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## (54) System of roof supports for providing a dormer and a roof support as part of the system

(57) A roof truss assembly as part of a dormer on a main roof. Each roof truss has a horizontal lower flange (11), a first top flange (22) and a second top flange (23). The first and second top flanges are joined at an apex (26) by their respective first ends, forming an angle between them that corresponds to the angle of the main roof. At least one of the top flanges (22, 23) has its other end at a distance from the lower flange (11) and is joined with a pier (28, 29) at this other end, which pier is oriented essentially parallel to the lower flange. The pier (28, 29) is joined with a support (12, 13) at the end opposite of the top flange (22, 23), which support is oriented essentially across the pier. The support (12, 13) is joined with the lower flange (11) at that end which is opposite of the pier (28, 29), so that the pier and the support (12, 13) form a projection from the at least one top flange (11). Several piers on adjacent roof trusses will together form the framework for a dormer.

A roof truss assembly for forming a dormer in a hip roof is also described.

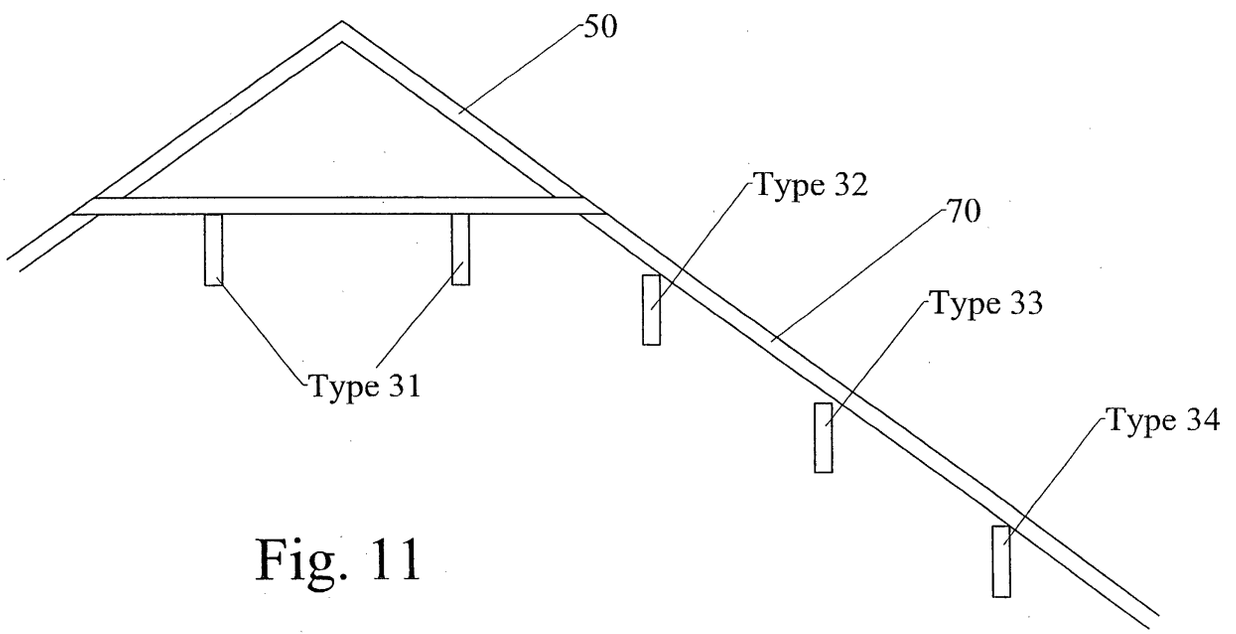


Fig. 11

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## Description

**[0001]** The present invention regards a roof truss assembly as part of a dormer on a main roof in accordance with the preamble of claim 1, a roof truss in accordance with the preamble of claim 6, and a roof truss assembly as part of a dormer on a hip roof in accordance with the preamble of claim 12.

**[0002]** Roof trusses are used as framework for roofs, and are today generally of the shape shown in Figure 1. The roof truss 1 consists of a, when assembled, horizontal lower flange 7 designed to rest on top of the framework of the walls of the house (not shown) and two top flanges 2 and 3 extending a an angle from each end 4 and 5 of the lower flange 1 to a common apex 6, which forms the ridge of the roof. Later, the underroof is provided on top of the top flanges 2 and 3, along with any roofing felt and roof tiles. Between the two top flanges 2 and 3 and between the lower flange 7 and the top flanges 2 and 3, there is also provided horizontal and vertical respectively, struts 16, 17a, 17b, 18a and 18b.

**[0003]** In order to build so-called dormers, i.e. additions that project from the inclined roof, preferably with a straight end wall in which windows may be inserted, these must today be built up rafter by rafter, a framework being constructed from two or more roof trusses, as is described e.g. in "Manual 38, wooden houses" from the Norwegian Building Research Institute. This is a laborious process, which is not only costly but also involves a certain amount of risk for the builders, who must spend a long time on the roof, move up and down, and carry out measurements, sawing and joining of rafters on the roof.

**[0004]** The present invention aims to provide a roof truss that greatly simplifies the work of building a dormer, thereby avoiding the above problems. This is achieved by the characteristics as stated in the characterising part of at least one of the appended claims 1, 6 and 12.

**[0005]** The present invention also gives, in addition to providing for a very simple and easy way of constructing dormers, further advantages, that provides for the realisation of dormers of a type that hitherto has not been possible. Since the roof load is distributed very evenly over the roof trusses, it is possible to move the outer wall of the dormer further out in the cornice. In a cornice of, e.g., 90 - 100 cm, the dormer wall may be moved as far out as 65 - 75 cm, and possibly even further. This provides for a larger space inside of the dormer. A sleeping chamber may this way be increased from, e.g., 7 $m^2$ to 10 $m^2$. The facade of the house will also become more attractive.

**[0006]** The invention will now be explained with reference to the embodiment indicated in the appended drawings, in which:

Figure 1 shows a conventional roof truss;

Figure 2 shows a lower part of a roof truss according to the present invention;

Figure 3 shows an upper part of a roof truss of a first type according to the present invention;

Figure 4 shows an upper part of a roof truss of a second type according to the present invention;

Figure 5 shows an upper part of a roof truss of a third type according to the present invention;

Figure 6 shows an upper part of a roof truss of a first type according to the present invention;

Figure 7 shows the positioning of roof trusses on a roof where roof trusses according to the present invention are employed;

Figure 8 shows a first type of a climbing truss for use with roof trusses according to the present invention;

Figure 9 shows a second type of a climbing truss for use with roof trusses according to the present invention;

Figure 10 shows the positioning of the climbing trusses according to Figures 8 and 9 on a roof truss according to the present invention;

Figure 11 is a cross section of the roof trusses according to the present invention;

Figure 12 shows a dormer in a hip roof and illustrates roof trusses according to the present invention for this;

Figure 13 is a side view of the roof trusses according to Figure 12;

Figure 14 shows an alternative embodiment to Figure 11, without climbing trusses; and

Figure 15 shows a house with a dormer.

**[0007]** A house such as shown in Figure 15 comprises a main roof H extending across the entire length of the house. A dormer K is formed on the main roof. Roof trusses are used to support the main roof H.

**[0008]** Figure 1 shows a conventional roof truss 1 consisting of a lower flange 7 and two top flanges 2 and 3, as explained above. This conventional roof truss will be used in cooperation with roof trusses according to the present invention.

**[0009]** Figure 2 shows a lower part 10 of a roof truss according to the present invention. The lower part 10 consists of a lower flange 1 land two, when the roof truss

is assembled, vertical supports 12 and 13. Inclined struts 14 and 15 are provided by the ends of each support 12 and 13, which inclined struts brace the supports 12 and 13 with respect to the lower flange 11. The inclined struts 14 and 15 have the same angle of inclination as the top flanges 2 and 3, respectively, in the conventional roof truss, and are joined to the lower flange 11 with the same spacing as the lower ends 4 and 5 of the top flanges 2 and 3. The length of the supports 12 and 13 will depend on which upper part is disposed on the lower part 10.

**[0010]** Figure 3 shows an upper part 34 of a roof truss of a first type according to the present invention. It comprises two inclined top flanges 22 and 23 joined at an apex 26. A pier 28 and 29 respectively, protrudes from the lower end 24 and 25 of each of the top flanges 22 and 23. In addition, a horizontal strut 116 is provided between the top flanges 22 and 23 and a vertical strut 117 between the horizontal strut 116 and one of the top flanges 22.

**[0011]** Figures 4 to 6 show roof trusses of the second, third and fourth type respectively, according to the present invention. The roof truss 33 of Figure 4, the roof truss 32 of Figure 5 and the roof truss 31 of Figure 6 are in principle constructed in the same manner as the roof truss 34 of Figure 3. Elements corresponding to elements in Figure 3 have therefore been given the same reference number.

