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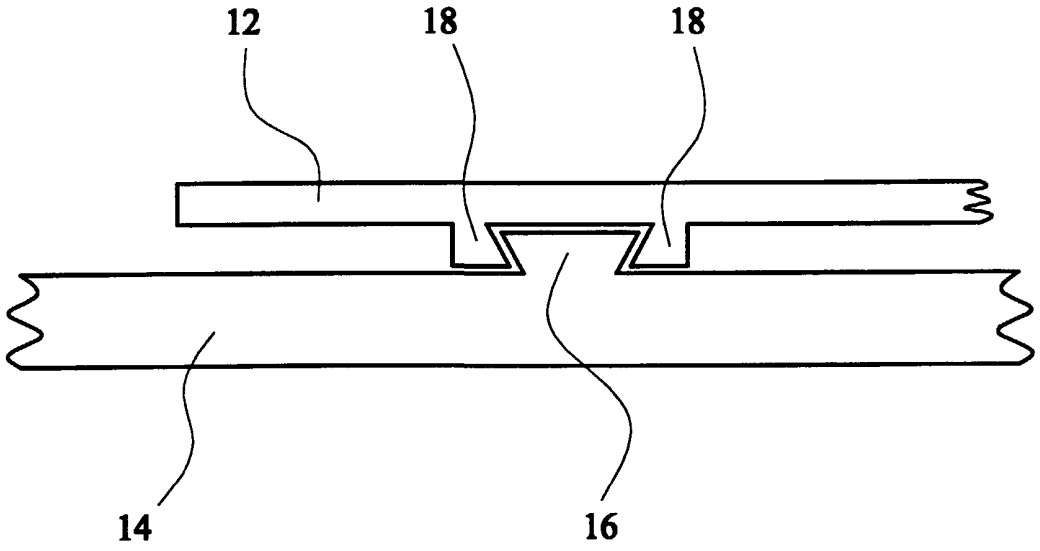
(54) Title: ROOFING SYSTEM




(57) Abstract: The roofing system (10) comprises a plurality of tiles (12) which are arranged to be secured on a roof of a construction unit using a fixation member in the form of a fixation sheet (14). The fixation sheet (14) has a plurality of retaining members which are male members (16) provided thereon. The tiles (12) have female members (18) defined thereon which are arranged to secure the tiles (12) to the fixation sheet (14) through an interference fit.

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# ROOFING SYSTEM

## Field of the Invention

The present invention relates to tiles and fixation sheets for tiles and especially, but not limited to, tiles which are adapted to be quickly and easily secured to a fixation sheet secured to a roof.

## Background to the Invention

Tiles are generally secured to a roof by securing the tiles to wooden batons on the roof. Such tiles are time consuming to secure and are not easy to remove and re-secure.

Conventional roofing systems comprise firstly laying sheets of felt in order to prevent fluid flow through the roof, for example to protect the construction unit from rain etc. A number of wooden batons are then secured over the felt in order to secure and support the tiles thereon. Accordingly, conventional roofing systems are lengthy to construct and require a lot of work to be conducted on the roof of the construction unit.

In a previous method, tiles are slidably engaged on batons provided on the roof. However, if a tile is damaged a number of tiles have to be slidably removed from the baton in order for the damaged tile to be removed and a new tile to be secured. Accordingly, such tiles are time consuming and difficult to replace.

It is an aim of the present invention to overcome at least one problem associated with the prior art whether referred to herein or otherwise.

## Summary of the Invention

According to a first aspect of the present invention there is provided a tile having securement means defined thereon wherein the securement means is arranged, in use, to secure the tile to a fixation member through an interference fit.

According to a second aspect of the present invention there is provided a fixation member which is arranged, in use, to have at least one tile secured thereto, whereby the tile is arranged, in use, to be secured to the fixation member through an interference fit.

According to a third aspect of the present invention there is provided building apparatus comprising at least one tile and at least one fixation member wherein the or each tile has securement means defined thereon wherein the securement means is arranged, in use, to secure the or each tile to the or each fixation member through an interference fit.

Preferably the or each tile is a roofing member.

Preferably the building apparatus is roofing apparatus.

Preferably the fixation member is a fixation sheet.

Preferably the securement means on the tile comprises a female member. Preferably the securement means on the fixation member comprises a male member.

