(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 129 347**
A2

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **84303450.5**

(22) Date of filing: **22.05.84**

(51) Int. Cl.³: **E 04 B 1/56**

(30) Priority: **18.06.83 GB 8316644**

(43) Date of publication of application:
27.12.84 Bulletin 84/52

(84) Designated Contracting States:
BE DE FR GB NL

(71) Applicant: **PRESS-BAT HOLDINGS LIMITED**
Halesfield 9
Telford Shropshire(GB)

(72) Inventor: **Andrews, Peter Mark**
3, Sherbourne Road The Mount
Shrewsbury Shropshire(GB)

(74) Representative: **Healy, Cecilia Patricia**
134 Grayswood Avenue
Coventry, CV5 8HQ(GB)

(54) Method of butt jointing timbers in a building and splice plate for performing the method.

(57) Methods of butt jointing timbers in a building and renovating timbers in a building use four splice plates (10) which each have at least two flanges (11, 12) at right angles. The plate (10) has nailing apertures (14; 28) in at least one flange (11), and a central portion devoid of such apertures has stiffening ribs or projections (16; 26, 27). The timbers are abutted and each splice plate (10) is nailed to abut the timber with both flanges (11, 12) spanning the butt joint. Renovation of old timbers involves removal and replacement of a deteriorated portion, the substitute portion (29) being secured with four splice plates (10) in place of the deteriorated portion.

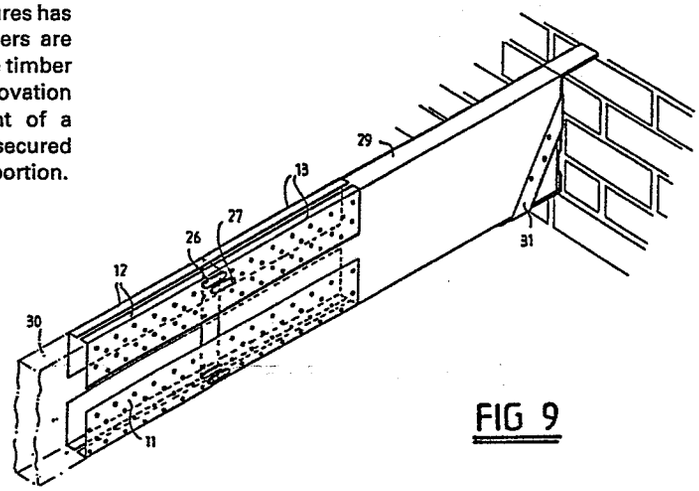

FIG 9

EP 0 129 347 A2

TITLE: "Method of Butt Jointing Timbers in a Building and Splice Plate for Performing the Method"

This invention relates to a method of butt jointing timbers and to a method of renovating timbers in a building, and to a splice plate for performing the method.

As a building becomes older, there is a risk of various forms of decay or damage occurring to timbers such as joists, roof trusses or timber studs. This decay or damage may have such varied causes as wet or dry rot, fungal attack, woodworm and similar pests, fire or impact.

As a typical example of the use of the invention, reference will be made in the following description to renovating floor joists where these have rotted adjacent a wall. However, it will be understood that this is only one example of many uses for the invention.

Timber is expensive, particularly for load bearing timbers such as joists which need to be of large cross-section.

Often, only part of a timber needs to be removed and replaced but this has hitherto been difficult and time-consuming work, requiring considerable skill and involving a substantial amount of replacement timber.

Taking the example of floor joist renovation, referred to above, after the floor boards have been lifted, the deteriorated portion of each joist is cut out, and a substitute length of timber used to replace it.

Traditionally, this substitute has been secured side-by-side with the remaining portion of the original joist by bolts. To achieve this, the substitute timber has had to be offset laterally, necessitating repositioning of the joist support point and needs to be about one metre longer than the deteriorated portion it replaces, to permit the overlap. This extra timber is expensive and adds unwanted extra weight. Both the substitute and the remaining original joist need to be drilled to take the bolts, which involves both extra time and the use of tools.

