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(54) **CORNER JOINT FOR A LOG STRUCTURE AND METHOD FOR MAKING A LOG STRUCTURE'S CORNER JOINT**

(57) The invention relates to a corner joint for a log structure. In each log layer of the log structure the ends (12, 13) of the logs (10, 11) to be joined end-to-end at an angle difference define a common intersection line (14). Locking cuts (15, 16) deviating from the intersection line (14) are machined in the ends (12, 13), the profiles of which correspond to each other in shape. Starting from the re-entrant corner (17) defined by the logs (10, 11) to be joined at an angle difference, one log (10) includes a protrusion (18) extending outwards from the intersection line (14), there being a corresponding recess (19) in the other log (11). The invention also relates to a method for making a corner joint in a log structure.

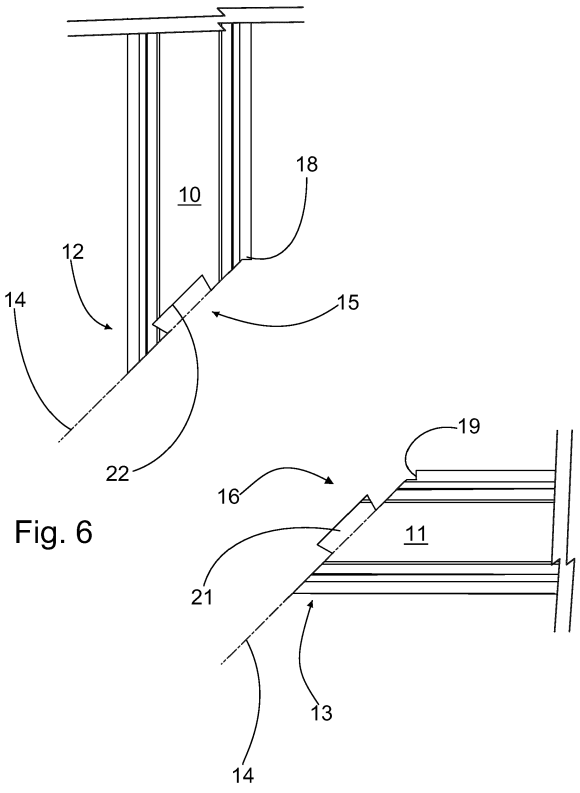

Fig. 6

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Description

[0001] The invention relates to a corner joint for a log structure, in each log layer of which the ends of the logs to be joined end-to-end at an angle difference define a common intersection line, and locking cuts, the profiles of which correspond to each other in shape, deviating from the intersection line are machined in the ends. The invention also relates to a method for making a log structure's corner joint.

[0002] Finnish utility model number 3865 discloses a so-called city-corner, which lacks the protruding parts characteristic of a traditional log structure. In addition, the logs to be joined to each other are on the same level. In other words, the overlapping of the log layers in the walls crossing over in a traditional log structure is missing. The corner joint is formed of locking cuts formed in the logs set end-to-end, the profiles of which are shaped to essentially correspond to each other. The log structure can then the designed freely, using, among other things, various angle values for the corner joint.

[0003] In the prior art, the ends of the logs to be joined together are mitred according to their common intersection line and locking cuts are formed in the evened ends of both logs. After installation, the logs dry and at the same time shrink, so that a vertical gap can form between the logs. Though the detriment is mainly aesthetic, it also affects the tightness of the corner joint. A cover board is generally recommended, especially in a re-entrant corner.

[0004] The invention is intended to create a new type of corner joint for a log structure, which is tighter than before, without detrimental gaps caused mainly by drying. The characteristic features of the corner joint according to the invention are stated in the accompanying Claim 1. In addition, the invention is intended to create a new type of method for forming a corner joint in a log structure, by means of which the corner joint is made tighter and more durable than previously. The characteristic features of the method according to the invention are stated in the accompanying Claim 11. In the corner joint according to the invention, locking cuts are formed in the end surfaces of the logs. In addition to this, in a re-entrant corner there are shapings deviating from the intersection line of the logs that are end-to-end. Thus, the finished re-entrant corner of the log structure is tight and neat, without an ever enlarging gap, despite the drying of the logs.

[0005] In the following, the invention is described in detail with reference to the accompanying drawings depicting some embodiments of the invention, in which

Figure 1 shows a top view of part of a log structure, in which there are corner joints according to the invention, deviating from a right angle,
Figure 2 shows the logs of the corner joint of Figure 1 separated from each other,
Figure 3 shows a perspective view of Figure 2,
Figure 4 shows a perspective view of part of a log structure, in which there are right-angled corner joints according to the invention,
Figure 5 shows the log of the corner joint of Figure 4 separated from each other,
Figure 6 shows a top view of Figure 5,
Figure 7 shows a partial enlargement of Figure 2.

[0006] The figures show various embodiments of the corner joint. Generally, the ends 12 and 13 of the logs 10 and 11 to be joined end-to-end at an angle difference in the log structure define a common intersection line 14. The intersection line is shown by a line of dots and dashes, but for reasons of clarity only in some of the figures. In the figures, one corner joint of one log layer is examined at a time. The same structure in principle is repeated in each corner joint of each log layer. In the corner joint, locking cuts 15 and 16 deviating from the intersection line 14, the profiles of which correspond to each other in shape, are machined in the ends 12 and 13 of the logs 10 and 11. In the embodiments shown, a so-called dovetail joint is used. According to the invention, starting from the re-entrant corner 17 defined by the logs 10 and 11 to be joined at a difference of angle, one log 10 includes a protrusion 18 extending outwards from the intersection line, to which a corresponding recess 19 is in the other log 11. When the logs shrink, the formation of an ever-enlarging gap is then avoided, when, thanks to the protrusion and the recess, the gap between the logs remains invisible from a normal angle of view. In practice, the log with the recess defines the edge of the gap, the gap caused by shrinkage remaining behind the edge. In addition, the edge creates a shadow-strip effect, which keeps the outwardly visible gap unchanged and with an even edge.

