

[54] **ADJUSTABLE SUBSTRUCTURE FOR INSTALLING SHEET ROOF**

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[63] Continuation of Ser. No. 200,970, Nov. 22, 1971, abandoned.

[52] **U.S. Cl.** 52/126; 52/283; 52/480;

52/22

[51] **Int. Cl.** **E04d 15/00**

[58] **Field of Search** 52/122, 126, 283, 301, 52/735, 296, 297, 365, 480

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Primary Examiner—Frank L. Abbott

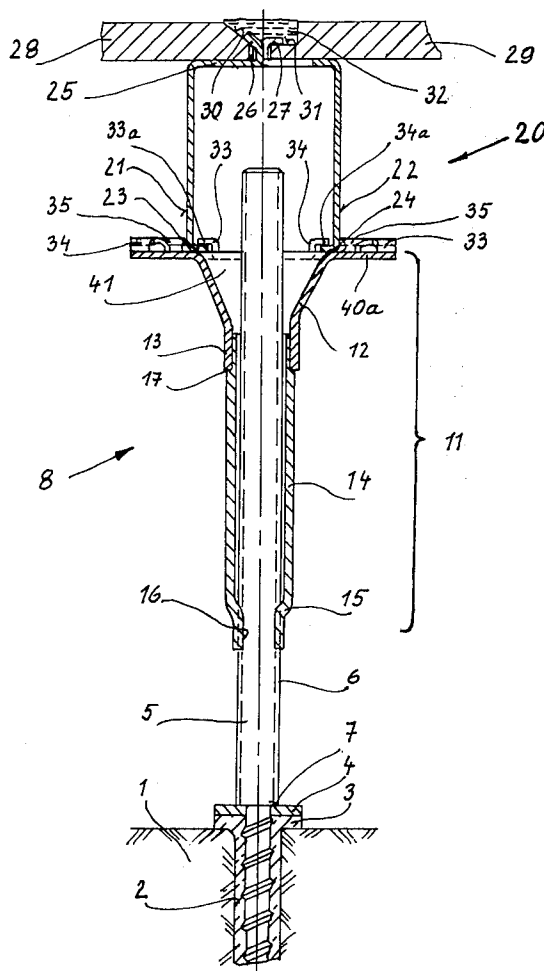
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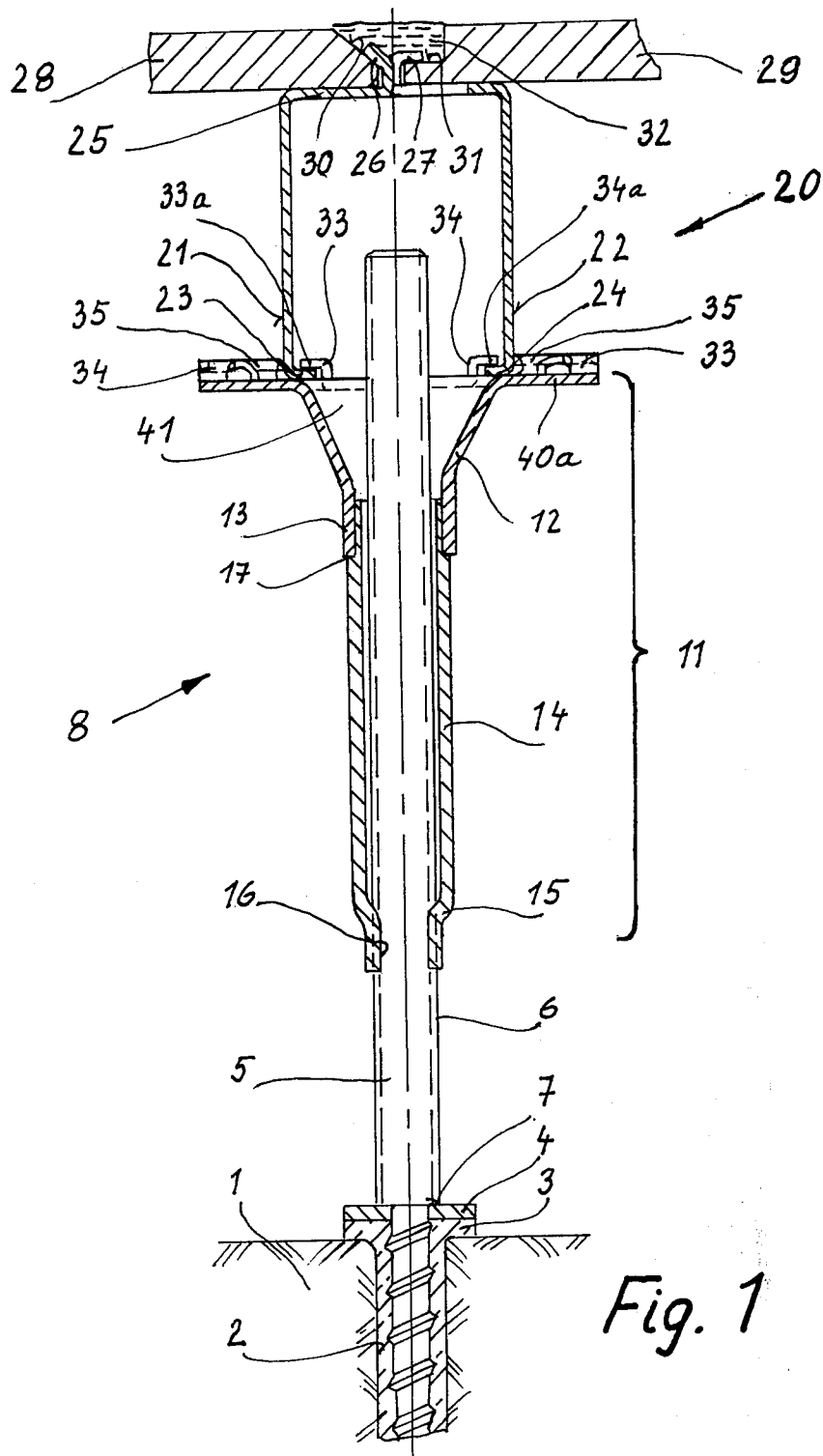
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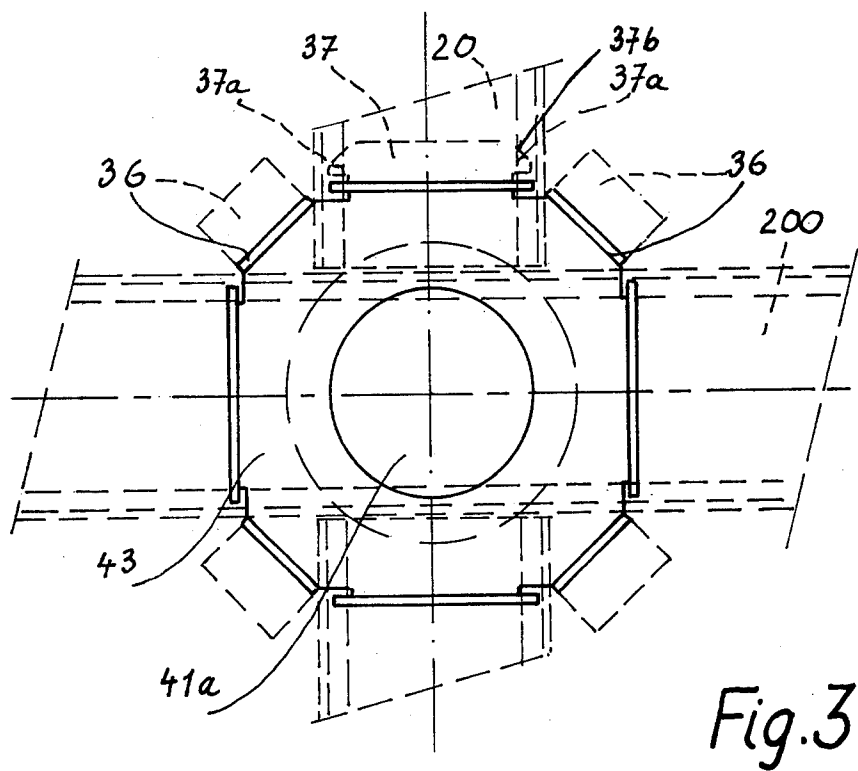
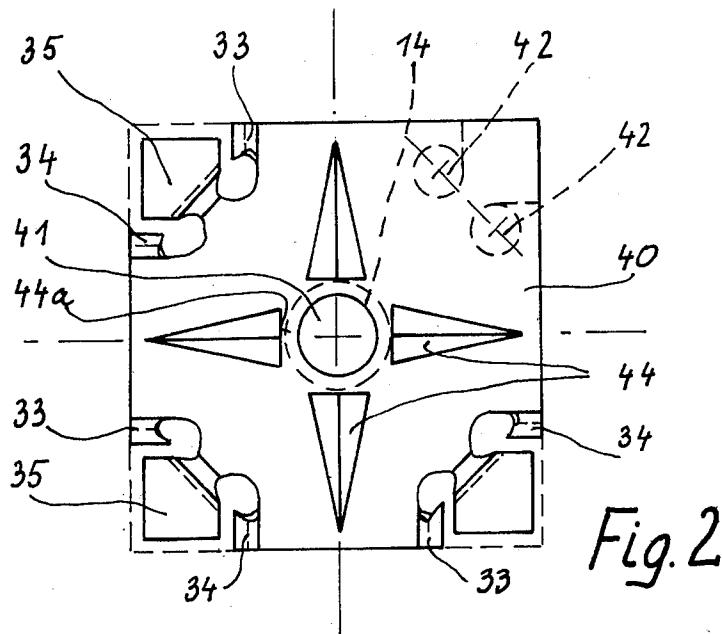
[57] ABSTRACT

