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(71) Applicant: **Metaal Techniek Belgie BVBA**
3920 Lommel (BE)

(72) Inventor: **Toonders, Roeland, Lambertus, Franciscus**
5575 CG Luyksgestel (NL)

(74) Representative: **Bleukx, Lucas Lodewijk M.**
Bleukx Consultancy BVBA
Derde Straat 7
3680 Maaseik (BE)

(54) Door and a door frame interacting with the door

(57) A door and a door frame interacting with the door, which door is hinged to the lower lintel and upper lintel, wherein the edge of the door, on the hinged side, is incorporated in U-profile that forms part of the door frame, and wherein the end edge of the flange of the U-profile extends mainly to the hinge line on the closing side. The end edge of the flange of the U-profile on the closing side will preferably extend over a distance that lies between the hinge line of the door and the associated edge of the door.

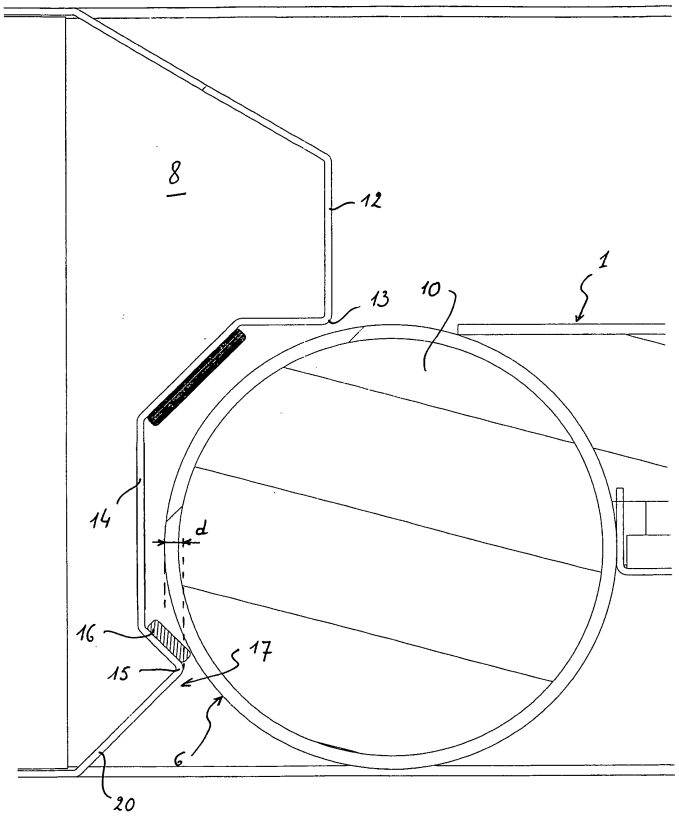

Fig. 4

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Description

[0001] The invention relates to a door and a door frame interacting with the door, which door is hinged to the floor and to the upper lintel.

Such a door is of prior art.

[0002] Such doors, where the door is not hinged to the door frame, but is hinged around a system that is connected to the floor or to the upper lintel, is often used in doors which must be finger-safe and/or in doors where fire protection is important. The reason for this is that on the one hand the doors must be able to be hung so accurately, in relation to the frame, that the space between the edge of the door and the frame is too small to be able to catch a finger in it, and on the other that reasonable protection is provided by this small space in particular in the case of a fire.

[0003] In practice, however, it has been found that such doors are still insufficiently fireproof because cracks and openings can be formed around the door due to the deformation of the door, which means that the fire is no longer retained. This occurs in particular on the side of the edge on which the hinges are located, since in this case the door is only retained above and below. In the middle section the door surface will bulge in the direction of the open side, i.e. towards the side on which the door opens, as a result of the heat development, thereby preventing fire protection.

[0004] The object of the invention is to provide a door of the above-mentioned type in which the above-mentioned disadvantages are avoided.

[0005] This object is achieved according to the invention in that the edge of the door is incorporated on the hinged side in a U-shaped profile that forms part of the door frame.

[0006] Due to the presence of U-profile that at least partially encloses the hinged edge of the door, the deformation of the door resulting from the heat that develops in a fire is considerably reduced, which means that the door is able to meet the standards imposed more easily.