[0007] The protrusion 18 and recess 19 of the invention are formed in the log structure in the horizontal cross-section of each log 10 and 11, extending over the full height of each log 10 and 11. In the finished corner, the re-entrant corner will then be unified and even in appearance. In addition, the vertical gap in the re-entrant corner will remain the same, despite the settling of the logs.

[0008] In the invention, in the cross-sectional plane of the logs 10 and 11 the protrusion 18 and recess 19 define, together with the intersection line 14, a right-angled triangle. The shapings then become sufficiently steep for the gap caused by shrinkage to be certain to remain hidden. In addition, the shapings are easy to machine using a simple tool. In Figure 7, the triangles are shown by broken lines. In all the figures, the logs have been machined ready for installation.

[0009] The city corner is generally formed in massive laminated logs, the width of which can be as much as 300 mm. However, the hidden gap according to the invention can be achieved already with very small shapings. In the invention, the dimension 20 in the line of intersection 14 of the protrusion 18 and the recess 19 is 10 - 30 mm, preferably 15 - 25 mm (Figure 7). More generally, the said dimension is 5 - 10 % of the thickness of

the log. Compared to the size of the log, the shapings are small, but sufficient. The massiveness of the log permits shapings easily without material waste. The machining includes an additional stage, the costs of which, compared to the advantages gained, are, however, infinitesimal. In the figures, the logs and the shapings made in them are in real scale relative to each other.

[0010] The city corner according to the invention is suitable for diverse building. In the corner joint, the angle between the logs 10 and 11 lying end-to-end is 60° - 170°. In other words, a difference of angle between the logs of 120° - 10°. Thus, nearly all kinds of the corner structure are possible. The figures show a corner joint according to the invention formed of two logs 10 and 11 in their real dimensions. The same reference numbers are used for functionally similar components. In addition, the logs 10 and 11 are shown separated, in order to illustrate the corner joints and the locking cuts 15 and 16 (Figures 2 , 3, and 5). The locking cuts 15 and 16 are formed in the log structure in the horizontal cross-section of each log 10 and 11 to extend over the full height of each log 10 and 11. In addition, the locking cuts 15 and 16 are located in different log layers on the same vertical line, so that the same profile extends over the full height of the corner joint. The log structure can thus be assembled differing from the normal manner, from the top down. In addition, the structure permits the logs to be joined to be set steplessly at different levels in the height direction. The strength of the corner joint is thus independent of the mutual differences in the height of installation of the logs being joined.

[0011] In the city corner shown, the locking cuts 15 and 16 are arranged in the end surfaces of the logs 10 and 11 to be joined together end-to-end at a corner angle, as shown in Figure 3, for example. The portion of waste material in the machine stage is then small. What is more important, however, is the fact that in the finished corner joint, the end surface of the logs 10 and 11, in addition to the cut surfaces of the locking cuts 15 and 16 are set essentially end-to-end. Thus, the corner joint is tight and tidy, without the ends or end surfaces of the logs being visible at all. This prevents the end of the logs from becoming wet and thus softening. In addition, the appearance of the entire log structure is smooth and corner boards are not necessarily needed at all.

[0012] Generally, the end surfaces of the logs to be joined are preferably bevelled in such a way that the angle between the end surfaces on a vertical plane of the log and the perpendicular segment against the longitudinal axis of an imaginary log to the terminal point of the log on the inside of the corner is half of the angular deflection of the corner. The logs set end-to-end are then in principle bevelled to an equally small extent, which reduces the loss of raw material. At the same time, the logs' common intersection line is formed. In connection with the bevelling of the end surfaces, locking cuts 15 and 16 are machined in the logs 10 and 11. The locking cuts 15 and 16 have preferably dovetail profiles, which protrude from the intersection line 14. Thus, in the corner joint, there is a dovetail profile 21 in one log and a corresponding dovetail groove 22 in the other. Sufficient strength is achieved in the corner joint by means of the dovetail joint. In addition, a dovetail joint is relatively simple to make. A dovetail joint has also been shown to only tighten when the logs shrink as they dry. Due to its advantageousness, the embodiments concentrate on precisely dovetail joints. A flexible seal is preferably placed in the dovetail joint during erection.

[0013] In principle, the locking cuts can have a different shape too, but variation complicates the machining of the locking cuts. In practice, it is preferable to arrange the bottom surface of the locking cut's dovetail groove to be parallel to the log's end surfaces. In other words, the dovetail profile is made to be symmetrical. In addition, the dovetail profiles are machined in a different work stage to the evening of the log's ends. The locking cuts can then be made freely at the desired location and at the same time many logs of different width can be machined using the same machine tool. On the other hand, by means of asymmetrical shaping of the locking cuts the strength of the corner joint can be increased in a desired direction. In connection with the locking cuts, for example, vertical sealing grooves can also be machined in the log, into which sealing strip can be installed for the whole height of the log corner (not shown).

[0014] By means of the corner joint described, it is thus possible to form corners with a different angle in log structures. In practice, the logs are joined at angles of 60° - 170°. By means of the joint depicted, all those corners can be formed in one and the same way according to the invention. In principle, the angle range is even greater. The corner can be implemented in such a way that the logs overlap regularly at different heights in a traditional manner. Each log is then attached to two opposite logs. On the other hand, logs of the same height can be set at the same height. Such a corner joint is as durable as the previous one, but is easier to make. This is because the layers of logs of both walls bordering the corner can be started from the foundation with full-height logs. In addition, logs of different height can be used mixed in the same wall in the corner joint.

[0015] The figures show two example models of a corner joint according to the invention applied to a laminated log. In the models, the angle differences of the joined logs are 45° and 90°, which are common in log structures. The margins, tongues, or similar machined in the logs do not interfere with the making of the locking joints or the formation of the corner joint.