**[0012]** The difference between the roof truss 34 (i.e. the upper part 34 of a roof truss according to the present invention) and the roof trusses 33, 32 and 31 (i.e. the upper parts 33, 32 and 31 respectively, of roof trusses according to the present invention) is that the top flanges 22 and 23 of the roof truss 34 are longer than the corresponding top flanges 22 and 23 of the roof truss 33. On the other hand, the piers 28 and 29 of the roof truss 33 are longer than those of the roof truss 34. The mutual length of the top flanges 22 and 23 and the piers 28 and 29 of the roof truss 33 are adjusted so that the overall width of roof truss 33 (i.e. the upper part 33 of a roof truss) is equal to the overall width of roof truss 34 (i.e. the upper part 34 of a roof truss).

**[0013]** Further, the roof truss 33 has longer top flanges 22 and 23 than the corresponding top flanges 22 and 23 of the roof truss 32. Analogous with the above, the roof truss 32 has longer piers 28 and 29 than the roof truss 33. The mutual length of the top flanges 22 and 23 and the piers 28 and 29 of the roof truss 32 are adjusted so that the overall width of the roof truss 32 (i.e. the upper part 32 of a roof truss) is equal to the overall width of the roof truss 33 (i.e. the upper part 33 of a roof truss), and also equal to the overall width of the roof truss 34.

**[0014]** Analogous with the above, the roof truss 32 has longer top flanges 22 and 23 than the corresponding top flanges 22 and 23 of the roof truss 31, and the roof truss 31 has longer piers 28 and 29 than the roof truss 32. The mutual length of the top flanges 22 and 23 and the piers 28 and 29 of the roof truss 31 are adjusted so that the overall width of the roof truss 31 (i.e. the upper part 31 of a roof truss) is equal to the overall width of the roof truss 32 (i.e. the upper part 32 of a roof truss), and also equal to the overall width of the roof trusses 34 and 33.

**[0015]** As the top flanges 22 and 23 of the roof truss 31 are very short, the roof truss 31 does not require a separate horizontal strut 116. Thus the piers 28 and 29 are carried across the entire width of the roof truss 31 as a continuous beam.

**[0016]** The upper parts 34, 33, 32 and 31 may be prejoined with respective lower parts 11 of the type shown in Figure 2. The lower part 11 is the same for all the upper parts, apart from the length of the supports 12 and 13 being adjusted to fit each of the upper parts 34, 33, 32 and 31. This adjustment is done in such a way that the top flanges 22 and 23 of the respective upper parts 34, 33, 32 and 31 remain in line with the inclined struts14 and 15 of the lower part 11. Thus the overall height of each complete roof truss will be the same.

**[0017]** The upper and lower parts may be already joined when the roof trusses leave the manufacturer. In order to simplify transport however, it may be more expedient to transport the upper and lower parts separately. The upper and lower parts can then be assembled on site. The length of the supports 12 and 13 of the lower parts may be adjusted in advance, or the supports may be cut to the correct length on site.

**[0018]** Figure 7 schematically shows a building with roof trusses, seen from above. Type 1 denotes roof trusses of a conventional type, such as the roof truss 1 shown in Figure 1. Type 2 denotes a roof truss (not shown) adapted to the construction of a staircase, but which for the purposes of this application may be considered principally to be identical to the roof truss 1 in Figure 1. Type 34 denotes a roof truss with the upper part 34 shown in Figure 3 and the lower part 11 according to Figure 2. Type 33 denotes a roof truss with the upper part 33 shown in Figure 4 and the lower part 11 according to Figure 2. Type 32 denotes a roof truss with the upper part 32 shown in Figure 5 and the lower part 11 according to Figure 2. Type 31 denotes a roof truss with the upper part 31 shown in Figure 6 and the lower part 11 according to Figure 2.

**[0019]** At each end 40 and 41 of the building, roof trusses of type 1 (or type 2) have been arranged for a certain portion of the length of the building. Approximately halfway along the length of the house there is a section 42 in which are arranged roof trusses according to the present invention. The roof trusses by the outermost ends of this section 42 are of type 34. On the inside of these are arranged respective roof trusses of type 33. On the inside of these again, are arranged respective roof trusses of type 32, and the two middle roof trusses in section 42 are of type 31. Preferably, the spacing between the roof trusses is equal.

**[0020]** Seen from the side, transverse to the direction of view in Figures 1 - 6, the section 42 looks as shown

schematically in Figure 11 (showing only a part of section 42). The outer end of each pier 29 of the roof trusses 34, 33, 32 and 31 has been shown. The lower part 11 has been left out. However the end of the top flange 3 of the most proximal conventional roof truss 1 has been shown. Here, one can see that the pier 29 of roof truss 34 lies at a somewhat higher level than top flange 2. Furthermore, the pier 29 of roof truss 32 lies at a higher level than the pier 29 of roof truss 33. Finally, the pier 29 of the two roof trusses 31 lie at a higher level than the pier of roof truss 32.

**[0021]** The piers 29 of roof trusses 32, 33 and 34 are arranged in a line. The piers 29 of roof trusses 31 lie slightly below this line.

**[0022]** Figure 8 shows a climbing truss 50, designed to straddle the piers 29 of the two central roof trusses 31, for use with the roof trusses 31, 32, 33 and 34 according to the present invention. The climbing truss 50 has the same general structure as a conventional roof truss, but is of a smaller size. It consists of a lower flange 51, two top flanges 52 and 53 and a vertical strut 54. The width of the climbing truss 50 corresponds to the distance between the roof trusses 32 in section 42. Figure 11 shows a climbing truss 50 placed on top of the piers 29 of the roof trusses 31. The top flanges 52 and 53 of the climbing truss have been extended by an extension rafter 70 down along the piers 29 of the roof trusses 32, 33 and 34, and if required, all the way down to the top flange 2 of the adjacent conventional roof truss 1.

**[0023]** Figure 10 shows the arrangement of several climbing trusses 50 along the piers 29 of the roof trusses 31.

**[0024]** Figure 9 shows a further type of climbing truss 60. This climbing truss 60 is even smaller than climbing truss 50. It consists of a lower flange 61 and two top flanges 62 and 63. This climbing truss 60 is used between the pier 29 and the apex 26, and is placed approximately halfway along the top flange 22 or 23, to straddle the top flanges 22 or 23 of the two central roof trusses 31. In this manner, the apices of the climbing trusses 50 and 60 lie along a horizontal line.

**[0025]** When the roof trusses 1, 34, 33, 32 and 31, the climbing trusses 50 and 60 and the extension rafters 70 have been assembled, the underroof can be laid. The underroof may consist of conventional boards or subroof plates.

**[0026]** Instead of using a climbing truss as shown in Figures 8 and 9, it is possible to construct a centre roof truss in such a manner as to make it reach all the way up to the ridge of the dormer. This roof truss will then assume the general shape of a rectangle, where the piers are in one piece, and where there is no top flange in the roof truss. Then inclined rafters can be laid on top of the piers from the centre roof truss and down to the top flange on the most proximal conventional roof truss. The further construction is as mentioned below.

**[0027]** As an alternative to climbing trusses, it is also possible, as shown in Figure 14, to build up in the conventional manner from the piers 29 of the centre roof trusses 31 to a level at which rafters 400 and 401 are arranged. Rafters 402, 403, 404 are also laid on the piers 29 of the roof trusses 32, 33 and 34, to leave the rafters 401 - 404 in a line.

**[0028]** Plyboards 405 (e.g. 12 mm thickness) and roofing felt is laid on top of these rafters. A board 406 is fitted at the end of the dormer.

**[0029]** In this manner, a large space is provided between the lower edge of the piers 29 and the upper edge of the rafters 401-404, which may be filled with insulating material.

**[0030]** The above shows and describes roof trusses for building a dormer on both sides of a slanting roof. Naturally, it is possible to build a dormer on one side of the roof only. In this case, the roof trusses according to the invention would only have piers on one side of the apex 26, while the other side would be constructed with a continuous top flange from the apex 26 to the lower flange 11. Further, the dormer may also have a different shape from that of a slanting roof, e.g. a straight roof. In this case, all the piers would be arranged at the same level. Here, all the roof trusses forming the dormer can be identical. Preferably, the piers will then not be completely horizontal, but will have a slight slope from the top flange down towards the support.

**[0031]** Figures 12 and 13 schematically show the construction of roof trusses as part of a dormer on a hip roof. The roof trusses 80 that are to form the dormer generally comprise a horizontal lower flange 81 and a horizontal top flange 82, which top flange is connected to the lower flange 81 via inclined rafters 83 and 84, which have the same angle of inclination as that of the conventional roof trusses placed further in on the roof.

