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(54) Composite panel for forming sectional doors.

(57) A composite panel for forming sectional doors, comprising two sheet metal supports (4, 6) bounding a layer (8) of synthetic thermoinsulating material, in which the two supports are bent over along their edges to form the two parts of the articulation joint, the outer support (4) has one edge bent over towards the panel interior and extending in the direction of the panel thickness, and has its other edge bent over towards the panel interior and extending in the direction of the panel thickness, the inner support (6) has one edge forming a first continuous longitudinal rib (24), and has its other edge forming a second continuous longitudinal rib, the distance between the edge of said first continuous longitudinal rib (24) and the base of the second continuous longitudinal rib (28) of the adjacent panel is not less than a predetermined safety value when the two panels are coplanar.

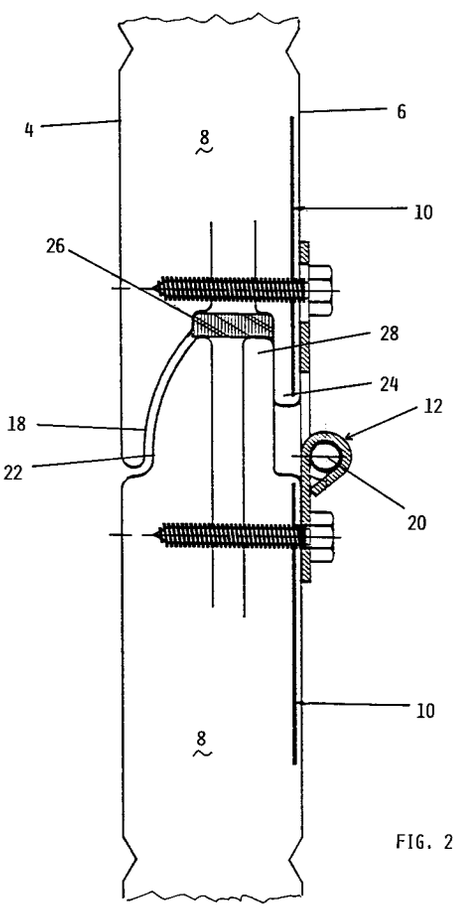

FIG. 2

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This invention relates to a composite panel for forming sectional doors.

Sectional doors are known consisting of a plurality of self-supporting panels hinged together and slidable on carriages along a pair of rails extending parallel to the edges of the aperture to be closed and parallel to the ceiling.

Generally sectional door panels lie coplanar both when the door is completely open and when it is completely closed, but in passing from one to the other configuration they change their attitude and hence undergo one relative to the other a first rotation in one direction about the common hinging axis and a subsequent rotation in the opposite direction. When in their condition of maximum mutual inclination the angle formed between two adjacent panels can reach and even exceed 45°.

A problem which panel manufacturers have always taken into account and have sought to solve is the risk of squashing the fingers of the user when manually operating the sliding door. In this respect, in moving adjacent panels for passage from their coplanar position to their angled position, the mutually hinged edges approach each other on the inside of the door, with evident danger of squashing any fingers which may be accidentally interposed between the two panels. In addition on the outside of the sliding door the mutually hinged edges withdraw from each other in passing from the position in which adjacent panels are coplanar to the position in which they are angled, and in the subsequent opposite passage they approach each other with the same risk to the user.

To obviate this drawback various solutions have been proposed, all based essentially on a particular shape of the panel edge, the purpose of which is either to hinder finger entry between the two angled panels on the outside of the panel, or to ensure that the gap between the two angled panels on the inside of the door does not fall below a predetermined safety value.

This general problem has been able to be solved in this manner, although its solution has given rise to further special problems such as the constructional complexity of the panel, its poor thermal insulation, the need to use specially constructed hinges, limited mutual angular travel between the panels, limited sealing power and life of the gaskets, and vibration under windy conditions.

An object of the invention is to provide a panel for sectional doors which eliminates any risk of accidental squashing of the user's fingers, while at the same time overcoming all the other drawbacks which known arrangements jointly or separately present.