[0016] The size of the locking cuts depends on the dimensions of the log. The desired strength is created in the corner joint by dimensioning the locking cuts to be sufficient. The dimensioning of the locking cuts then becomes a normal strength calculation. In the case of a dovetail profile, enlarging the cutting angles and lengthening the dovetail profile reduces the transverse surface area of the dovetail profile. Thus must be taken into ac-

count in dimensioning. Generally, the depth of the profiles of the locking cuts is 8% - 12% of the width of the end surfaces, when a suitable strength will be achieved with the smallest amount possible of waste material.

[0017] The invention also relates to a method for making a corner joint in a log structure. In the method, the ends 12 and 13 of the logs 10 and 11 to be joined end-to-end at an angle difference are machined according to a common intersection line 14. In addition, locking cuts 15 and 16, the profiles of which are arranged to correspond to each other in shape, and which differ from the intersection line 14, are machined in the ends 12 and 13. According to the invention, starting from the outer surface of the log on the side 17 of the re-entrant corner defined by the logs to be joined at an angle difference, when machining the end in question in one log 10 a protrusion 18 is formed extending outwards form the intersection line 14, a recess 19 corresponding to which being formed in the other log 11. In the finished corner structure, the protrusion then goes into the recess, so that the edge of the recess defines a visible boundary. When the logs dry, the location of the edge may alter, without, however, enlarging the visible gap.

[0018] Figure 7 shows in principle the machining of the logs. According to the invention, the ends 12, 13 are levelled using the same tool 23 as was used to machine the protrusion 18 and the recess 19. More specifically, first of all the protrusion and recess are machined, after which the ends of the logs are levelled. In the method, the aforementioned definitions of the protrusion and recess are used. In practice, for example according to Figure 7, first the protrusion 18 is formed, after which using the same tool the end of the log is levelled with several movements of the tool 23. The tool is preferably a rectangular milling cutter. Figure 7 does not show the machining reservation demanded by the protrusion, which is, however, only a few millimetres. For the recess, a machining reservation is unnecessary. Once the tool 23 has been used to machine the protrusion 18 or recess 19, the end 12 and 13 of each log is levelled according to the intersection line 14. The locking cuts 15 and 16 are then machined after the protrusion 18 and recess 19 and the levelling of the ends 12 and 13 of the logs 10 and 11. The locking cuts can thus be machined at the desired location. A different tool 24, which is preferably a conical milling cutter, is used for machining the locking cuts. A precise shape is thus given to the locking cut at one time. In Figure 7, the tools 23 and 24 are shown schematically and, for reasons of clarity, smaller than their real size. The tool 23 can have a diameter of, for example 120 mm, in which case the protrusion and recess are machined with the every edge part of the tool. When machining the log end, the full width of the tool can then be exploited.

[0019] By applying the log corner and method according to the invention, it is possible to manufacture very different kinds of corner, without the durability of the corner joint suffering, or the number of work stages increasing. In addition, many kinds of raw material can be utilized. Thus, savings can be made in building costs. On the other hand, the corner joint can be widely varied, which increases freedom in the planning and design of log structures and buildings.

[0020] The logs end in the corner joint without the end surfaces becoming at all visible. The finished corner joint is thus neat and little material is wasted. In addition, by means of the corner joint according to the invention corners with a different angle can be formed over a wide range. At the same time, the gap in the re-entrant corner is hidden, making separate boards unnecessary. In the corner joint, the locking cuts are arranged in the log in such a way that the logs ending in the corner joints can be a different heights relative to each other. In addition, this relation can be steplessly adjusted. Thus, logs of different height can be easily joined to the corner joint. Correspondingly, logs of the same height can be set at the same height, without substantially weakening the corner joint.

Claims

1. Corner joint for a log structure, in each log layer of which the ends (12, 13) of the logs (10, 11) to be joined end-to-end at an angle difference define a common intersection line (14), and locking cuts (15, 16) deviating from the intersection line (14) are machined in the ends (12, 13), the profiles of which correspond to each other in shape, **characterized in that**, starting from the re-entrant corner (17) defined by the logs (10, 11) to be joined at an angle difference, one log (10) includes a protrusion (18) extending outwards from the intersection line (14), there being a corresponding recess (19) in the other log (11).

2. Corner joint according to Claim 1, **characterized in that** the protrusion (18) and the recess (19) are formed in the horizontal cross-section of each log (10, 11) in the log structure, extending to the full height of each log (10, 11).

3. Corner joint according to Claim 1 or 2, **characterized in that** the protrusion (18) and the recess (19) in the cross-sectional level of the log (10, 11) define, with the intersection line (14), a right-angled triangle.

4. Corner joint according to any of Claims 1 - 3, **characterized in that** the dimension (20) of the protrusion (18) and the recess (19) in the direction of the intersection line (14) is 5 - 10 % of the thickness of the log (10, 11).

5. Corner joint according to any of Claims 1 - 3, **characterized in that** the dimension (20) of the protrusion (18) and the recess (19) in the direction of the intersection line (14) is 10 - 30 mm, preferably 15 -

25 mm.

6. Corner joint according to any of Claims 1 - 5, **characterized in that** the angle between the logs (10, 11) set end-to-end in the corner joint is 60° - 170°.

7. Corner joint according to any of Claims 1 - 6, **characterized in that** the angle difference between the logs (10, 11) to be joined end-to-end in the log structure is 120° - 10°.

8. Corner joint according to any of Claims 1 - 6, **characterized in that** the locking cuts (15, 16) have dovetail profiles, which protrude from the intersection line (14).

9. Corner joint according to Claim 8, **characterized in that** the locking cuts (15, 16) are formed of a dovetail profile (21) and a dovetail groove (22) corresponding to it.

10. Corner joint according to any of Claims 1 - 9, **characterized in that** the depth of the profiles of the locking cuts (15, 16) is 8% - 12% of the width of the logs' end surfaces (10, 11).