The female member may comprise two elongate retaining sections. Preferably the elongate retaining sections are spaced apart with respect to the longitudinal axes of the retaining sections. The retaining sections preferably define a retaining area therebetween which is arranged, in use, to retain the male member. The retaining area may comprise convergent sides which converge towards a receiving area. Preferably the receiving area enables the male member to pass therethrough in order for the male member to be located in the retaining area.

Preferably, the female member must be expanded in order to retain the male member by the female member. Alternatively or additionally, the male member may be contracted in order for the male member to be retained by the female member.

Preferably the male member is inhibited from removal from the retaining area by abutment of a lateral wall of the male member with the convergent sides provided by the female member.

Preferably the female member extends laterally across the tile for substantially the whole width of the tile.

Preferably the male member is an elongate male member. Preferably the male member extends laterally across the fixation member and preferably for substantially the whole width of the fixation member. Preferably the fixation

member comprises a plurality of male members defined thereon. Preferably the male members are spaced apart longitudinally.

The male member may comprise a raised member Preferably the male member has two lateral sides. Preferably the lateral side are divergent relative to each other and may extend towards a planar surface.

The male member and female member may comprise a dovetail joint.

The tile may have an aperture defined therein. The aperture may enable a securement member to project therethrough. The securement member may comprise a screw.

The tile may comprise sections of differing widths. The tile may comprise three sections. The tile may have a lip section which may be defined at a first longitudinal end thereof. The tile may have a body section which may be the longitudinally central portion of the tile. The tile may have a flange section which may be defined at a second longitudinal end thereof. In use, the lip section of one tile may be located adjacent to the flange section of a longitudinally adjacent tile and preferably is located underneath the flange section of a longitudinally adjacent tile.

According to a fourth aspect of the present invention there is provided a method of building comprising securing a tile to a fixation member by an interference fit.

Preferably the method of building comprises a method of constructing a roof.

Preferably the tile is a roofing tile.

Preferably the fixation member is a fixation sheet.

Preferably the method comprises laying the fixation member on roof members and securing thereto. Preferably the method comprises securing a plurality of fixation members.

Preferably the method comprises securing a plurality of tiles to the or each fixation member.

The method may comprise expanding a retaining member. The method may comprise contracting a retaining member.

Brief Description of the Drawings

The present invention will now be described by way of example only, with reference to the drawings that follow, in which:

Figure 1 is a cross-section of a tile secured to a fixation sheet;

Figure 2 is a perspective view of a fixation sheet.

Figure 3 is a perspective view of a tile.

Figure 4 is a side cross-section through a part of a row of tiles.

Description of the Preferred Embodiments

The building system or especially the roofing system 10 comprises a plurality of tiles 12 which are arranged to be secured on the roof of a construction unit using a fixation member in the form of a fixation sheet 14, as shown in Figure 1. The fixation sheet 14 comprises a sheet of a plastics material having raised retaining members defined thereon, as shown in Figure 2. Each fixation sheet may have three retaining members defined thereon. The fixation sheet may be 48 inches or 96 inches wide. The retaining means comprises elongate male retaining members 16 to secure within a female retaining member 18 provided on the underside of the tiles 12. The male members 16 and female members 18 are arranged to engage each tile 12 to the fixation sheet 14 through an interference fit whereby a force is required to cause expansion of at least a part of the female member 18 or contraction of the male member 16 in order for at least a part of the male member 16 to be retained by the female member 18.

As shown in Figure 1 and Figure 2, the male retaining member 16 is a raised member having upwardly divergent lateral sides. The male member 16 may have a width of 1½ inches or ¾ inch at the upper end thereof. The female member 18 comprises two spaced apart elongate retaining sections. Each elongate section having inwardly facing walls defining a retaining space therebetween. The inwardly facing walls being downwardly convergent in order

to define a retaining space to cooperate with the male retaining members 16.

Accordingly, in use, the tiles 12 are simply and quickly affixed to the fixation sheets 14 and retained on the roof of the construction unit. Since the tiles are secured using an interference fit, the tiles 12 can be secured from a direction substantially perpendicular or normal with respect to the roof. This is advantageous in a system comprising a row of adjacent tiles secured to the same elongate male member. For example, if a tile is damaged which is not located adjacent to one of the elongate ends of the male member, then the tiles can be easily removed and replaced without the need for sliding the tiles along the retaining member.

The tiles 12 may be square tiles and may be 12 inch square tiles.

The male members 16 and female members 18 may have any suitable cross-sectional shape in order to perform the function of the interference fit.