This aim is reached according to the invention through a composite panel for forming sectional door as described in claim 1.

The present invention is described in detail hereinafter with reference to the accompanying drawings, in which:

- Figure 1 is a schematic perspective view of a sectional door formed from four panels according to the invention hinged together;
- Figure 2 is an enlarged schematic detailed view showing the joint between two panels when mutually coplanar;
- Figure 3 is a schematic view of the same detail as Figure 2 when the two panels are in the condition of maximum mutual angulation.

As can be seen from the figures, the composite panel according to the invention for forming sectional doors is indicated overall by 2 and comprises two supports 4, 6, which are located in the door on its outside and on its inside respectively, for which they are indicated hereinafter as the outer support 4 and inner support 6. Between the two supports there is interposed a layer 8 of high-density polyurethane insulating material, which gives the panel solidity, high insulation and maximum practicality of use.

On the inside of said supports 4, 6 and hence embedded in the layer of polyurethane material there are also provided steel plates 10, which as will be apparent hereinafter provide secure fixing for the hinges 12, for the carriages 14 on which the door slides along rails 16, and for other possible accessories with which the door is to be provided.

Each panel 2 has two opposing edges hinged to the adjacent panels, and for this purpose the two supports 4 and 6 have their adges suitably bent over and embedded in the layer of polyurethane material 8 but without being in mutual contact.

Specifically, the outer support 4 has an edge bent towards the interior of the panel 2 to form a first appendix 18 having its outer wall flat and coplanar with the support, and its inner wall curved concavely with its arc of curvature coincident with the axis 20 of the hinges 12.

The opposite edge of the outer support 4 is also bent towards the interior of the panel 2 to form a second appendix 22 having its outer wall curved convexly with its axis of curvature coincident with the axis 20 of the hinges 12.

Both the curved walls of the appendices 18 and 22 extend through an angle of at least 25° to reach substantially the middle of the thickness of the layer 8 of polyurethane material.

That edge of the inner support 6 corresponding to the appendix 18 is bent to form a first rib 24, having a wall coplanar with the surface of the support and another wall which is more internal.

The first appendix 18 and the first rib 24 together form the female element of the joint be-

tween mutually hinged adjacent panels, and house a longitudinal seal gasket 26 in the channel defined by them.

That edge of the inner support 6 opposite that which forms the rib 24 is bent to form a second rib 28 positioned more inward than the preceding.

The second appendix 22 and the second rib 28 together form the male element of the joint between mutually hinged adjacent panels and are provided at their top with an adhesive tape 30 cooperating with the gasket 26.

The bent-over edges of the outer support 4 and inner support 6 are embedded in the layer of polyurethane material 8 without being in mutual contact, so eliminating the creation of any thermal bridge and hence ensuring optimum heat insulation for the panel.

The hinges 12 are applied to the reinforcement plates 10 of the panels 2 for their mutual hinging. The two constituent elements of each hinge are applied to the inner support 6 of two adjacent panels, hence making it possible to use hinges normally available commercially, they being mounted such that their hinging axis 20 lies outside the panel.

The carriages 14 on which the panels slide along the door guide rails 16 are also applied to said reinforcement plates 10. During this axial sliding, the adjacent panels rotate one relative to the other, any accidental interposing of the fingers between adjacent edges being prevented for any mutual annular position of the panels because of the coincidence between the hinging axis 20 of the hinge 12 and the axis of curvature of the curved walls of the appendices 18 and 22 of each joint.

In addition, as the distance between the edge of the rib 24 of each panel and the base of the rib 28 of the adjacent panel is chosen so as not to be less than a predetermined safety value (for example 20 mm), even if the fingers are interposed between the two edges they run no risk of being squashed.

When the door is closed and the two adjacent panels are mutually coplanar (see Figure 2), the male element of the joint exerts a compressive force on the gasket 26 present in the channel of the female element, so achieving a considerable sealing effect and life of the gasket, which is not subjected to any sliding stress.

When in this closed configuration the inner wall of the rib 24 of each panel adheres to the outer wall of the rib 28 of the adjacent panel, to again contribute to a satisfactory seal and also eliminating, by virtue of this support, any possibility of vibration under windy conditions.