It is an object of the present invention to provide a new or improved method of butt jointing timbers in a building, which overcomes or reduces these disadvantages, a method of renovating timbers, and a splice plate which can be used for performing the methods according to the invention.

According to a first aspect of the invention, there is provided a method of butt jointing two timbers in a building comprising:-

taking a plurality of splice plates, each splice plate having at least two mutually perpendicular flanges;

and securing each splice plate to both said timbers with the ends of the timbers positioned in contact with each other; each flange abutting a respective surface of each of said timbers; and the splice plates being secured by fasteners passing through at least one of said flanges directly into each of said timbers.

According to a further aspect of the invention there is provided a method of renovating timbers in a building comprising:-

cutting away a deteriorated portion of an original timber;

taking a substitute timber of the same length;

placing said substitute timber in the place formerly occupied by the deteriorated portion;

taking a plurality of metal splice plates;

and securing each splice plate to both the substitute timber and the remaining portion of the original timber with the ends of said substitute and said remaining portion in contact with each other;

each splice plate having at least two mutually perpendicular flanges, each flange abutting a respective surface of each of said substitute and said remaining portion and the splice plate being secured by fasteners passing through at least one of said flanges directly into each of the timbers.

In either of the foregoing methods there may be included the step of cutting a slot into one or more surfaces of the timbers to generate internal surfaces of the timbers against which one or more of said flanges may abut.

The timbers may be slotted on a central longitudinal plane.

The fasteners preferably comprise nails.

The invention also provides a splice plate for securing together timbers in performance of the methods according to the invention, the splice plate comprising a single sheet metal member having at least two mutually perpendicular flanges, at least one flange being provided with a plurality of apertures to receive fasteners, and a central portion of the splice plate extending across both or all of the flanges being devoid of apertures.

The splice plate may be provided with stiffening means, which may comprise ribs or depressions in the metal of the plate. Preferably, these stiffening means are disposed in said central portion devoid of apertures.

The stiffening means may be localised near the junction between said flanges.

The apertures may be provided in a pattern such that no three adjacent apertures in any direction are aligned with each other, to reduce the risk of tensile failure of the plate by tearing along a line of apertures and to reduce splitting of the timbers fastened using the plate.

The splice plate may comprise two flanges, meeting at right angles, one of which is of narrower width than the other.

Alternatively, the splice plate may comprise three flanges, defining a channel-section, the base of the channel being of the same width as the timbers to be secured together.

A further alternative form of splice plate is of T-section, the upright of the T being adapted to be inserted into a slot cut in a timber.

Methods and apparatus embodying the invention will now be described by way of example only, with reference to the accompanying drawings, in which:-

FIGURE 1 is a front elevational view of a first embodiment of splice plate;

FIGURE 2 is a top plan view of the plate of Figure 1;

FIGURE 3 is a side elevation of the same plate;

FIGURE 4 is a sectional view of a renovated timber, which has been secured together using splice plates as shown in Figures 1 to 3;

FIGURE 5 is a sectional view of renovation using a first alternative form of splice plate;

FIGURE 6 is a sectional view of renovation using a second alternative form of splice plate.

FIGURE 7 is a side elevational view of a further alternative form of splice plate.

FIGURE 8 is a section of the splice plate of Figure 7 taken on the line 7-7.

FIGURE 9 is a perspective view of the splice plate of Figures 7 and 8 in use in a butt joint.

FIGURE 10 diagramatically illustrates butt joints which can be secured using the splice plate.

Referring firstly to Figures 1 to 3 of the drawings, a splice plate 10 is made of galvanised steel sheet, stainless steel sheet or other strong and corrosion resistant sheet metal. It comprises a first flange 11 and a narrower second flange 12, meeting at right angles at a junction line 13.