As shown in Figure 3 the female retaining member 18 is located adjacent to one longitudinal edge of the tile 12. The female member 18 extends on the underside of the tile 12 for the whole of the lateral width of the tile 12.

The tile 12 comprises three adjacent longitudinal sections extending laterally across the tile 12. These comprise a lip section 20 at the first longitudinal end of the tile 12, a body section 22 in a central region and a flange section 24 at the second longitudinal end of the

tile 12. In use, the tiles 12 are retained in rows and columns whereby laterally adjacent tiles in a row simply abut or cooperate with each other. However, in longitudinally adjacent tiles in a column the lip section 20 of a first tile locates underneath the flange section 24 of a second tile as shown in Figure 4. In a downwardly angled roof it is the lip section 20 of the lower tile that locates underneath the flange section 24 of the upper tile which thereby encourages fluid (for example rain) to flow down the roof over the surface of the tiles without penetrating the roof.

The flange section 24 of the tile 12 may comprise a flush member 26 which may be integral with the tile 12, as shown in Figure 4. The flush members 26 may enable the tile 12 to produce a relatively planar appearance.

The female retaining member 18 locates underneath the lip section 20 of the tile 12 and, thereby, in a downwardly angled roof the female retaining member 18 is located above the body section 22 and flange section 74 of the tile 12 and hence supports the weight of the tile 12.

The male member 16 and female member 18 may be reversed such that the male member 16 is located in the tile 12 and the female member 18 is located on the fixation sheet 14.

The fixation sheet 14 preferably comprises a plastics material, for example polycarbonate and the tile 12 may comprise a plastics material, for example polycarbonate.

The fixation sheet 14 has a number of lateral extending female members 18 defined thereon which are longitudinally spaced apart, The longitudinal spacing may be adjusted to suit tiles of different longitudinal lengths, for example standard roof tile or small roof tiles for use on small roofs.

The tiles 12 may also be secured to the fixation sheet 14 by securement members (not shown), for example screws. The screws may project through an aperture defined in the lip section 20 of the tile 12 and secure into a part of the fixation sheet 14 or another part of the roof. The screw may be countersunk with respect to the surface of the tile 12 such that the screwhead is concealed once the flange 24 of an adjacent tile is located over the lip 20 of the tile 12.

The first tile is located adjacent to the bottom of the roof and is secured in position using both the interference fit and by a screw. Thereafter, only every other row of tiles is secured using screws, for example the first, third, fifth.... rows are secured using both an interference fit and screws whereas the second, fourth, sixth.... rows of tiles are only secured using an interference fit.

Finally, the tile 12 may comprise a lateral flange member 30 which is arranged to cooperate with a laterally adjacent tile, as shown in Figure 5. The flange member 30 may comprise a profile of the tile 12 having a reduced height such that it does not project upwardly to the full height of the tile 12. Accordingly, the other lateral side of the tile 12 may incorporate a flange member 32

also having a reduced height. This flange member 32 may incorporate the upper surface of the tile 12 but reduced in height such that it does not extend downwards fully. Accordingly, when the lateral flange members 30, 32 are overlapped, the height of the flange members together substantially equals the height of the tile. This overlap increases the efficiency of preventing liquid flowing inbetween adjacent tiles.

In addition, the flange members 30, 32 may have a retaining section comprising either a male member or female member provided on the lower flange member and an associated male or female member provided on the upper flange member. The male member and female member engage so as to improve the join between laterally adjacent tiles. For example, the male member may locate between two parallel but spaced apart female members. Such elongate male and female members may be provided on tiles. However, such members may be crucial on prior art tiles where only a single nail connects the tile to the roof since these tiles are able to rotate within the nail acting as a pivot point. Accordingly, in the present invention the tile is secured through an interference fit and preferably an elongate interference fit which prevents the tile from rotating. Therefore, the lateral flange members 30, 32 may simply comprise planar surfaces which would reduce the cost and be easier to manufacture with the tiles also being prevented from rotating.

The reader's attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and which are open to public inspection with this

specification, and the contents of all such papers and documents are incorporated herein by reference.

All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

Each feature disclosed in this specification (including any accompanying claims, abstract and drawings), may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.

The invention is not restricted to the details of the foregoing embodiment(s). The invention extend to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

## Claims

1. Building apparatus comprising at least one tile and at least one fixation member wherein the or each tile has securement means defined thereon wherein the securement means is arranged, in use, to secure the or each tile to the or each fixation member through an interference fit.