**[0032]** The top flange 82 is broken by an addition 85, so that the top flange consists of two parts 82a and 82b. The addition 85 generally comprises two inclined rafters (top flanges) 86 and 87 joined at an apex 88. Opposite of the apex 88, these inclined rafters 86 and 87 may either be connected directly to the respective two parts 82a and 82b of the top flange 80, or be connected to the top flange 80 via respective vertical supports 89 and 90, according to the desired shape of the dormer.

**[0033]** As shown in Figure 13, the roof trusses that form the dormer have different shapes, the roof truss 80 most proximal to the end of the building exhibiting a relatively small distance between the top flange 82 and the lower flange 81 and a relatively high addition 85. In the inside roof truss 100, there is a greater distance between the top flange 102 and the lower flange 101. In this case, the addition 105 has approximately the same height as the addition 85, so as to form a slope between the apices 86 and 106.

**[0034]** The roof truss 200 further in has an even greater distance between the top flange 202 and the lower flange 201, while the addition 205 is of approximately the same height as the addition 105. Preferably, the

slope 91 between the apices 206, 106 and 86 form the same angle as the hip 92.

**[0035]** The innermost roof truss 300 has an even greater distance between the top flange 302 and the lower flange 301, while the addition 305 has a reduced height, to leave the apex 306 in line with the apex 206. The next roof truss has the same shape as a conventional roof truss for a hip roof, while the further roof trusses are of the conventional type as shown in Figure 1.

## Claims

1. A roof truss assembly as part of a dormer on a main roof, comprising a plurality of roof trusses, each of which has a lower flange (11) which, when the roof truss is assembled, is mainly horizontal, a first top flange (22) and a second top flange (23), where the first and second top flanges are joined at an apex (26) by their respective first ends, forming an angle with each other that corresponds to the angle of the main roof, and where the other end of one of the first or second top flange (22, 23) may possibly be joined with the lower flange (11) at one end of this, **characterised in that** the roof trusses are prefabricated for forming the dormer, **in that** at least one of the top flanges (22, 23) has its other end at a distance from the lower flange (11) and is joined with a pier (28, 29) at this other end, which pier is mainly oriented parallel to or slightly inclined in relation to the lower flange, that the pier (28, 29), at that end which is opposite the top flange (22, 23), is joined with a support (12, 13) oriented mainly across the lower flange, and that the support (12, 13), at that end which is opposite of the pier (28, 29), is joined with the lower flange (11), so that the pier and the support (12, 13) form a projection from the at least one top flange (11).

2. A roof truss assembly according to Claim 1, **characterised in that** the roof trusses have piers (28, 29) at different distances from the lower flange (11), so that piers on roof trusses that are designed to form a dormer, seen in a parallel direction to the piers, together form a convexity that essentially coincides with the course of the roof on the dormer.

3. A roof truss assembly according to one of the preceding claims, **characterised in that** two adjacent roof trusses (31) with piers (28, 29) arranged at the same distance from the lower flange (11) form a top level in the dormer, and that at least one climbing truss (50, 60) with a generally triangular shape is designed to be arranged on top of and across the piers (28, 29).

4. A roof truss assembly according to Claim 3, **characterised in that** an extension (70) of the top flanges (52, 53; 62, 63) of the climbing truss (50, 60) lies on top of the piers (28, 29) of the outside roof trusses.

5. A roof truss assembly according to Claim 1 or 2, **characterised in that** rafters (400 - 404) are arranged over the piers (29), immediately on top of or at a distance from the piers (29), that the rafters (400 - 404) essentially lie along a line parallel to the course of the roof of the dormer, and that an underroof is placed on top of the rafters (400 - 404).

6. A roof truss as part of a system for forming a dormer, comprising a lower flange (11) that, when the roof truss is assembled, is essentially horizontal, a first top flange (22) and a second top flange (23), where the first and second top flanges are joined at an apex (26) by their respective first ends, forming an angle with each other that corresponds to the angle of the main roof, and where the other end of one of the first or second top flange (22, 23) may possibly be joined with the lower flange (11) at one end of this, **characterised in that** the roof trusses are prefabricated for forming the dormer, **in that** at least one of the top flanges (22, 23) has its other end at a distance from the lower flange (11) and is joined with a pier (28, 29) at this other end, which pier is oriented essentially parallel to or slightly inclined in relation to the lower flange, that the pier (28, 29), at that end which is opposite the top flange (22, 23), is joined with a support (12, 13) oriented essentially across the lower flange, and that the support (12, 13), at that end which is opposite the pier (28, 29), is joined with the lower flange (11), so that the pier and the support (12, 13) form a projection from the at least one top flange (11).

7. A roof truss according to Claim 6, **characterised in that** the lower flange (11) projects outside the support (12, 13), and that a strut (14, 15) is provided between the projecting end of the lower flange (11) and the support, which strut (14, 15) is in line with the top flange (22, 23), which is arranged on the same side of the apex (26).

8. A roof truss according to one of the Claims 6 - 8, **characterised in that** the roof truss comprises an upper part (34, 33, 32, 31) that is mainly constituted by the top flanges (22, 23) and the pier/piers (28, 29), and a lower part (10) that is mainly constituted by the lower flange (11) and the support/supports (12, 13), and that the upper part (34, 33, 32, 31) and the lower part (11) are separate parts designed to be joined on site.

9. A roof truss according to Claim 8, **characterised in that** the support(s) (12, 13) of the lower part (10) has a length corresponding at least to that which is

needed for joining with the upper part (31) that has a pier (12, 13) designed to be arranged at the greatest distance from the lower flange (11), and that the support/supports (12, 13) are cut on site for the upper part (34, 33, 32, 31) to which it is to be joined.

**10.** A roof truss according to one of the Claims 6 - 9, **characterised in that** the roof truss has only one pier (28), and that the top flange (23) on the opposite side of the apex (26) extends all the way down to the lower flange (11).

**11.** A roof truss according to one of the preceding Claims, **characterised in that** the support (12, 13) is joined to the lower flange (11) close to the end of the lower flange (11).

**12.** A roof truss assembly as part of a dormer on a hip roof, comprising a plurality of roof trusses, each of which has a lower flange (81, 101, 201, 301) that, when the roof truss is assembled, is essentially horizontal, a top flange (82, 102, 202, 302) oriented to be essentially parallel to the lower flange (81, 101, 201, 301) and joined with a respective inclined rafter (83, 84) at the ends, which inclined rafters (83, 84) are joined with a respective end of the lower flange (81, 101, 201, 301),
**characterised in that** the roof trusses are prefabricated for forming the dormer, **in that** the top flange (82, 102, 202, 302) is split into at least two parts (82a, 82b) between its ends, so as to form a free section between the two parts (82a, 82b), and that an addition (85, 105, 205, 305) is provided across the free section, which addition is connected to the parts of the top flange (82a, 82b).

**13.** A roof truss assembly according to Claim 12, **characterised in that** the addition has a generally triangular shape, with two top flanges (86, 87) joined at an apex (88) and, by its ends opposite the apex (88), joined with a respective part (82a, 82b) of the top flange (82), possibly via a respective support (89, 90).

**14.** A roof truss assembly according to Claim 12 or 13, **characterised in that** the top flange (82, 102, 202, 302) of roof trusses that are to make up the dormer have an increasing distance to the respective lower flange (81, 101, 201, 301) from the end of the building, and that the addition (85, 105, 205, 305) has a height that, together with the distance between the lower flange (81, 101, 201, 301) and the top flange (82, 102, 202, 302), constitutes the height ofthe dormer from the framework of the building.