In this embodiment each flange is provided with a plurality of apertures 14, to receive nails, which will be used to secure together timbers for renovation. Careful examination of the pattern of apertures will show that these are arranged so that no three adjacent apertures are aligned. The plate will be subjected to tensile stress in use, and alignment of the apertures could lead to failure by tearing along a line of apertures. The offset pattern of holes helps to prevent such failure. It may also reduce the risk of splitting timbers secured using the splice plate.

The central portion 15 of the splice plate is devoid of apertures. Building Regulation require that timbers should not be nailed within a certain distance of their ends, to reduce risk of splitting, which could make the nails insecure. The central portion 15 will overlie the ends of two abutting timbers in use.

In this central region, there are provided stiffening formations in the form of ribs 16 or depressions in the material of the plate, these ribs 16 being made in both first and second flanges 11 and 12.

The version of splice plate shown in Figures 7 and 8 of the drawings is similar to that described above with certain exceptions. Where similar parts are shown, they are given the same reference numerals.

The first difference in the embodiment shown in Figures 7 and 8 is that the narrow second flange 12 does not have apertures similar to the apertures 14 shown in Figure 2 and does not have a central stiffening rib 16. It has been found in practice that these can be omitted without detriment to the functioning of the splice plate to be described below and their omission leads to simpler manufacturing.

A second difference is in the shape of the stiffening formations indicated at 26 and 27 in the drawings. Instead of a single generally Z shaped stiffening rib, a pair of straight stiffening ribs 26, 27 are provided, again lying in the central region of the splice plate which is devoid of apertures. However, the ribs 26, 27 are located adjacent the junction line 13 between the first and second flanges 11 and 12. This provides increased stiffening at the point where it is most needed. This will be referred to again in the description of the use of the splice plate below.

It will be seen that the ribs 26 and 27 are off-set on opposite sides of the centre line of the splice plate. The reason for this is to avoid the ribs obstructing a hammber which is used to nail fasteners in the group of apertures indicated at 28 which surround the stiffening formation.

The stiffening formations are intended to stiffen the splice plate, to make it more resistant to the bending moments and shear forces which will be exerted on it in use. To explain this, the method of use of the splice plate needs to be considered, in relation to the chosen example of renovation of rotten timber joists adjacent a wall.

Turning to Figure 9 of the drawings, the splice plate of Figures 7 and 8 is shown in use. Figure 4 shows a section through the plate of Figures 1 to 3 in use. Where a joist has rotted adjacent a wall, the deteriorated portion is cut out. A substitute timber 29 of the same cross-section as the original joist 30 is cut to the same length as the deteriorated original portion which has been removed. The substitute timber is then placed in the same position as that removed, using the same joist hanger 31 if a suitable one is in use or using a new hanger in the original position. As a further alternative, the joist can be built directly into the masonry (not shown).

The substitute timber 29 occupies exactly the same position as the deteriorated portion which it replaces and abuts the remaining portion 30 of the original joist, where it is secured by means of the splice plates 10 described. In Figure 9, these are in the form shown in Figures 7 and 8 but they could be as shown in Figures 1 to 3.

Four splice plates, are used to secure together the timbers 29, 30. Similarly, a timber is shown in section at 25 in Figure 4. Each of the two flanges 11 and 12 is

arranged in firm engagement with a respective face of the abutted timbers 29, 30, and nails passing through the apertures 14 are used to secure the flanges of the splice plates directly to these faces of the timbers. In Figure 9, only the larger flange 11 is nailed. Figure 4 also shows also the narrow second flange 12 nailed in place.

It will be seen that no drilling of the timbers is needed, in contrast to the prior method which involved the use of bolts passing through side-by-side timbers. The only tool required is a hammer, and the securing of the timbers is relatively quick and needs much less skill than the previously-used method. Since no overlap is provided between the remaining original and substitute timbers, the method is economical in the use of timber.

The substitute timber may be swung laterally or downwardly into a position where it is brought into abutment with one or more splice plates 10 secured to the remaining original timber 30, which serve to support it until the other splice plates 10 are added and the assembly is nailed firmly together.

