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

(11) EP 0 843 054 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
20.05.1998 Bulletin 1998/21

(51) Int. Cl.[6]: **E04C 2/296**

(21) Application number: **97120073.8**

(22) Date of filing: **17.11.1997**

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **19.11.1996 IT TO960931**

(71) Applicant: **IBL S.p.A.**
20122 Milano (IT)

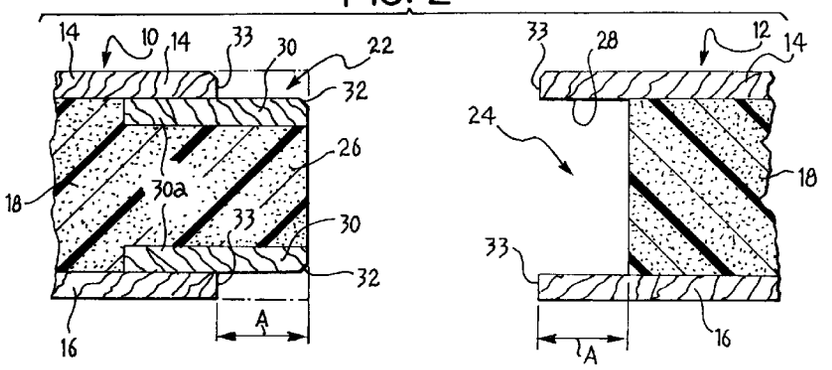
(72) Inventor:
Bonzano, Bruno
C.na Merli 61
(Allessandria) (IT)

(74) Representative:
Rambelli, Paolo et al
c/o JACOBACCI & PERANI S.p.A.
Corso Regio Parco, 27
10152 Torino (IT)

(54) A thermally insulating building panel

(57) A thermally-insulating construction panel comprising two parallel, spaced outer slabs (14, 16) of wood-based material with a layer (18) of expanded, extruded thermal insulation material between them. The slabs (14, 16) of wood-based material have head portions which are substantially smooth and without joints. Connecting means are formed in the layer (18) of thermal insulation material to include a projecting portion (26) and a groove (28) which are at least twice as thick as each sheet of wood-based material (14, 16).

FIG. 2



EP 0 843 054 A2

Description

The present invention relates to a panel for use in the building industry in the construction of roofs, partition walls and the like, of the type which comprises a layer of thermally-insulating expanded extruded material arranged between two outer sheets of wood-based material.

The invention relates, more precisely, to a construction panel of the type which includes connection means for coupling with corresponding means of an adjacent panel of the same type so as to form a junction region able to withstand forces acting transverse the panels.

A construction item in the form of a beam is known from Swiss Patent No. 601.603 which includes a central layer of thermal insulation material arranged between two outer layers of wood-based material. Both the two wood-based layers and the inner insulation layer have projecting ribs along one edge of the element in the form of a beam and grooves along the opposite edge in order to enable it to be coupled with other elements of the same type.

The arrangement described in the aforesaid Swiss patent is rather expensive owing to the need to form the projections and grooves in the layers of wood-based material and requires that the wood-based layers have a considerable thickness in order to be able to form the projections and grooves required to join two elements of the same type.

Italian utility model VR93U000013 describes a different arrangement, which involves the use of a peripheral spacing and reinforcing frame between the two outer layers of wood-based material. An intermediate layer of thermal insulation material is arranged between the two outer layers of wood-based material. The peripheral spacing and reinforcing frame has male and female coupling means for joining it to other panels of the same type.

The panel with a peripheral spacing and reinforcing frame is relatively expensive and also has the disadvantage of creating areas of discontinuity in its thermal insulation capability at the junction region. This is because the insulation material is totally missing from the junction region between two adjacent panels, thereby creating a thermal bridge and encouraging thermal leaks.

The object of the present invention is to provide a thermally-insulating construction panel which is both more simple and more economical than the prior art panels described above and has no thermal bridges at its junction regions.

This object is achieved according to the present invention by providing a panel having the characteristics forming the subject of the appended claims.