[0007] Other characteristics and advantages of the door and a frame interacting with the door are explained clearly in the following description in which reference is made to the following drawings.

[0008] In the drawings:

Fig. 1 shows a view of a door and the door frame interacting with it according to the invention.

Fig. 2 shows a cross-section along line II-II in Figure 1,

Fig. 3 shows a cross-section along line III-III in Figure 1, and

Fig. 4 shows a cross-section on a larger scale, according to Figure 3, of the hinged side of the door and a door frame interacting with it according to the invention.

Fig. 5 shows a cross-section on a larger scale, according to Figure 4, of a section of Figure 4.

[0009] Figures 1, 2 and 3 show a door with a door frame according to the invention, which door, in the embodiment shown, consists of a door leaf 1. In the case of a fireproof door such a door leaf is constructed from several layers. A typical composition could be a first lower manufactured from sheet steel 3 mm thick, on this layer a second layer of rock wool 50 mm thick, then a fireproof layer based on plasterboard, such as that commercially available under the brand name Promotec H, 10 mm thick, a fourth layer of 10 mm manufactured from neoprene, and finally a fifth layer of sheet steel 2 mm thick.

[0010] In the embodiment shown two sealable openings are provided in the door panel, which openings are specially designed for certain applications, for example as a door in an institute for the mentally handicapped. This is an opening or passage 2 which serves as an inspection opening and a hatch 3 which can be used for passing through certain objects such as food or the like.

[0011] Door panel 1 is also fitted with a handle 4 with which the door can be opened or closed. The door has an open side, i.e. a side in which the door can be opened. This side is the side of view in Figure 1, and in Figures 2 and 3 it is the downwardly directed edge of the door leaf. The other side of the door leaf is indicated as the closing side. Furthermore, the door leaf has an open edge 5 with which the door bears against a door post 7, and which moves away from door post 7 when the door is opened. The second upright edge 6 of the door is hinged side 6, which bears against door post 8, and on which side the door is provided with a hinged structure for opening and closing the door, the upright edge only being deformed in relation to door frame 6, but does not move further relative to door frame 8.

[0012] In the embodiment of the door shown hinged side 6 of the door leaf is constructed in a special manner. Hinged side 6 has the shape of a tube or cylinder 10 with a diameter that is greater than the thickness of door leaf 1, cylinder 8 projecting towards the open side of the door leaf, but on the closing side it connects tangentially to the closing side of door leaf 1. Cylinder 8 extends over the entire height of door leaf 1, and the upper side and underside of the cylinder are hinged to the upper and lower lintels respectively or to the floor. In the simplest embodiment such a hinged structure may be obtained by providing the top and bottom of the cylinder with a pin which can be incorporated rotarily in an opening in the upper and lower lintels respectively. The hinging axis of the door preferably coincides with the centreline of cylinder 10.

[0013] Of course other rotary systems are also possible, but in regard to the invention it is important for the

door to be hinged to the upper and lower lintels and not to frame 8.

[0014] Upright edge 5 of door leaf 1 has a bevelled edge which connects to a bevelled edge in door frame 7, as is clearly shown in Figures 2 and 3, thereby ensuring a reliable and safe connection between the door and the door frame on the side of door panel 1.

[0015] On the hinged side a special structure has been selected which on the one hand provides a finger-safe solution and on the other provides better fire protection. This is shown in greater detail in Figure 4. In the horizontal cross-section door frame 8 has a mainly U-shape on the hinged side of the door. This U-shape, viewed from the closing side of the door, consists of a part 12 which extends in the direction of the other door frame until always halfway along the diameter of cylinder 10, and whose corner 13 lies a small distance of 2 to 4 mm from the outer circumference of the cylinder. This prevents people from catching their fingers in the door by accident when it is open, since the free space is limited and is constant. This is particularly safe in the case of children and mentally handicapped people.

