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

(11) Publication number: **0 374 316**
A1

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **88312089.1**

(51) Int. Cl.5: **E04C 3/32, E04B 2/58**

(22) Date of filing: **21.12.88**

(43) Date of publication of application:
27.06.90 Bulletin 90/26

(84) Designated Contracting States:
AT BE CH DE ES FR GB GR IT LI LU NL SE

(71) Applicant: **Bodnar, Ernest R.**
2 Danrose Crescent
Don Mills Ontario M3B 3NS(CA)

(72) Inventor: **Bodnar, Ernest R.**
2 Danrose Crescent
Don Mills Ontario M3B 3NS(CA)

(74) Representative: **Hands, Horace Geoffrey et al**
GEORGE FUERY & CO Whitehall Chambers
23 Colmore Row
Birmingham B3 2BL(GB)

(54) Metal stud.

(57) Metal stud (12) having two parallel spaced apart L-shaped portions (20, 22) defining wall supporting flanges (24, 26) lying in parallel spaced planes, at right angles, struts (36) extending from one L-shaped portion to the other and being spaced apart from one another to define openings (46), edge flange formations (40, 42, 44) formed on the struts extending completely around the openings, enlarged roots (48, 50) on each end of the struts where they join the L-shaped members, and, indented ribs (52, 54) formed transversely in the L-shaped portions, and extending into the wall supporting flanges. Also disclosed is a wall comprising a plurality of metal studs, wall panelling (10) on the studs, and fastenings (14) passing through the panelling, and portions of the studs.

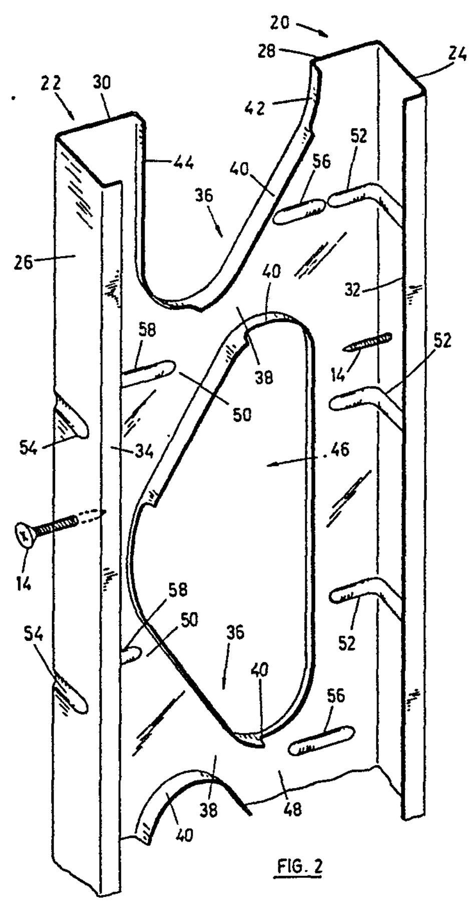

FIG. 2

EP 0 374 316 A1

METAL STUD

The invention relates to a structural member formed of sheet metal for use in construction of buildings, and in particular to a metal stud member for use in building of bearing and non-loadbearing walls and partitions.

Construction makes use of studs either of wood or metal. Metal studs are greatly preferred in many forms of construction, since they are resistant to termites, rot and fire damage. Metal studs are lighter than wooden studs, of equal strength, and are thus suitable for non-loadbearing walls and partitions in commercial buildings. In high rise buildings they are preferred, or even required by architects and engineers, in order to avoid excessive weight in the building.

Metal studs support wall covering materials and are frequently used in association with panels of drywall material. Walls also carry services such as wiring, and the like.

It is desirable that the walls shall readily pass services to and fro without obstruction.

In any metal stud it is desirable to reduce the effects inherent in the use of metal, such as transfer of heat, and transfer of sound. Heat loss is a significant problem in exterior walls. Various proposals have been made to provide studs for exterior walls, in which the path for heat transfer has been reduced by forming openings in the stud.

In interior walls, the studs should be as free as possible from sound transfer. It is also desirable that they shall be as rigid as is required to maintain the panels in position, and also to be as light as possible.

In the past, typical metal drywall studs involved a generally three sided channel section having a central web and two side walls, bent into a channel shaped cross-section. This section was continuous along the length of the studs.

These studs have been widely used in the past and have proved satisfactory in many cases. There are however various disadvantages which arise from this particular design. In the first place the central web is generally speaking a continuous barrier throughout the height of the wall. Consequently, it is necessary to leave openings in the web in order to pass wiring through it. These tend to leave relatively sharp edges, which may possible lead to damage to services. Also, these openings tended to weaken the stud and make it less rigid, and such holes could only be opened up in a very restricted manner.

