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(54) Thermally insulated container and its manufacturing process.

(57) The process is characterized by the use of joints (1', 1", 2') of thermal expansion and elastic deformation between the plates (1, 2); by the use of angles (4) having housing (4') to receive and pressure glue the edges (5') of the cover plates (5) of the panels (3) to be fitted together; and by the use of welded transverse beams (9) for the connection to the floor (5, 8). In this way the drawbacks of the known techniques are eliminated; for the holed container they were represented by many corrosion-raising zones, whereas for the welded ones they came essentially from the demand of a big amount of manhours, high manufacture accuracy, very expensive tooling with low production rate.

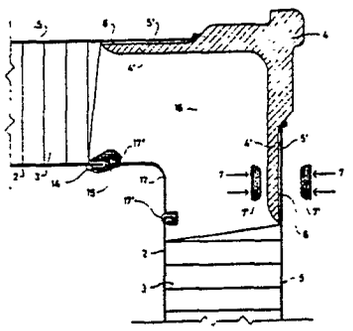

Fig 5

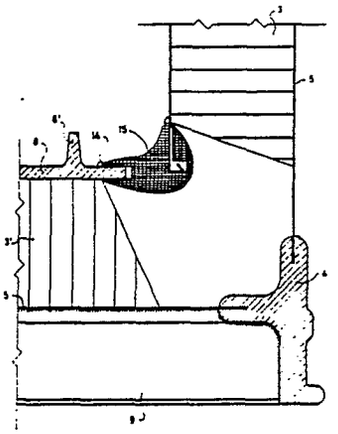

Fig 7

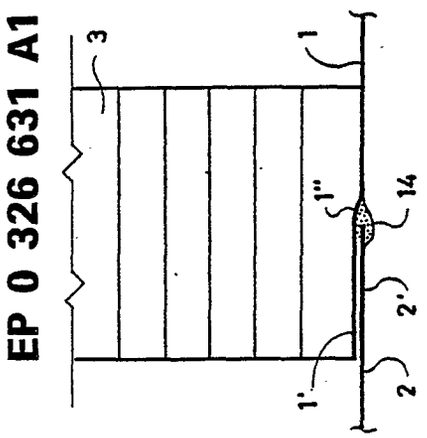

Fig. 2

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THERMALLY INSULATED CONTAINER AND ITS MANUFACTURING PROCESS

The present invention refers to a process for the quick assembly of a thermally insulated container and to the container produced in this way.

The technology of the containers, particularly the frigorific ones, has reached a very mature state; for this reason the innovation tendencies are mainly oriented to the manufacture and corrosion protection processes and not to the product itself. From this analysis a reasearch project has been carried out, leading to a new
PROCESS FOR THE QUICK ASSEMBLY OF A THERMALLY INSULATED CONTAINER, AVOIDING THE DRILLING AND RIVETING TECHNIQUES; BY MEANS OF FITTING TOGETHER, POSSIBLY BY WELDING, THE COVER PLATES ALONG THEIR INTERNAL SURFACE WITH MEANS SUITABLE TO COMPENSATE THE DIFFERENT THERMAL AND LOAD EXPANSIONS, AND CONNECTION OF THE ANGLES TO THE EXTERNAL PLATE BY GLUEING WITH RELEVANT QUICK-FIXING JOINTS OF THE ANGLES TO THE PLATE.

In fact the aim of the project was to obtain as result the fit, possibly by welding, of cover plates "Inox", with a thin thickness, less than 0.6 mm, with very fast fit, and in the case of welding with a very small heating in order to avoid blackening, opacity and so on and to guarantee smooth surfaces without undercuts and holes.

The container at the state-of-the-art shows major drawbacks with regard to the manufacturing costs and to the zones subject to corrosion, due mainly to the fact that it is manufactured by assembly methods based on riveted connections. Particularly the Thyssen patent (Country , Nr.) exploited under licence in Various countries, refers to a fit method of the wall internal cover, without riveting, by means of spot welding of two plate edges to be connected at a corner and subsequent foaming "in situ" after the assembly. Being this assembly process very expensive, the following drawbacks arise:

a) A big amount of manpower is required to handle the various items.

b) A very high manufacture accuracy both of the components and of the sub-assemblies is required.

c) A very expensive tooling is required (particularly the big jigs for the "in situ" foaming of the lateral walls).

d) The process doesn't allow big production volumes because of some "bottle-necks" on the production line, requiring unlikely modifiable fixed times (e.g. the operations quoted at point (c)).

As return it shows the indisputable advantage to be without any doubt the best welded container today on the market. Other processes show at the contrary the drawbacks to require very bulky and expensive forms for the foaming with low production rates.

Aim of the present invention is to obtain an assembly process able to avoid the afore-mentioned drawbacks and to allow to obtain containers with high characteristics from the point of view of the thermal insulation, the structural stiffeness, the resistance to the corrosion, with high production rates and low unit cost.

The present invention refers mainly to a
PROCESS FOR THE QUICK ASSEMBLY OF A THERMALLY INSULATED CONTAINER, AVOIDING THE DRILLING AND RIVETING TECHNIQUES CHARACTERIZED BY THE FACT THAT THE FIT OF THE PLATES COVERING THE INSULATION PANELS, BY WHICH IT IS FORMED, IS REALIZED BY DAP AND SLIP JOINTS, ALLOWING THE DIFFERENT THERMAL AND LOAD EXPANSIONS; THE CONNECTION OF THE ANGLES TO THE EXTERNAL PLATE OF SAID PANELS OCCURS BY GLUEING WITH QUICK-FIXING JOINTS OF THE ANGLES TO THE PLATE; AND THE CONNECTION OF THE FLOOR OCCURS BY MEANS OF WELDED BEAMS.