Further characteristics and advantages of the present invention will become clear from the detailed description given hereafter purely by way of non-limitative example, with reference to the appended drawings, in which:

Figure 1 is a schematic perspective view illustrating the manner of use of panels according to the present invention;

Figures 2 and 3 are sections on an enlarged scale, showing the junction region of a first embodiment of the panel according to the invention;

Figures 4 and 5 are section views similar to Figures 2 and 3, illustrating a second embodiment of the panel of the invention;

Figures 6 and 7 are section views similar to those of Figures 2 and 3, illustrating a third embodiment of the panel of the invention; and

Figure 8 is a section view of another embodiment of the panel.

In Figure 1, two construction panels, used for example in the construction of the roof of a house, are indicated 10 and 12. Each panel is a self-supporting sandwich construction constituted by two slabs 14, 16 of wood-based material such as plywood or the like, with a thick layer 18 of thermally-insulating expanded extruded material such as expanded polystyrene or extruded expanded polystyrene.

The panels 10, 12 are rested at their ends on bearing joists 20 and fixed to the latter by means of screws or nails. Each panel 10, 12 has connection means 22, 24 arranged at opposite sides. The connection means 22, 24 are provided to couple with the complementary connection means of an adjacent panel of the same type. As will be better explained below, the connection means 22, 24 are intended to form a junction region for withstanding forces acting transverse the panels. The junction region is formed in such a way as to provide continuity of the layer of thermally-insulating material at the junction from one panel to another, thus avoiding the formation of any thermal dissipation area owing to reduced insulating capability.

With reference to Figures 2 and 3, in a first embodiment of the present invention, the connection means 22 and 24 comprise a projecting portion 26 of thermal insulation material intended to be inserted into a groove 28 in an adjacent panel. The groove 28 is formed by removing insulating material, for example by milling to a depth substantially equal to the height of the projecting portion 26. The groove 28 and the projecting portion 26 extend for the entire length of the panel. In order to increase the resistance to stress of the projecting portion 26, a pair of reinforcing strips 30 may be arranged along the longer sides of the central core of thermal insulation material of the projecting portion 26. The strips 30 are glued to the layer of expanded material and preferably comprise a portion 30a extending beneath the corresponding layer of wood-based material 14, 16. The strips 30 may have bevelled corners 32 for facilitating insertion into the groove 28. Alternatively the strips 30 can be integral with the respective layer 14 or 16.

The end portions 33 of the layers of wood-based material 14 and 16 are smooth and have no connection means. This makes it possible to reduce the thickness of the layers 14, 16 as there is no need to form grooves or projecting ribs on them.

Figure 3 illustrates the junction region between the panels 10 and 12 in an assembled configuration. It may be seen that the overall thickness of the projecting portion 26, including the strips and the layer of thermal insulation material is considerable, equal to that of the layer 18 of thermal insulation material. This ensures high resistance to forces perpendicular to the panels and also makes the panels easier to put in place, since it is far easier to centre a rather large groove than to couple ribs and grooves of limited dimensions. The junction area is therefore robust and strong, with no discontinuity in the thermal insulation material.

The slabs of wood-based material 14 and 16 may be from 6 to 9 mm thick and be constituted by three- or five-layer plywood. The thickness of the layer of insulation material may vary between 40 and 100 mm according to the application for which it is intended, with the result that the overall thickness of the panel will range from around 50 to around 120 mm.

When mass producing the panel illustrated in Figures 2 and 3, two grooves are milled with dimensions equal to those of the strips 30. The strips 30 are then positioned and glued at the site of the grooves after which the sheets 14 and 16 are glued to the outer surfaces of the layer of insulation material. Once the structure thus obtained has been pressed, the wooden portions indicated by the broken line in Figure 2 are cut away and the thermal insulation material is also cut away to form the groove 28.

A second embodiment of the panel according to the present invention is illustrated in Figures 4 and 5. This embodiment differs from the first in that the projecting portion 26 is constituted by an element 34 of thermal insulation material with a greater density than that of the material constituting the layer 18.