Another disadvantage is the fact that unless such studs were made of extremely thin gauge metal, they tended to be unnecessarily heavy, and costly for the job to be done.

In addition, it is desirable if possible to have a stud which has the same overall dimensions as a regular 2 X 4 stud. However, for reasons of economy and the like, it has been the practice to reduce the width of the web of the metal stud, so that the end result was a wall which was somewhat thinner than was the case using wooden studs.

This tended to increase the sound transfer through the walls. In addition, the existence of a continuous metal web extending from one side of the wall to the other tended to assist in transferring sound.

A further and more serious disadvantage arose during installation of the drywall. When the drywall is installed on such metal studs, the workman uses and electrical screwdriver similar to a power drill, and a self-tapping screw. The screw has a particular form of self boring screw point which is intended to be applied directly to the sheet metal of the stud, and to pierce its own hole through the stud, after which it will tighten up and secure the drywall panel to the stud. These screws have proved most satisfactory. However, where the thickness of the sheet metal in the metal stud is reduced, for reasons of economy, the side walls of the stud become relatively flexible. As a result, when the drywall workmen are inserting the screws, as they press the screw point against the side wall of the stud the side wall tends to flex. This then allows the screw to slip to one side, consequently damaging the drywall, and leading to a slow down in work. As a result, the thinner gauge drywall studs of this type have caused various problems.

Clearly however, it is desirable as far as possible to reduce the thickness of the gauge of sheet metal used in such studs, providing the disadvantages listed above can be avoided.

With a view to overcoming the foregoing disadvantages, the invention comprises a light weight structural metal stud member, formed of thin gauge sheet metal, and having two parallel spaced apart generally L-shaped angled members extending parallel to one another, a plurality of spaced apart strut members extending integrally from one said angle member to the other, and defining openings therebetween, edge flange formations formed on the said strut members, enlarged root portions on each end of said strut members where the same join said L-shaped members, each of said L-shaped members defining parallel spaced apart panel attaching facing flanges, lying in generally parallel spaced apart planes, to which wall covering materials may be attached, and, a plurality of intended rib formations formed transversely of said

L-shaped angle portions, said ribs being formed in said wall facing flanges, and in adjacent portions of said L-shaped angle members, said ribs being formed at spaced apart intervals along the length of said L-shaped members, whereby to resist flexing of said facing flanges during insertion of fastening members therethrough.

It is also an objective of the invention to provide a wall construction comprising such structural members and wall panelling attached thereto.

The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this disclosure. For a better understanding of the invention, its operating advantages and specific objects attained by its use, reference should be had to the accompanying drawings and descriptive matter in which there are illustrated and described preferred embodiments of the invention.

IN THE DRAWINGS

Figure 1 is a perspective illustration of a portion of a typical wall, partially cut-away to reveal the structural members according to the invention;

Figure 2 is a greatly enlarged perspective illustration of the structural member of Figure 1;

Figure 3 is a section of an alternate form of stud;

Figure 4 is a partial perspective of the stud of Figure 3, and,

Figure 5 is an elevation of another embodiment.

DESCRIPTION OF A SPECIFIC EMBODIMENT

Referring first of all to Figure 1 it will be seen that a typical wall comprises panels of walls covering material, typically plasterboard or dry wall materials, indicated as panels 10, supported on spaced-apart vertical metal stud members indicated generally as 12. The stud members 12 in this embodiment will typically be spaced apart at intervals of sixteen inches, assuming that the panel 10 has a standard dimension of four feet by eight feet. In some wall systems the studs may be further apart or closer together, and in any event this is well known in the art and forms no part of the invention.

In a typical wall system, there will be top and bottom plate members (not shown) which will typically be metal channel sections attached to the floor and to the fabric of the ceiling, for securing the top and bottom of each stud.

In some walls, there will also be intermediate cross members (not shown) extending between adjacent studs, midway between the top and bottom plate members for bracing the studs.

All of this is, in any event, well known in the art and forms no part of this invention.

While Figure 1 illustrates wall panelling materials on both sides of the stud, and thus illustrates an interior wall, it will of course be appreciated that when used for exterior walls, wall panelling would be attached usually to only one side, and some other material would be attached to the other side, depending upon the type of construction.