[0016] A part 14, which largely follows the circumference of the cylinder and terminates in a nose 17 with a tip 15, which also lies at a small distance of a few millimetres from the outer circumference of cylinder 10, connects to part 12. On the other hand, tip 15 projects so far in the direction of the other door frame that tip 15 projects past the part of the circumference of cylinder 10 that lies farthest in the direction of door frame 8. As shown in Figure 4, tip 15 overlaps the outer circumference of cylinder 10 over a distance d. This means that when, as a result of fire or overheating, the door tends to become deformed, the hinged side of the door is not immediately pushed away from the door frame but is retained by nose 17, and in particular by the part of the door frame belonging to tip 15. Therefore the door will not remain open on the hinged side and will guarantee a considerable degree of fire protection. In the embodiment shown in Figure 4 a locking plate 16 is secured to part of the tip, thus improving sealing.

[0017] In the case of overheating of the door, the door will swell in all directions, i.e. also in its width, which means that the overlap between tip 15 and the hinged edge of the door is still greater and the door will be retained even more firmly by the part of the door frame belonging to tip 15.

[0018] Since the door and frame interacting with it are intended on the one hand to be protected against the catching of fingers or the like, and on the other hand must have sufficient fire-preventing properties, certain requirements have been imposed on the dimensions of the different parts of the door and frame, and certain proportions must be taken into consideration here. See in particular Figure 5 in this regard.

[0019] It is therefore desirable for the gap between cylinder 10 and tip 15 of nose 17 to have a dimension that is smaller than 4 mm, preferably even smaller than 2 mm. In addition, it is necessary for the door to have an opening angle which is greater than 90°, preferably equal to 135° or more.

[0020] Taking as a basis a door 1 with a thickness that exceeds half the diameter of cylinder 10, this means that the oblique side 20 of nose 17 is positioned so that the distance between side 10 and centreline 21, parallel with this side, is at least equal to the dimension of the door thickness minus half the diameter of cylinder 10.

[0021] In order to provide nose 17 with sufficient stiffness, to ensure that the deformation of cylinder 10 does not push tip 15 away from nose 17 in the event of a fire, but in any one case only after a certain time, it is necessary for line 25 which connects the tip of nose 15 to the point of intersection of the circumference of cylinder 10 with centreline 22, parallel with the plane of the door when closed, to form an angle k with a line 26 which is perpendicular to the plane of the door, when closed, which is at least equal to 6°, but preferably greater than 8°.

[0022] It is clear that the invention is not limited to the embodiments described and shown, but that numerous modifications that form part of the invention can be made within the scope of the claims.

Claims

1. A door and a door frame interacting with the door, which door is hinged to the lower lintel and upper lintel, **characterised in that** the edge of the door is incorporated on the hinged side in a U-shaped profile that forms part of the door frame.

2. The door and a door frame interacting with the door according to Claim 1, **characterised in that** the end edge of the flange of the U-profile, in the closing side, extends largely to the hinge line of the door.

3. The door and a door frame interacting with the door according to Claim 1 or 2, **characterised in that** the end edge of the flange of the U-profile on the open side extends over a distance that lies between the hinge line of the door and the associated edge of the door.

4. The door and a door frame interacting with the door according to any one of claims 1 to 3, **characterised in that** the edge of the door, on the hinge side, has the shape of a tubular element which comprises the hinge line, and **in that** the door leaf has a thickness which is smaller than the corresponding dimension of the tubular element.

5. The door and a door frame interacting with the door according to Claim 4, **characterised in that** the tubular element has the shape of a cylinder.

6. The door and a door frame interacting with the door

according to Claim 5, **characterised in that** the centreline of the cylinder coincides with the hinge line of the door.

7. The door and a door frame interacting with the door according to Claim 4, 5 or 6, **characterised in that** the tubular element is located partially within the U-shaped profile.

8. The door and a door frame interacting with the door according to any one of Claims 4 to 7, **characterised in that** the closing side of the door bears firmly against the outer circumference of the tube.

9. The door and a door frame interacting with the door according to Claim 5 or 6, and either of Claims 7 or 8, **characterised in that** the distance between the outer circumference of the cylinder and the ends of the flanges of the U-profile is smaller than 4 mm, preferably smaller than 2 mm.

