supporting and locating the joist although the joist is not secured to this support portion 23. A large opening 24 is provided in the support portion 23, to be used for securing, for example, plasterboard to the underside of the joist.

The other flange 16 also includes a bearing portion 25. This bears on the upper surface of a supporting structure 26 shown in dotted outline. The bearing portion has a large aperture 27 which may be used as a mortar key to embed the bearing portion 25 in mortar used between adjacent courses of masonry. This keying is also assisted by virtue of the fact that a corner 28 of the member 10 is also positioned to the left hand side as shown of the line 21 which represents the position of the end of the joist and also of the edge of the supporting structure 26; thus, the corner 28 is embedded in the mortar if mortar is provided.

Additionally, a pair of nail holes 29 are provided, to enable the joist support to be used on a supporting structure of timber, to which it will then be nailed using these holes 29. Alternatively, a bolt can be inserted through the aperture 27 or other purpose designed fixing means can be provided.

If reference is now made to Figure 2 of the drawings it will be seen that, in use, a joist support as shown in detail in Figure 1 is secured to each end of the joist 17 and effectively forms an extension 30 of the joist projecting from the end of the joist. This extension is the part of the joist support to the left hand side of the line 21 in Figure 1.

When the joist has been thus extended by means of a pair of joist supports, these extensions 30 can be rested on the previously provided supporting structures 26. For example, where one is considering the building of a house using masonry walls, the walls will be built up to the level at which the joists are to be provided and a pair of joist supports according to the invention will then be secured, for example by nailing, to the end portions of the joist 17. The extensions 30 at each end of the joist can then be rested on the masonry of the walls as shown in Figure 2. It will be seen that the structure is fully stable without any additional courses of masonry being built above the joist support at that stage.

In contrast, the correct use of a conventional joist hanger requires that it is held in place by several courses of masonry above the level of the hanger before the joist can be supported. In practice, this requirement is frequently ignored and it is not unknown for the joists to be inserted with no masonry provided above the conventional hangers and for the bricks or blocks to be used in building the wall above to be stacked on boarding

laid across the joists which those masonry elements ought to be anchoring in position. This frequently results in distortion of the conventional type of joist hanger which can result in its subsequently pulling out of the masonry and can also result in the masonry being excessively stressed at the edge adjacent the joist, causing damage to the masonry.

With the joist support according to the invention, this problem is completely eliminated because the structural strength comes from the rigid spine afforded by the fold 11 and not from any anchoring effect due to masonry disposed above the bearing portion 25.

This feature of the joist support makes it adaptable for use in securing roof trusses in place to the top of a wall. In this case, there would normally be no masonry above the level of the base of the roof truss which would make the use of a conventional joist hanger impracticable.

Returning now to Figure 1 of the drawings it will be seen that the width of the bearing portion 25 in the region of the line 21 at the end of the joist is at its greatest, and that the width then tapers away in the form of a triangle but with the fold 11 affording a rigid spine throughout the distance from the line 21 to the corner 12.

When the joist support is placed in position on a partly built wall formed of lightweight thermal insulating blocks, it will be appreciated that the load of the joist is spread across the width of the bearing portion in the region of the line 21 denoting the end of the joist, which coincides roughly with the edge of the lightweight blocks forming the supporting structure 26. The rigidity of the spine formed by the fold 11, however,

also serves to distribute the joist load across the thickness of the lightweight block. In this way, the load is not concentrated on the forward edge of the block, which might cause that forward edge to crumble, but is spread over a large, generally triangular region of the top surface of the block. It has been established empirically that, using a bearing surface which measures approximately 80 millimetres along the line 21 by 70 millimetres along the fold 11, it is possible to load the joist so strongly that distortion of the metal of the joist support will occur before failure of lightweight blocks with a crushing strength as low as 3.5 N/m^2 for example.