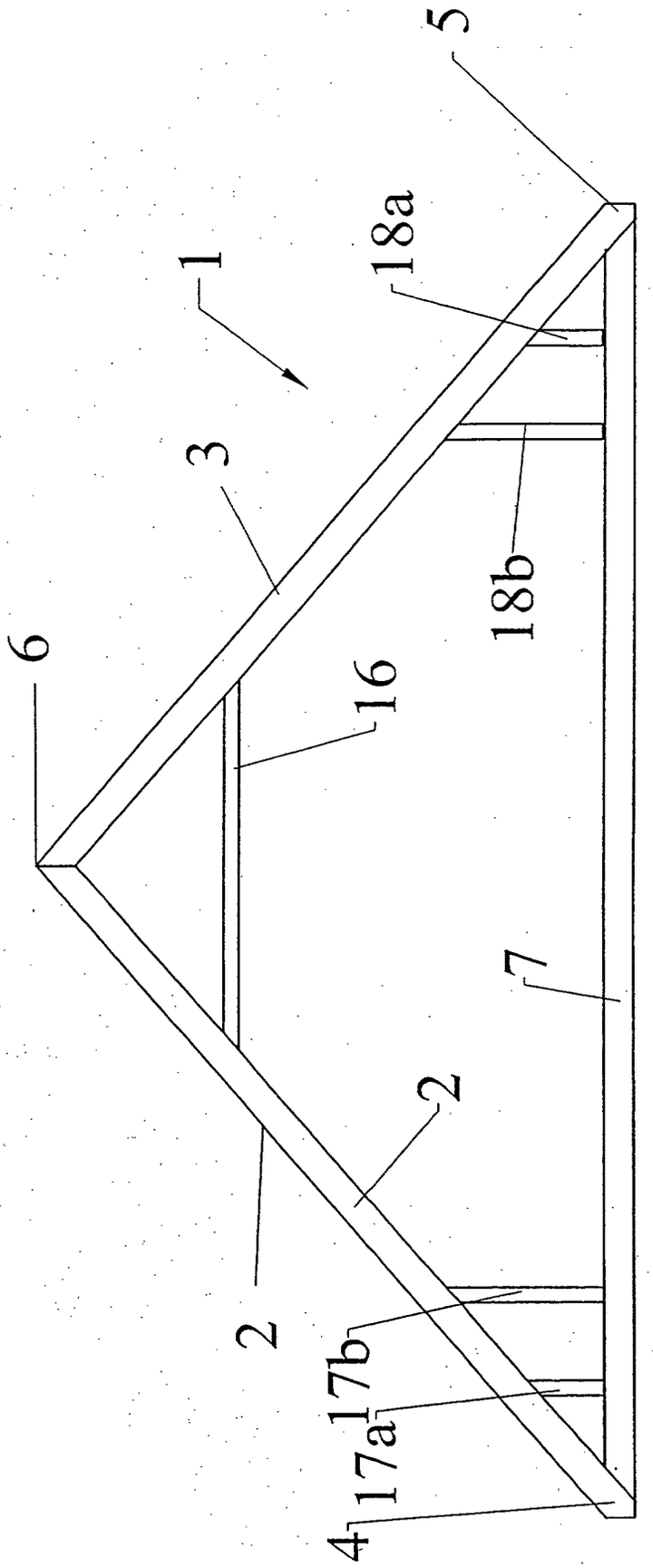



Fig. 1

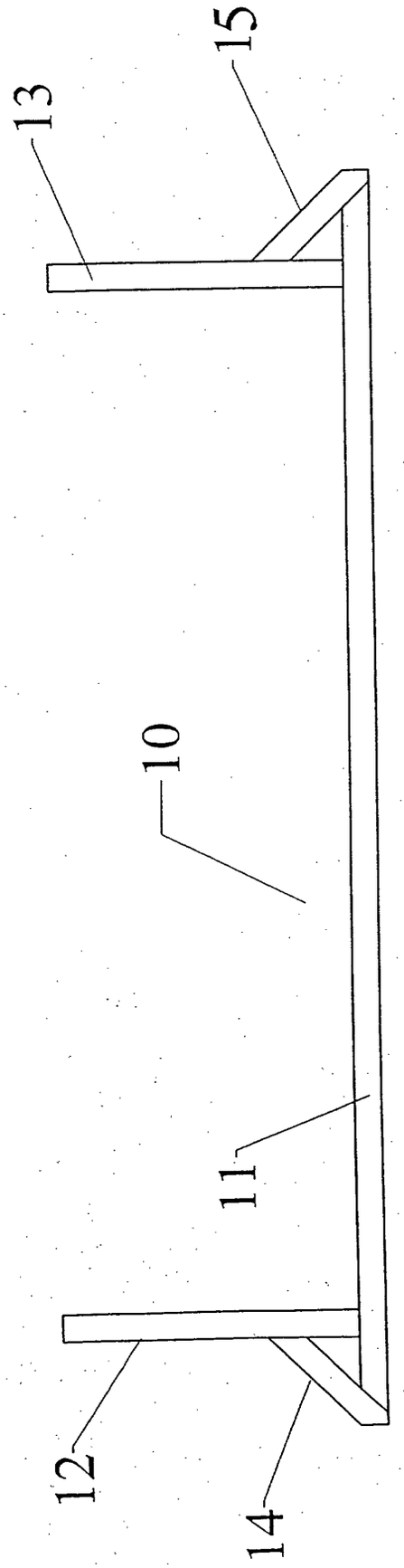



Fig. 2

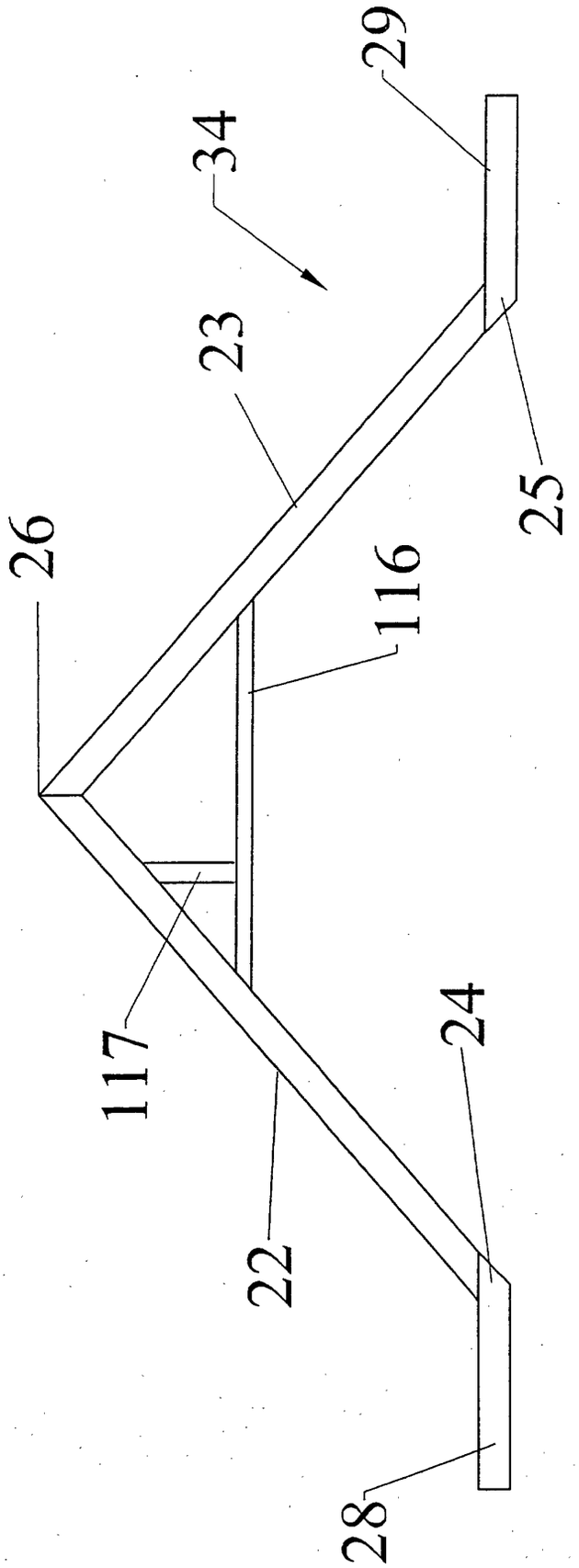



Fig. 3