It will be, of course, well understood that the panels 10 are secured to the studs 12 by means of fastening devices typically being so-called drywall screws shown generally as 14. Such screws 14 while forming no part of this invention, are of significance in that they are generally formed with what is known as a self-tapping point. In a typical drywall screw a portion of such point is cut away so as to leave a sharp cutting edge.

When such a point is driven into a metal stud 12, and is rotated for example, by means of a power operated screwdriver or the like, it will pierce its own hole in the stud, and will bore its way into it, and then tighten up thereby securing the wall panel to the stud.

Normally, there would be anywhere between thirty and fifty screws per panel. It will thus be appreciated that if there is any difficulty at all in inserting the screws and causing them to pierce the stud and tighten up, it will substantially slow down the installation of the drywall and thereby increase the overall cost.

On the other hand, it is desirable to make the studs themselves of thin gauge material, so as to both save in weight, and also save in material cost.

As described above these two factors have tended to conflict with one another in the construction of studs to the point where any reduction in gauge was offset by an increasing difficulty in inserting screws.

As better shown in Figures 2, 3 and 4, the drywall stud according to the invention will be seen to comprise inner and outer generally L-shaped angle portions 20 and 22.

For the purpose of this discussion, reference will be made to inner and outer merely for the sake of differentiating between one such angel member and the other. It will, of course, be understood that in interior walls there is no such thing as an inside or an outside surface. In addition, the stud may be used either way around, or either way up, so that either side may be considered the inside or either side may be considered the outside at any given moment.

Both angle portions 20 and 22 are of identical construction. They comprise facing flanges 24, 26 and side flanges 28, 30 normal thereto. The free edge of the facing flanges 24 and 26 are turned in as at 32, 34. In accordance with well known practice in the art, the outwardly directed surface of the facing flanges 24, 26 may be provided with a surface formation defining a plurality of small closely spaced indentations. These indentations are now shown, but in any event it is well understood that they facilitate the insertion of the screwpoint into the sheet metal, by their tendency to hold the screw point and prevent it from slipping sideways on the metal surface.

Extending between the two angle portions 20 and 22, are a plurality of generally diagonally arranged struts 36. Each of struts 36 comprises a web portion 38 and sidewall portions 40-40.

The free inward edges of the side flanges 28 and 30 are turned inwardly as at 42, 44. The inturned portions 42-44 are continuous edge-wise extensions of the sidewalls 40-40 of the struts 36.

Because the struts 36, there are defined openings 46 of generally trapezoidal shape.

The roots or ends of the struts 36 are flared outwardly, as at 48,50, and thus provide a smooth transfer of forces from the angle portion 20-22, through the struts 36.

In order to increase the rigidity of the facing flanges 24-26, and often enable the gauge of the metal to be reduced, a plurality of transverse indented rib formation 52-54 are formed. The rib formations 52-54 extend in this preferred embodiment preferably in the region of the flared portion 48-50 at the end or roots of the struts 36.

Additional such ribbed formations are formed at periodic intervals along the length of the angle members 20-22.

Further ribs 56-58 are formed extending into the roots of the struts and preferably merging with ribs 52-54.

Ribs 56-58 will be formed at one stage of the manufacture. Ribs 52-54 will be formed later, after formation of the longitudinal bends in an angle portions 20-22.

The operation of the invention is self-evident from Figure 1.

Once the studs have been erected side by side at spaced intervals, the wall panel covering materials are applied and fastened by means of screws.

As the screws are pressed through the wall paneling material, against the facing flanges 24 or 26, the point of the screw will pierce the facing flange, and then pass through it, and the threads of the screw will then form their own thread, thereby causing the screw to become fastened in the facing flange.

The tendency of the facing flange 24 or 26 to become deflected under the pressure of the point of the screw, is resisted by means of the idented ribs 52 or 54, which tend to hold the facing flange 24 normal to the side flange 28 and 30. In this way, the tendency of the screw point to skid off the surface of the flange 24 or 26 is reduced to minimum.

It will, of course, be appreciated that if possible, any services such as electrical wiring, plumbing and the like will have been passed through the openings 46 in the studs 12, prior to the application of the wall panel.

The side flanges 28 and 30 provide a convenient means for attaching electrical service boxes for example again by means of sheet metal screws or drywall screws.

Once the wall has been covered in with wall panel, it will be appreciated that the tendency for the wall to transmit vibrations or sound is substantially reduced by the existence of the spaces 46, and the relatively small portion of metal contained in the diagonal struts 36. In this way sound transmission is reduced to a minimum.