The embodiment of joist support shown in the drawings and described above has considerable advantages compared with a conventional welded joist hanger. Firstly, it can be manufactured quite simply by stamping and pressing from sheet metal which can be galvanised to any desired thickness as it does not need to be welded. The sheet metal member 10 is generally rectangular, being slightly skewed as shown to permit the corner 28 to lie inboard of the line 21 and of the edge of the supporting structure 26. This means that large numbers of the metal members can be cut without substantial wastage from a single sheet.

As referred to above, it is unnecessary to have any masonry above the joist support to make it fully effective. It can therefore be used for fixing roof joists and roof trusses for example including trusses used for mono-pitch and part-profile roofs. It is not necessary for there to be a mortar bond to hold the joist support in position. If mortar is used, however, the bond is extremely good and, compared with a conventional welded hanger, it will be appreciated that there is a much reduced tendency for the mortar bond to be broken. The

forces acting on the bearing portion 25 of the joist support, in use, are largely downward compressive forces whereas, with a conventional joist hanger, the forces on the bearing portion tend to be both downward compressive forces and lateral shear forces tending to pull the bearing portion out of the mortar joint. This is because the joist is disposed below the forward edge of the bearing portion of a conventional joist hanger.

The joist support of the present invention is positively secured at the side of the joist by means of the fixings passing through holes 19 or 20. There is an upright 31 provided by the one flange 15 of the extension 30. This upright 31 is disposed between adjacent masonry elements of the wall structure as it is built up. In combination, these two features permit the joist support to give some lateral restraint to the joist, in addition to merely transferring the load from the joist to the wall.

Since the joist is located only against the two flanges 15 and 16, it will be appreciated that all sizes of joist can be accommodated with one or two suitable sizes of joist support and also that, provided adequate fixing and bearing areas are provided, structures such as roof trusses and so on can also be accommodated. This means that a supplier or a builder does not need to hold a large range of stocks to cover all requirements. It will be seen that the joist supports in the form shown are capable of being stacked one on another in a very minimal space and can readily be packed for transport and storage.

It will be appreciated that various modifications can be made to the shape of the joist support and to the fixing arrangements. For example, instead of providing nail holes and bolt holes 19 and 20 on the fixing portion

of the one flange 15, this could be provided with punched-out tongues forming a nail plate so that the joist could be driven into position using a hammer or press. In this way, roof trusses for example could be provided with supports of the general type shown which are fitted in the factory before the roof trusses are delivered to a building site.

Although the joist support shown has a fold 11 extending somewhat diagonally from one corner 12 to the region of the opposite corner 14, this need not necessary be the case and the support could be of simple angle section, provided that adequate bearing area and fixing area were provided. In this case, it might be necessary to reduce the height of the upright 31 on the extension 30 of the one flange 15, in order to accommodate coursing of brickwork or other masonry in use.

Although the flanges are generally planar, they could be ribbed or otherwise profiled for stiffness or to improve keying or friction.

It is intended the joist support shown should be provided in left-hand and right-hand forms. If these are used alternately, with the joist disposed at conventional centres of 400 millimetres, the upright 31 will be spaced correctly to occur in the interstices between building elements of a course of masonry in alternate bays.

If it is found, in use, that the positioning of the joist supports does not agree with the positioning of the masonry elements, a masonry saw can be used to slot the masonry elements to accommodate the upright 31. If it is desired to use the joist support in renovation of existing buildings, a masonry saw can again be used to produce

a pair of perpendicularly disposed slots into which the joist support can be slid. It will be appreciated that no mortar is required to secure the joist support in position so that renovation work is much more satisfactory than it would be using a conventional joist hanger which requires a mortar bond to provide edge bearing and hold it securely in position.