2. Apparatus according to claim 1 in which the or each tile is a roofing member.

3. Apparatus according to claim 1 or claim 2 in which the building apparatus is roofing apparatus.

4. Apparatus according to any preceding claim in which the fixation member is a fixation sheet.

5. Apparatus according to any preceding claim in which the securement means on the fixation member comprises a male member.

6. Apparatus according to claim 5 in which the male member extends laterally across the fixation member.

7. Apparatus according to claim 6 in which the male member extends laterally across the fixation member for substantially the whole width of the fixation member.

8. Apparatus according to any one of claims 5 to 7 in which the fixation member comprises a plurality of male members defined thereon.

9. Apparatus according to claim 8 in which the male members are spaced apart longitudinally.

10. Apparatus according to any preceding claim in which the securement means on the tile comprises a female member.

11. Apparatus according to claim 10 in which the female member extends laterally across the tile for substantially the whole width of the tile.

12. Apparatus according to claim 10 or 11 when dependent upon any one of claims 5 to 9 in which the female member must be expanded in order to retain the male member by the female member.

13. Apparatus according to any one of claims 10 to 12 when dependent upon any one of claims 5 to 9 in which the male member is contracted in order for the male member to be retained by the female member.

14. Apparatus according to any one of claims 10 to 13 when dependent upon any one of claims 5 to 9 in which the male member and the female member comprise a dovetail joint.

15. Apparatus according to any preceding claim in which the tile has an aperture defined therein.

16. Apparatus according to claim 15 in which the aperture enables a securement member to project therethrough.

17. Building apparatus substantially as described herein with reference to, and as shown in any of the accompanying drawings.

18. A tile having securement means defined thereon wherein the securement means is arranged, in use, to secure the tile to a fixation member through an interference fit.

19. A tile according to claim 18 in which the tile is a roofing member.

20. A tile according to claim 18 or claim 19 in which the securement means on the tile comprises a female member.

21. A tile according to claim 20 in which the female member extends laterally across the tile for substantially the whole width of the tile.

22. A tile according to any one of claims 19 to 21 in which the tile has an aperture defined therein.

23. A tile according to claim 22 in which the aperture enables a securement member to project therethrough.

24. A tile substantially as described herein with reference to, and as shown in any of the accompanying drawings.

25. A fixation member which is arranged, in use, to have at least one tile secured thereto, whereby the tile is arranged, in use, to be secured to the fixation member through an interference fit.

26. A fixation member according to claim 25 in which the fixation member is a fixation sheet.

27. A fixation member according to claim 25 or claim 26 in which the securement means on the fixation member comprises a male member.

28. A fixation member according to claim 27 in which the male member extends laterally across the fixation member.

29. A fixation member according to claim 28 in which the male member extends laterally across the fixation member for substantially the whole width of the fixation member.

30. A fixation member according to any one of claims 25 to 29 in which the fixation member comprises a plurality of male members defined thereon.

31. A fixation member according to claim 30 in which the male members are spaced apart longitudinally.

32. A fixation member substantially as described herein with reference to, and as shown in any of the accompanying drawings.

33. A method of building comprising securing a tile to a fixation member by an interference fit.

34. A method according to claim 33 in which the method of building comprises a method of constructing a roof.

35. A method according to claim 33 or claim 34 in which the tile is a roofing tile.

36. A method according to any one of claims 33 to 35 in which the fixation member is a fixation sheet.

37. A method according to any one of claims 33 to 36 in which the method comprises laying the fixation member on roof members and securing thereto.

38. A method according to any one of claims 33 to 37 in which the method comprises securing a plurality of tiles to the or each fixation member.

39. A method according to any one of claims 33 to 38 in which the method comprises expanding a retaining member.

40. A method according to any one of claims 33 to 39 in which the method comprises contracting a retaining member.

41. A method of building substantially as described herein with reference to, and as shown in any of the accompanying drawings.