When portions of floor joists are secured together using the splice plates shown, the downward loading on the joists as a whole exerts a bending moment on the junction between the original and substitute portions 30 and 29. The lower face tends to be placed in tension, while the upper face is in compression.

The compressive strength of the joint between the joist portions relies mainly on the compressive strength of the joist timbers themselves in their abutting position. The tensile strength is derived from that of the metal splice plates 10. The stiffening ribs are positioned close to the junction 13 of the flanges 11 and 12 to minimise any tendency for the plate to buckle under this loading.

Figure 10 illustrates forms of joint which can be secured using the splice plate. In the upper two of the illustrations, there is no gap left between the two timbers to be secured together. The timbers are either abutted at upright faces or at mating oblique faces.

However, the lowest of the three illustrations showing a pair of timbers which merely make contact at the upper faces is acceptable provided that the gap between the lower faces of the timbers is restricted to a fairly small size, for example a maximum of 20 mm for a joist of 98 mm nominal depth. Joints between joists which make contact only at their lower face are not preferred since the performance of the splice joint is reduced. This is because of the reduction in the compressive strength of the joint, which as previously stated relies mainly on the strength of the joist timbers themselves in their abutting position at the upper face of the joint.

Although the splice plates shown in Figures 1 to 4 and in Figures 7 and 8 may have particular usefulness in assisting correct positioning of the substitute timber during renovation, other forms of splice plate may be used.

Figure 5 shows a modified splice plate 17, similar to that of Figures 1 to 4 except that it has a channel-section, effectively combining two of the splice plates 10. This form of splice plate 17 is of course limited to use with a particular width of timber, since the base 18 must be of the same width as the timber, so that the side flanges 19, 20 of the channel abut the side faces of the timber 25. However, the extra metal width in the horizontal planes of the top and bottom of the joists gives this version of splice plate some extra strength to resist heavy bending moments.

In Figure 6, the timbers are slotted at 21 on a central upright plane, and a T-shaped splice plate 22 is used,

(or two of the angle shaped splice plates 10 are used back-to-back) with the upright web 23 of the T inserted into the slot. The web 23 need not be provided with holes, as their positions would not be visible from the face of the timbers. Long nails are driven through the timber, penetrating the web 23 within.

The horizontal (as shown) cross-pieces of the T, (or the second flanges 12 of the angle-section splice plates 10) are nailed directly to the top and bottom faces of the timbers.

This version of splice plate provides extra strength on the central longitudinal axis of the timbers at their junction, without obscuring their side faces and without any limitation to the width of timbers which can be secured together.

Other forms of splice plate can be devised for use in the method of butt jointing of timbers according to the invention. It will be appreciated that parts of the foregoing description in relation to renovating a rotten joist may not be appropriate to butt jointing of other timbers, such as upright timber studs for example. However, the invention can be applied to such situations with appropriate modifications.

CLAIMS:

1. A method of butt jointing two timbers in a building characterised in that it comprises the steps of:-

taking a plurality of splice plates, each splice plate having at least two mutually perpendicular flanges;

and securing each splice plate to both said timbers with the ends of the timbers positioned in contact with each other; each flange abutting a respective surface of each of said timbers; and the splice plates being secured by fasteners passing through at least one of said flanges directly into each of said timbers.

2. A method of renovating timbers in a building characterised in that it comprises the steps of:-

cutting away a deteriorated portion of an original timber;

taking a substitute timber of the same length;

placing said substitute timber in the place formerly occupied by the deteriorated portion;

taking a plurality of metal splice plates;

and securing each splice plate to both the substitute timber and the remaining portion of the original timber with the ends of said substitute and said remaining portion in contact with each other;

each splice plate having at least two mutually perpendicular flanges, each flange abutting a respective surface of each of said substitute and said remaining portion and the splice plate being secured by fasteners passing through at least one of said flanges directly into each of the timbers.

3. A method according to claim 1 or claim 2 further characterised in that it includes the step of cutting a slot into one or more surfaces of the timbers to generate internal surfaces of the timbers against which one or more of said flanges may abut.