CLAIMS:

1. A joist support for use in building, for securing a joist to a supporting structure, characterised in that the joist support comprises a sheet metal member having a fold (11) extending completely across it to form a rigid spine which divides the member into a pair of generally planar mutually perpendicular flanges (15,16); one of the flanges (15) including a fixing portion having fixing means (19,20) for securing an end portion of the joist (17) to the member; the other flange (16) comprising a bearing portion (25) adapted to bear on the supporting structure (26); location means (18) being provided on said one or said other flange for locating the end (21) of the joist (17) at a position such that a substantial part (30) of the member projects beyond the end of the joist, the bearing portion (25) of said other flange (16) being located wholly within said projecting part (30) and the rigid spine (11) extending throughout at least a major part of both the fixing portion and the bearing portion and being aligned, in use, along an elongate edge of the joist (17).

2. A joist support according to Claim 1 further characterised in that the location means (18) are disposed on said one flange (15).

3. A joist support according to Claim 1 or Claim 2 further characterised in that the location means (18) comprise one or more tongues of metal pressed out of the plane of the flange.

4. A joist support according to Claim 1 or Claim 2 wherein the location means comprise one or more apertures (18) through which the end (21) of the joist can be seen.

5. A joist support according to any preceding claim further characterised in that said other flange (16) may additionally include a support portion (23) disposed, in use, in supporting relation beneath the end portion of the joist (17).

6. A joist support according to any preceding claim further characterised in that the width of said other flange (16) measured from the rigid spine (11) is substantially greater than the width of the joist (17) at least at the region thereof adjacent the end (21) of the joist.

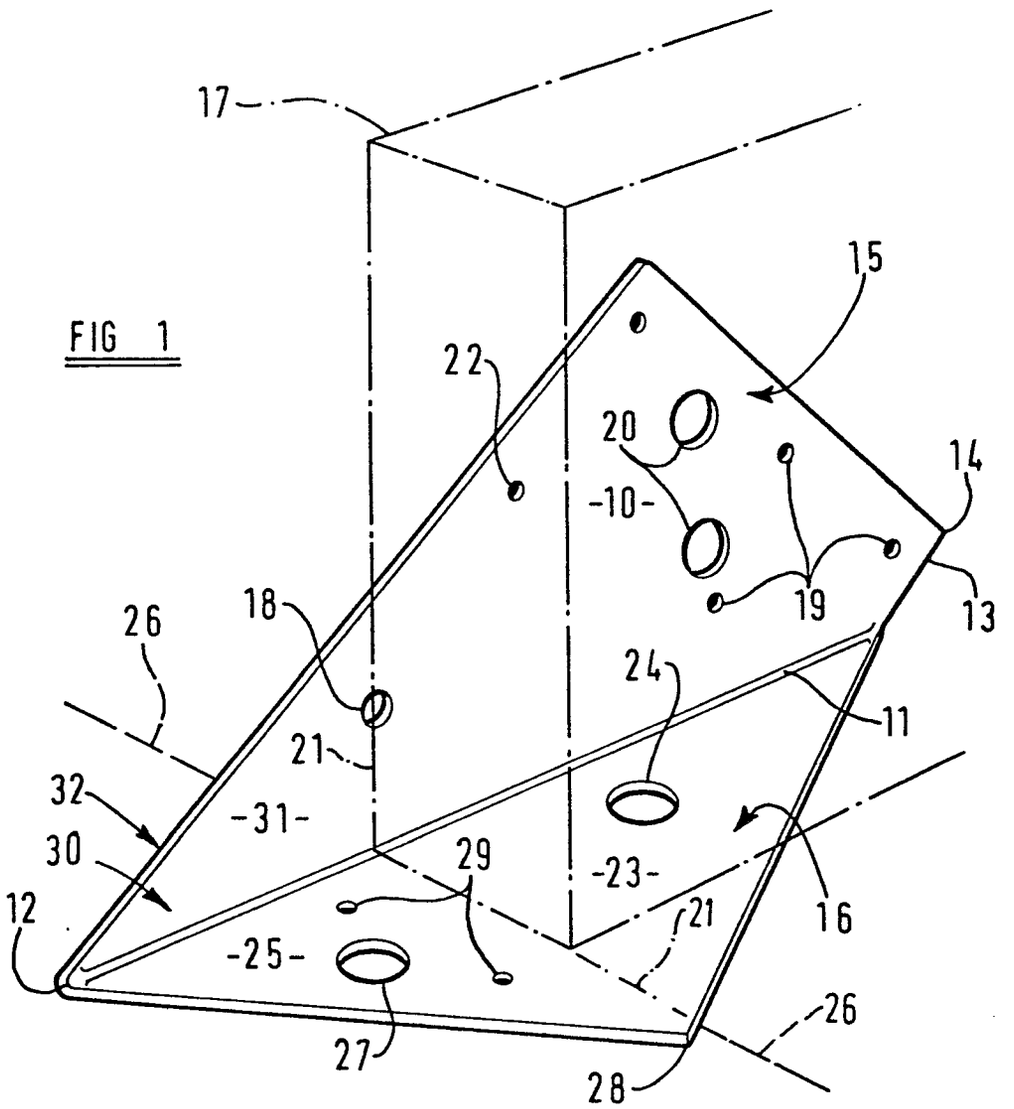
7. A joist support according to any preceding claim further characterised in that one or more keying formations (27) are provided on the bearing portion (25).

