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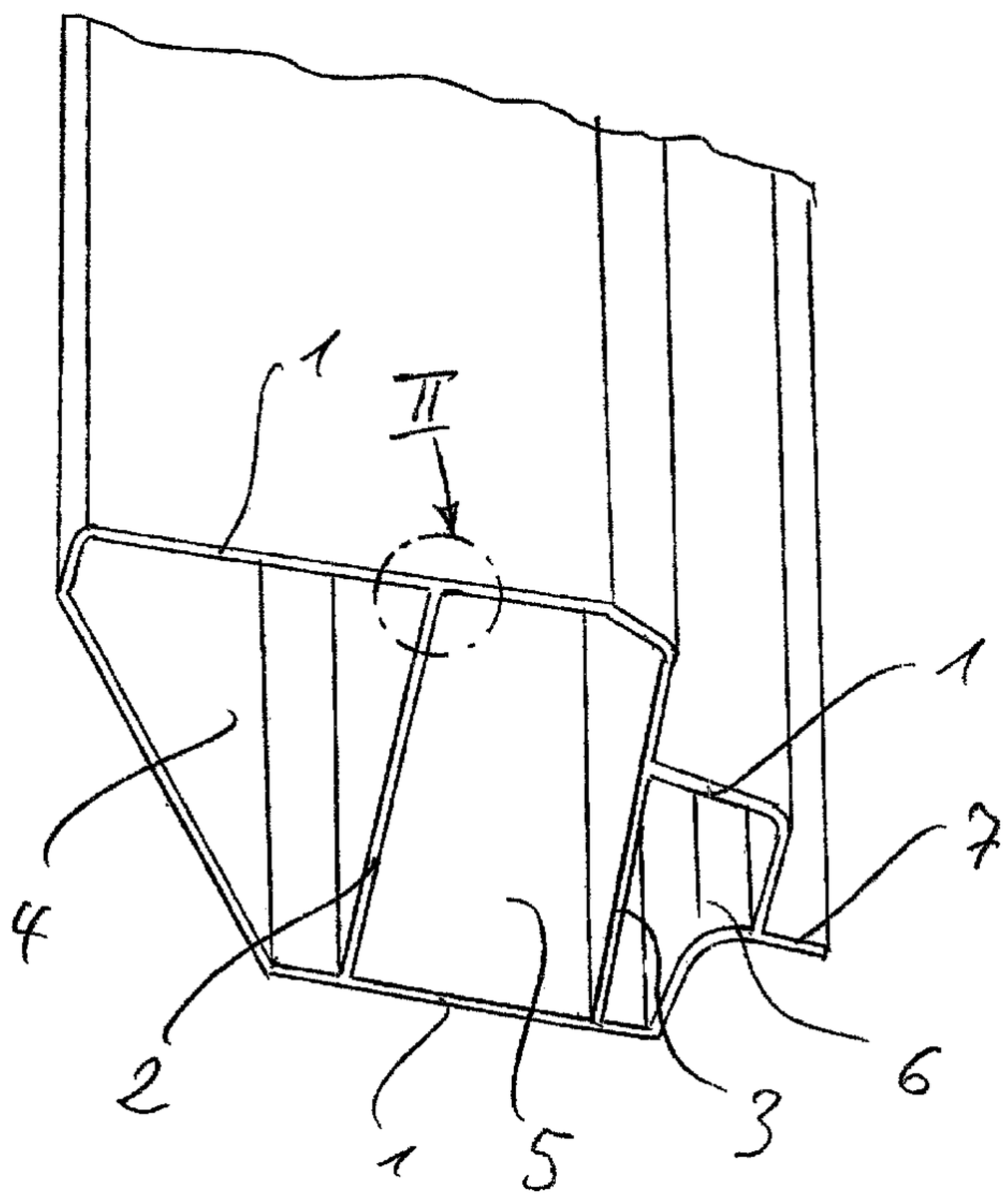
(54) Title: METHOD AND APPARATUS FOR HIGH-PRESSURE INTERNAL SHAPING