We give now in the following a detailed description of some not-limiting preferred forms of execution of the process subject of the invention, with reference to the attached figures, taking away nothing from the generality of the invention itself.

- The figures 1, 2, 3 show three different forms of realization of the joints performing the compensation of the thermal and load expansions of the wall plates.

- The figure 4 shows (cutaway view) the means (angles) performing a first technique of connection between the external cover plate and the angles for the assembly of the different panels.

- The figure 5 shows (cutaway view) the means allowing the performance of a second technique of assembly of the said angles to the said plates.

- The figure 6 shows (cutaway view) the means allowing the connection of the said angles to the said plates, according to a third execution technique.

- The figure 7 shows (cutaway view) the way in which the connection to the floor is realized.

- The figure 8 shows an exploded view of the components and sub-assemblies to be assembled.

- The figure 9 shows (perspective) the corner junction with internally welded bolts.

The main target has been to reduce to the highest degree the manufacture times in order to reduce the costs. This target has been hit in two ways:

A) Reduction of the items to be assembled

a) The vertical stiffeners on the walls have been deleted, because they were not necessary being the wall stiffened by the sandwich shape.

b) The various connecting pieces (PVC and aluminum) have been deleted, assigning their functions to the bend of the ends of the plates.

B) Deletion of the riveted joints

a) Nearly all the riveted joints have been deleted, turning the joints into glueing, whose seal is guaranteed by the large surface and by the pressure technique of the assembly.

To hit the targets quoted at point (A) a CONNECTION JOINT TO COMPENSATE THE DIFFERENT THERMAL AND LOAD EXPANSIONS has been realized between the plates to be fitted together; it has been mainly executed according to three different variants.

The way to work of the joint compensating the internal expansions is realized according to three preferential forms of execution as shown in the figures 1, 2 and 3.

In the known technique the expansion compensating device is realized by a grooved PVC block. With the new method the expansion compensating device is realized directly by plate bend, according to the solutions described in the following.

In the first variant (fig. 1) the joint is obtained by a welded foil 1′ on one of the plates 1 to be fitted together in order to create a cleft or slide on which the other plate 2 can fit itself and slide. The joint is then finished by addition of SIKAFLEX 14.

In the second variant (fig. 2) the two plates are simply superimposed, one (2′) on the housing (1″) machined on the other (1′), so that they can run freely and the relative motion is obtained. The joint is then finished by addition of SIKAFLEX 14.

In the third variant (fig. 3) the joint is obtained by bend to profile one of the plates (1) with U-shaped end (1″), into which the end (2′) of the other plate (2) can slip, ensuring the relative sliding.

By means of the device formed by the addition of a piece of welded plate as in the case of fig. 1 or by the bend of one of two plates to be fitted together, according to a particular shape as in the cases of fig. 2 and fig. 3, a slide is created, into which a plate fits itself and/or slips with reference to the other, allowing their relative motion and therefore the thermal and elastic expansions.

Peculiarities:

Machining of the plate sheet, which had to be executed in the old model too, but with deletion of a number of pieces and related assembly times.

To hit the targets quoted at point (B) a CONNECTION EXTERNAL PLATE - ANGLES has been realized as shown in figures 5 and 6, according to different techniques. After the realization of the sandwich by foaming the panels are assembled to the angles by glueing and not by riveting, with considerable saving of manhours (due to the deletion of drilling and riveting). The most interesting feature of this process, to be realized by means of the following techniques, is the glueing reliability due to the uniformity of the pressures exerted on the glueing surfaces.

PROCESS TO ASSEMBLY PANEL EXTERNAL PLATE / ANGLES ACCORDING TO TECHNIQUE I (fig. 4)

by:

a) Extruded angle 4 with walls tapered and/or slanting at the ends 4′ by extrusion, in order to make easy the assembly and facilitate the glueing pressure.

b) Foamed panel 3 tapered at its ends by interposition of a spot- or seam-welded Al plate.

C) Pressure jacks 7 by interposition of an elastic bar 7′.

d) Insertion, rigid block 15 and foaming of the remaining part 16.

e) Painting of the finished container.

Peculiarities:

Quick assembly without riveting; rigid assembly jigs are required to exert sufficient pressure by means of jacks in the glueing zones. Deletion of pieces and related assembly times. The sandwich panels are flat without stiffeners, being the stiffeness given by the sandwich structure.

The thickness of the external plate (possibly by aluminum) is calculated in order to withstand alone the necessary shear and torsion load.

PROCESS TO ASSEMBLY PANEL EXTERNAL

PLATE / ANGLES ACCORDING TO TECHNIQUE II (fig. 5)
by:

a) Extruded angle 4 with housing 4′ machined on its end to allow the rest and the glueing of the end 5′ of the external plate 5.

b) Pressure jacks 7 by interposition of the elastic bar 7′.

c) Insertion of the foil 17 for the corner connection between the panel internal plates 2 and connection on rigid block 15 with bends 17′ connecting the edges, realized in the plates themselves.

d) Foaming of the remaining part.

e) Painting of the finished container.

Peculiarities:

Still greater semplicity in the machining of the extrusion, in the glueing and in the panel foaming.