11. Method for making a log structure's corner joint, in which method the ends (12, 13) of the logs (10, 11) to be joined end-to-end at an angle difference are machined according to a common intersection line (14), and locking cuts (15, 16) deviating from the intersection line (14) are machined in the ends (12, 13), the profiles of which are arranged to correspond to each other in shape, **characterized in that**, starting from outer surface of the log from the side of the re-entrant corner (17) defined by the logs (10, 11) to be joined at an angle difference, a protrusion (18) extending outwards from the intersection line (14) is formed in one log (10) when machining the end in question, a recess (19) corresponding to which is formed in the other log (11).

12. Method according to Claim 11, **characterized in that** the ends (12, 13) are evened using the same tool (23) as that with which the protrusion 18) and recess (19) are machined.

13. Method according to Claim 12, **characterized in that** the protrusion (18) or recess (19) are machined using the tool (23), after which the end (12, 13) of each log is evened according to the intersection line (14).

14. Method according to any of Claims 11 - 13, **characterized in that** the locking cuts (15, 16) are machined after the protrusion (18) and recess (19) as well as the evening of the ends (12, 13) of the logs (10, 11).

15. Method according to any of Claims 11 - 14, **characterized in that** a protrusion (18) and recess (19) according to any of Claims 2 - 5 are formed in the logs (10, 11).