At the same time any tendency for the struts 12 to flex is substantially reduced by the angled formations 20 and 22, being connected by means of transverse struts 36, which comprise channel sections along their length, and having sidewalls 30 merging with inturned edge portions 42, 44 of the angled portions 20 and 22.

The improved rigidity inherent in a stud according to the invention enables studs to be made of thinner gauge sheet metal. This produces a saving in weight, and also a saving in material cost, without an unacceptable loss of rigidity.

A further embodiment of the invention is shown in Figure 3 and 4. It will be seen that this embodiment comprises inner and outer column portions 60 and 62, each of which comprises a facing flange 64, adapted to lie in the plane of the wall and adapted to support wall covering materials. At right angles to the facing flange 64, is a side flange 66. At right angles to flange 66 is a return flange 68. The free edge of facing flange 64 is turned inwardly at right angles as at 70.

The free edge of return flange 68 is turned inwardly at right angles, as at 72, so that it lies in the same plane as side flange 66, and is located in a plane spaced more or less between the plane of flange 66, and edge 70.

The two column portions 60 and 62 are interconnected in this embodiment by generally diagonal struts 74. Struts 74 are of generally channel shaped cross section having an enlarged root portion 76, and side walls 78 formed at right angles thereto.

Between the struts 74, openings are formed of generally triangular shape.

Flanges or walls 78 continue completely around such openings, and extend along side the free edges of flanges 72, thereby providing a continuous right angular reinforcing rib or flange giving extra strength.

In order to resist flexing of the facing flanges 64 of the members 60 and 62, right angular transverse indentations for ribs 80 are formed at spaced intervals, extending through the right angular corner between flanges 64 and 66.

Additional strength can be provided by forming similar further reinforcing ribs 82, across the right angular joint between flanges 66 and 68.

If possible, the adjacent ends of the ribs 80 and 82 should overlap and register with one another so as to form continuous ribs through flanges 66.

However, in may cases since these ribs 80 and 82 will have to be formed at different stages during manufacture this will not always be practical.

In practice however it does not make too much difference to the overall strength whether such overlapping is achieved or not.

Further reinforcing ribs 86 may also be provided at the roots of struts 76, extending through the flanges 72 and into the flanges 68.

A further embodiment of the invention is shown in Figure 5.

In this embodiment, right angular L-shaped portions 90 and 92 are formed, having panel supporting facing flanges 94, and side flanges 96, formed at right angles to one another.

Edge flanges 98 are turned in on the free edge of flanges 94.

Members 90 and 92 are formed integrally of a single piece of sheet metal, and are connected integrally by interconnecting struts 100.

Struts 100 are separated from one another by means of openings 102 which in this case are formed as circular openings. Rims or edge flanges 104 are turned inwardly all around openings 102 for greater strength.

In order to give greater strength to the struts 100, transverse reinforcing ribs 106 are formed, extending right through struts 100 and preferably into side flanges 96.

In order to give greater strength to the L-shaped angle portions 92 and 92, transverse indented rib formations 108 are formed in the same way as in the embodiment of Figure 2, at spaced intervals there along, whereby to resist flexing of the flanges 94.

The foregoing is a description of a preferred embodiment of the invention which is given here by way of example only. The invention is not to be taken as limited to any of the specific features as described, but comprehends all such variations thereof as come within the scope of the appended claims.

Claims

1. An integral one-piece structural metal stud member 12, formed of sheet metal, characterized by:

two parallel spaced apart generally L-shaped angled portions (20,22) extending parallel to one another defining parallel spaced apart wall supporting flanges (24, 26), lying in parallel spaced apart planes, to which wall covering materials may be attached, and further defining parallel spaced apart side flanges (28,30) formed integrally with said supporting flanges, and extending at right angles thereto;

a plurality of strut members (36) extending integrally from one said angle portion to the other and spaced apart from one another to define openings (46);

edge flange formations (40) formed on said strut members, whereby said strut members have a generally channel-shape in cross-section along at least a portion of their length, and further edge flange formations (42,44) said side flanges whereby said edge flange formations extending completely around said openings;

generally triangular enlarged root portions (48,50) on each end of said strut members where the same join said L-shaped angle portions, and,

a plurality of indented rib formations (52,54) formed transversely of said L-shaped angled portions, said rib formations being formed in said wall supporting flanges, and in adjacent portions of said side flanges said rib formations being formed at spaced apart intervals along the length of said L-shaped angled portions whereby to resist flexing of said wall supporting flanges during insertion of fastening members therethrough.

2. An integral one-piece structural metal stud member as claimed in Claim 1, wherein the said rib formations (52,54) are indented inwardly with respect to said wall supporting flanges and said side flanges.