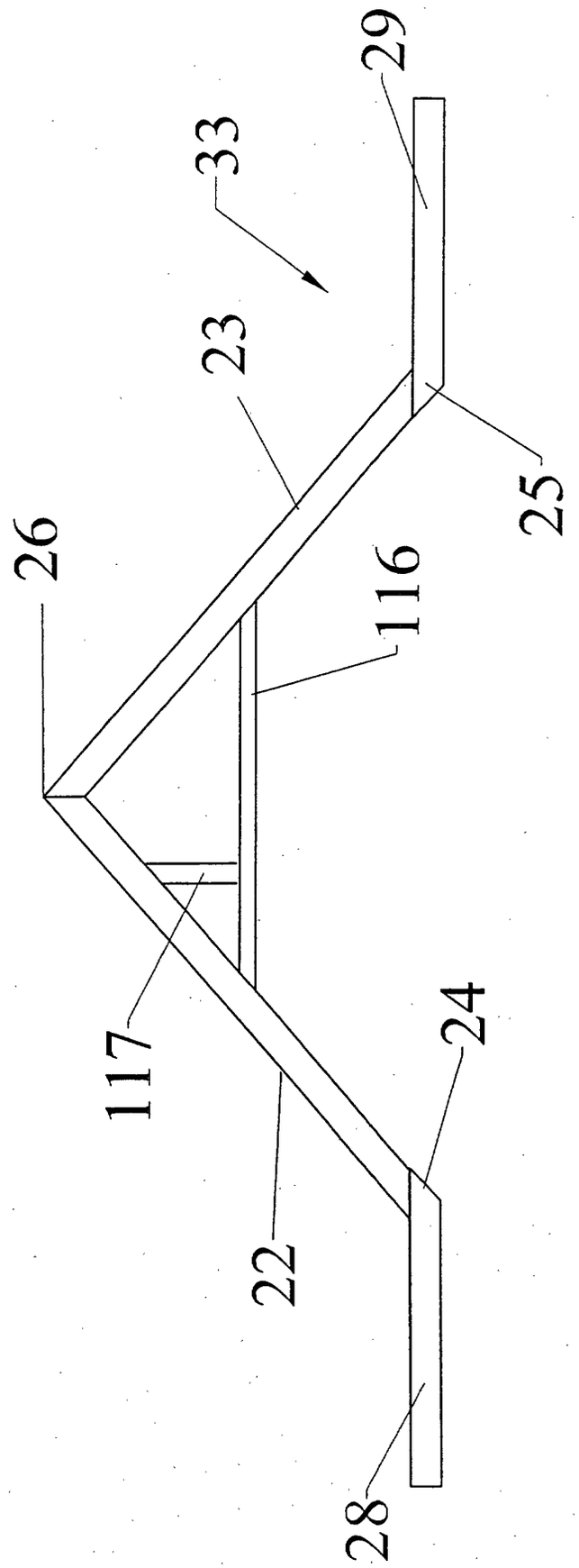



Fig. 4

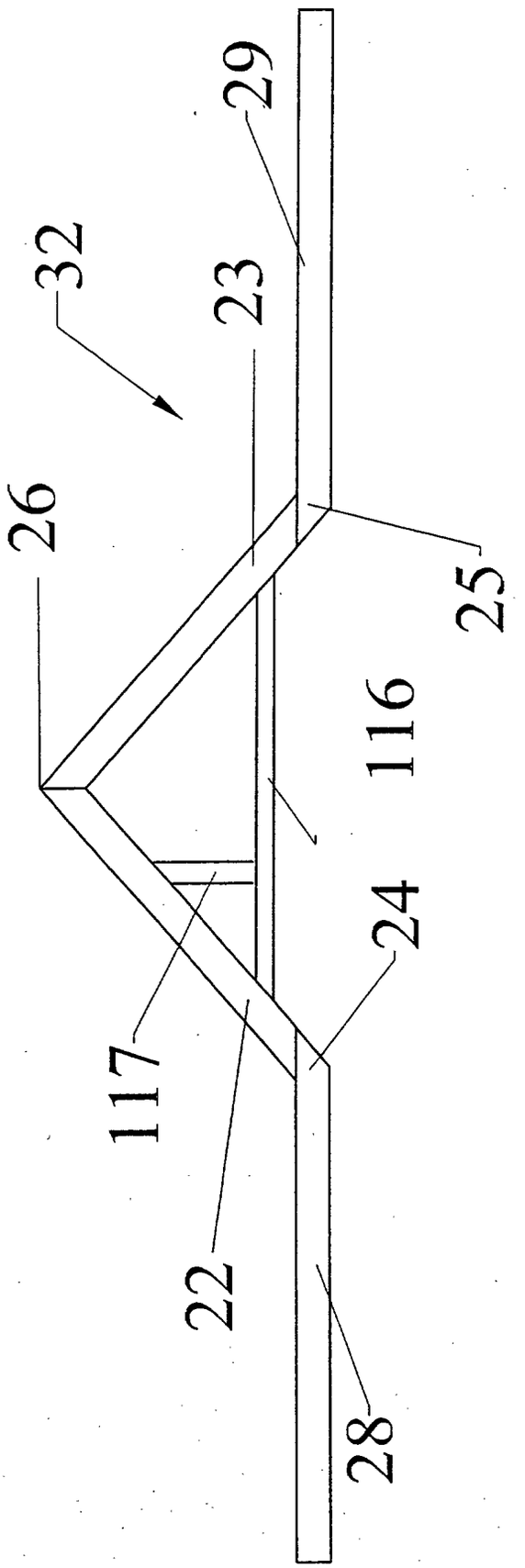



Fig. 5

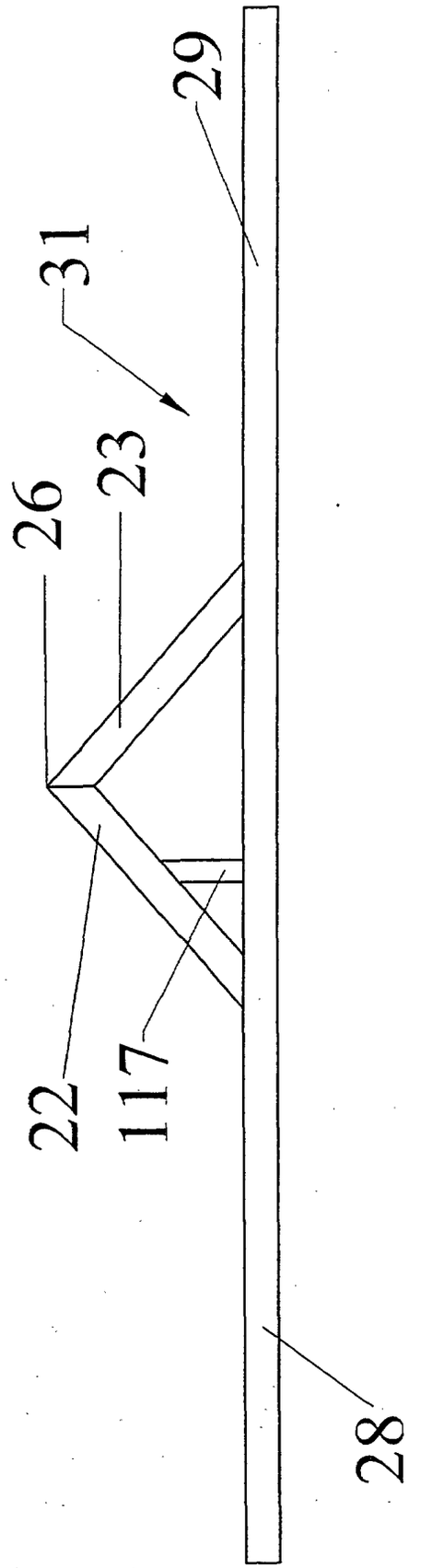
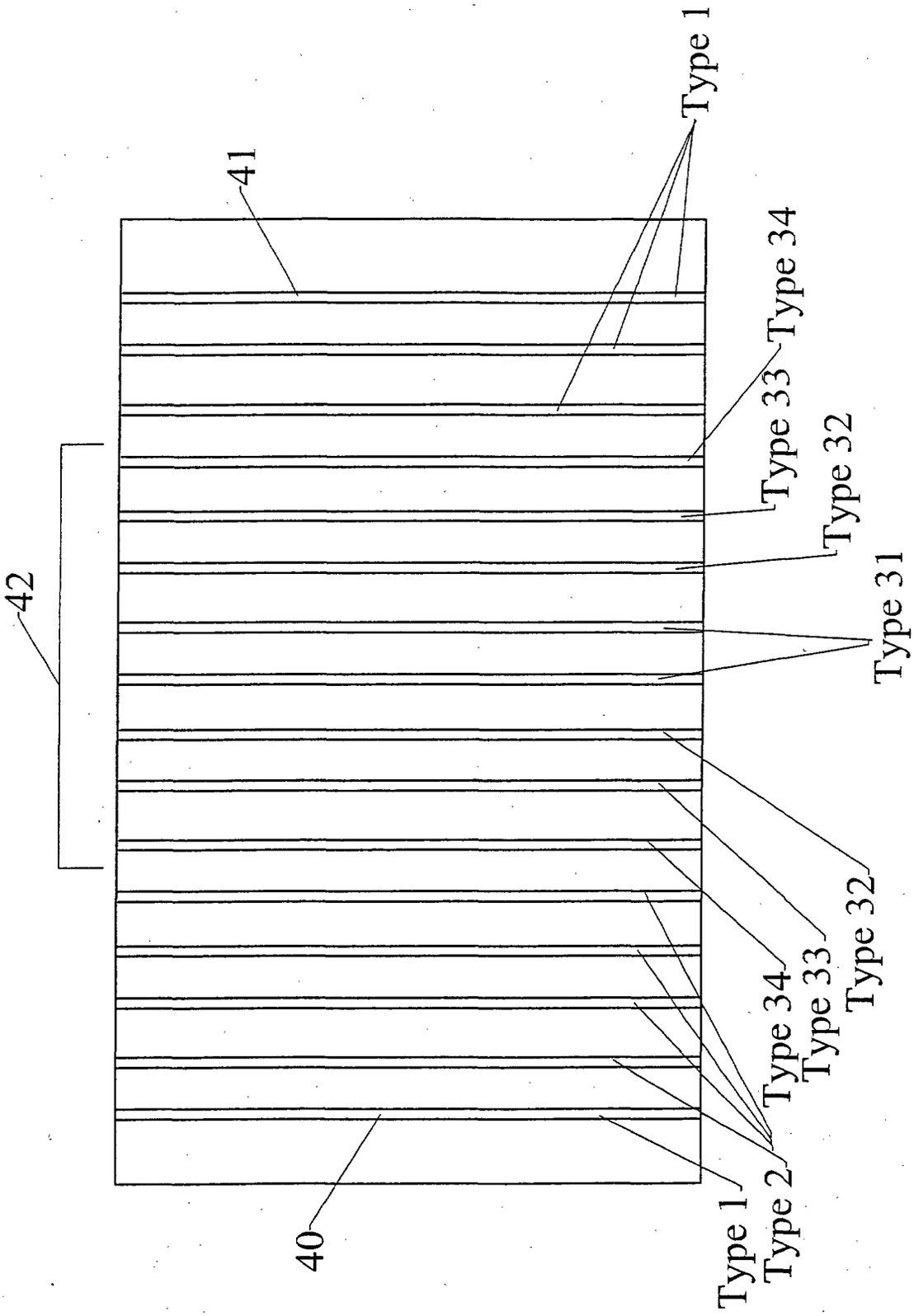