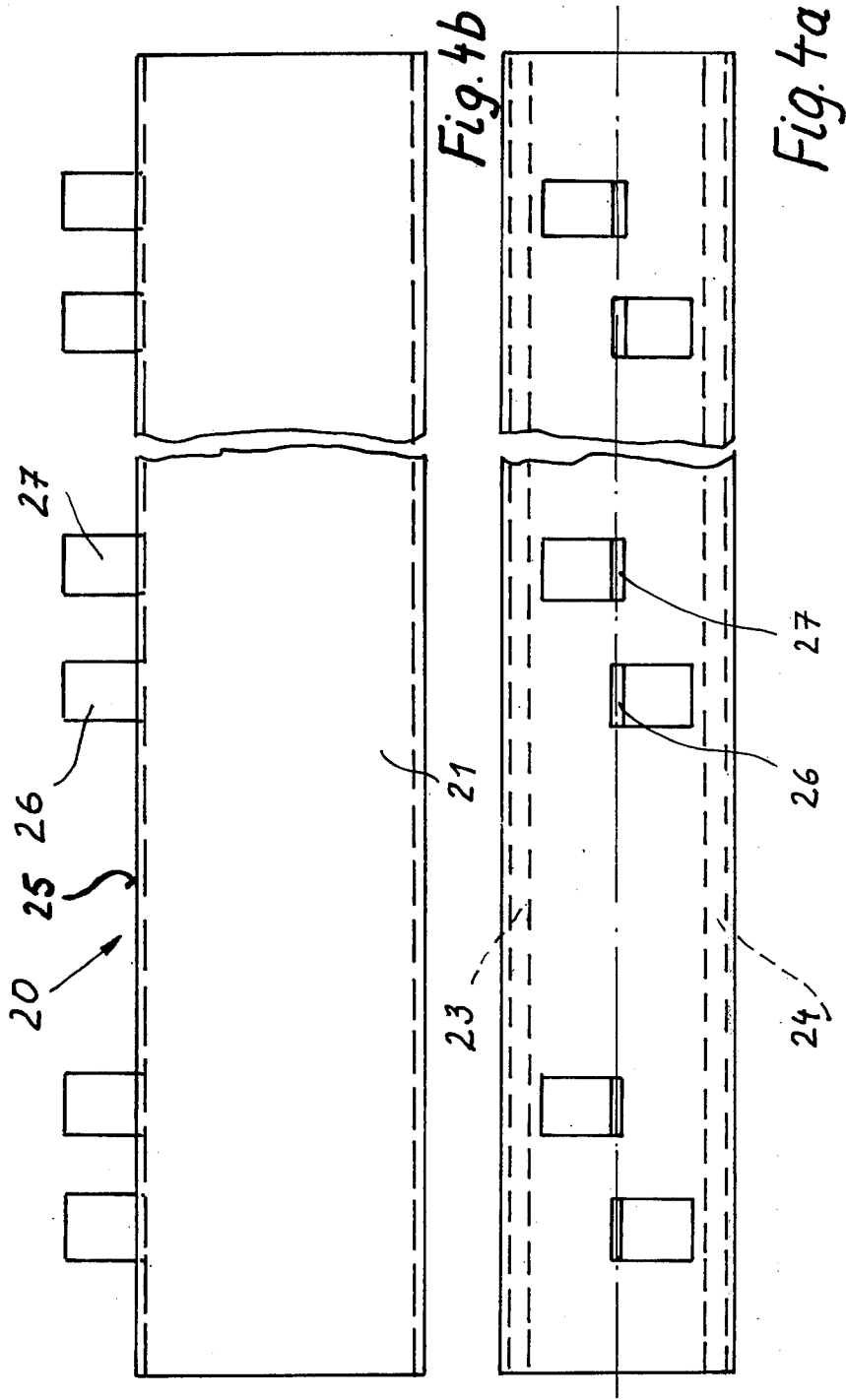
Substructure for installing a sheet roof on a bare ceiling or the like by means of support bolts and interconnecting roofing sheet brackets, in which the roofing sheet brackets are U-shaped frames having downwardly-facing openings. The U-shaped frames are connected by means of mounting and locking members to support mounts which can be placed on support bolts and locked on the support bolts at any desired height.