(57) Abrégé/Abstract:
A method using high interior pressure to reshape structural section of continuously bounded overall cross-section, whereby the overall cross-section can be provided with extra walls or chambers and a stopper is forced radially against each end of the piece. The object is to reduce wear on the stopper while ensuring that any walls or chambers in addition to its overall cross section will buckle or bulge only at their ends. Either any walls (2 & 3) that partition the chambers (4, 5, & 6) and any independent wall (7) are provided with slots (17) at the ends of the piece that parallel the inner surface (18) and outer surface of the piece or the stopper (8) itself is provided with grooves (19) adjacent to and matching the shape of the walls.

Abstract

A method using high interior pressure to reshape structural section of continuously bounded overall cross-section, whereby the overall cross-section can be provided with extra walls or chambers and a stopper is forced radially against each end of the piece.

The object is to reduce wear on the stopper while ensuring that any walls or chambers in addition to its overall cross section will buckle or bulge only at their ends.

Either any walls (2 & 3) that partition the chambers (4, 5, & 6) and any independent wall (7) are provided with slots (17) at the ends of the piece that parallel the inner surface (18) and outer surface of the piece or the stopper (8) itself is provided with grooves (19) adjacent to and matching the shape of the walls.

METHOD AND DEVICE USING HIGH INTERIOR PRESSURE TO RESHAPE STRUCTURAL SECTION

The present present invention relates first, to a method using high interior pressure to reshape structural section as recited in the preamble to Claim 1, and second, to a device as recited in the preamble to Claim 5 for carrying out the method.

The structural section being reshaped using high internal pressure may be tubing as disclosed in German 3 923 358 A1 and in US 4 414 834 A. Pieces with a non-circular cross-section, however, can also be reshaped. Such material is usually extruded.

To ensure unobjectionable fluid tightness, a stopper is forced radially against each end of the structural section. The end of the piece rests against an edge of the stopper, creating a seal. To reduce wear on the stoppers as much as possible, the seal-creating edge is made of a wear resistant material and is forced against the interior surface of the section subject to relatively high pressure.

It would also be desirable to similarly use high interior pressure to reshape pieces with extra walls or chambers

projecting into or out of their overall cross-section. There is, however, a drawback to such a procedure in that the walls or chambers tend to deform axially along the piece, allowing the edges to buckle or bulge out axially undefined. It is of course possible to counteract this tendency by making the edges of a softer material. This approach, however, increases wear on the edges.

The object of the present invention is accordingly a method of and a device for using high interior pressure to reshape structural section with walls or chambers that project into or out of its overall cross-section, whereby the stoppers are subjected to low wear and whereby the extra walls or chambers will buckle or bulge out only at their ends.

This object is attained by the characteristics recited in Claims 1 and 5. Practical and advanced embodiments are addressed in Claims 2 through 4 and 6 through 9.

The major advantage of the present invention is that complex structural section with extra walls or chambers can be reshaped using high interior pressure, decreasing the cost of manufacture. Since the section is reshaped only slightly

at the ends, they will need to be trimmed only slightly if at all as the material is further processed.

One embodiment of the present invention will now be specified with reference to the accompanying drawing, wherein

Figure 1 is a view of one end of a length of extruded structural section with several walls,

Figure 2 is a larger-scale view of detail II in Figure 1,

Figure 3 illustrates a stopper sealing off the end illustrated in Figure 1,

and

Figure 4 is a larger-scale view of detail IV in Figure 3.

Figure 1 depicts a length of typical extruded structural section that is to be reshaped using high interior pressure. The extrusion has a continuously bounded cross-section 1 partitioned by two walls 2 and 3 into three chambers 4, 5,

and 6. Finally, the section is provided with an independent wall 7 that extends out of cross-section 1.