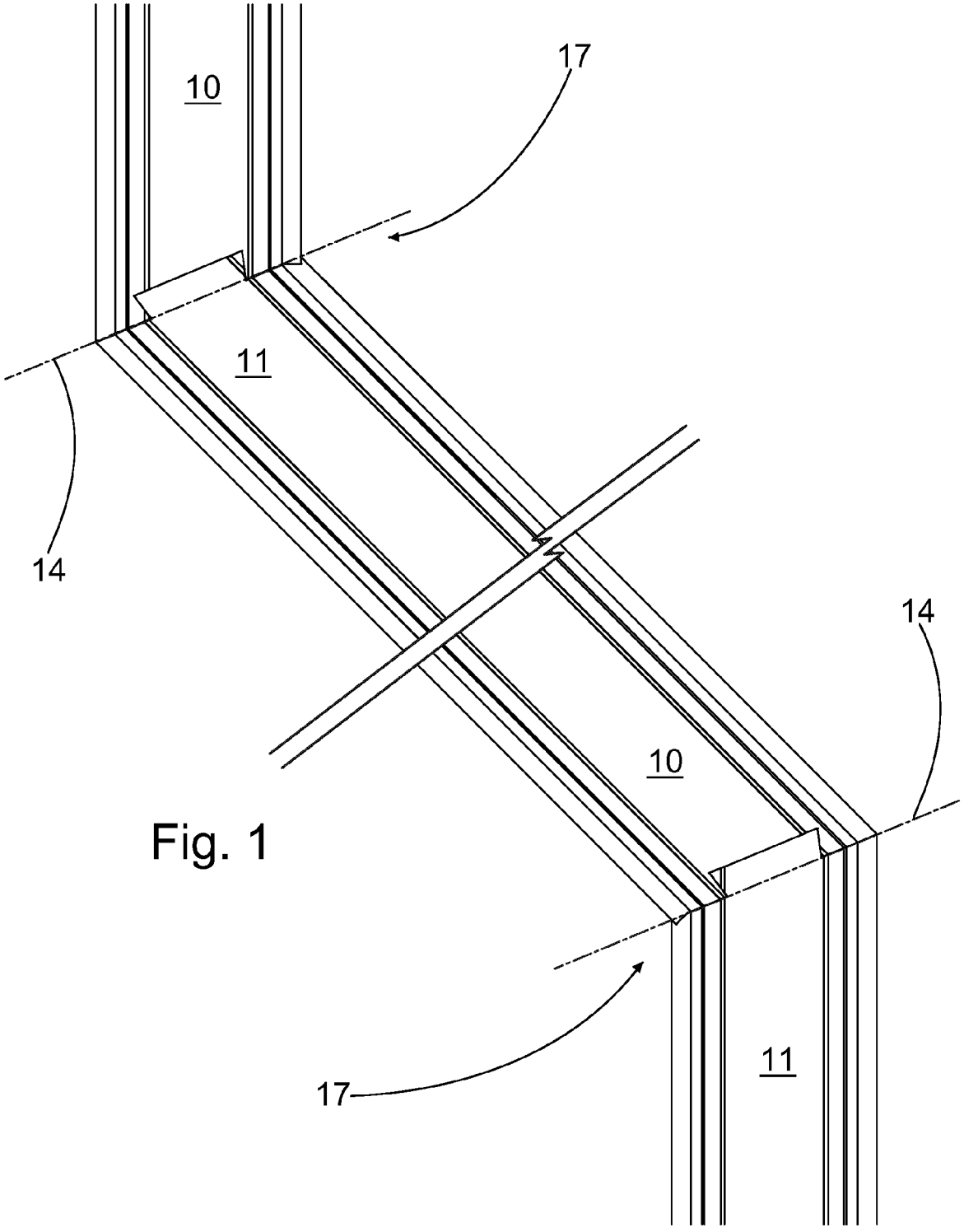


Fig. 1

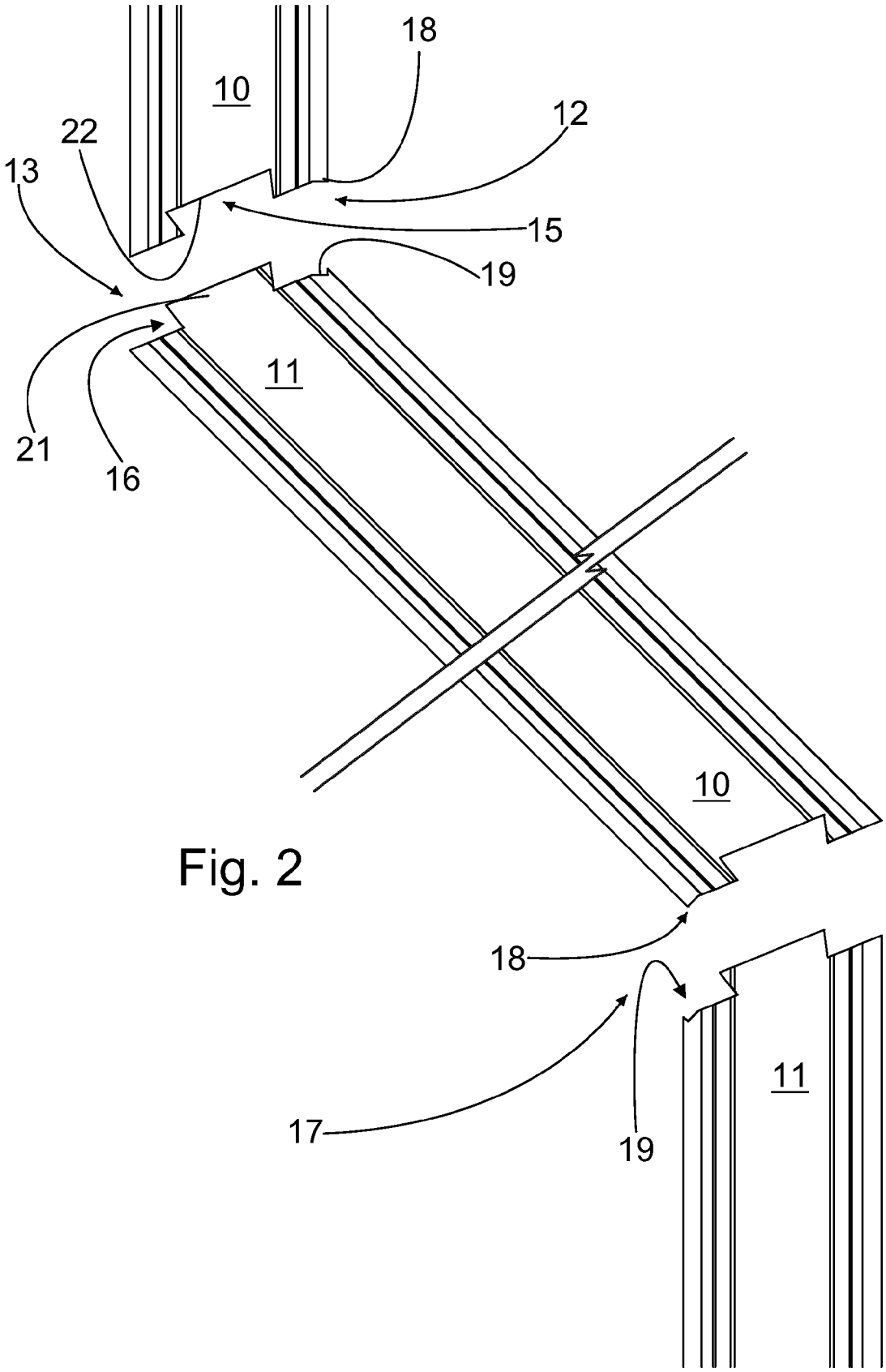