The purpose of this greater density is essentially to improve the mechanical strength of the projecting portion 26 which, unlike the preceding embodiment, has no protective elements. The element 34 has a root portion which is glued between the two slabs 14 and 16 and has an inclined surface 36 for guiding it into the groove 28 on a corresponding inclined surface 38 thereof.

A third embodiment of the panel according to the invention is illustrated in Figures 6 and 7. In this case, the two panels 10, 12 to be joined have identical grooves 28 formed, for example, by cutting into the layer of thermal insulation material 18. The two panels 10, 12 are joined by means of a strip 40 the width of which is twice the depth of the grooves 28. The strip 40 may be constituted by high-density thermal insulation material. Alternatively, a wooden element 42 may be used, preferably with bevelled corners. The thickness of the strip 40, 42 is around one third of the overall thickness of the layer 18 of thermal insulation material and therefore substantially greater than the thickness of the slabs of wood-based material 14, 16.

One important characteristic of the panel of the invention consists in the fact that the connecting means exploit the mechanical properties of the thermal insulation material; thus the protective scope of the invention also covers panels with mortice and tenon connecting means, in which the tenon element comprises the thermal insulation layer and the mortice element is constituted by a complementary groove extending for at least the entire thickness of the insulating layer.

For example, as illustrated in Figure 8, the tenon element 26 is obtained by removal, for example by milling, an outer surface portion of each layer 14 and 16 in their end regions so that the tenon comprises an end portion of the thermally-insulating layer 18 and a rebated region 44 of each layer. Correspondingly, the complementary mortice element 28 is obtained by removal of an inner portion of each layer, in their edge regions, and is formed by a groove which extends throughout the entire thickness of the insulation layer and for a part 46 of the thickness of each layer. In this case the edge portions 33 also have no connection joint.

Claims

1. A thermally-insulating construction panel, which includes two parallel, spaced outer slabs (14, 16) of wood-based material, with a layer of expanded, thermal insulation material (18) arranged between them, the panel also including connection means (22, 24) for coupling with corresponding means of an adjacent panel of the same type so as to form a junction region able to withstand forces acting transverse the panels, the said connection means (22, 24) comprising a projecting portion (26) and a groove (28) formed in the said layer of thermal insulation material (18), characterised in that the slabs (14, 16) of wood-based material have smooth edge portions (33) with no joints and in that the said projecting portion (26) and the said groove (28) are at least twice as thick as each slabs (14, 16) of wood-based material.

2. A panel according to Claim 1, characterised in that the mechanical strength of the projecting portion (26, 40) is greater than that of the remaining portion of thermal insulation material (18).

3. A panel according to Claim 2, characterised in that the projecting portion (26) is of substantially the same thickness as the layer of thermal insulation material (18) and has a central portion of thermal insulation material and two protective layers (30) of wood-based material parallel of the said outer slabs (14, 16).

4. A panel according to Claim 3, characterised in that the said protective layers (30) extend partly between the layer of thermal insulation material (18) and a corresponding outer slab (14, 16).

5. A panel according to Claim 3, characterised in that the said groove (28) is constituted by an area delimited by two end portions of the said outer slabs (14, 16) from which the thermal insulation material has been removed.

6. A panel according to Claim 2, characterised in that the projecting portion (26) is formed by an element (34) of thermal insulation material with a greater density than that of the remaining portion of thermal insulation material (18), the thickness of the said element (34) being substantially equal to that of the layer of thermal insulation material (18).

7. A panel according to Claim 6, characterised in that the said element (34) forming the projecting portion (26) has an inclined surface (36) for co-operation with a corresponding inclined surface (38) of the groove (28).

8. A panel according to Claim 2, characterised in that the said projecting portion (26) is formed by a strip (40) provided to engage two grooves (28) formed in two adjacent panels (10, 12), the width of the said strip (40) being substantially twice the depth of each of the said grooves (28).

9. A panel according to Claim 8, characterised in that the said strip (40) is made of wood-based material, or of thermal insulation material with a greater density than that of the material constituting the said layer of thermal insulation material (18), and in that the thickness of the said strip (40) is substantially equal to one third of the thickness of the layer of thermal insulation material (18).