PROCESS TO ASSEMBLY PANEL EXTERNAL PLATE / ANGLES ACCORDING TO TECHNIQUE III (fig. 6)
by:

a) Extrusion 4 with housing, notch, groove or cleft 4′ to receive the ends 5′ of the plates 5, whose walls are inserted, then squashed by hammering against those of the plate itself.

b) Hammering 7 of the extrusion ends 4 with related deformation. Double safety coming from hammering plus glueing in the zone of junction of the plates.

c) Insertion of a corner connection foil (16-17) between the internal plates 2 of the two panels to be fitted together, equal or similar to that of the previous technique with connections 17 by plate bending and insertion of PVC block 15 after foaming.

d) Final foaming of the remaining part.

e) Painting of the finished container.

Peculiarities:

The hammering avoids the manufacture of rigid jigs and gives a better reliability of the glueing. A dedicated system is used for the hammering; it includes pneumatic hammers moving along the assembly feet.
The foaming hole shall be executed at the head of the channel to be foamed; then it is sealed by a PVC plug 15.

FLOOR (fig. 7)

The connection to the floor is shown in fig. 7 (items 5, 8, 8′). In the floor the deletion of the riveting happens by means of the welded beams 9. The internal corner locking of the floor is realized by PVC 15.

Peculiarities:

The traverse stiffeners under the floor are welded instead of to be riveted. The assembly time saving comes from the reduction of the number of pieces. For the shaping 8 of the interior of the floor, profiles compliant with the different safety and hygiene standards are selected.

ASSEMBLY (fig. 8)

It is articulated in the following phases:

a) Preparation of the shaped sandwich and manufacture of the roof 3″, walls 3, heads 3′ floor 8 panels.

b) Preparation of the side frames (10, 10′, 10″) with drilling just at the ends of the beam for the connections to the corner joints.

c) Assembly of the roof on the four angles.

d) Assembly of the walls and ends to the roof.

e) Bolt fixing of the angles by means of an added angular block 11 and top and bottom plate (figures 8 and 9).

f) Manufacture by welding of the floor (fig. 7).

g) Assembly of the roof and walls to the floor (fig.8).

h) Locking by PVC inserts and foaming.

i) Assembly of the doors.

j) Painting

k) Assembly of the door gaskets and fitting-up of the doors

CORNER JOINTS

The particular assembly phase of the corner joints is realized as shown in the figure 9.
The assembly of the angles 4 happens by means of an added steel angular block 11, with internally welded bolts 13 to form the thread of the assembly bolts.

Claims

1) Process for the quick assembly of a thermally insulated container avoiding the drilling and riveting techniques, characterized by the fact that the fit of the plates (1, 2), covering the insulating panels (3), by which it is formed, is realized by dap and slip joints (1, 1″, 2′), allowing the different thermal and load expansions; the connection of the angles (4) to the external plate (5) of the said panels (3) occurs by glueing with related quick-fixing points of the angles to the plate (5″); and the connection of the floor (5, 8, 8′) occurs by means of welded beams (9).

2) Process for the quick assembly of a thermally insulated container according to the claim 1, characterized by the fact that the fitting and slipping means to compensate the thermal and load expansion between the internal plates are realized on the plates themselves.

3) Process for the quick assembly of a thermally insulated container according to the claim 2, characterized by the fact that the said fitting and slipping means (1′, 1″, 2′) are realized by means of a plate (1′) welded on one of the plates to be fitted together (fig. 1).

4) Process for the quick assembly of a thermally insulated container according to the claim 2, characterized by the fact that the said fitting and slipping means (1′, 1″, 2′) are realized by simple overleap of the two plates (1, 2) to be fitted together (fig. 2).

5) Process for the quick assembly of a thermally insulated container according to the claim 2, characterized by the fact that the said fitting and slipping means (1′, 1″, 2′) are obtained by bending of one (1) of the two plates to be fitted together like a profile (1′) with final dap housing (1″) (fig. 3).

6) Process for the quick assembly of a thermally insulated container according to one of the claims 1 to 5, characterized by the fact that the fitting means of the angles (4) of the external plate (5) are formed by wedge-shaped housings (4′), obtained by welding of an added foil (5′) on the plate itself (5), where the ends (4′) of the said angles, also preformed, extruded, wedge-shaped, are inserted, with a preliminary addition of adhesive (6) and subsequent pressure (7) to increase the efficency of the glueing itself (fig. 4).

7) Process for the quick assembly of a thermally insulated container, according to one of the claims 1 to 5, characterized by the fact that the said quick-fixing joints are formed by housings (4′) machined on the external walls (7) of the extrusion on which the plate (5′) is pressure glued (6-7) (fig. 5).

8) Process for the quick assembly of a thermally insulated container according to one of the claims 1 to 5, characterized by the fact that the fitting of the extrusions to the plate is obtained by insertion of this into a groove (4′) or cleft machined in the extrusion (4) with interposition of the adhesive (6) and subsequent hammering (7) with deformation of the extrusion itself (fig. 6).

9) Process for the quick assembly of a thermally insulated container according to one of the claims 1 to 8, characterized by the fact that the fitting of the walls to the floor occurs by means of welded beams, fixing the basement (5) of the floor (8) to the extruded angles, whereas the internal corner locking is accomplished by PVC (15).