Fig. 2

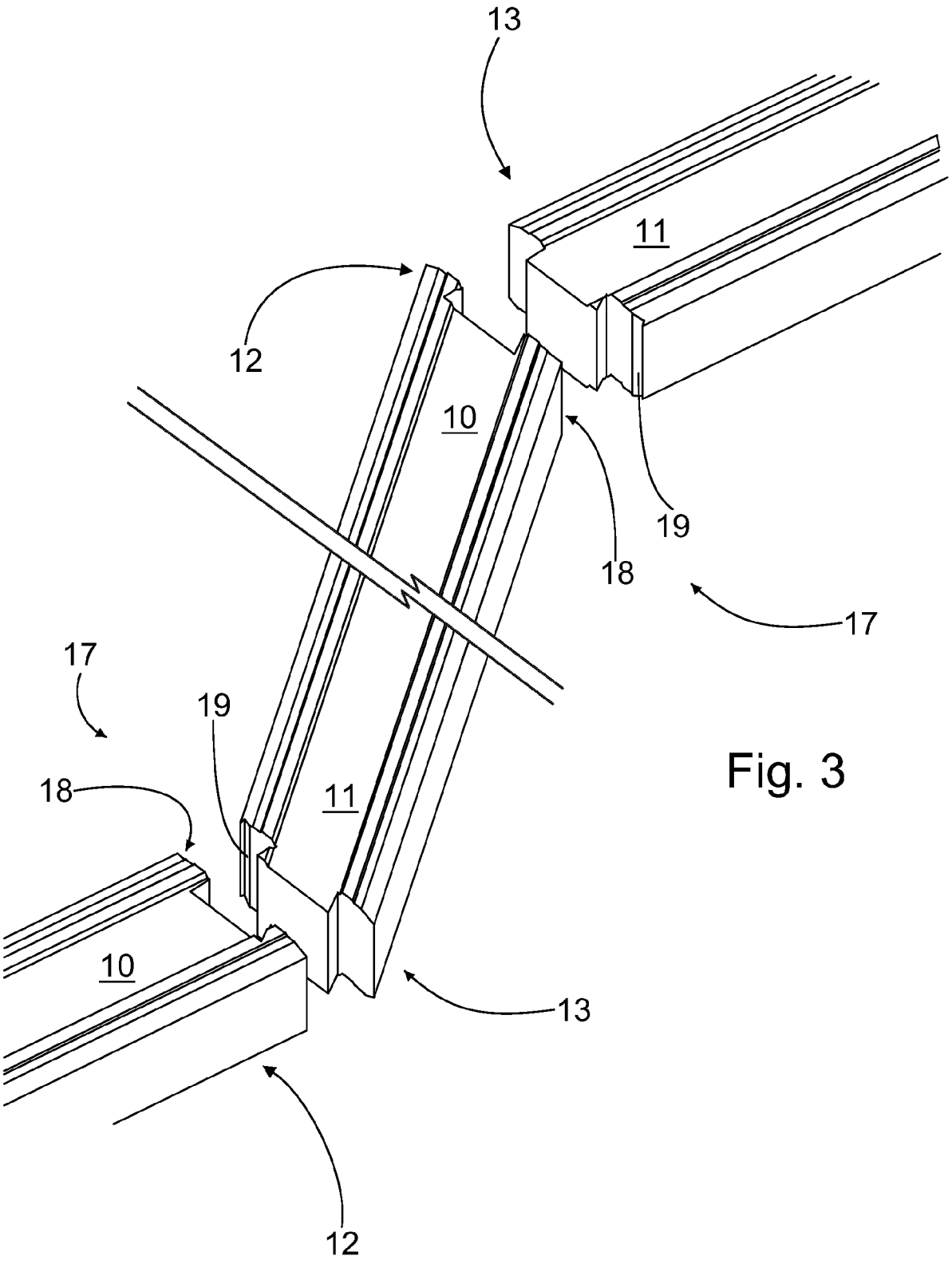
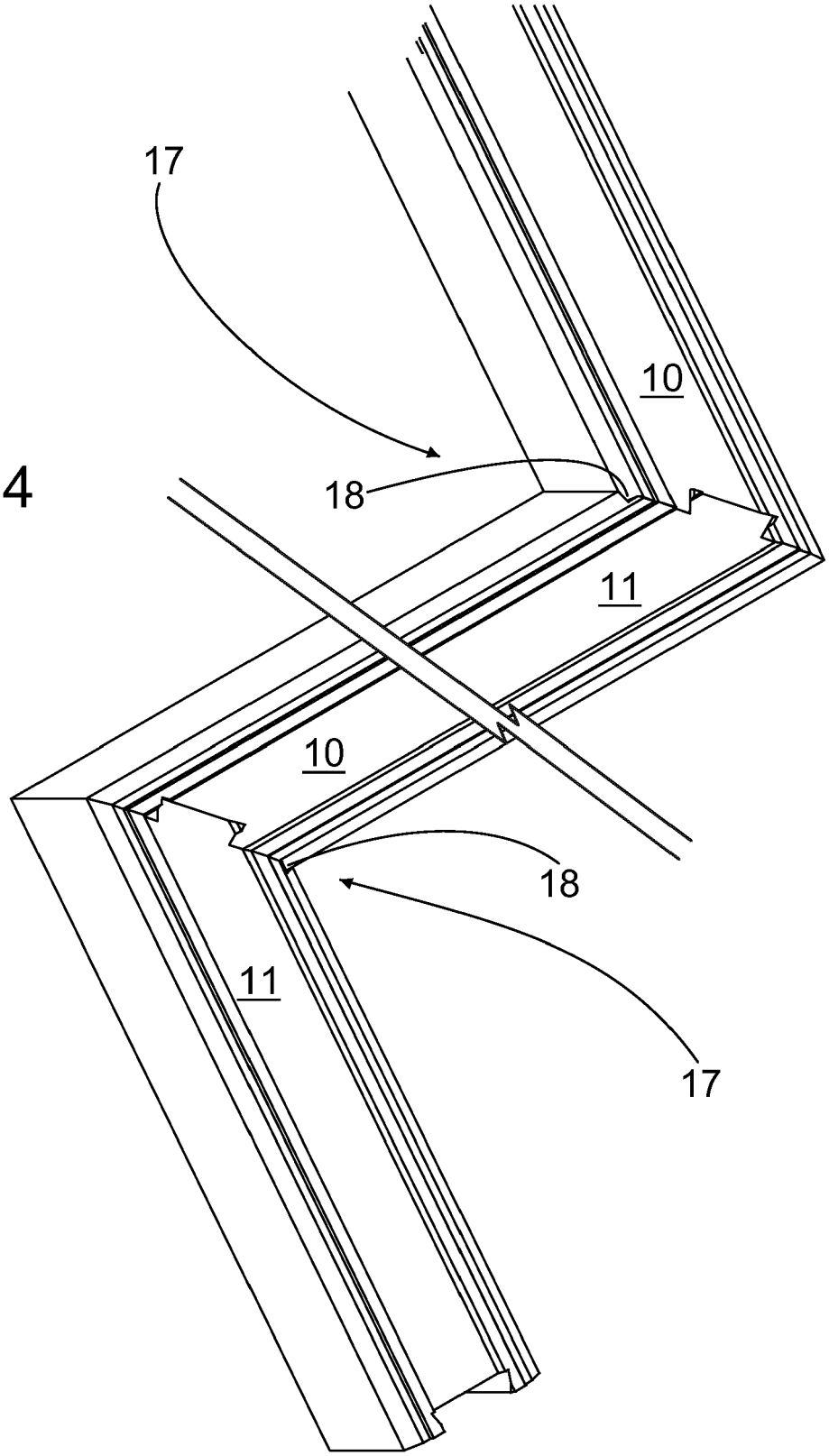