4. A method according to claim 3 further characterised in that the timbers are slotted on a central longitudinal plane.

5. A splice plate for securing together timbers in performance of the methods according to any one of claims 1 to 4, characterised in that it comprises a single sheet metal member having at least two mutually perpendicular flanges, at least one flange being provided with a plurality of apertures to receive fasteners, and a central portion of the splice plate extending across both or all of the flanges being devoid of apertures.

6. A splice plate according to claim 5 further characterised in that it is provided with stiffening means such as ribs or depressions in the metal of the plate.

7. A splice plate according to claim 5 or claim 6 further characterised in that the stiffening means are disposed in said central portion devoid of apertures.

8. A splice plate according to claim 6 or claim 7 further characterised in that the stiffening means are localised near the junction between said flanges.

9. A splice plate according to any one of claims 6 to 8 further characterised in that the apertures are provided in a pattern such that no three adjacent apertures in any direction are aligned with each other.

10. A splice plate according to any one of claims 6 to 9 and characterised in that it comprises two flanges meeting at right angles, one of said flanges being of narrower width than the other.

11. A splice plate according to any one of claims 6 to 10 characterised in that it comprises three flanges defining a

channel-section, the base of the channel being of the same width as the timbers to be secured together.

12. A splice plate according to any one of claims 6 to 10 which is of T-section, the upright of the T being adapted to be inserted into a slot cut in a timber.