While it is being reshaped and still inside the reshaping tool, the ends of the piece are sealed by stoppers 8 forced radially against them. Each stopper 8 is provided with a seal-creating edge 9 established on the surface of a gasket 10 that rests against the stopper. Each edge 9 accordingly fits tight into the structural section. Each stopper 8 is provided with aligners 11, 12, and 13 that more or less fit into chambers 4, 5, and 6, which they enter into as stopper 8 is advanced toward the piece. Partitioning walls 2 and 3 and overall cross-section 1 are accordingly secured radially, the overall piece being introduced against and correctly positioned in relation to each stopper 8. Gasket 10 and aligners 11, 12, and 13 can now attach the schematically illustrated connectors 14, 15, and 16 to stopper 8. Connectors 14, 15, and 16 can also convey the fluid that provides the reshaping pressure.

To ensure a well controlled buckling or bulging out by walls 2, 3, and 7, they are provided with slots 17 more or less paralleling the inner surface 18 or outer surface of cross-section 1. The slot 17 in the illustrated example is very

near inner surface 18. These slots are preferably produced by an appropriately shaped bit on stopper 8 as the stoppers are brought together.

Figure 4 illustrates an alternative or additional embodiment of the present invention. Gasket 10 is in this embodiment provided with grooves 19 extendng along the walls 2 and 3 that partition cross section 1. Grooves 19 allow partitioning walls 2 and 3 to stretch axially without buckling or bulging as the section is reshaped. Since the independent wall 7 that extends out of cross-section 1 does not rest against stopper 8, the measures addressing this wall in the foregoing will obviously not be necessary. What is on the other hand essential is that grooves 19 do not extend all the way to edge 9, providing the overall structural section with a well defined continuous seal.

Claims

1. Method using high interior pressure to reshape structural section of continuously bounded overall cross-section, whereby a stopper is forced radially against each end of the piece, characterized in that when, in addition to its overall cross section (1), the piece is provided with one or more extra walls (2, 3, & 7) or chambers (4, 5, & 6), the stopper (8) will seal the structural section only at its continuous boundary.

2. Method as in Claim 1, characterized in that the independent wall (7) and the partitioning walls (2 & 3) are provided with slots (17) that project more or less out of the inner surface (18) and the outer surface of the overall cross-section (1).

3. Method as in Claim 2, characterized in that the slots (17) are less than 1 cm deep.

4. Method as in Claim 2, characterized, when the structural section has several chambers (4, 5, & 6), by additioal slots (17) at the intersections between and branches off of the partitioning walls (7).

5. Device for using high interior pressure to reshape structural section of continuously bounded overall cross section, whereby a stopper is forced radially against each end of the piece, characterized in that when, in addition to its overall cross-section (1), the piece is provided with one or more extra walls (2, 3, & 7) or chambers (4, 5, & 6), the stopper (8) will seal the structural section only at its continuous boundary.

6. Device as in Claim 5, characterized in that the stopper (8) is provided with grooves (19) that match the shape of, and merge with, the extra walls (2, 3, & 7).

7. Device as in Claim 5, characterized in that the grooves (19) extend almost to the boundart of the overall cross-section (1).

8. Device as in Claim 6, characterized in that the grooves (19) are less than 1 cm deep.

9. Device as in Claim 6, characterized, when the structural section has several chambers (4, 5, & 6), by additioal grooves (19) at the intersections between and branches off of the partitioning walls (7).