3. An integral one-piece structural metal stud member as claimed in Claim 2, wherein said L-shaped angled portions (20,22), and said strut members (36), are all formed of a single piece of sheet metal, with a plurality of spaced apart openings (46) defining a generally triangular shape with rounded corners, said openings being alternately reversed with respect to one another, and said strut members being formed by sheet metal portions left between adjacent said triangular openings.

4. An integral one-piece structural metal stud member as claimed in Claim 3, wherein said side flanges, (28,30), and said strut members (36) and said triangular root portions (48,50) all lie in a common plane, such common plane being normal to the planes of said wall supporting flanges (24,26).

5. An integral one-piece structural metal stud member as claimed in Claim 4 including further rib formations (56,58) extending at least partially into said triangular enlarged root portions (48,50).

6. An integral one-piece structural metal stud member as claimed in Claim 5 including first edge formations (42,44) having a predetermined depth around said openings, and second edge formations (40) on said strut members having a predetermined depth greater than the depth of said first edge formations.

7. An integral one-piece structural metal stud member as claimed in Claim 2, wherein said side flanges (66) are located in a common plane, and wherein said strut members (74) are located in a plane parallel to but spaced from the plane of said side flanges, and including return flanges (68) extending between said side flanges and said strut members, said return flanges being located in planes parallel to but spaced inwardly from the planes of said wall supporting flanges (64).

8. An integral one-piece structural metal stud member as claimed in Claim 7, including rib formations (80,82), indented in wall supporting flanges (64) and in said side flanges 66, and in said return flanges.

9. An integral one-piece structural metal stud member as claimed in Claim 2, wherein said L-shaped angled portions (90,92) and said strut members (100) are all formed of a single piece of sheet metal, with a plurality of spaced apart openings (102) defining generally circular holes, and defining said strut members between said holes, and including edge flange formations (104) formed completely around said openings, and rib formations (108) extending through said strut members, between said openings.

10. A plurality of integral one-piece structural stud members (12) as claimed in Claim 1, said stud members being arranged in side-by-side spaced apart parallel relation, and wall panelling (10) lying on at least one side thereof, and fastening means (14), passing through said wall panelling and through said wall supporting flanges.