10) Process for the quick assembly of a thermally insulated container according to one of the claims 1 to 9, characterized by the fact that it comprises the following phases:

a) Preparation of the shaped sandwich and manufacture of the roof (3″), walls (3), heads (3′), floor (8) panels.

b) Preparation of the side frames (10, 10′, 10″) with drilling just at the ends of the beams for the fittings to the corner joints.

c) Assembly of the roof (3″) on the four angles (4).

d) Assembly of the walls (3) and heads (3) to the roof.

e) Bolt-fixing (13) of the angles by means of an added angular block (11) and top and bottom plate (figures 8 and 9).

f) Manufacture by welding of the roof (fig. 7).

g) Assembly of the roof and walls to the floor.

h) Locking by PVC inserts (15) and foaming.

i) Assembly of the doors.

j) Painting

k) Assembly of the door gaskets and fitting-up of the doors.

11) Thermally insulated container obtained by the process according to one of the claims 1 to 10.

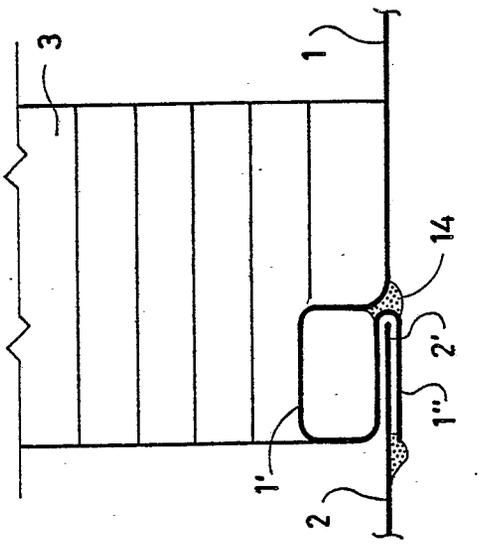

Fig. 3

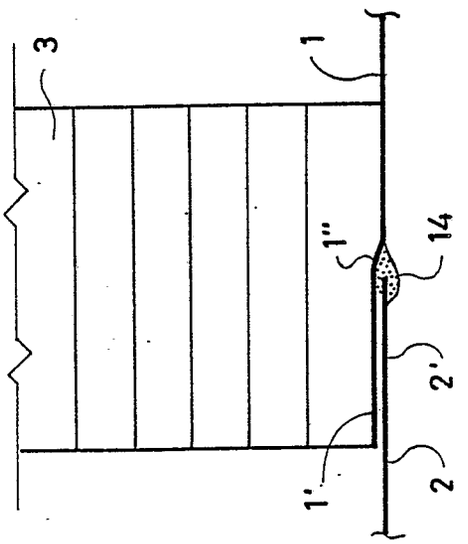

Fig. 2

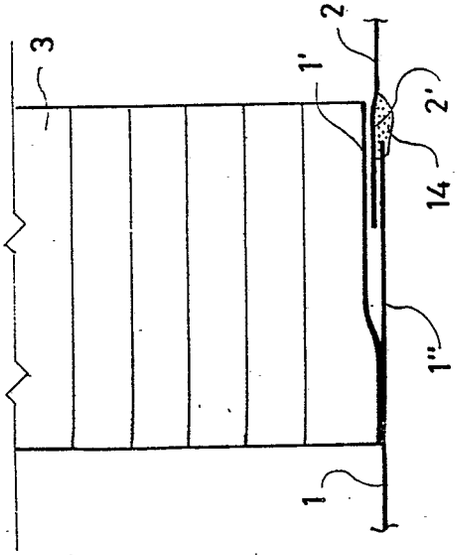

Fig. 1

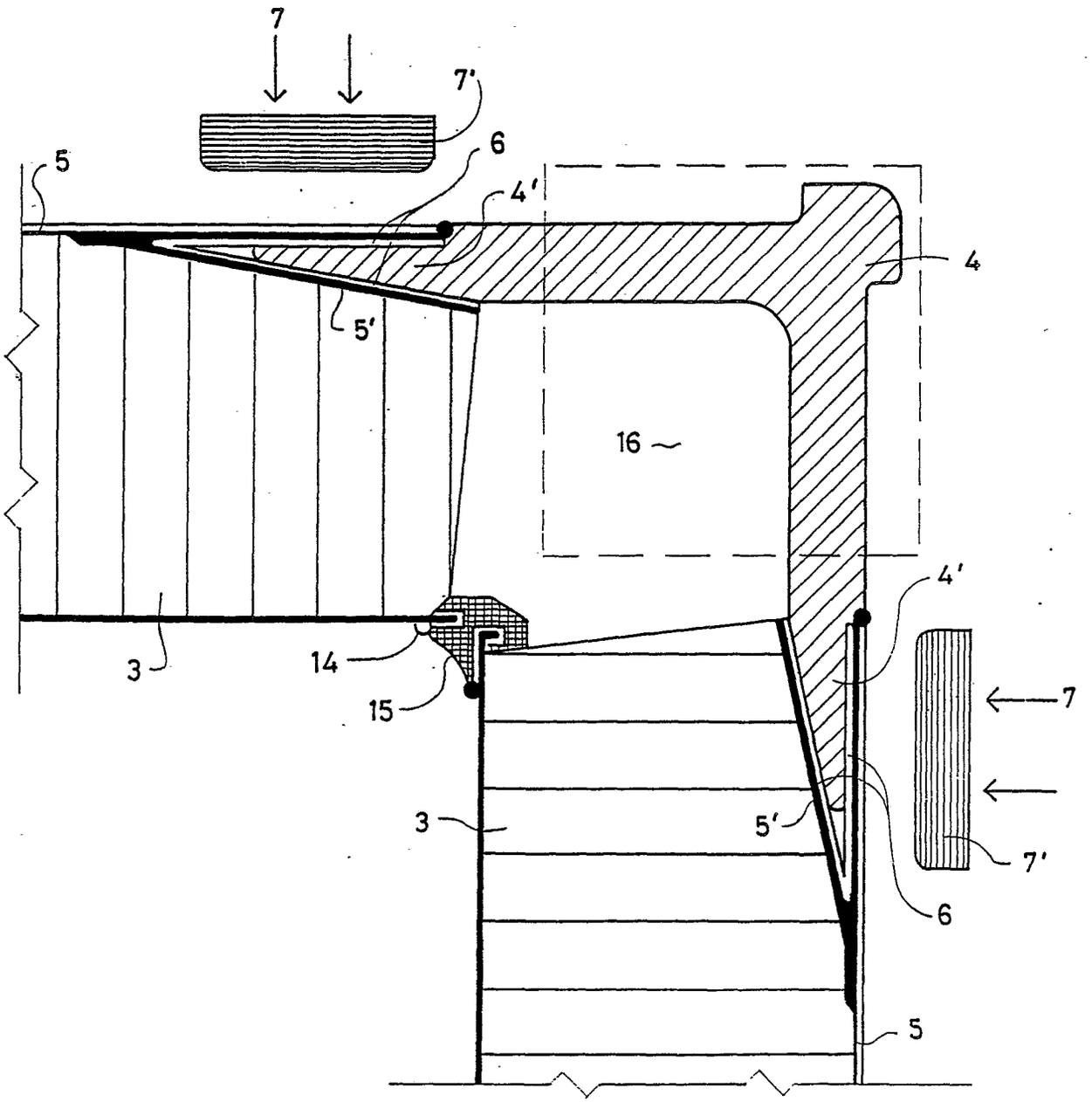

Fig. 4

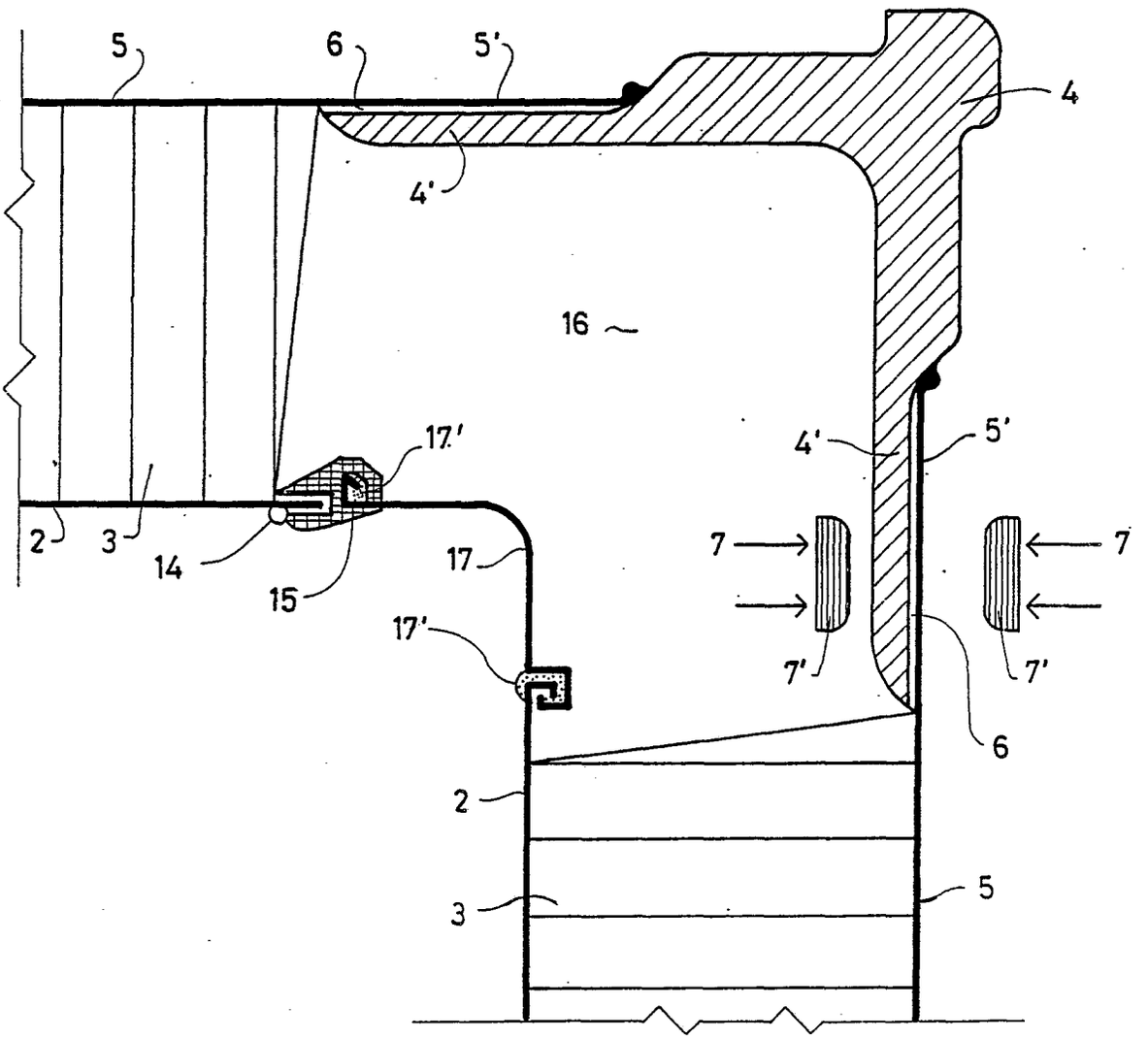

Fig. 5

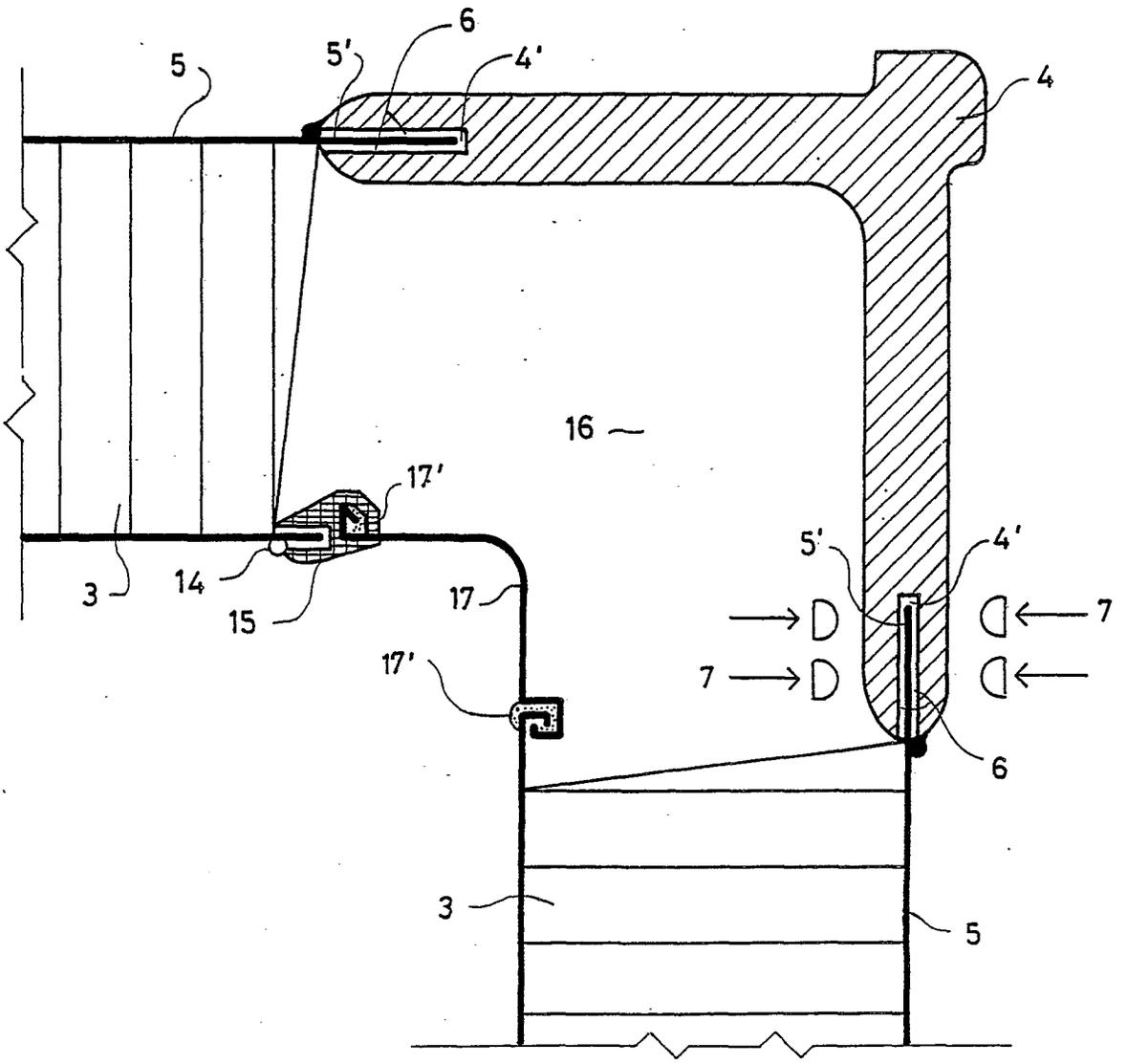

Fig. 6