List of parts

1. overall cross-section
2. partitioning wall
3. partitioning wall
4. chamber
5. chamber
6. chamber
7. independent wall
8. stopper
9. seal-creating edge
10. gasket
11. aligner
12. aligner
13. aligner
14. connector
15. connector
16. connector
17. slot
18. inner surface
19. groove

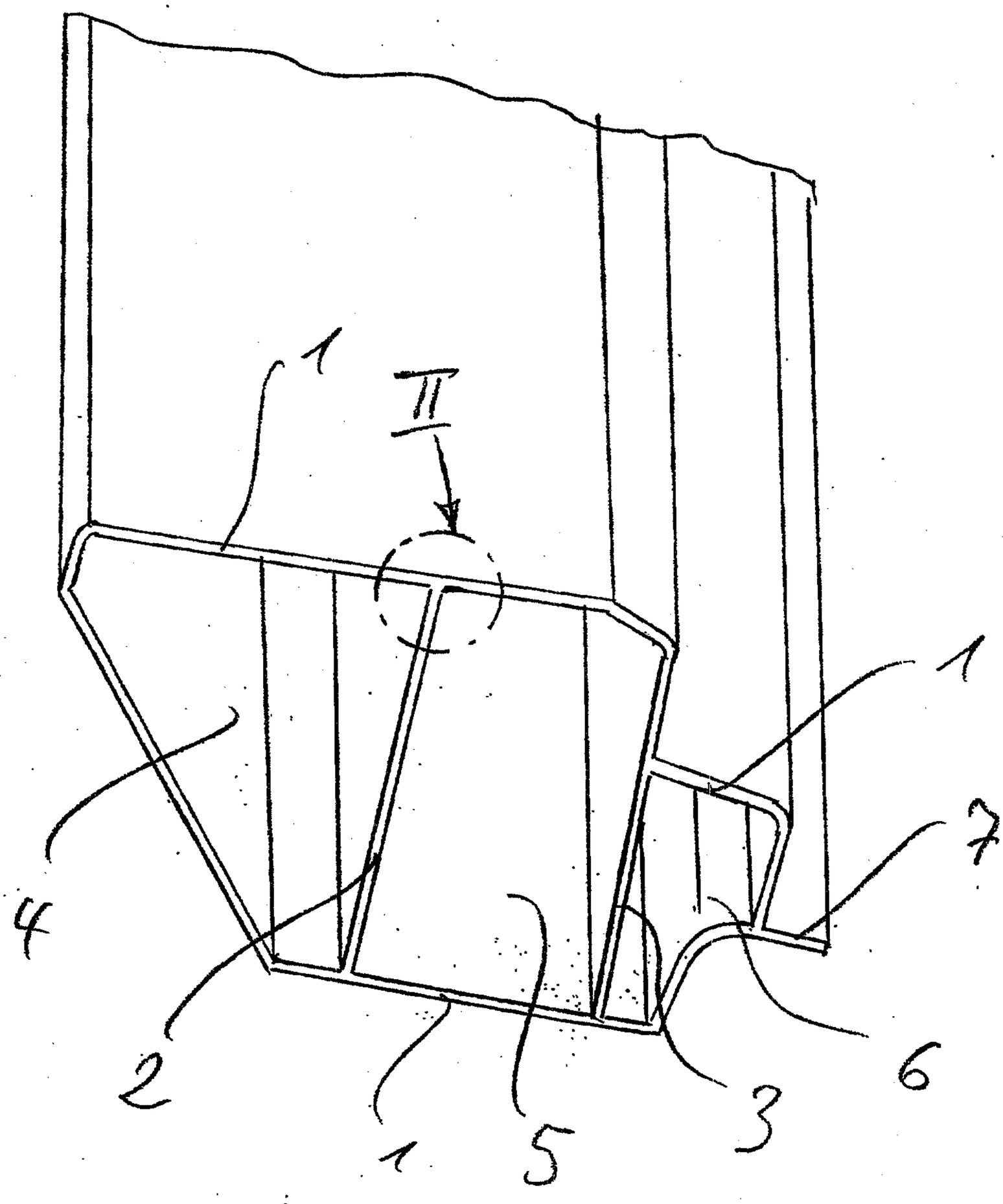


Fig. 1