10. A thermally-insulating construction panel comprising two parallel, spaced outer slabs (14, 16) of wood-based material, with a layer (18) of expanded thermal insulation material between them, and including connecting means (22, 24) with a mortice (28) and tenon (26) at the edges of the panel for coupling with corresponding means of an adjacent panel of the same type, characterised in that the tenon element (26) comprises the layer of thermal insulation material (18) and the mortice element (28) comprises a complementary groove (28) extending at least for the entire thickness of the insulating layer (18).

FIG. 1

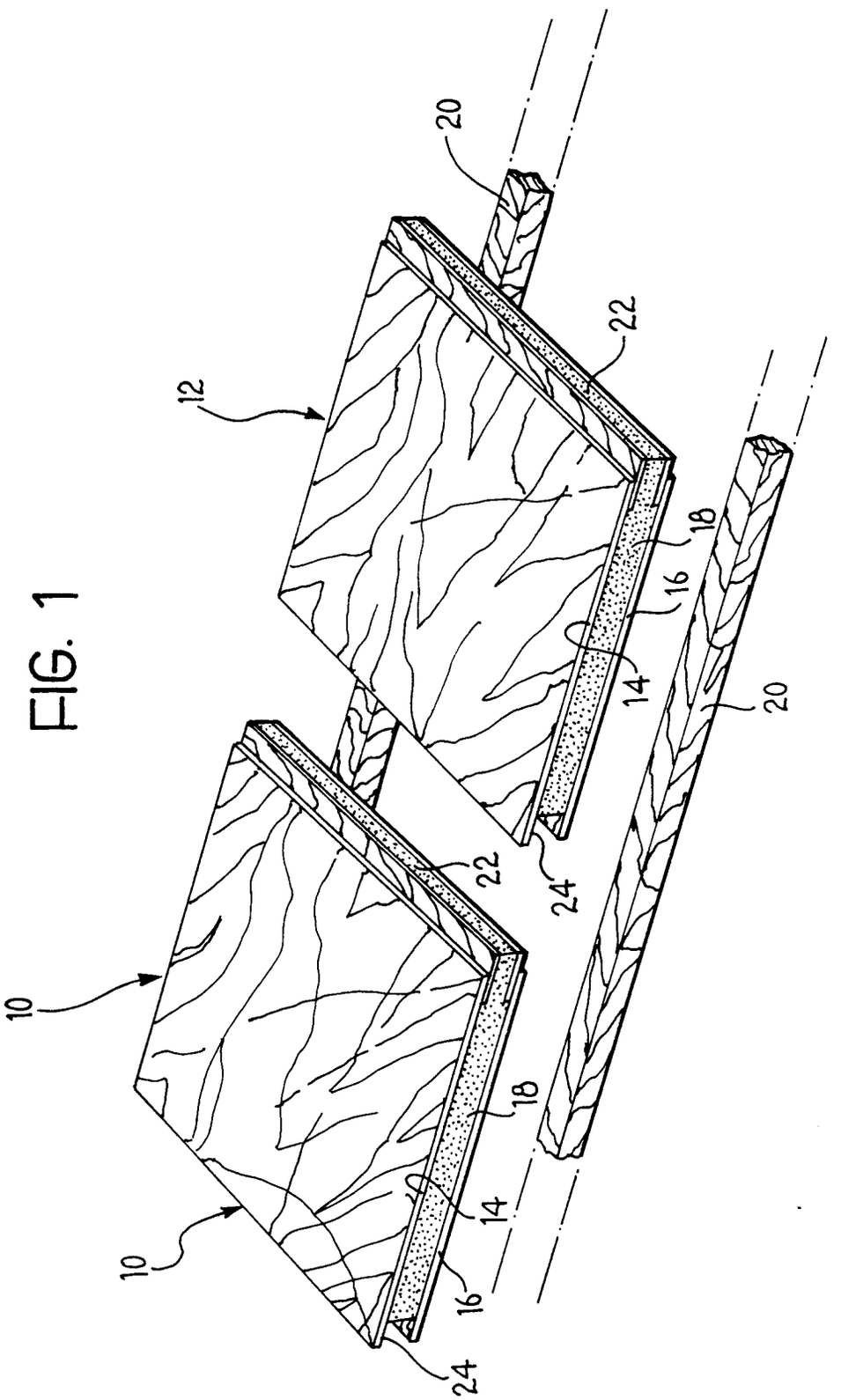


FIG. 2

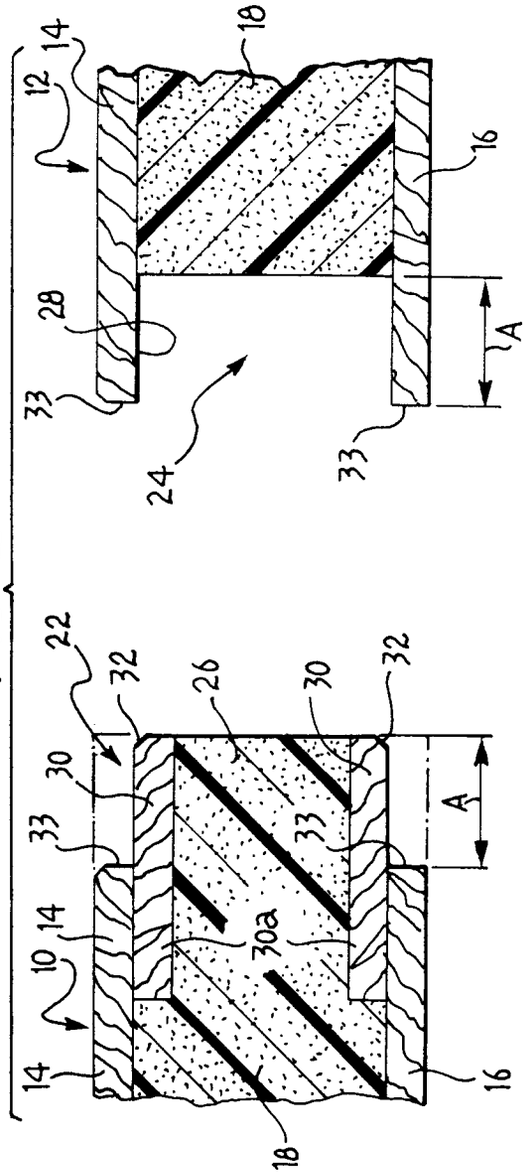


FIG. 3

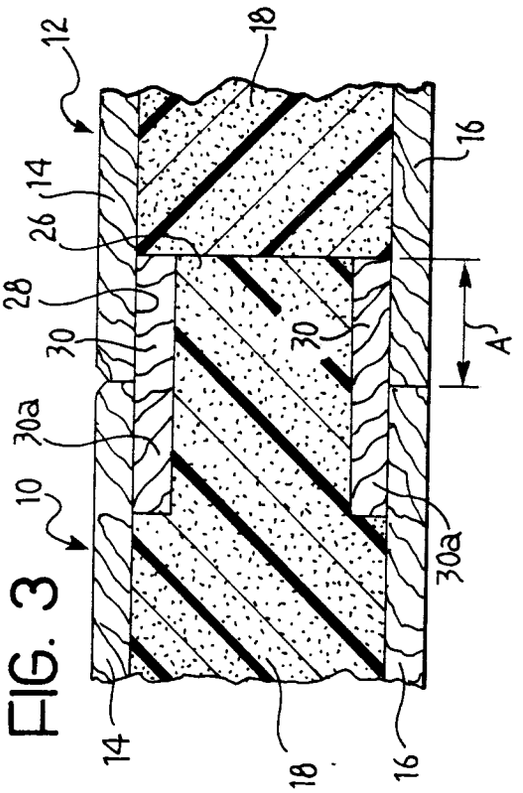


FIG. 4

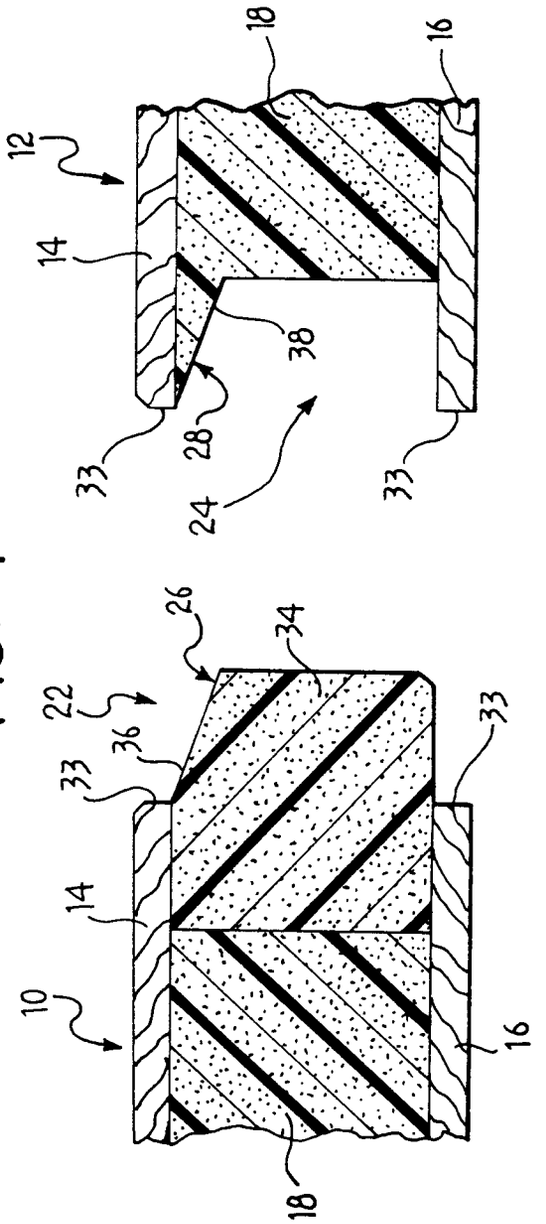
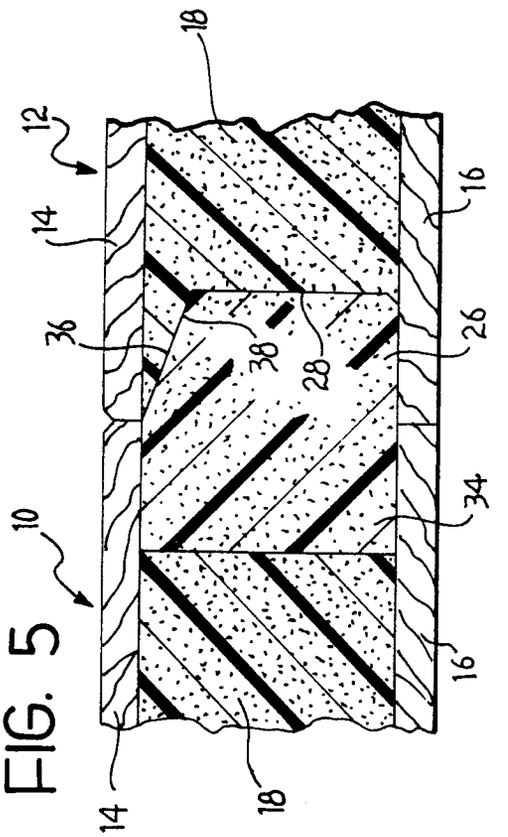