10. The door and a door frame interacting with the door according to any one of the preceding claims, **characterised in that** the door has an opening angle of at least 90°, preferably 135°.

11. The door and a door frame interacting with the door according to any one of the preceding claims, wherein the U-profile forms a nose with a tip which projects in the direction of the plane of the door when closed, **characterised in that** the line which connects the tip of nose 15 to the point of intersection of the circumference of the cylinder 10 with the centreline, parallel with the plane of the door, when closed, forms an angle with the line that is perpendicular to the plane of the door, when closed, which is at least equal to 6°, but preferably greater than 8°.

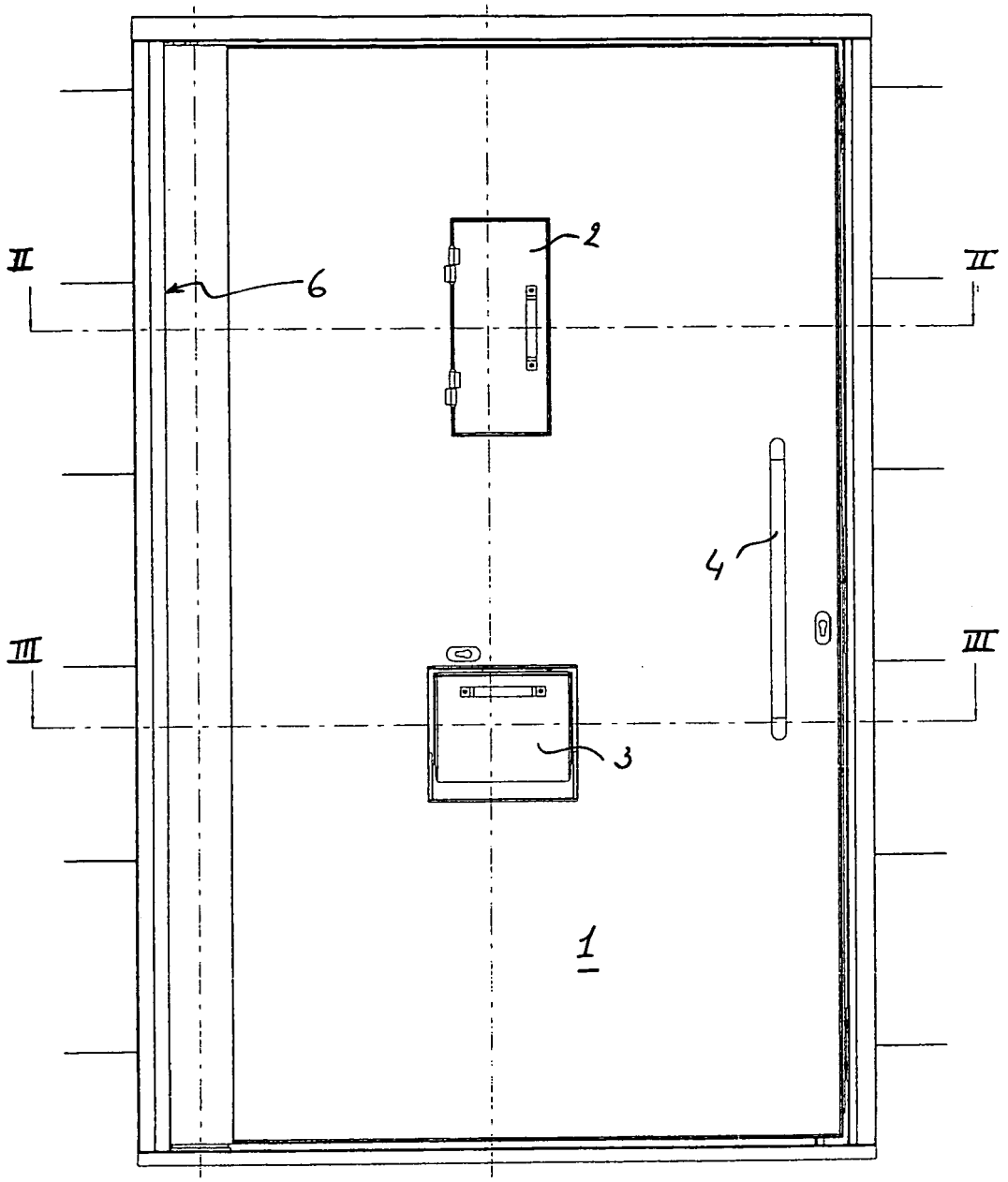

Fig. 1