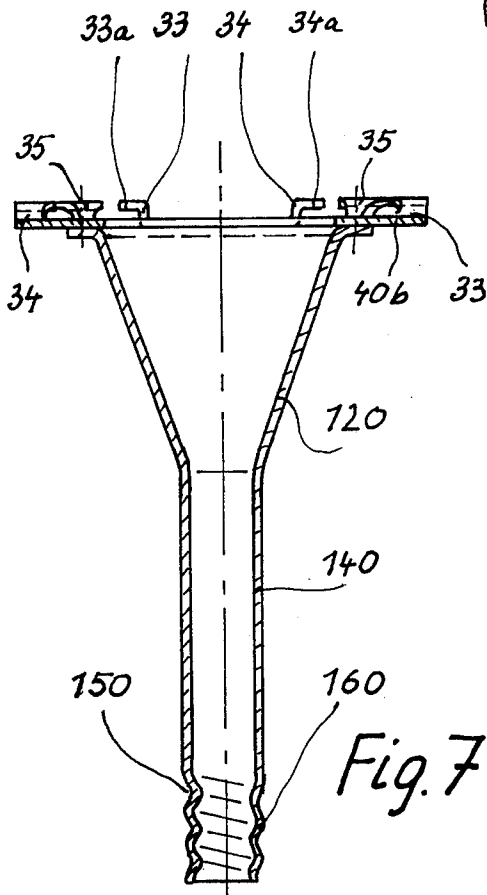
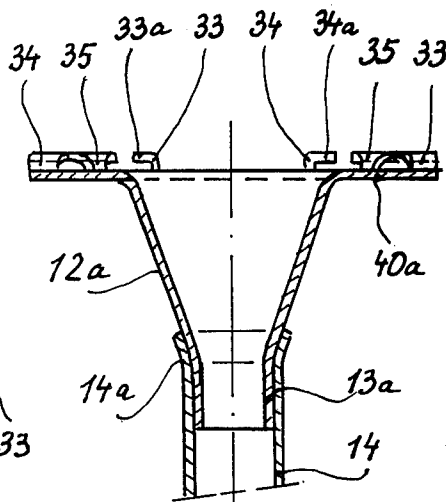
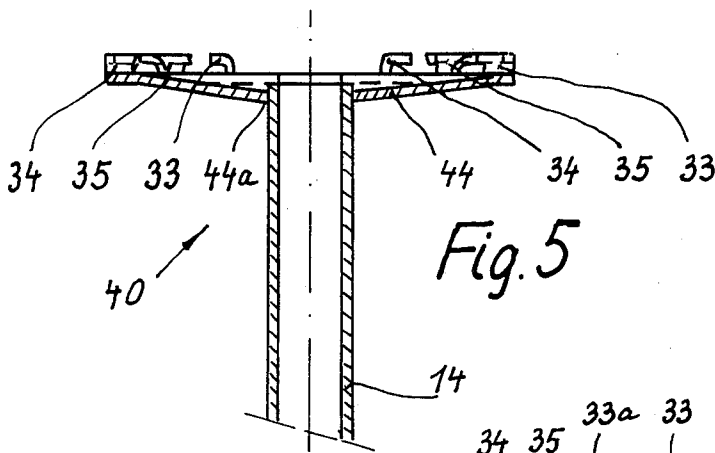
16 Claims, 16 Drawing Figures