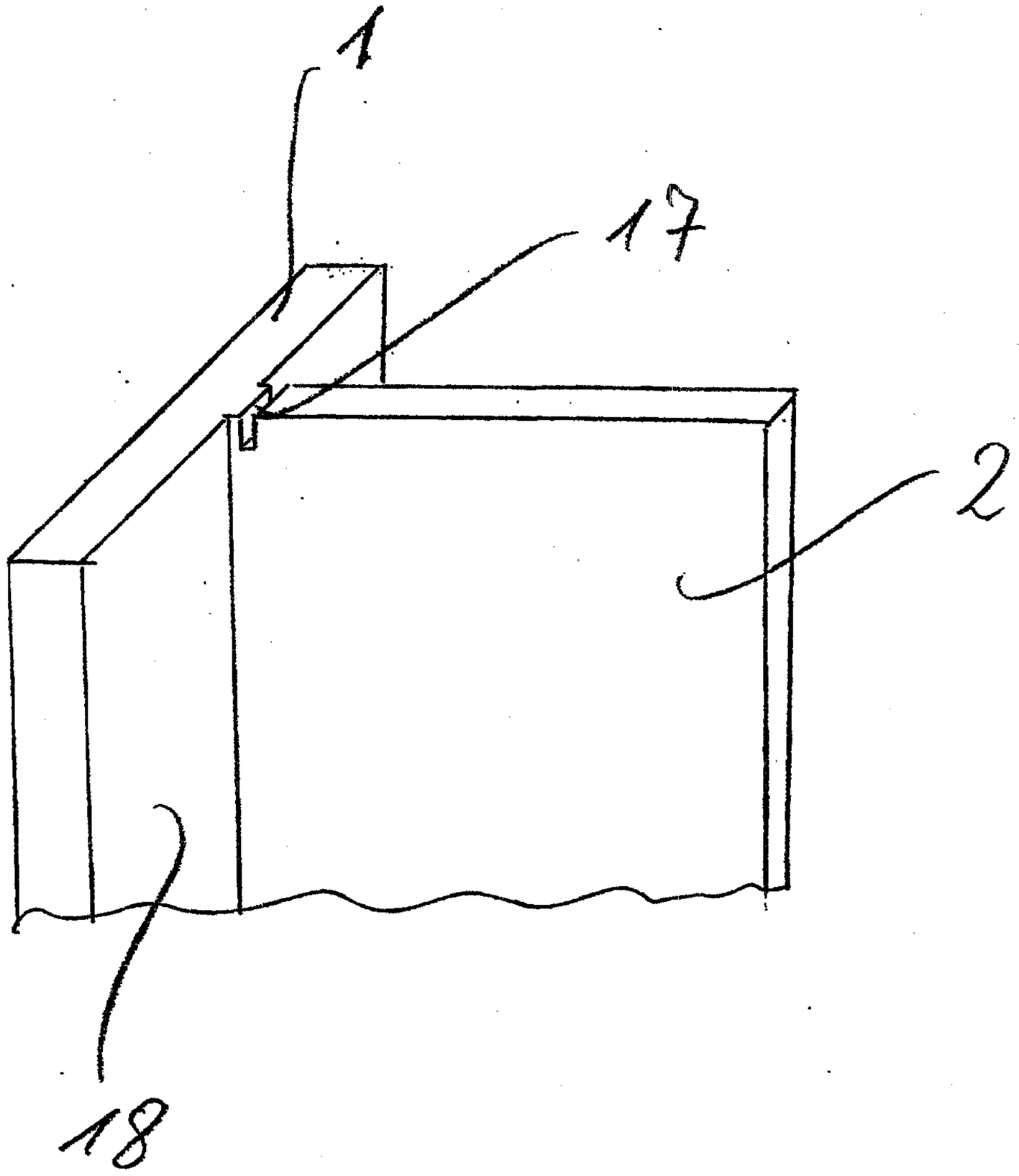


Fig. 2

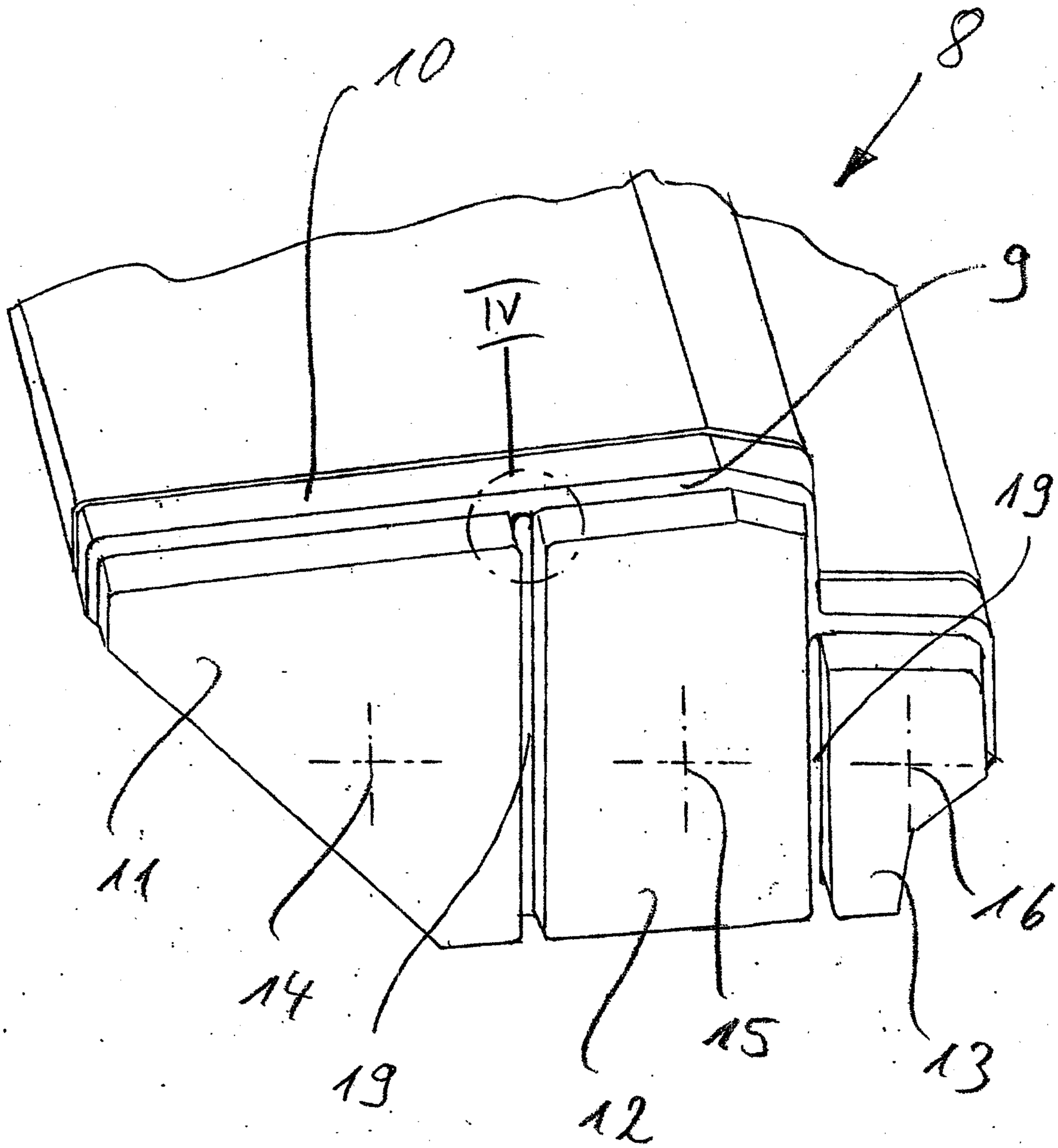


Fig. 3

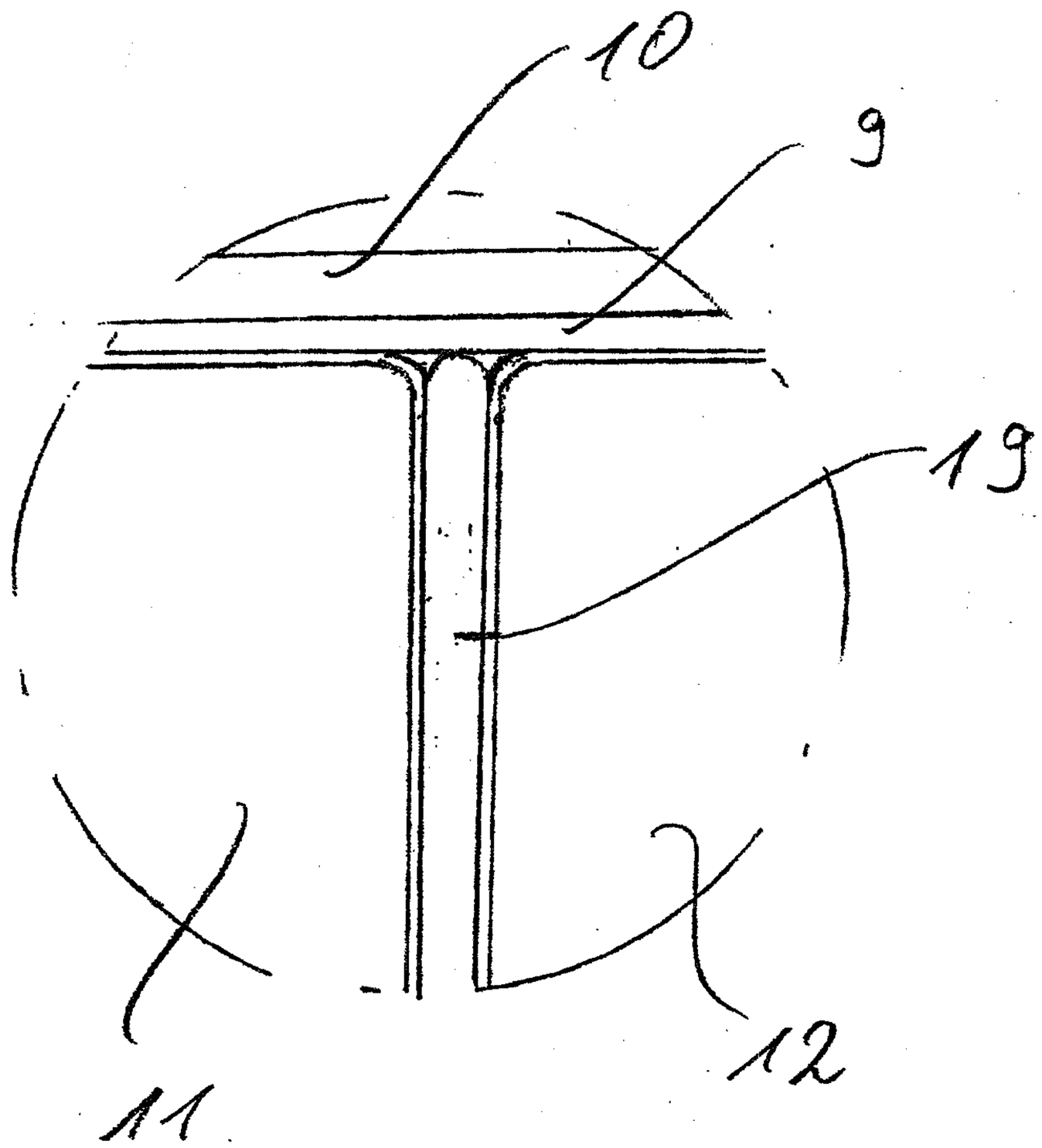