18
16
12
14
38
28
33
24
33
26
34
22
36
33
33
14
10
16
18

FIG. 5


18
12
16
14
36
38
28
26
34
10
16
14
18

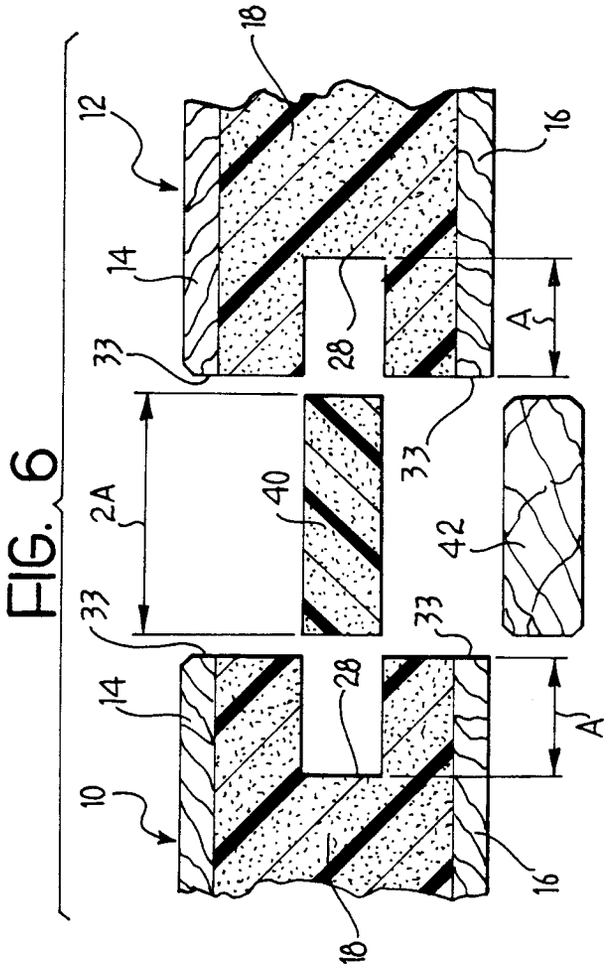


FIG. 6
10
12
14
16
18
28
33
40
42
2A
A
A

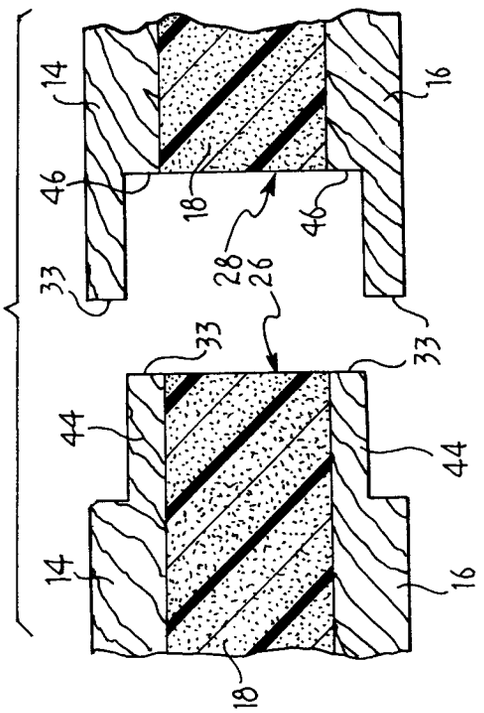


FIG. 8
14
16
18
26
28
33
44
46

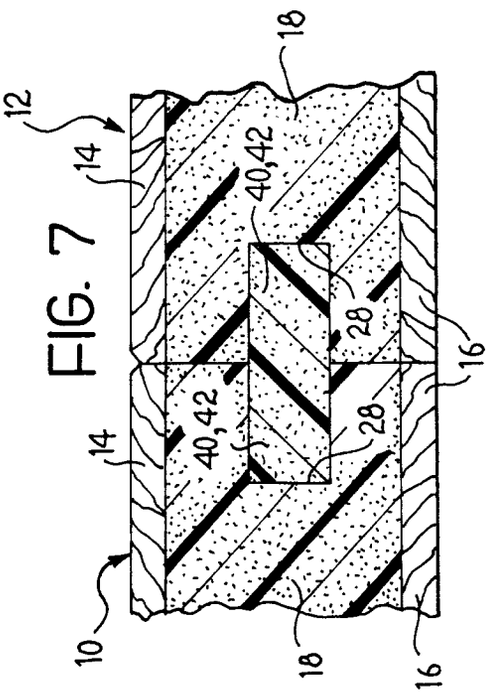


FIG. 7
10
12
14
16
18
28
40,42