Fig. 6


Type 1
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Type 34
Type 33
Type 32
Type 31
42
Type 32
Type 33
Type 34
Type 2
Type 1
40

Fig. 7

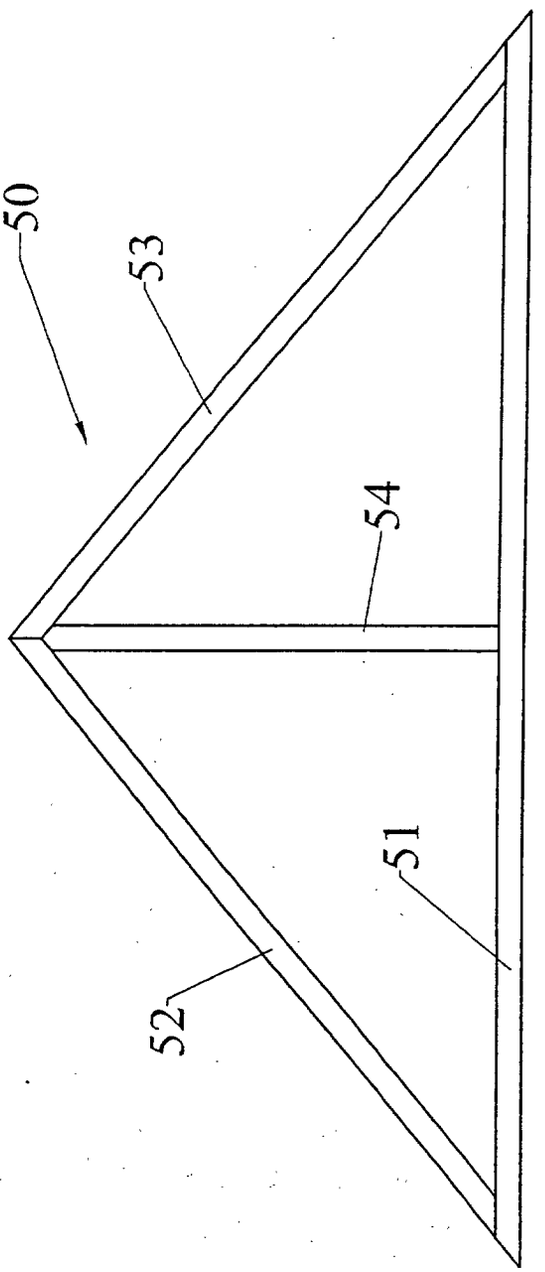


Fig. 8

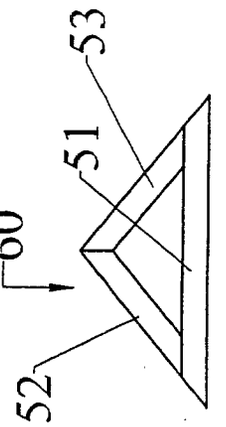


Fig. 9