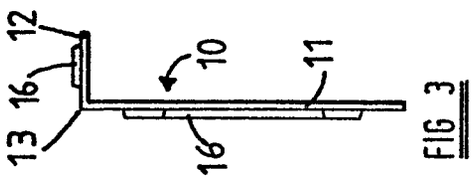

FIG 3

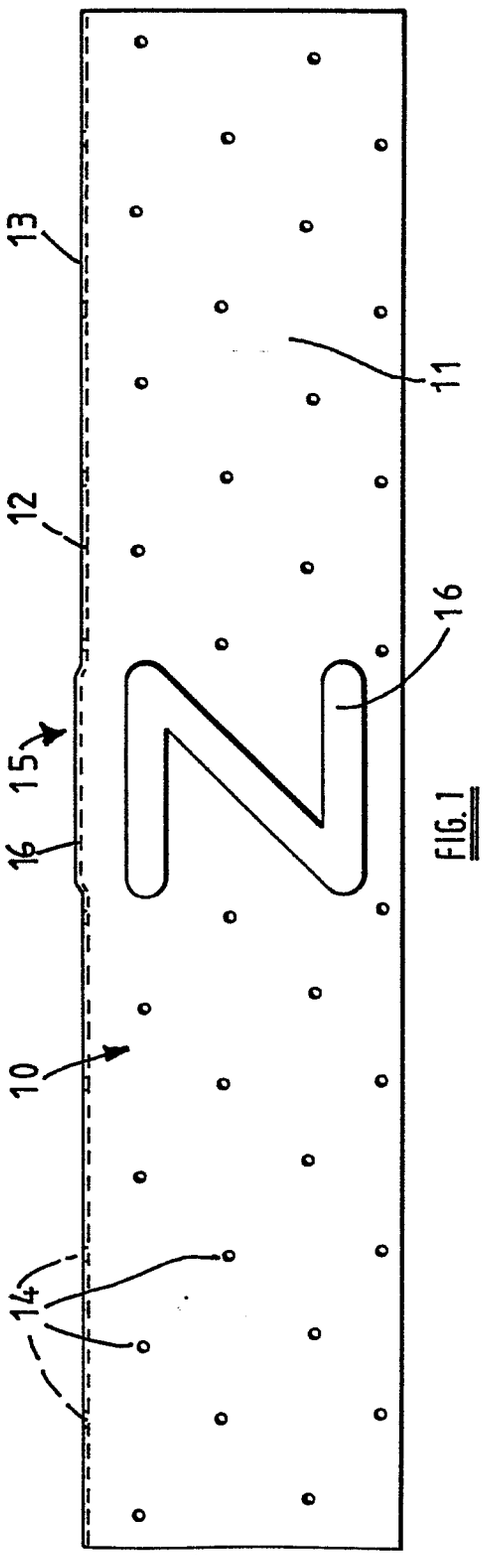

FIG. 1

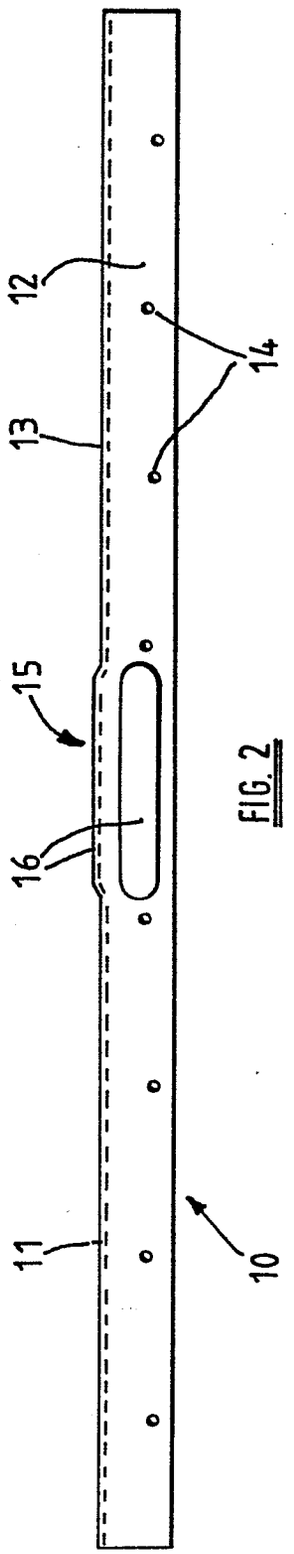

FIG. 2