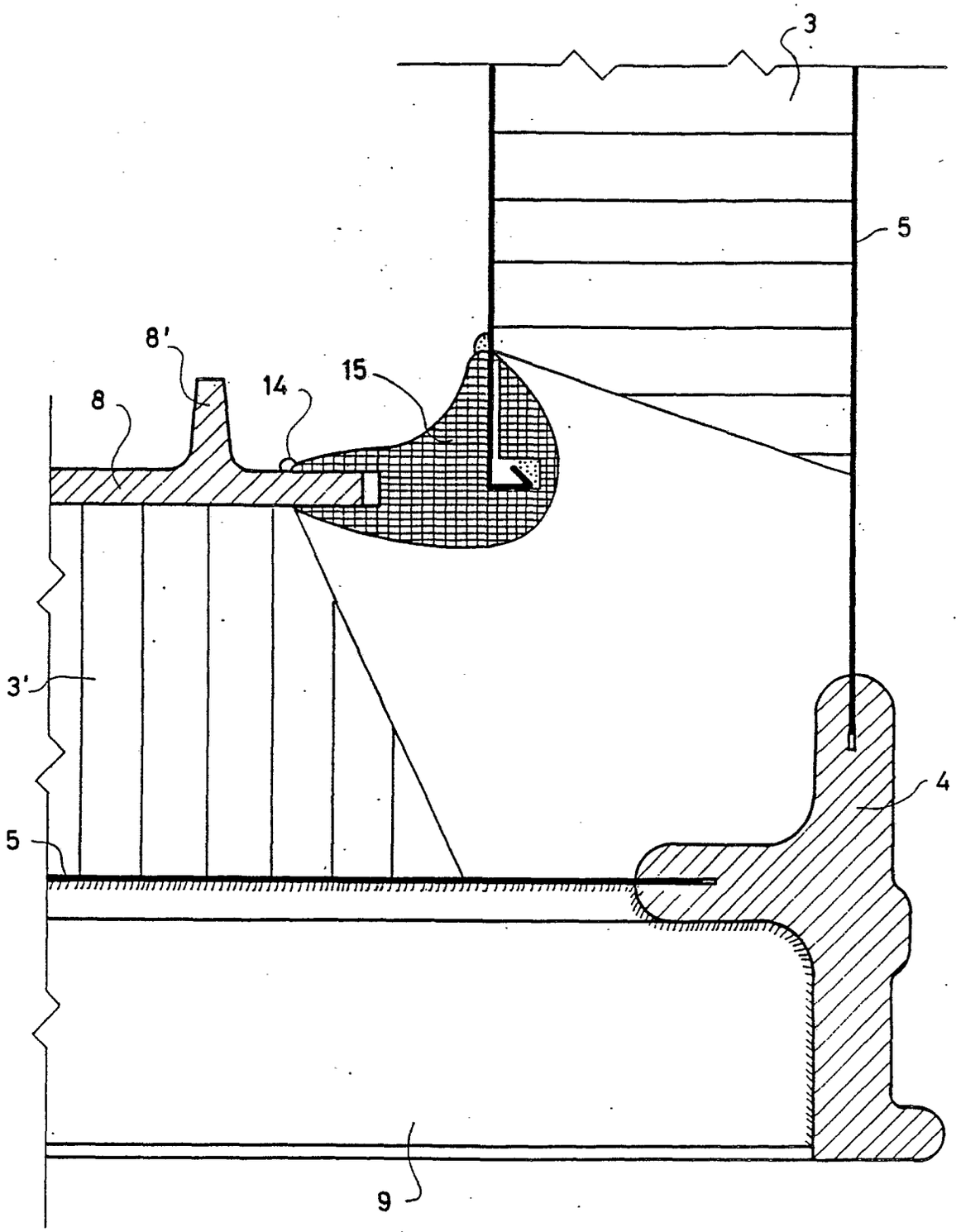

Fig. 7

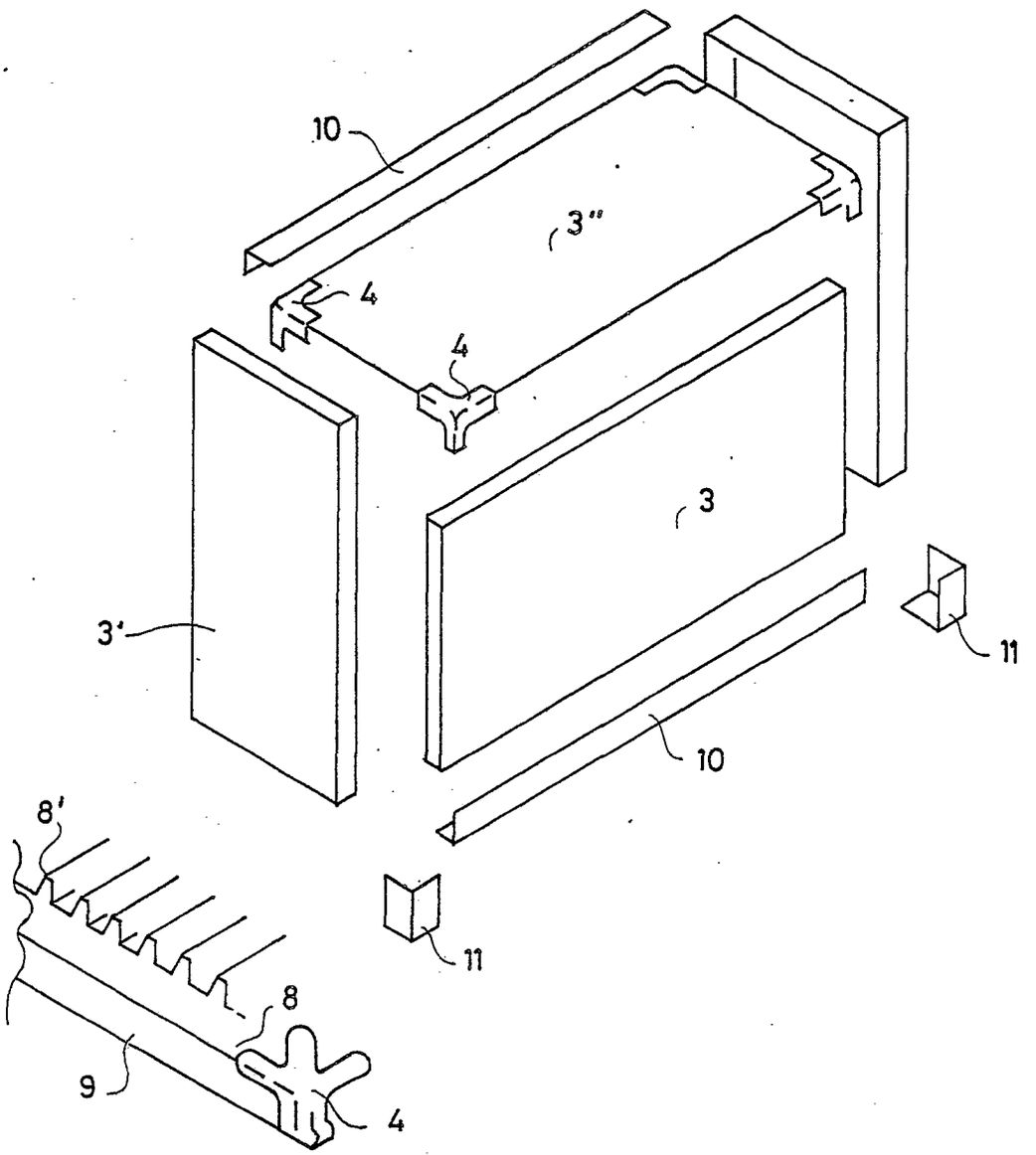

Fig. 8

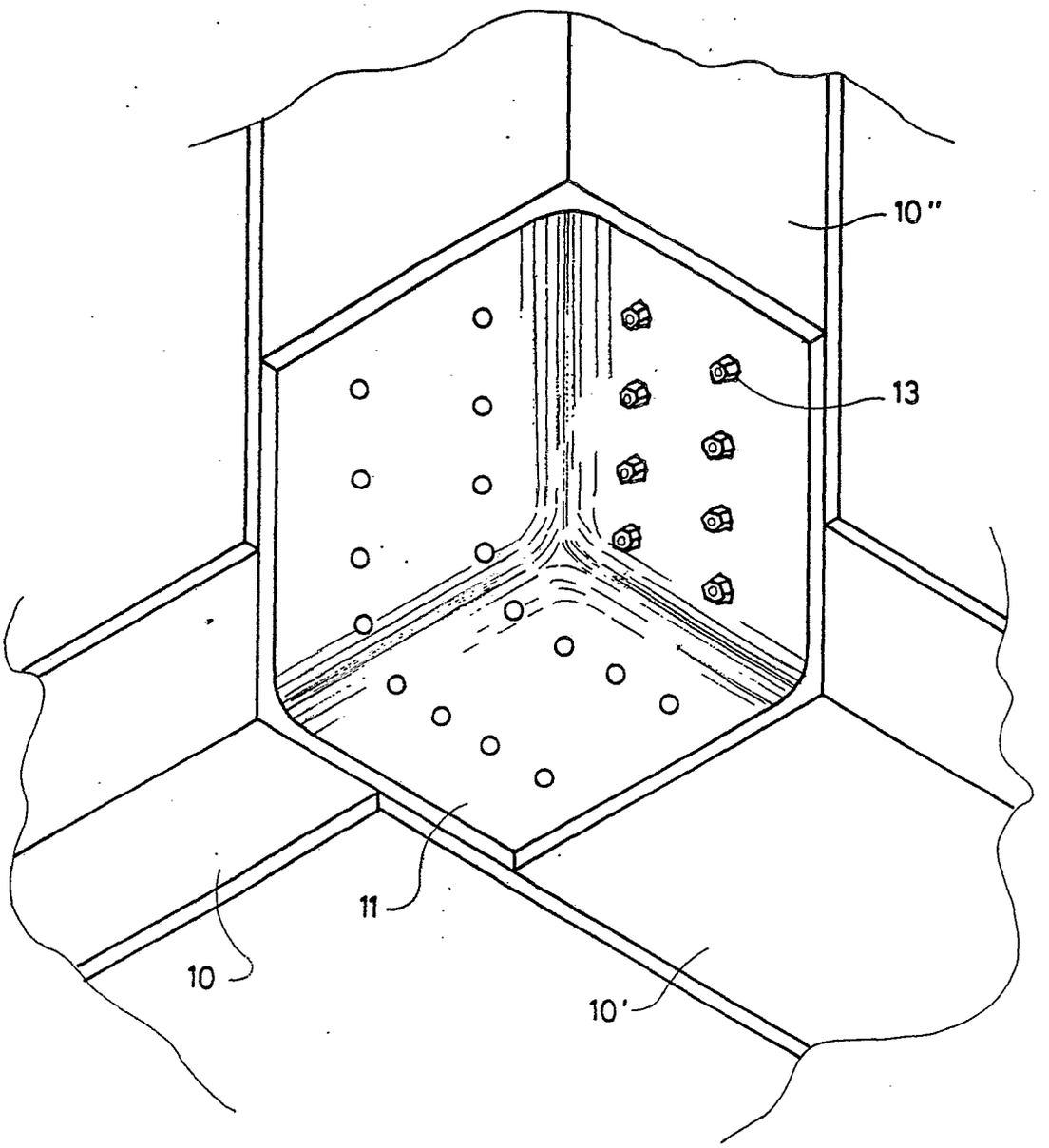

Fig. 9

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 88 10 1475

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.4)
X	US-A-3 561 633 (R.S. MORRISON) * Column 3, line 10 - column 4, line 26; figures *	1	B 65 D 90/08 B 65 D 90/06
A		9,11	
X	US-A-4 325 488 (C.R. KETMER) * Column 3, line 17 - column 5, line 21; figures *	1,2	
A		10,11	
A	FR-A-2 526 069 (VIESSMANN KG) * Claims 1,2,4,8,10; figures *	3,4,5,6	
A	EP-A-0 029 229 (P. MADER) * Abstract; figures *	7,8	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

B 65 D
E 04 C
E 04 H
E 04 B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	20-09-1988	VAN ROLLEGHEM F.M.

CATEGORY OF CITED DOCUMENTS

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