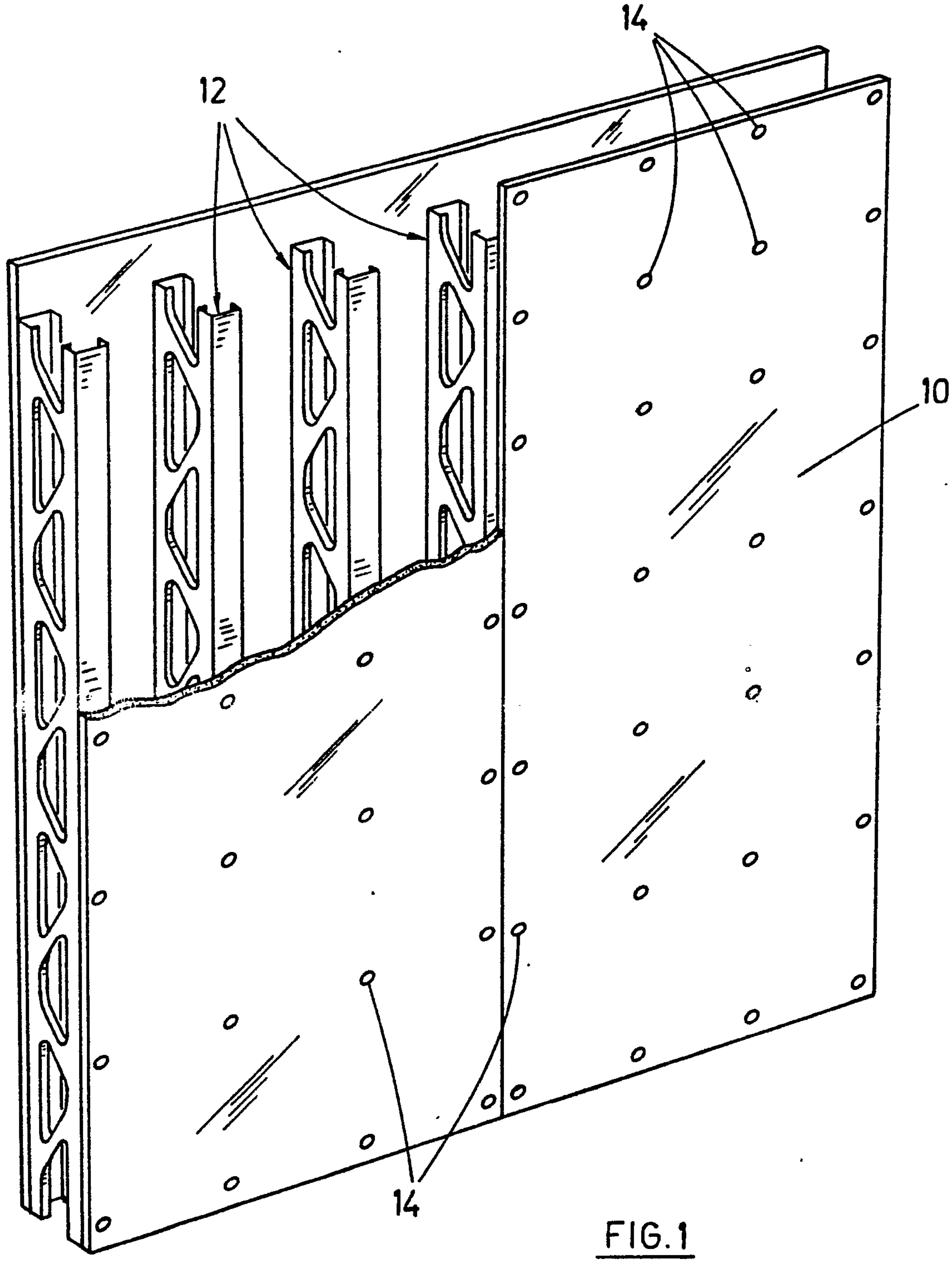

FIG.1

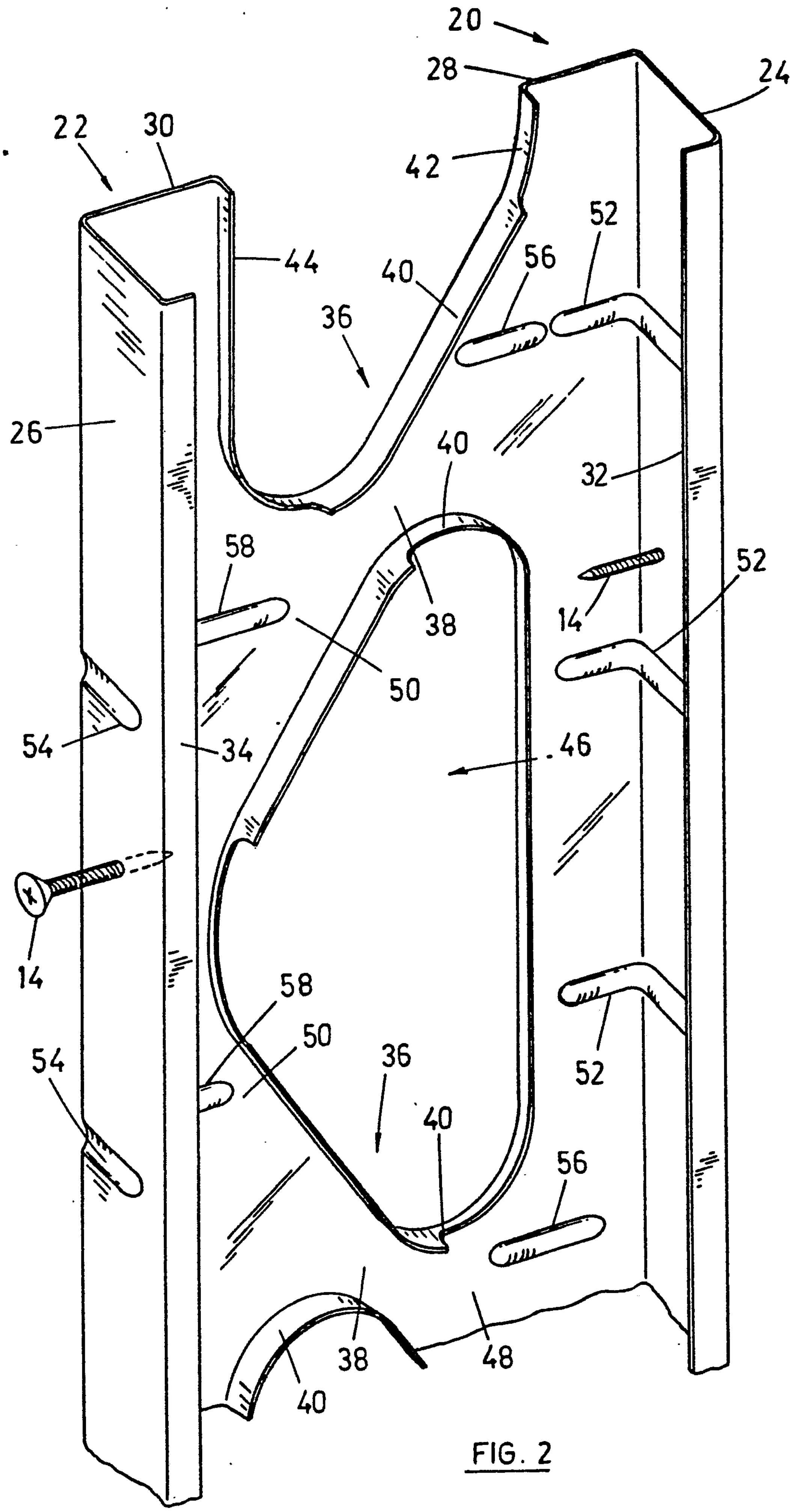
20
28
24
22
30
42
44
52
56
40
36
26
40
32
58
38
14
52
50
54
34
46
14
58
50
36
52
54
40
56
38
48
40