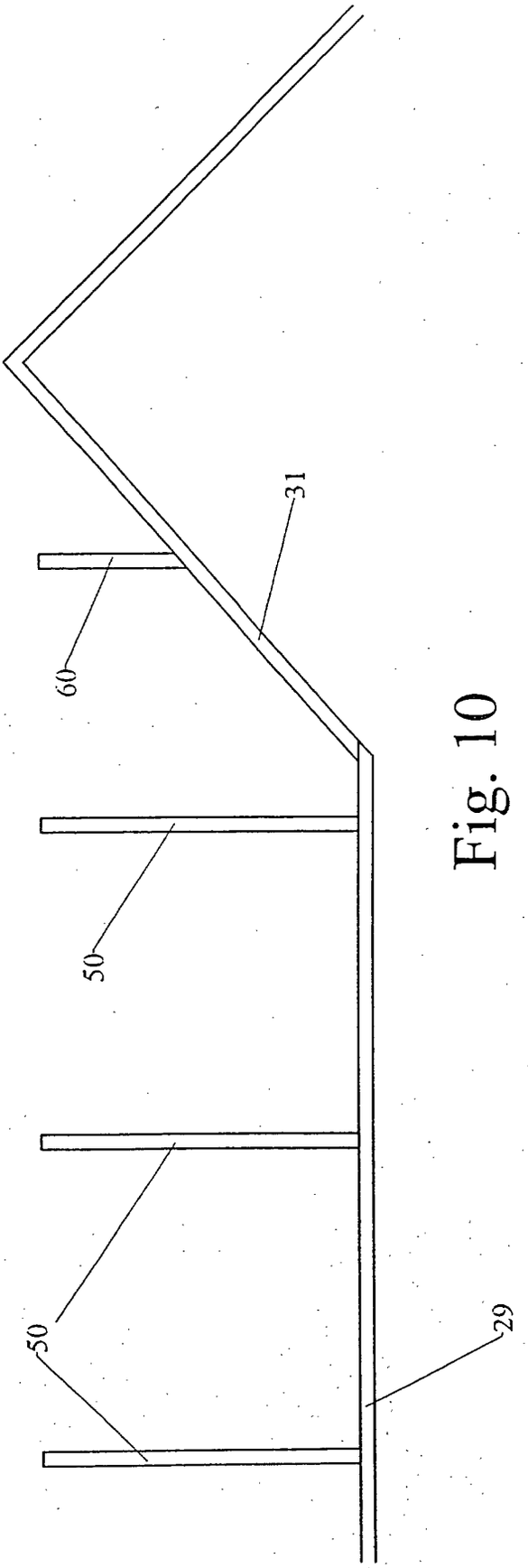


Fig. 10

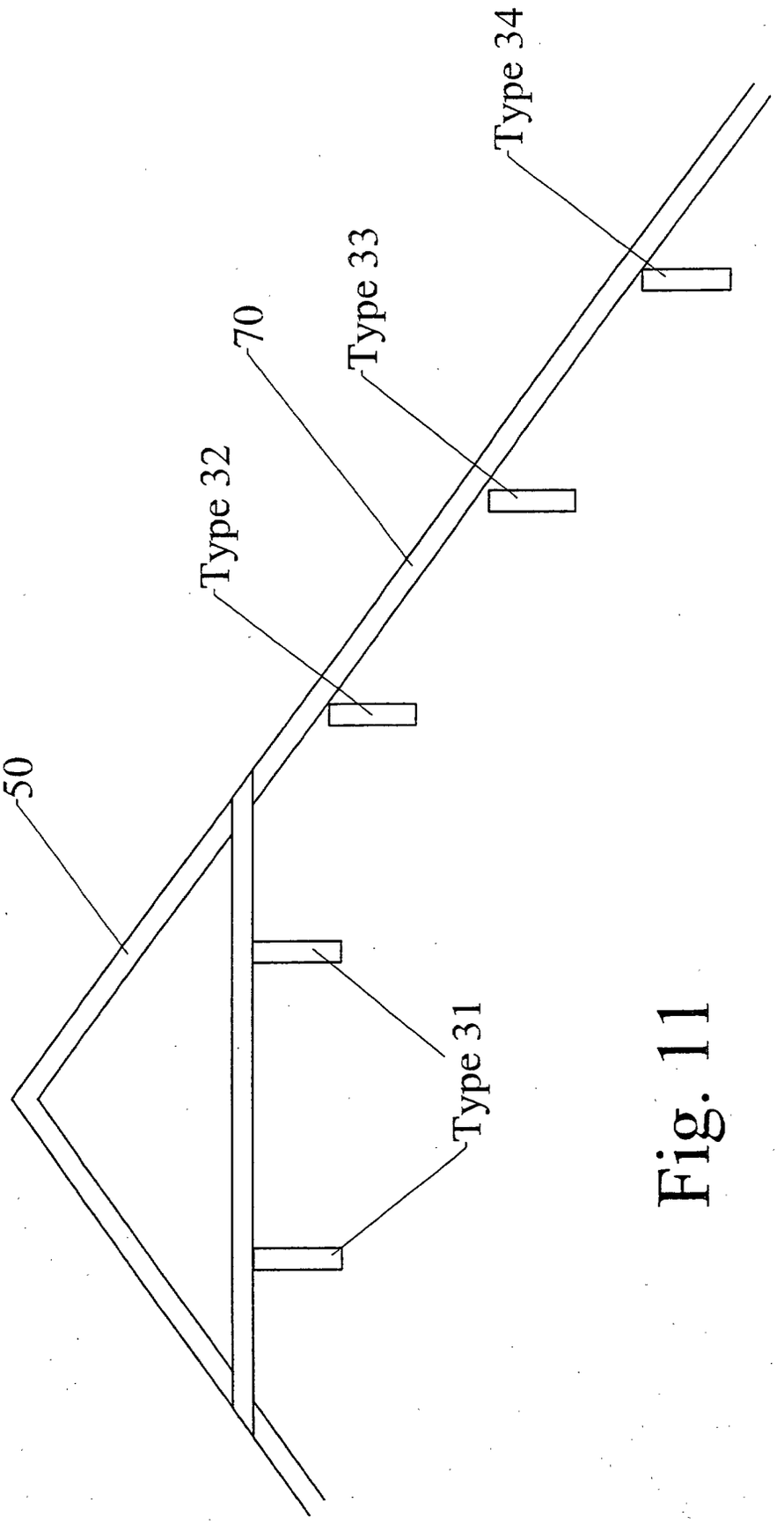


Fig. 11

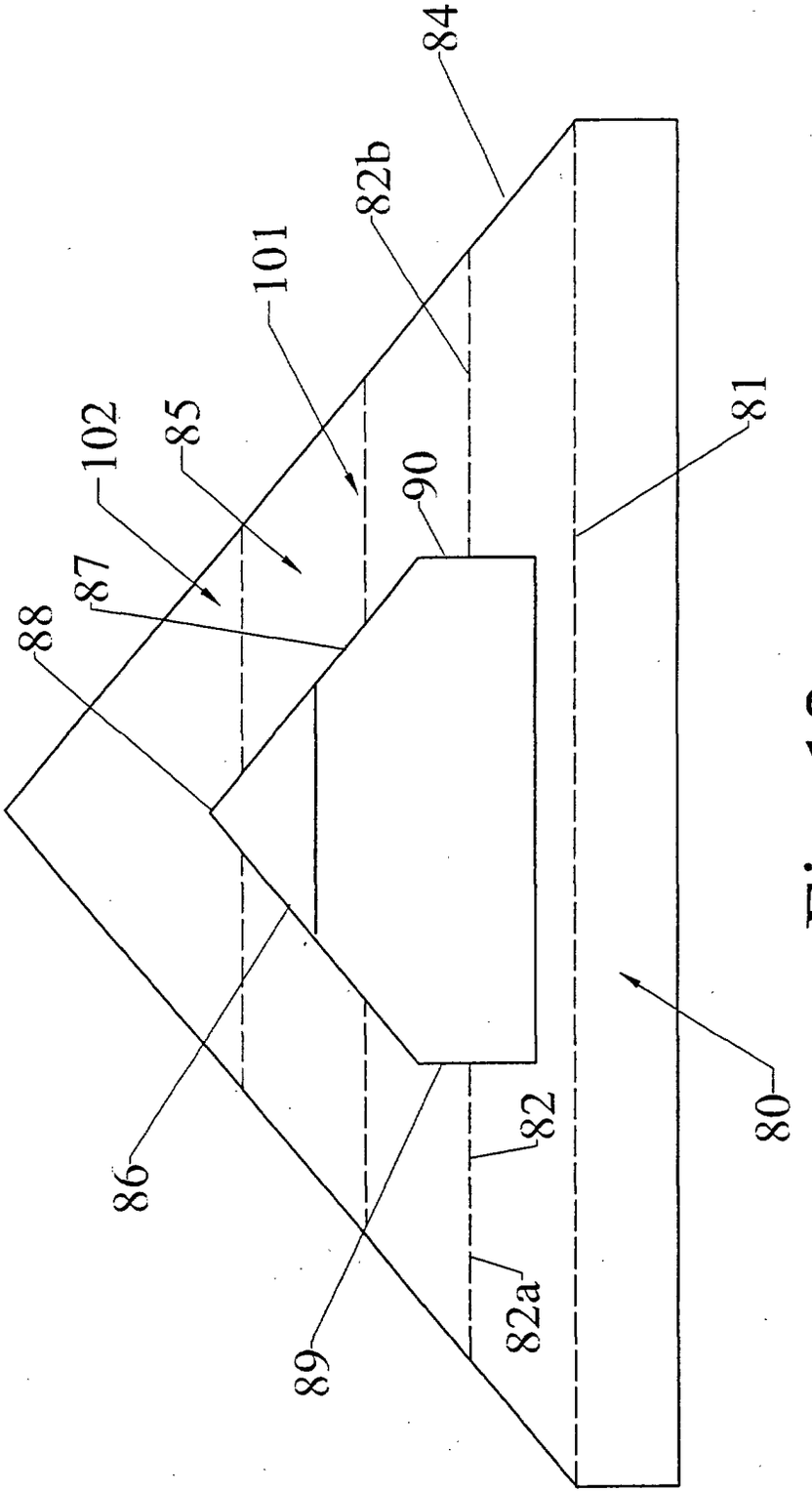


Fig. 12

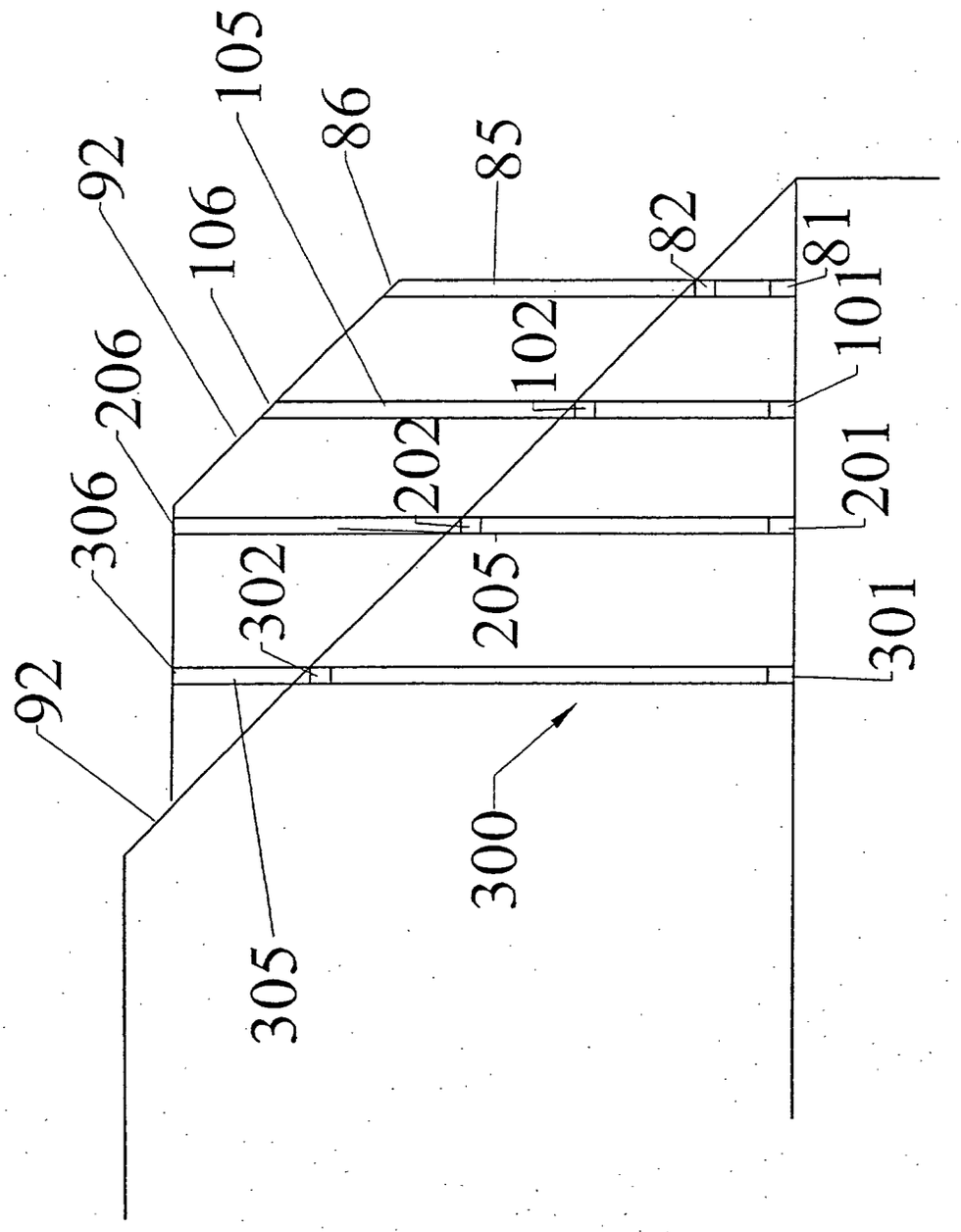
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Fig. 13