8. A joist support according to any one of Claims 1 to 6 further characterised in that fastener receiving openings (29) are provided in the bearing portion (25).

9. A joist support according to any preceding claim further characterised in that the sheet metal member is of slightly elongate generally rectangular form and the fold (11) extends obliquely across the member from one corner (12) to intersect the longer side (13) of the elongate rectangle adjacent the opposite corner (14).

10. A building structure characterised in that it comprises a supporting structure (26), a joist (17), and a joist support according to any one of Claims 1 to 9 securing the joist to the supporting structure.

FIG 1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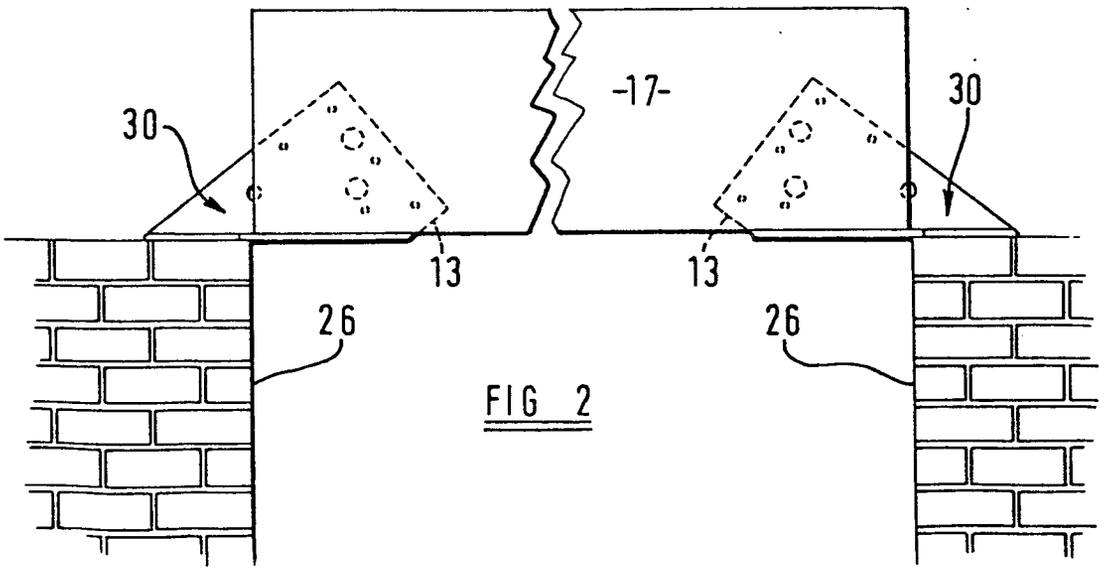
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FIG 2