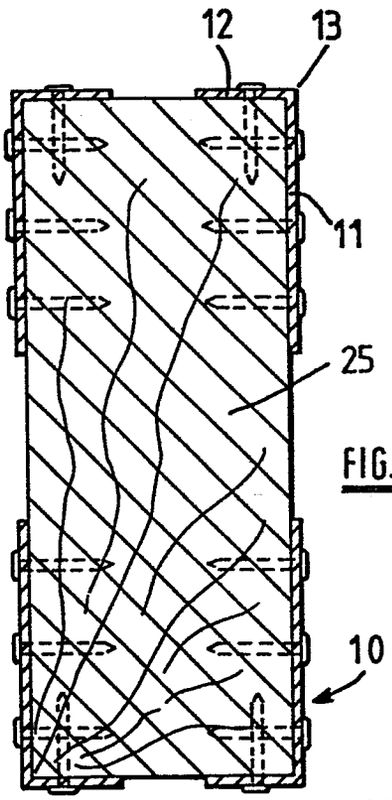

FIG.4

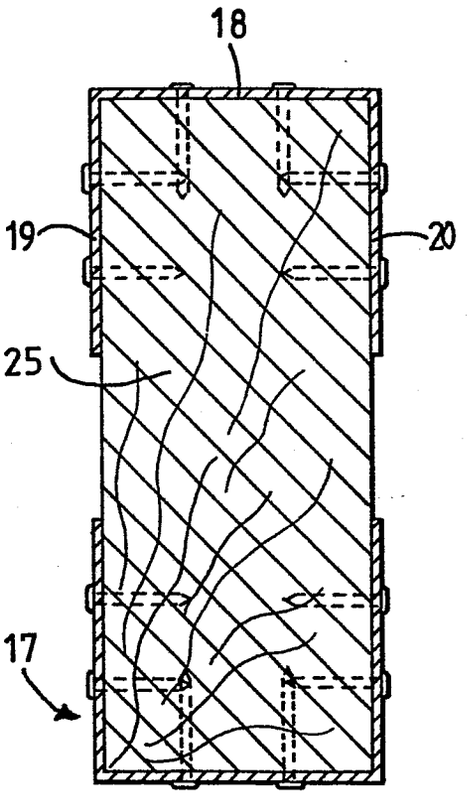

FIG.5

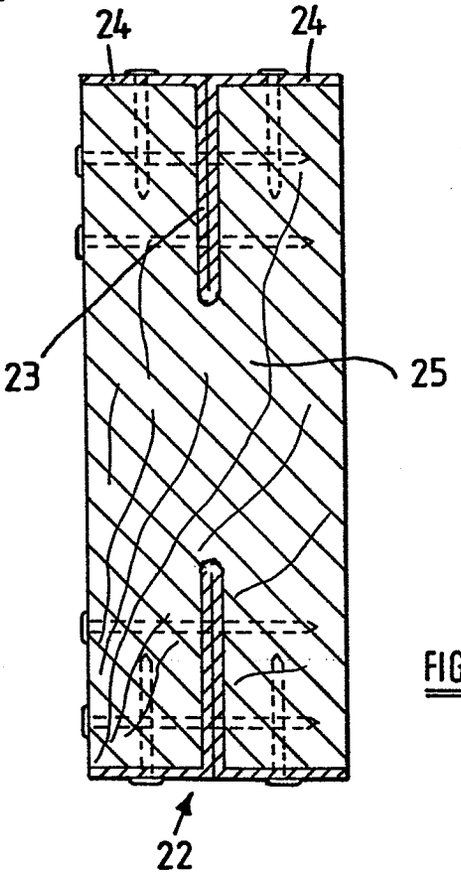

FIG.6

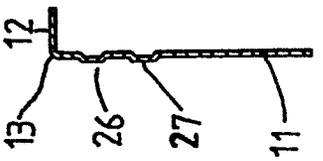