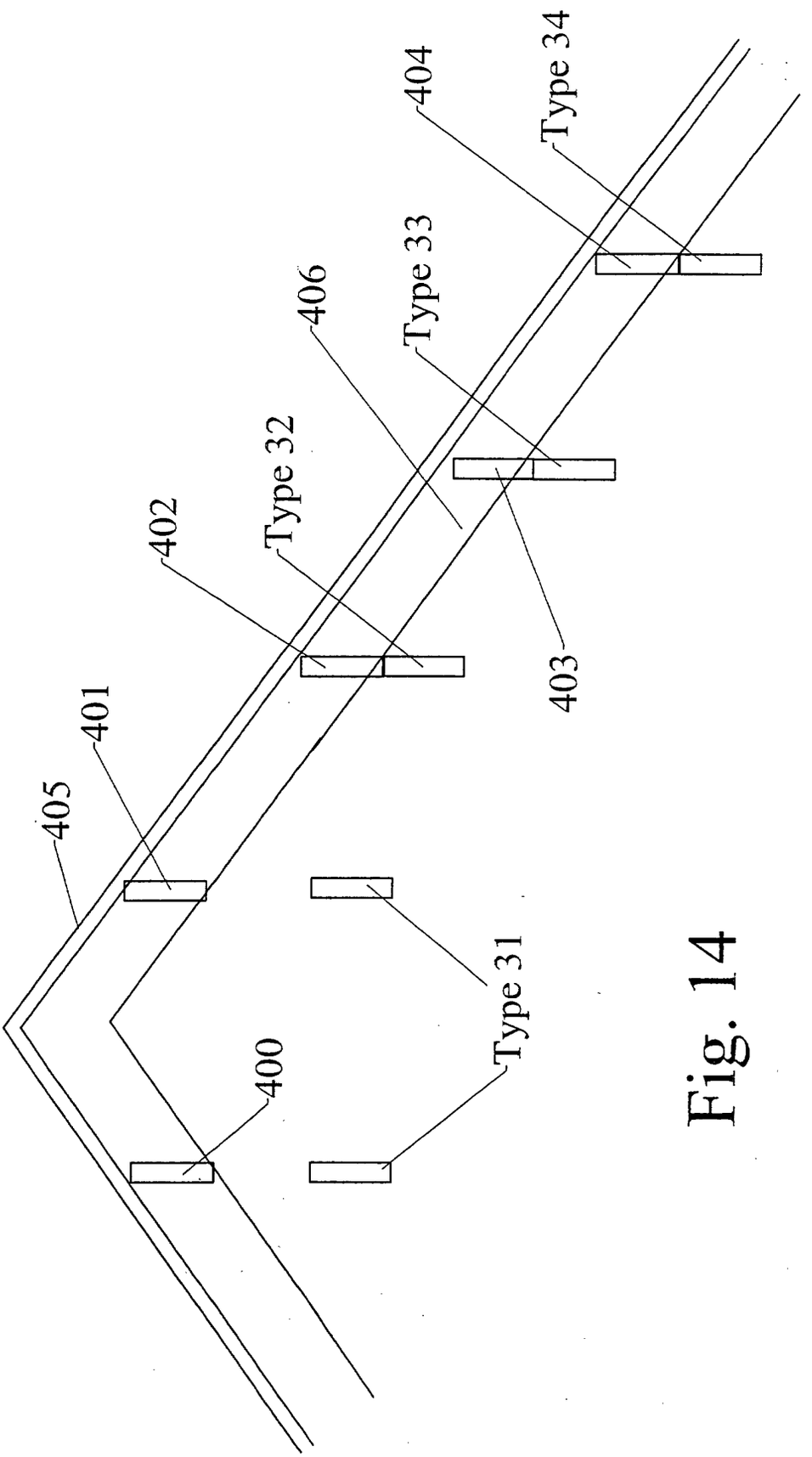


Fig. 14

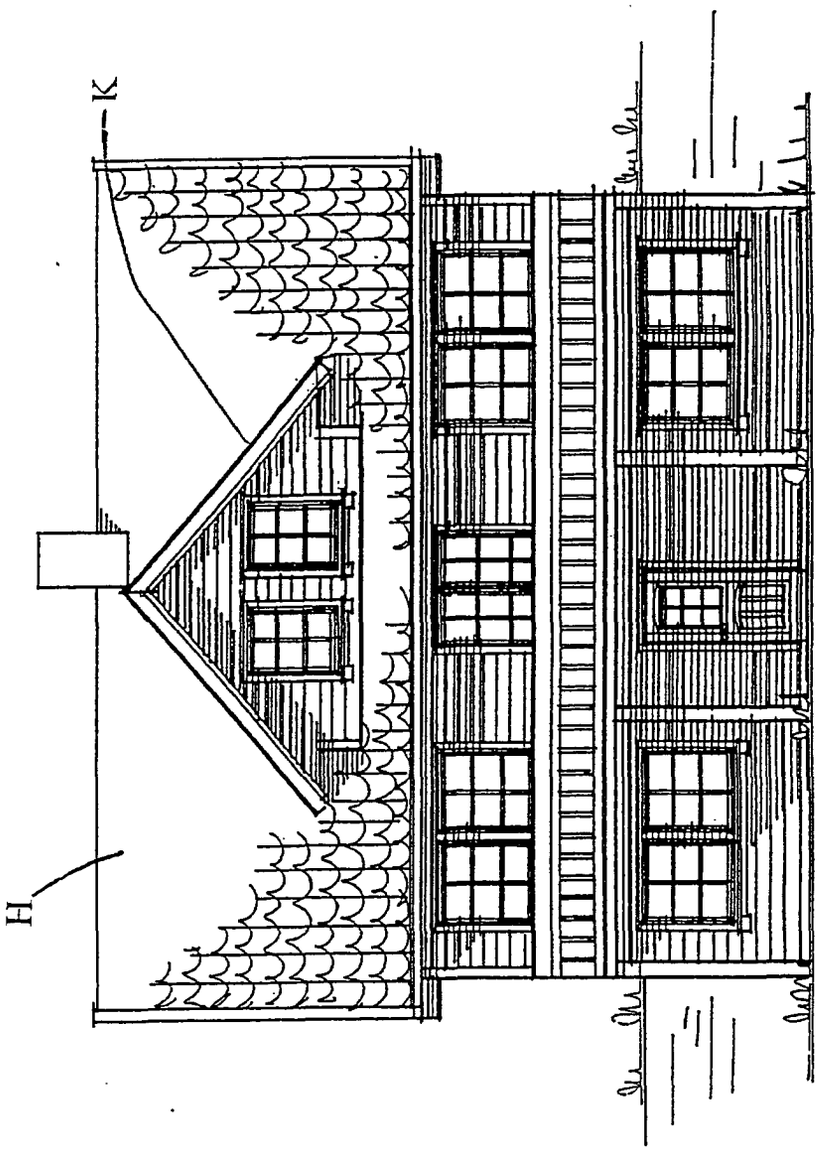


Fig. 15