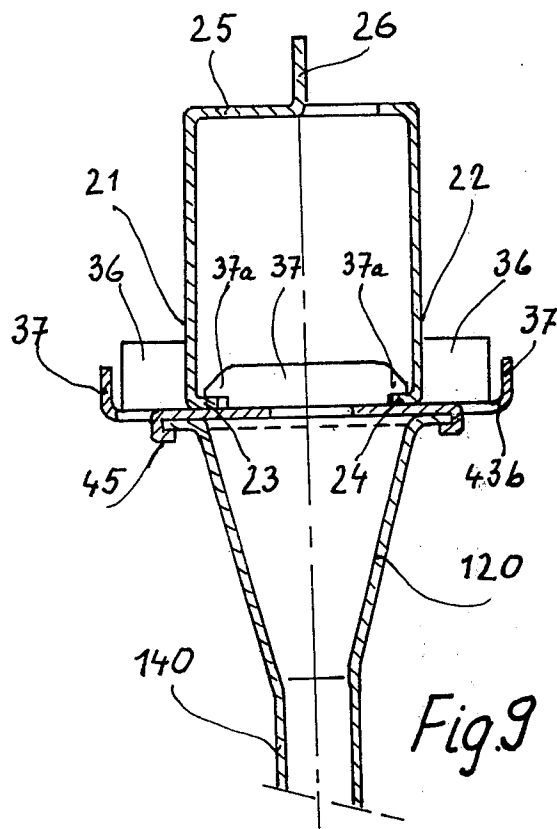
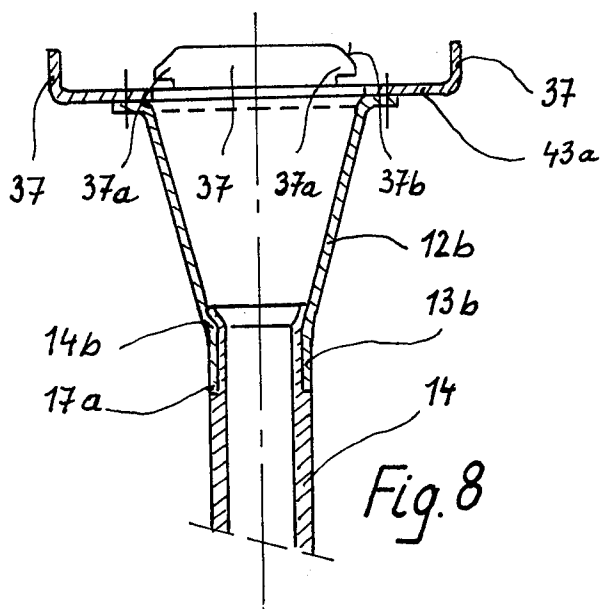