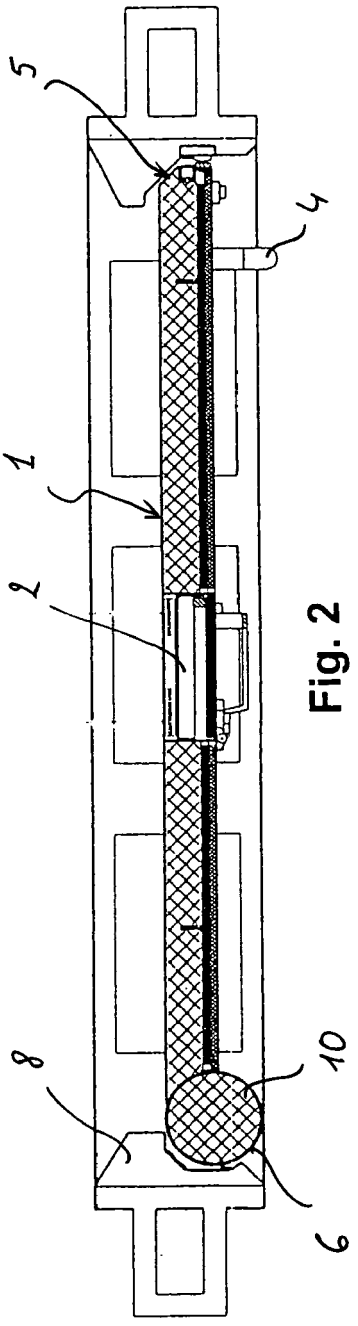

Fig. 2

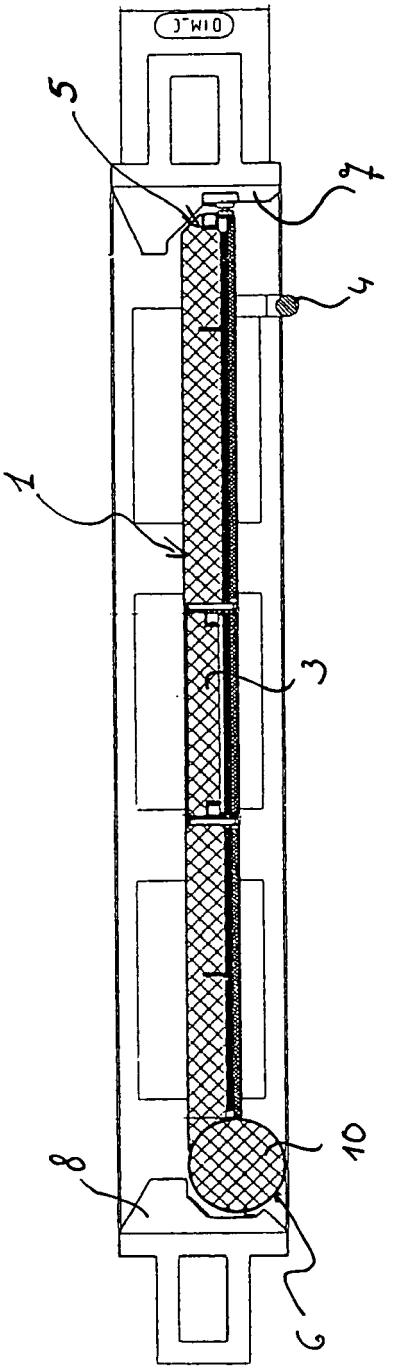

Fig. 3

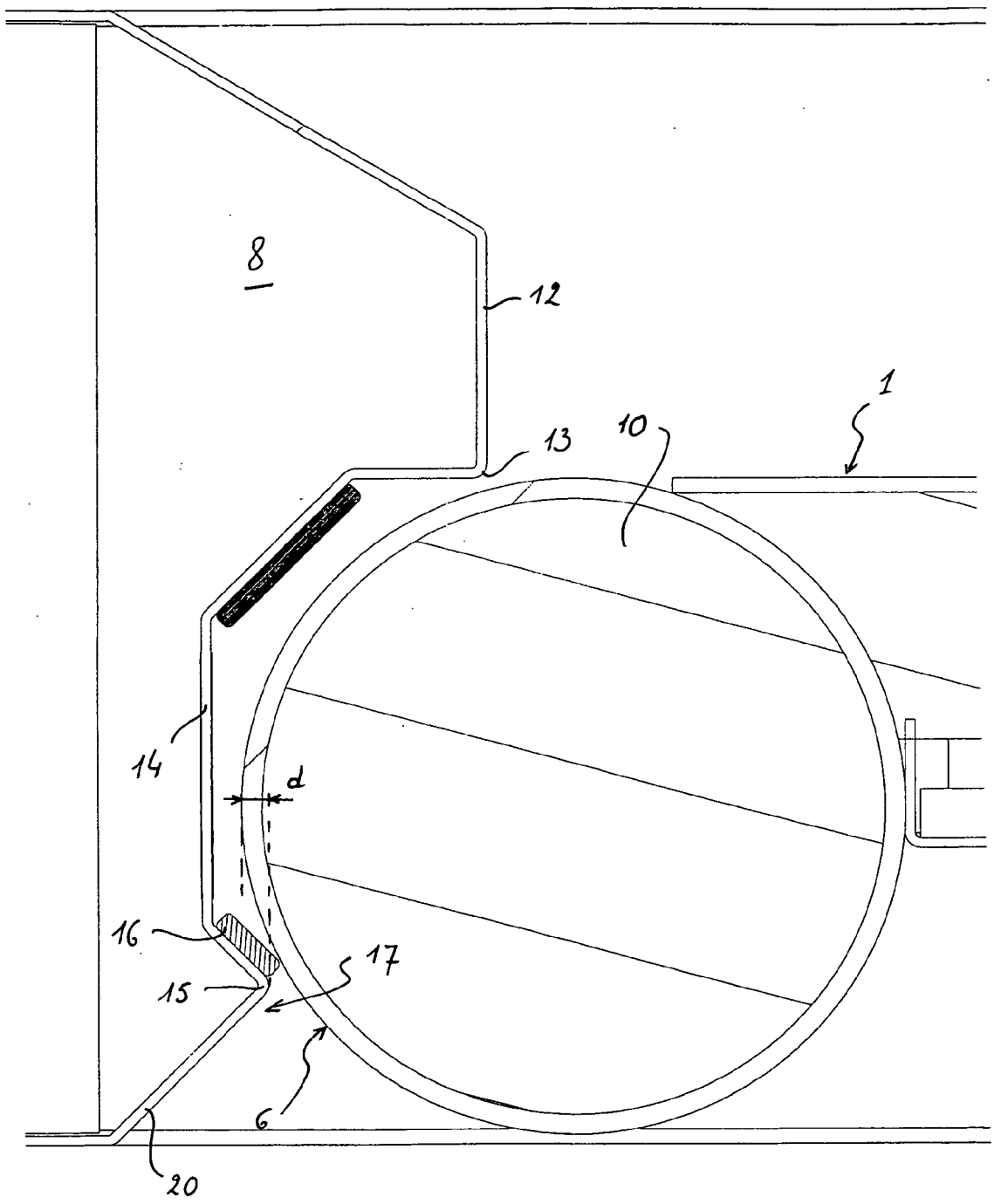

Fig. 4

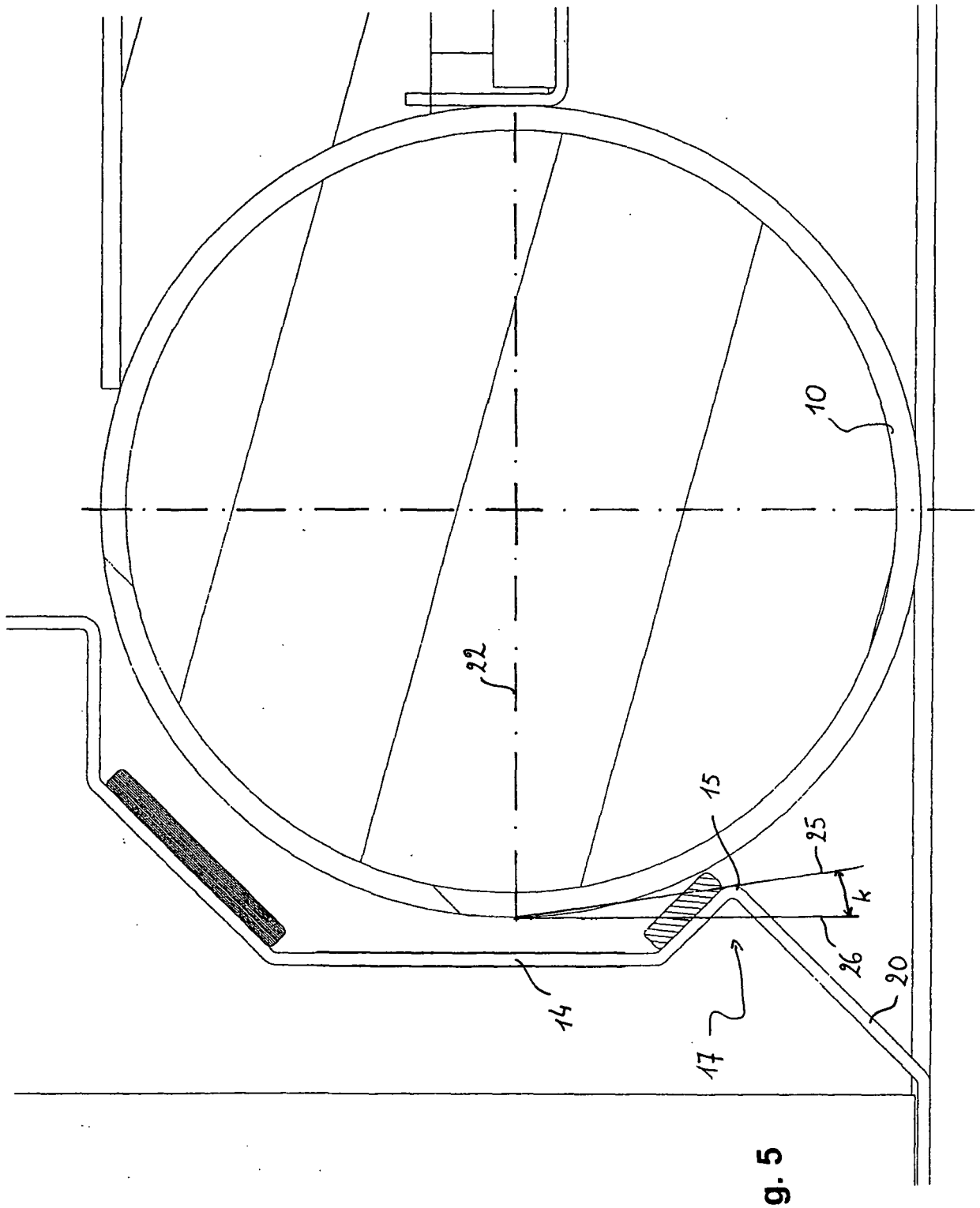

Fig. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 09 00 4022

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	BE 1 014 653 A5 (MOENS HEYLEN EN CO N V NV [BE]) 3 February 2004 (2004-02-03) * figures 1-7 * * page 1, lines 4-13 * * page 5, lines 5-16 * * page 6, lines 28-31 * * page 7, lines 5-28 * * page 11, lines 11-18 *	1,3-11	INV. E06B3/36 E06B7/36
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			TECHNICAL FIELDS SEARCHED (IPC) E06B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	29 June 2009	Blancquaert, Katleen

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 09 00 4022

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