FIG. 2

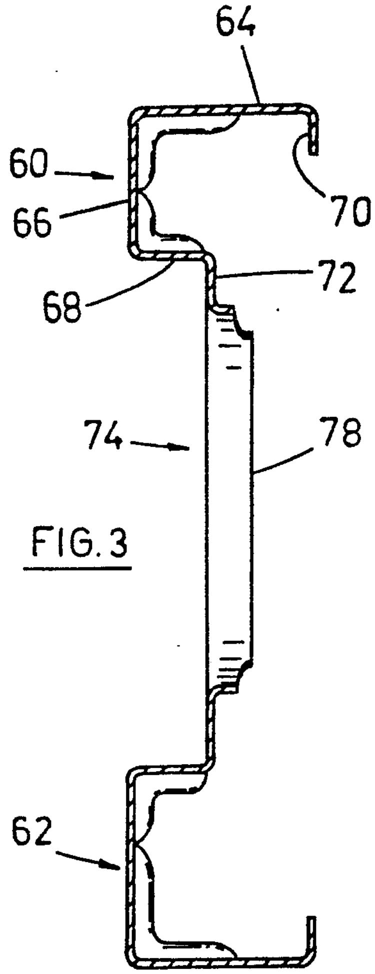

FIG. 3

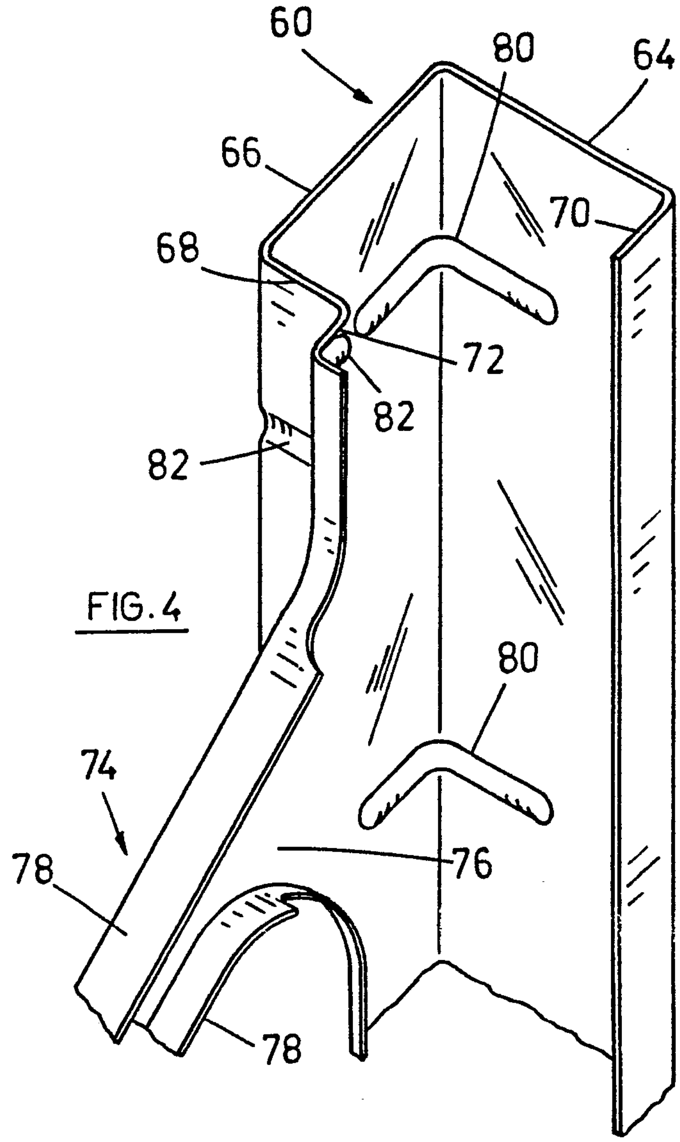

FIG. 4

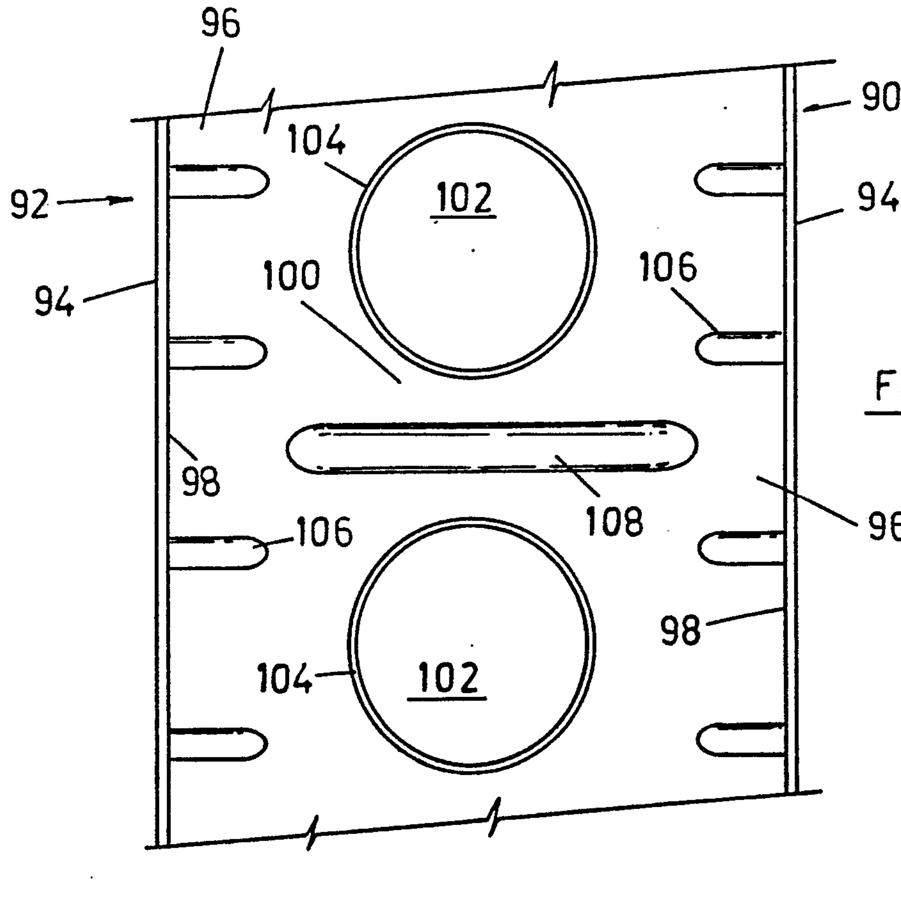

FIG. 5

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 88 31 2089

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
E,X	US-A-4 793 113 (E.R. BODNAR) * Column 4, lines 17-46; claim 1; figures 1,2 * ---	1-6,10	E 04 C 3/32 E 04 B 2/58
Y	US-A-2 088 781 (R.A. FOLSOM) * Page 1, column 1, line 1 - column 2, line 34; figures 1-4 * ---	1-5	
Y A	DE-C-3 442 355 (RICHTER-SYSTEM) * Column 3, lines 6-44; figures 1-5 * ---	1-5 8	
A	GB-A- 125 748 (D.J. MOONEY) * Page 2, lines 21-41; figure 6 * ---	1-9	
A	US-A-3 381 439 (F.A. THULIN Jr.) * Column 4, lines 61-65; claim 1; figures 1-3 * ---	9	
A	US-A-3 243 930 (R.H. SLOWINSKI) * Column 2, lines 63-68; column 4, line 65 - column 5, line 4; figures 1-4 * -----	10	TECHNICAL FIELDS SEARCHED (Int. Cl.5) E 04 B E 04 C B 64 C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	25-07-1989	RIGHETTI R.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P0401)