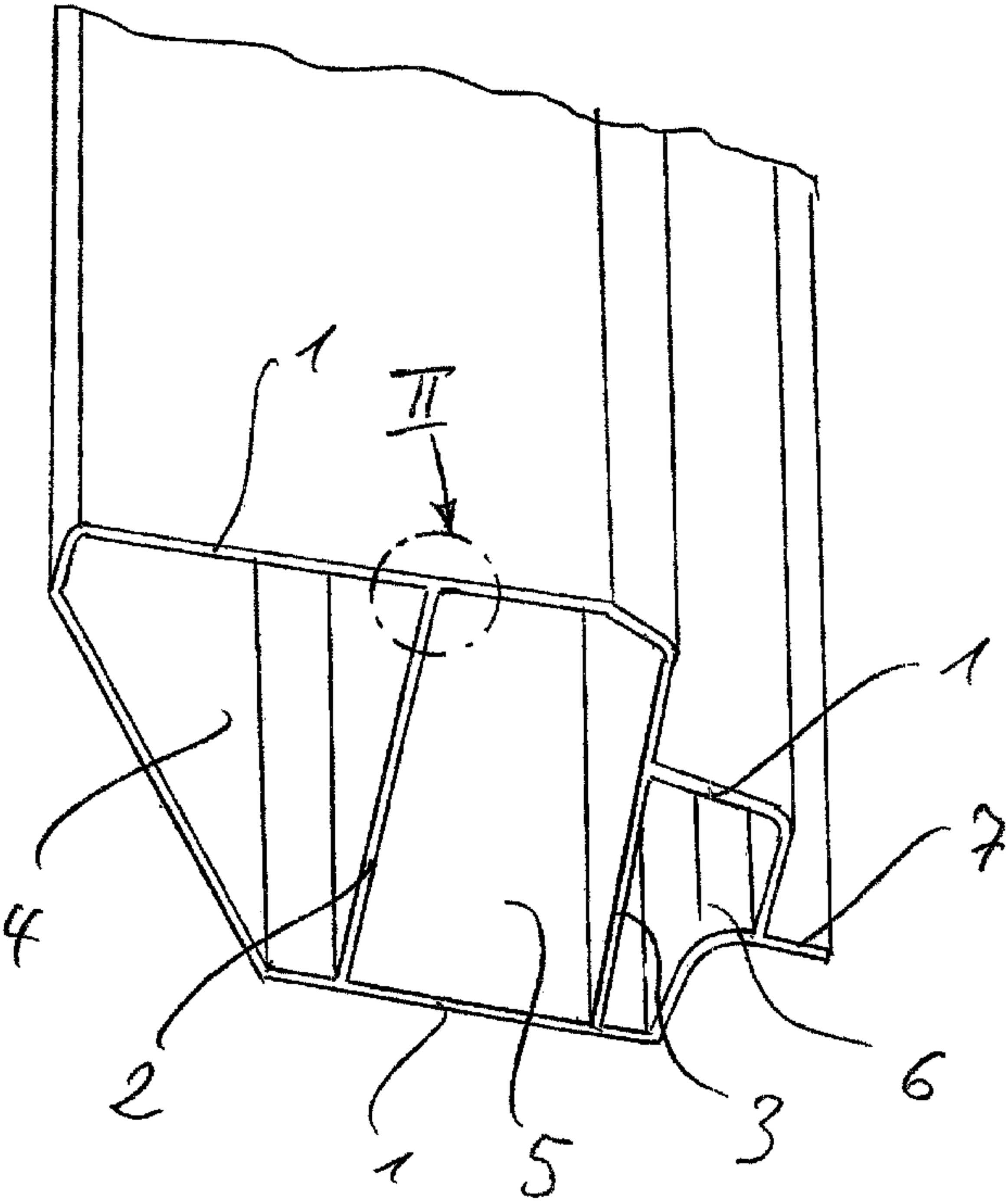


Fig. 4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