Essentially, the panel according to the invention is considerably more advantageous than conventional panels for forming sectional doors, and in particular:

- it can be completely constructed by an automatic continuous production cycle, and hence at a high prodution rate, with production constancy, low cost, and the possibility of cutting the panels to size according to requirements,
- it has no thermal bridges and hence provides high heat insulation,
- it enables standard hinges easily obtainable commercially to be used,
- it offers virtually absolute safety against accidental squashing of the fingers, even for angles between adjacent panels exceeding 45°,
- it provides optimum sealing linked to the fact that the gaskets operate by compression and not by sliding, plus a very long gasket life,
- it has considerable mechanical strength and allows secure fitting of hinges, carriages and other accessories which may be required for door operation, and
- it does not vibrate, even if wind is present.

Claims

1. A composite panel for forming sectional doors, comprising two sheet metal supports (4, 6) bounding a layer (8) of synthetic thermoinsulating material, characterised by comprising the following combination of characteristics:
   - the two supports are bent over along their edges to form the two parts of the articulation joint, the bent-over edges being embedded in the layer of synthetic material without coming into mutual contact,
   - the outer support (4) has one edge bent over towards the panel interior and extending in the direction of the panel thickness as far as about the middle of said thickness to form a first appendix (18) having its outer wall flat and coplanar with the support and its inner wall concavely curved,
   - the outer support (4) has its other edge bent over towards the panel interior and extending in the direction of the panel thickness as far as about the middle of said thickness to form a second appendix (22) having its outer wall convexly curved in a manner complementary to the shape of the inner wall of the first appendix (18),
   - the inner support (6) has one edge forming a first continuous longitudinal rib (24) having a wall coplanar with said inner support and a parallel wall lying in-

wards thereof,

- the inner support (6) has its other edge forming a second continuous longitudinal rib (28) lying inwards of the first rib (24) and such as to adhere to this when the two panels are coplanar,
- the distance between the edge of said first continuous longitudinal rib (24) and the base of the second continuous longitudinal rib (28) of the adjacent panel is not less than a predetermined safety value when the two panels are coplanar,
- the distance between the end of the first appendix (18) and the end of the second appendix (22) of the outer support (4) does not exceed a predetermined safety value when the panels are in their maximum angular position to each other,
- the second appendix (22) of the outer support (4) and the second rib (28) of the inner support (6) together form the male element of the joint between adjacent panels,
- the first appendix (18) of the outer support (4) and the first rib (24) of the inner support (6) together form the female element of the joint between adjacent panels and house at their base a seal gasket (26) cooperating by compression with the male element of the adjacent panel when the two panels are coplanar,
- to the inner support of two adjacent panels hinge elements (18) are fitted with their hinging axis external to the panels and substantially coincident with the axis of curvature of the inner wall of the first appendix (18) and of the outer wall of the second appendix (22) of the two adjacent panels.

2. A panel as claimed in claim 1, characterised in that hinge fixing plates (10) are embedded inwards of the supports (4, 6).

3. A panel as claimed in claim 1, characterised in that the inner wall of the first appendix (18) and the outer wall of the second appendix (22) extend through an angle of about 25°.

4. A panel as claimed in claim 1, characterised in that the second appendix (22) and the second rib (28) are provided at their top with an adhesive tape (30) cooperating with the gasket (26).

5. A panel as claimed in claim 2, characterised in that carriages (14) are fitted to the plates (10) to enable the panels to slide along guide rails (16).