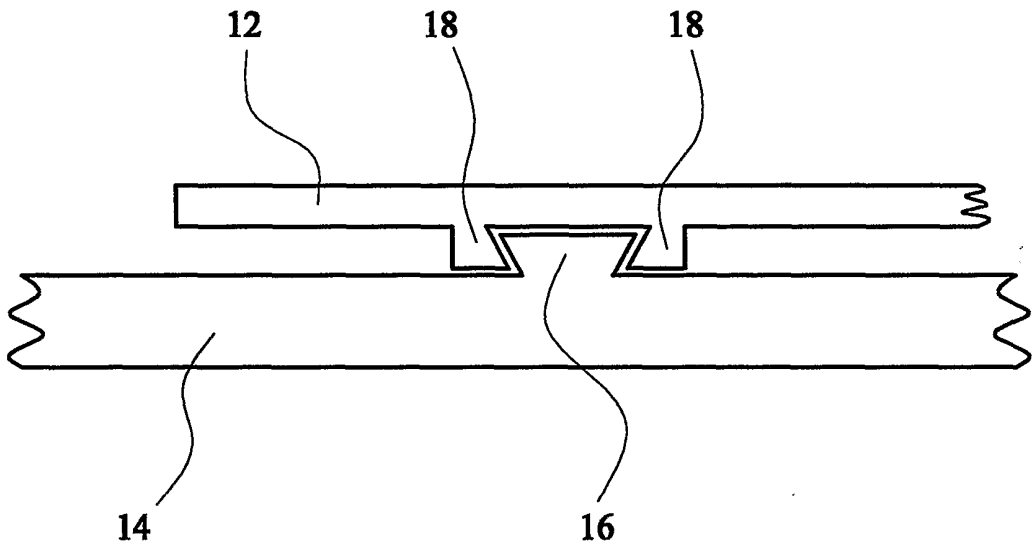


FIG. 1

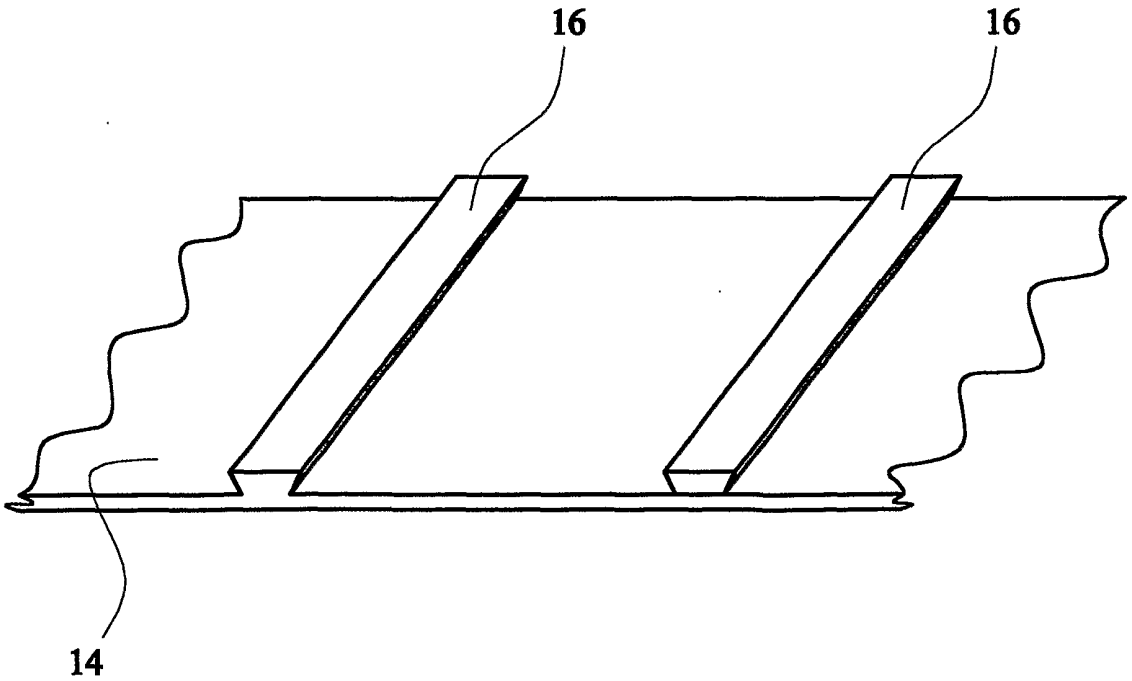


FIG. 2

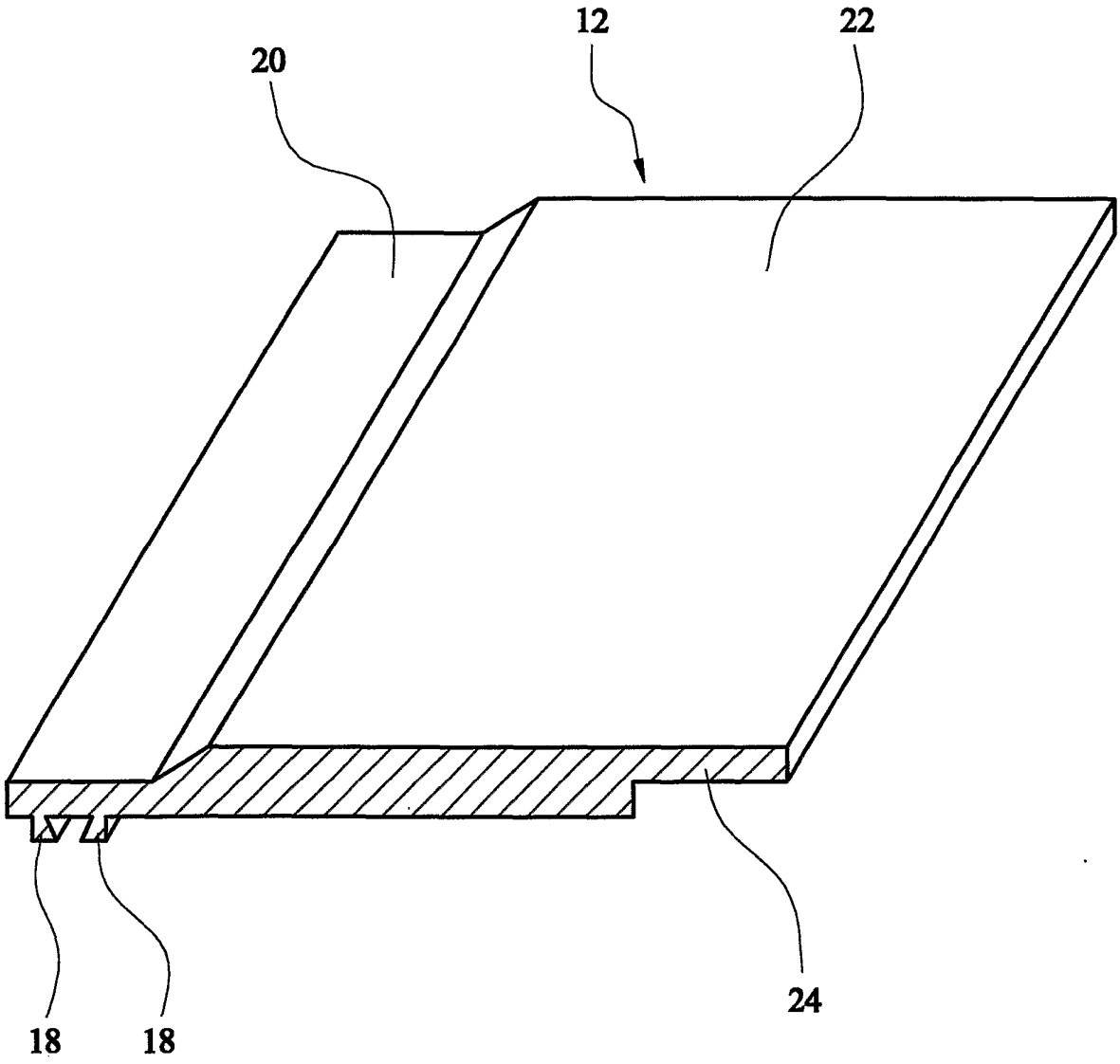


FIG. 3

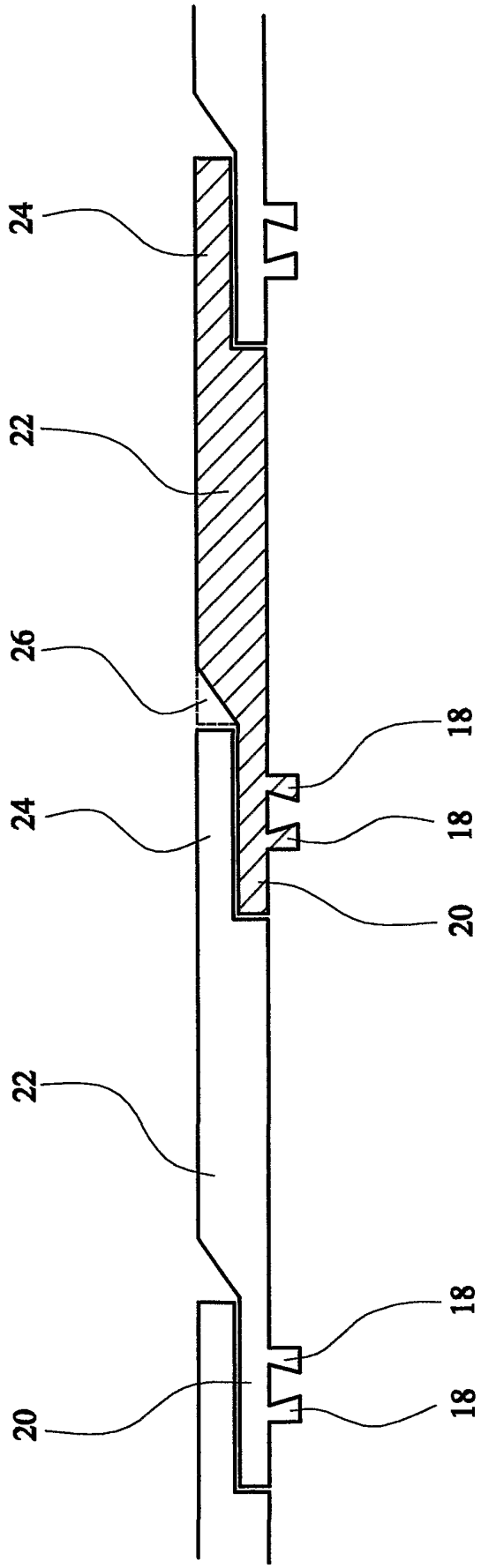


FIG. 4

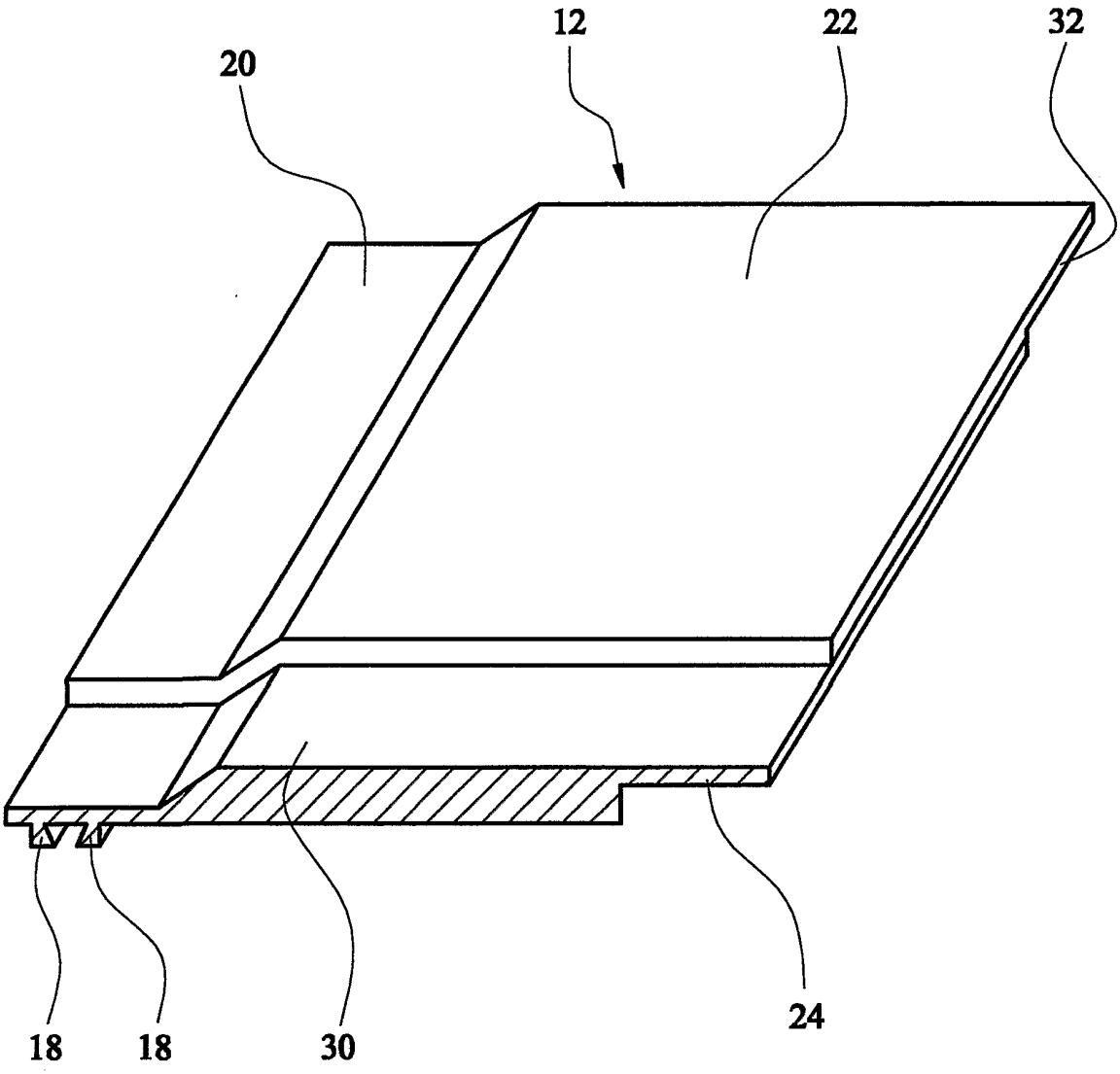


FIG. 5

# INTERNATIONAL SEARCH REPORT

In tional Application No
PCT/GB 01/03987

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 E04D12/00 E04D1/04 E04D1/34

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 E04D

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

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

EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category ° | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | GB 2 241 520 A (CANGE CONTROLS LTD)<br>4 September 1991 (1991-09-04) | 1-3,<br>18-21,<br>25,33-35 |