FIG 8

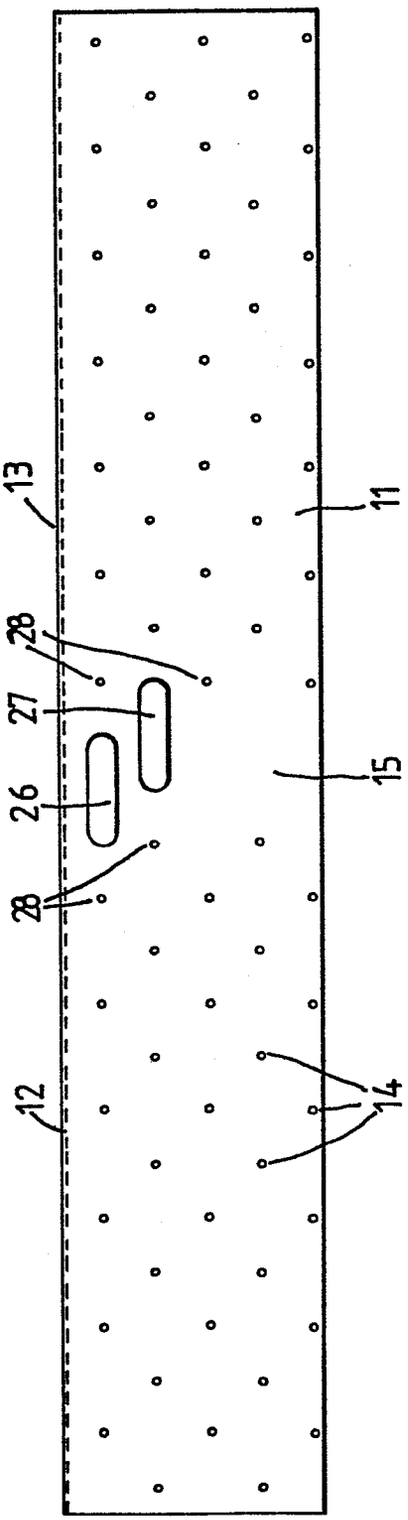

FIG 7

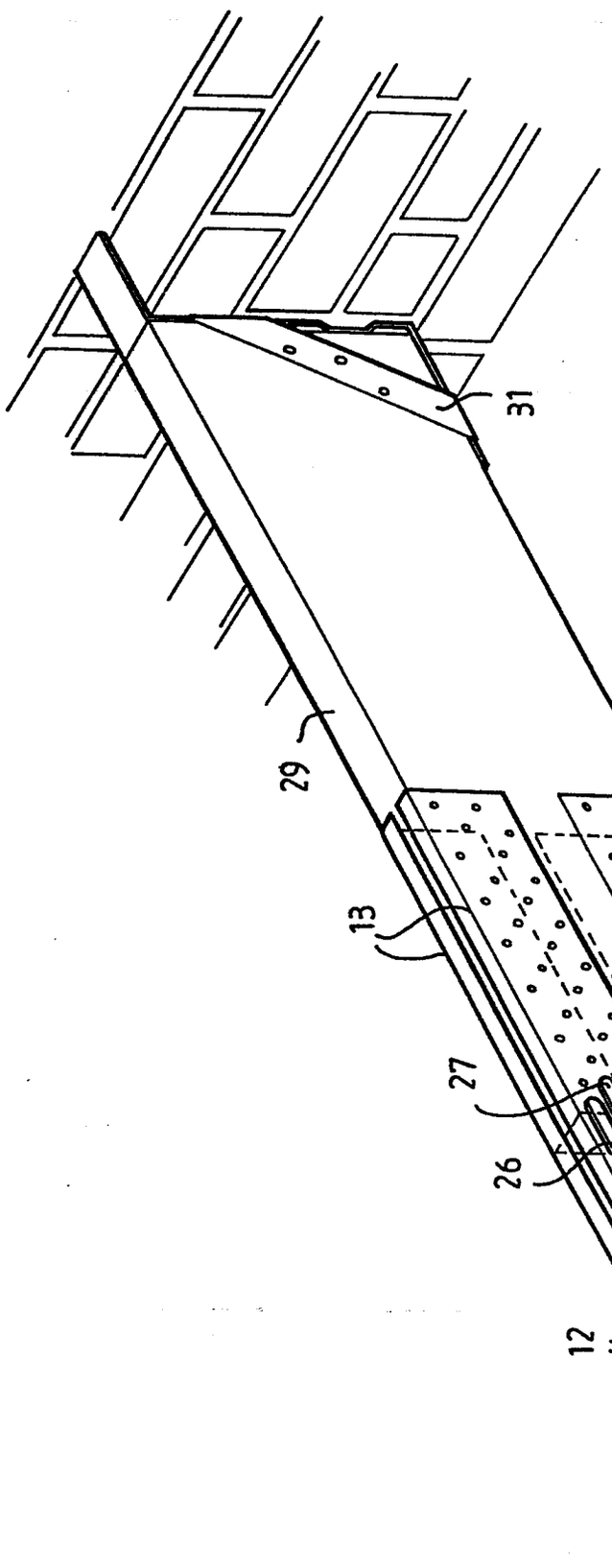

FIG 9

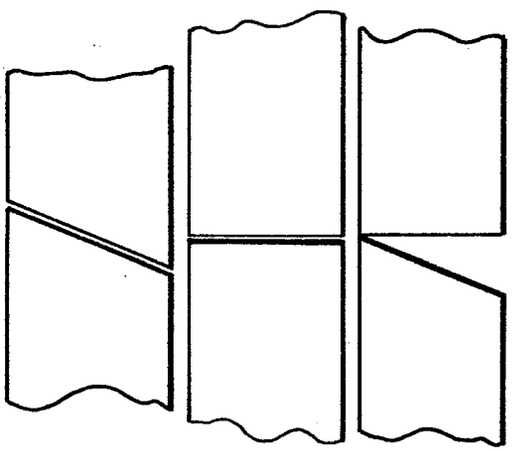

FIG 10