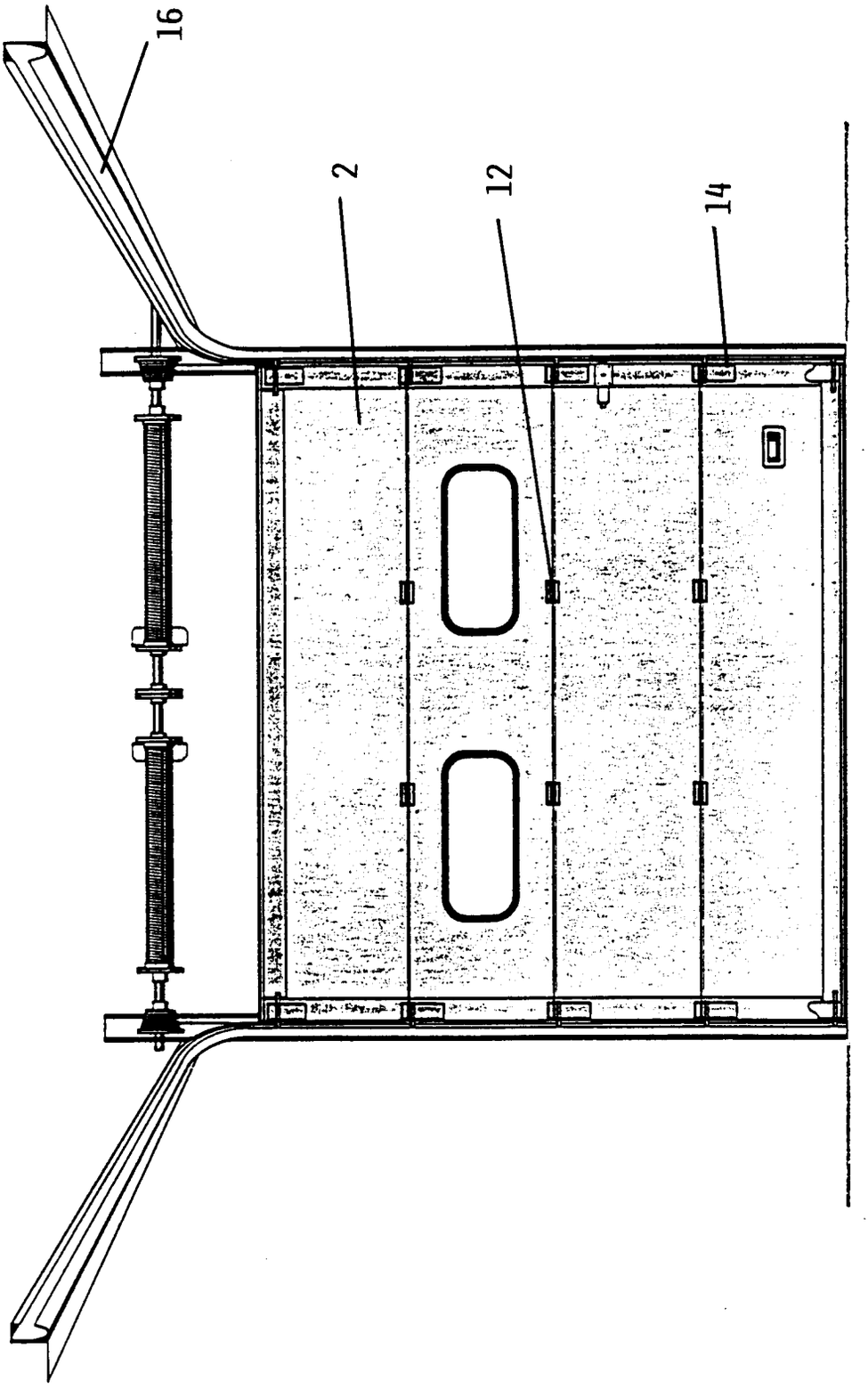

FIG. 1

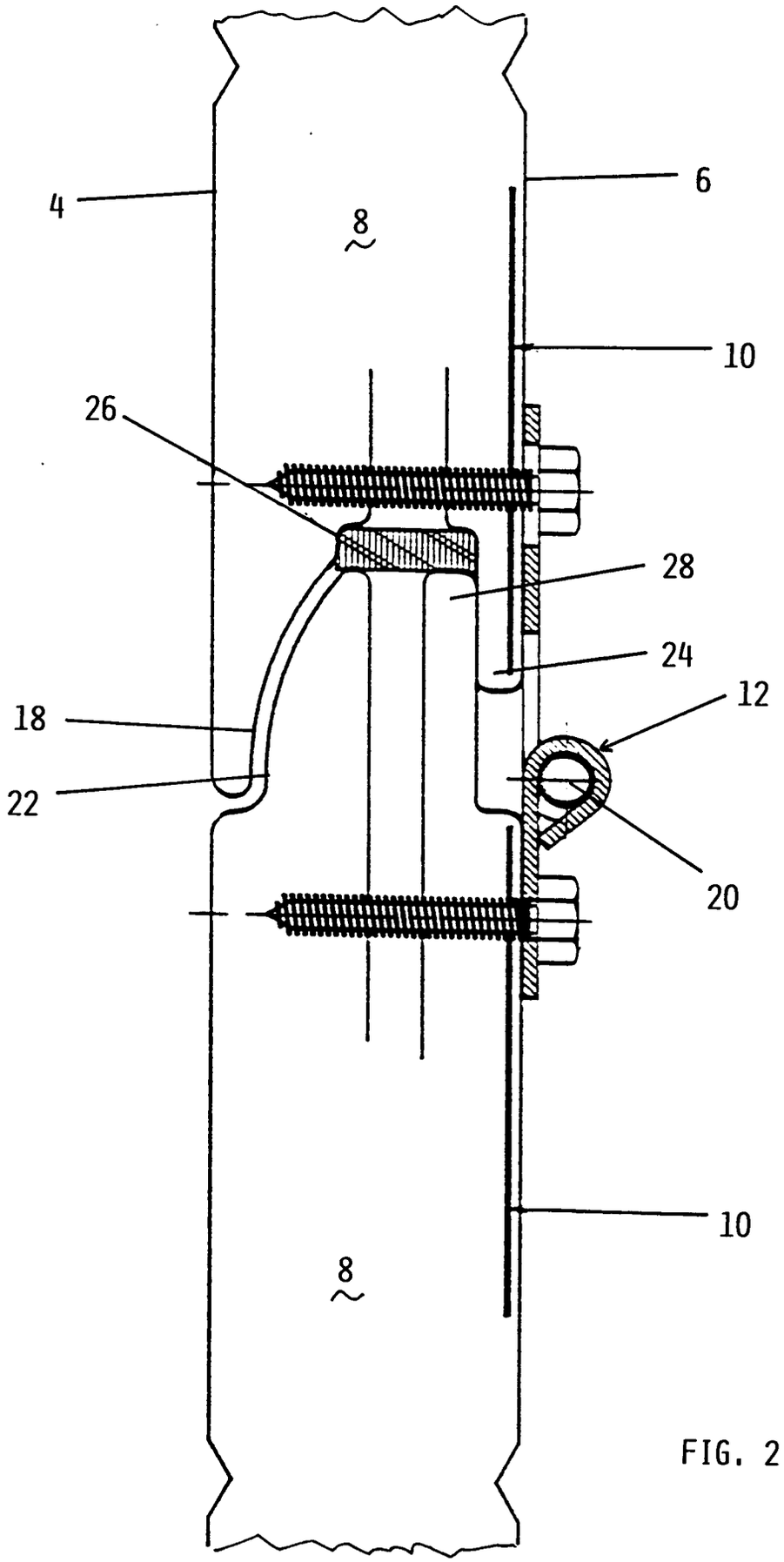

FIG. 2

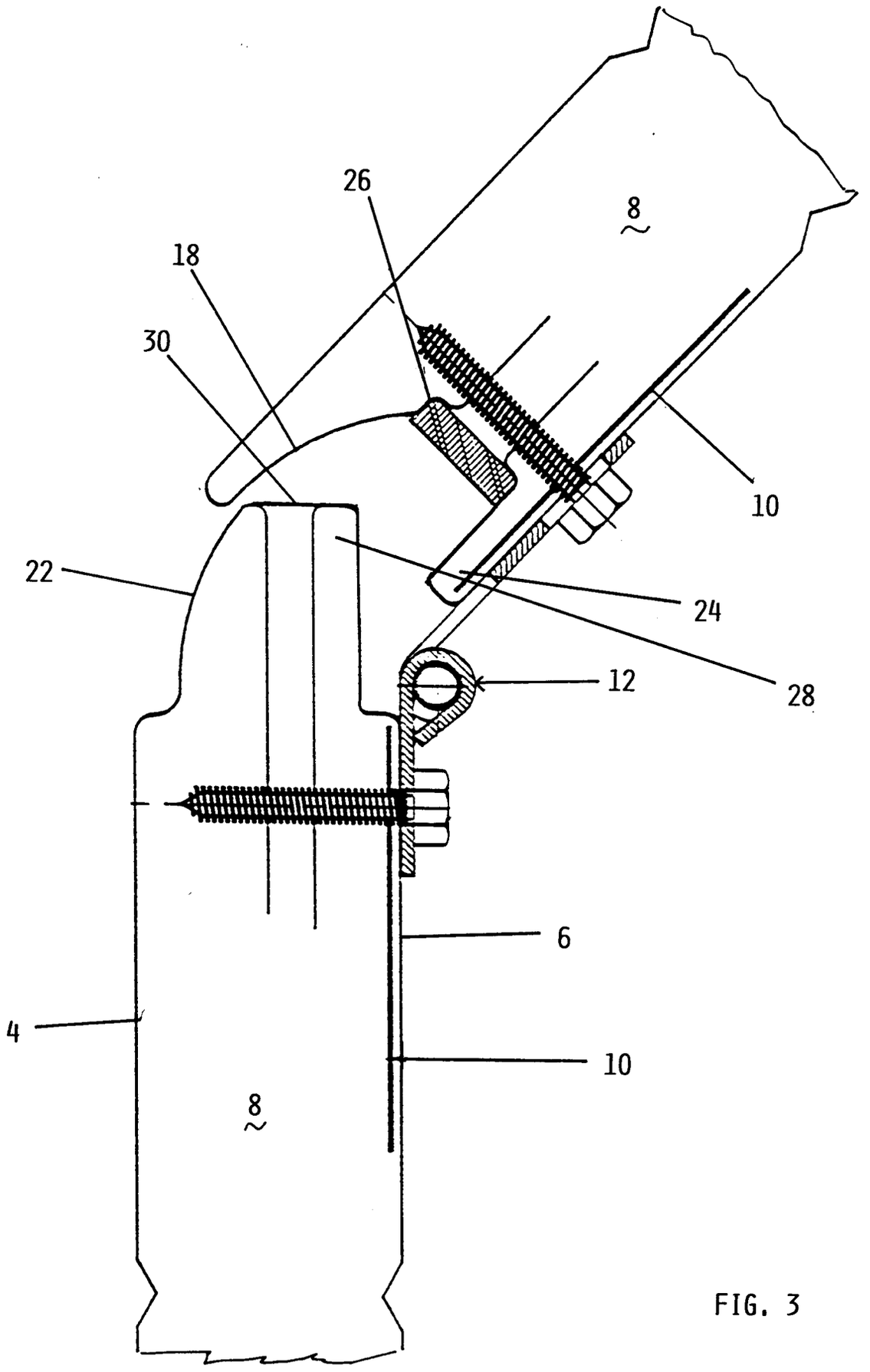

FIG. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 95 10 0488

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.6)
Y	EP-A-0 304 642 (HÖRMANN) * column 4, line 11 - column 7, line 15 * * figures 3-7,12-14 *	1,3	E06B3/48
Y	DE-A-40 19 569 (GUTTMANN) * column 1, line 31 - column 2, line 19; figures *	1,3	
A	EP-A-0 418 629 (SCHRECKENBERG) * column 8, line 16 - line 49 * * column 10, line 55 - column 11, line 26 * * figures 1,3-7 *	1,2,5	
A	EP-A-0 370 376 (HÖRMANN) * column 4, line 15 - column 13, line 55; figures *	1,3	
A	EP-A-0 394 691 (NIEMETZ TORSYSTEME) * column 5, line 42 - column 11, line 12; figures *	1,3,4	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6) E06B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	18 May 1995	Depoorter, F

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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