| Y | page 2, paragraph 1 -page 2, paragraph 2<br><br>page 2, paragraph 5 -page 3, paragraph 2<br>page 5, paragraph 1<br>claims 1,3,5-7; figures 1-3 | 4-11,13,<br>26-31,<br>36-38,40 |

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 27 November 2001 | 04/12/2001 |

| Name and mailing address of the ISA | Authorized officer |
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| European Patent Office, P.B. 5818 Patentlaan 2<br>NL – 2280 HV Rijswijk<br>Tel. (+31–70) 340–2040, Tx. 31 651 epo nl,<br>Fax: (+31–70) 340–3016 | Hendrickx, X |

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# INTERNATIONAL SEARCH REPORT

In tional Application No
PCT/GB 01/03987

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category ° | Citation of document, with indication,where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| Y | FR 2 631 646 A (HENRY ALAIN)<br>24 November 1989 (1989-11-24) | 4-13,<br>26-31,<br>36-40 |
| A | page 4, line 21 -page 6, line 3<br>page 6, line 23 -page 6, line 36<br>page 8, line 36 -page 9, line 21<br>page 9, line 36 -page 10, line 6<br>page 10, line 15 -page 10, line 18<br>page 10, line 26 -page 11, line 7<br>figures 1-7 | 14 |
| X | NL 6 616 589 A (W. DE WOLDE)<br>27 May 1968 (1968-05-27) | 1-3,18,<br>19,25,<br>33-35 |
| Y | page 2, line 2 -page 2, line 20 | 4-9,26,<br>27 |
| A | page 3, line 5 -page 3, line 9<br>page 3, line 16 -page 3, line 21<br>figures 1-3 | 14 |
| X | DE 299 10 093 U (GEHRING MANFRED)<br>23 September 1999 (1999-09-23) | 1-3,<br>18-20,<br>25,33-35 |
| Y | page 3, line 27 -page 4, line 7<br><br>page 5, line 12 -page 5, line 19<br>figures 1,2 | 4-10,12,<br>26,27,<br>36-39 |
| A | FR 2 495 669 A (CHICOT DOMINIQUE)<br>11 June 1982 (1982-06-11)<br>page 3, line 31 -page 3, line 36<br>figures 1,3,4 | 14,18-21 |
| A | FR 1 303 992 A (ATELIERS PLASTIQUES GRAVURES) 18 January 1963 (1963-01-18)<br>abstract; claims 1-3 | 15,16,<br>22,23 |

1

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
P../GB 01/03987

| Patent document cited in search report | | Publication date | Patent family member(s) | | Publication date |
|---|---|---|---|---|---|
| GB 2241520 | A | 04-09-1991 | NONE | | |
| FR 2631646 | A | 24-11-1989 | CH | 665868 A5 | 15-06-1988 |
| | | | FR | 2631646 A1 | 24-11-1989 |
| NL 6616589 | A | 27-05-1968 | NONE | | |
| DE 29910093 | U | 23-09-1999 | DE | 29910093 U1 | 23-09-1999 |
| | | | GB | 2352257 A | 24-01-2001 |
| FR 2495669 | A | 11-06-1982 | FR | 2495669 A1 | 11-06-1982 |
| FR 1303992 | A | 18-01-1963 | NONE | | |