Fig. 3

Fig. 4



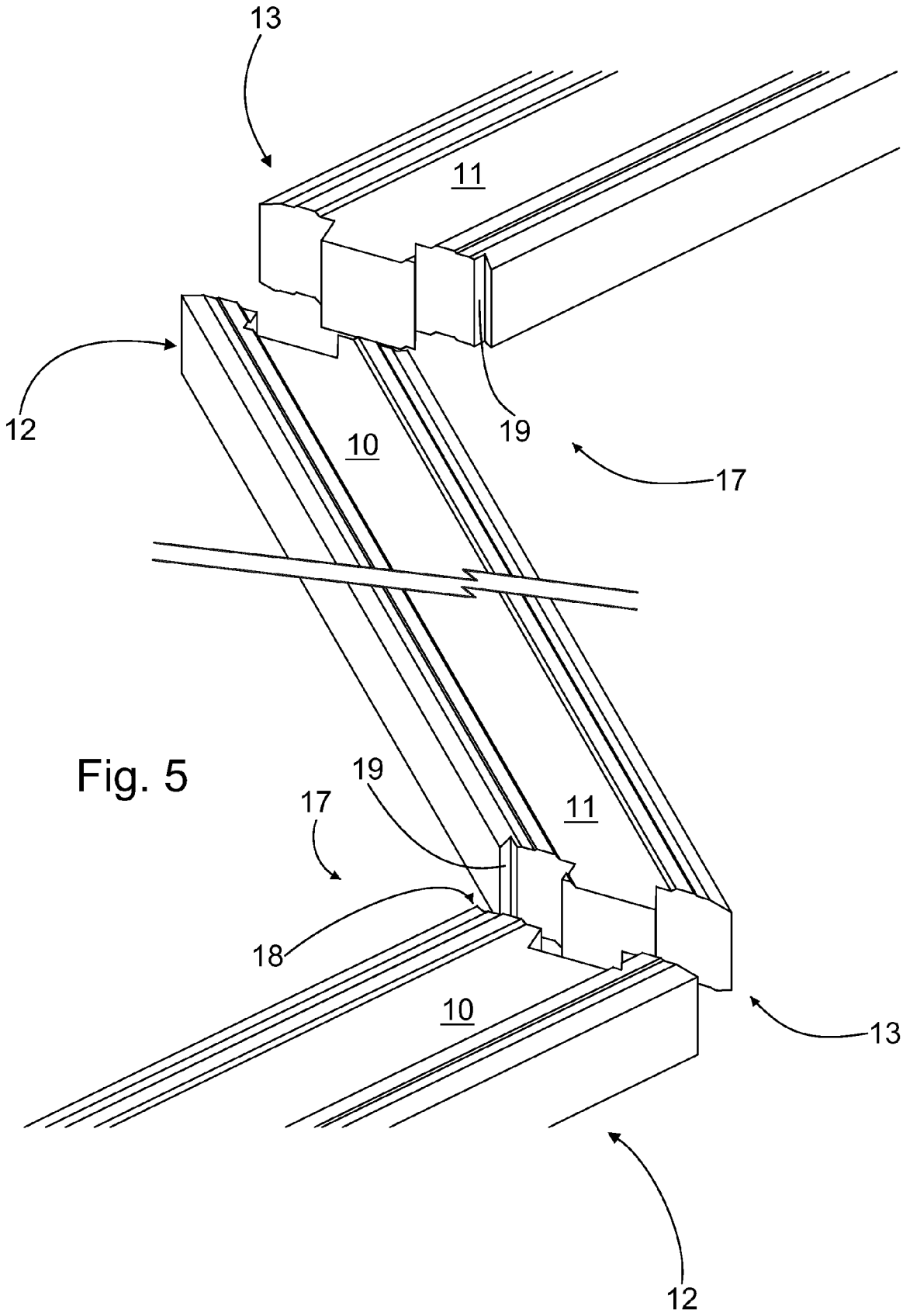


Fig. 5

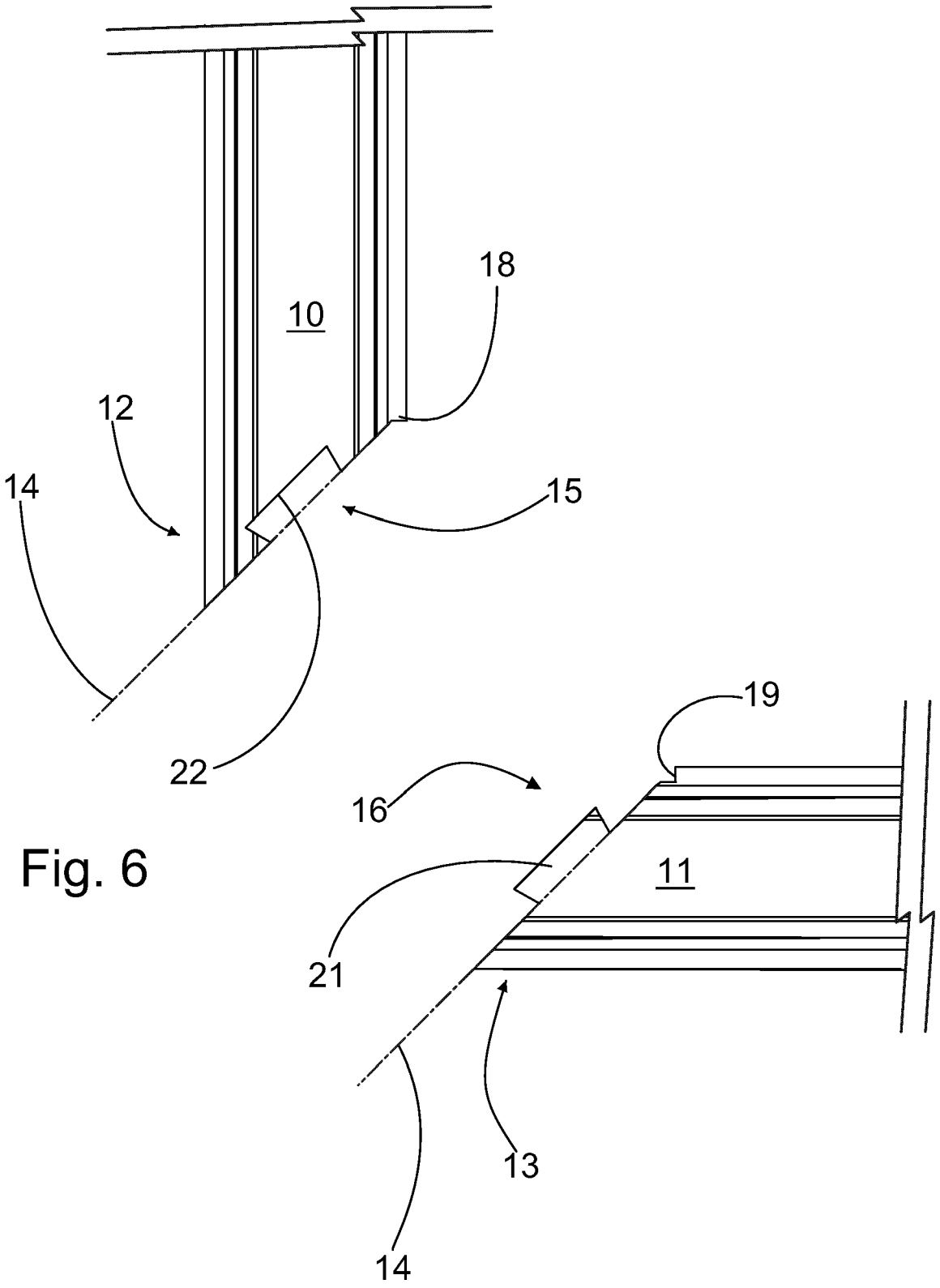


Fig. 6

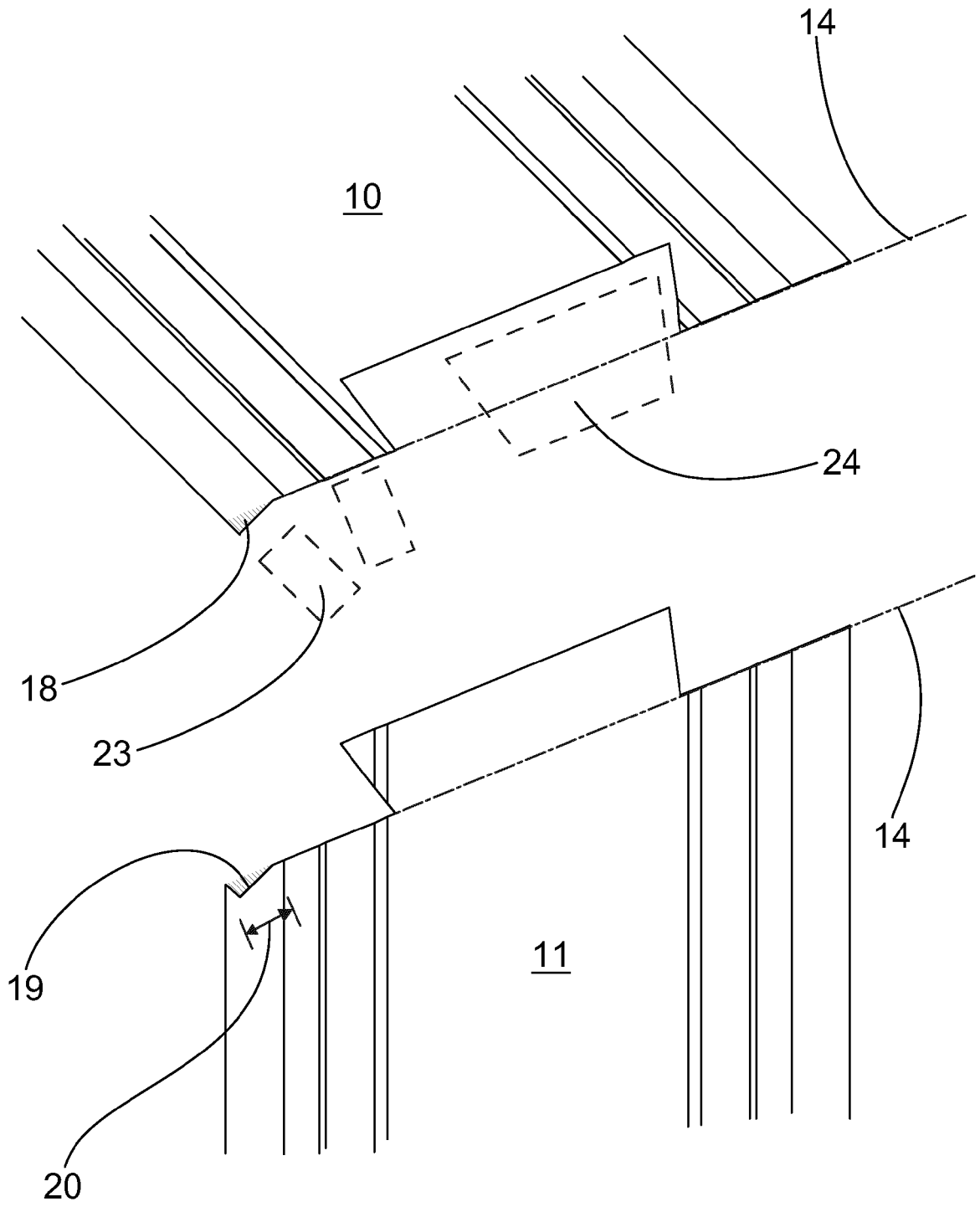


Fig. 7

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EUROPEAN SEARCH REPORT

Application Number
EP 15 16 7134

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	CA 2 234 732 A1 (MAITERTH KONRAD UWE [CA]) 14 October 1999 (1999-10-14) * page 6, line 14 - line 21; figure 5 * -----	1-7, 10-15	INV. E04B2/70 E04B2/08
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TECHNICAL FIELDS SEARCHED (IPC)
E04B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	9 September 2015	Porwoll, Hubert

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FR 2917105 A1	12-12-2008	NONE	
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Patent documents cited in the description

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