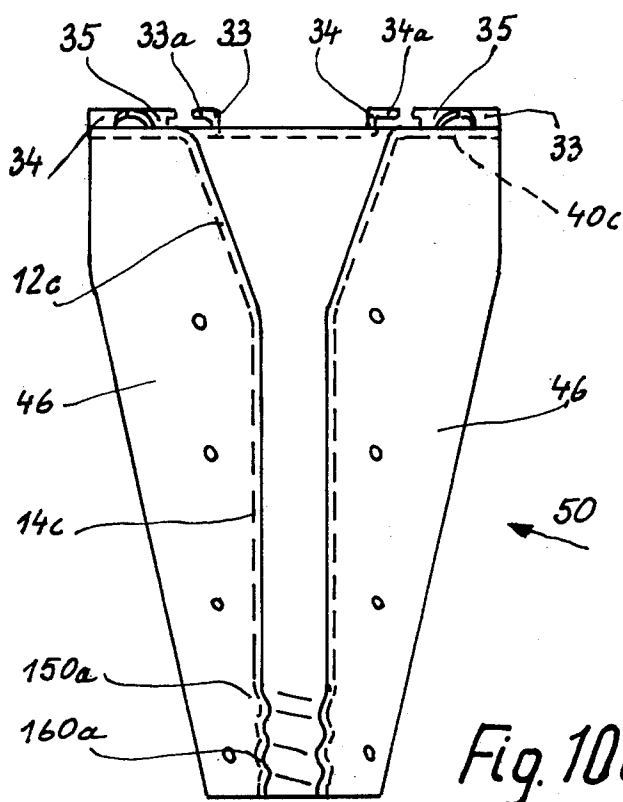


Fig. 10a

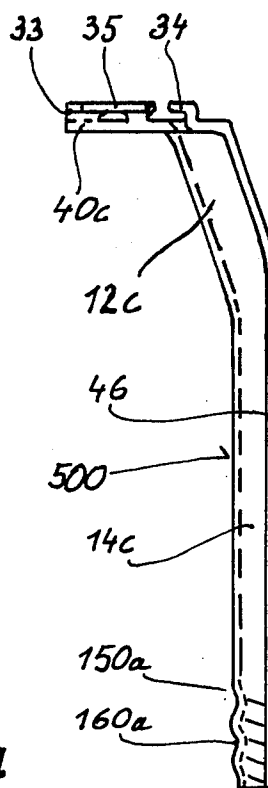


Fig. 10b

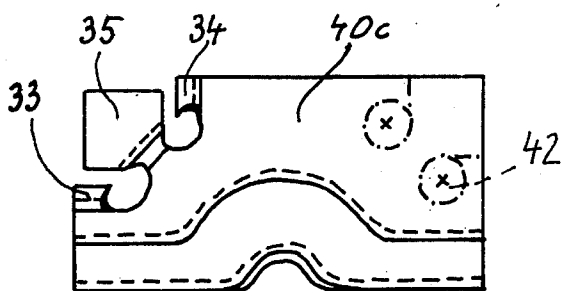
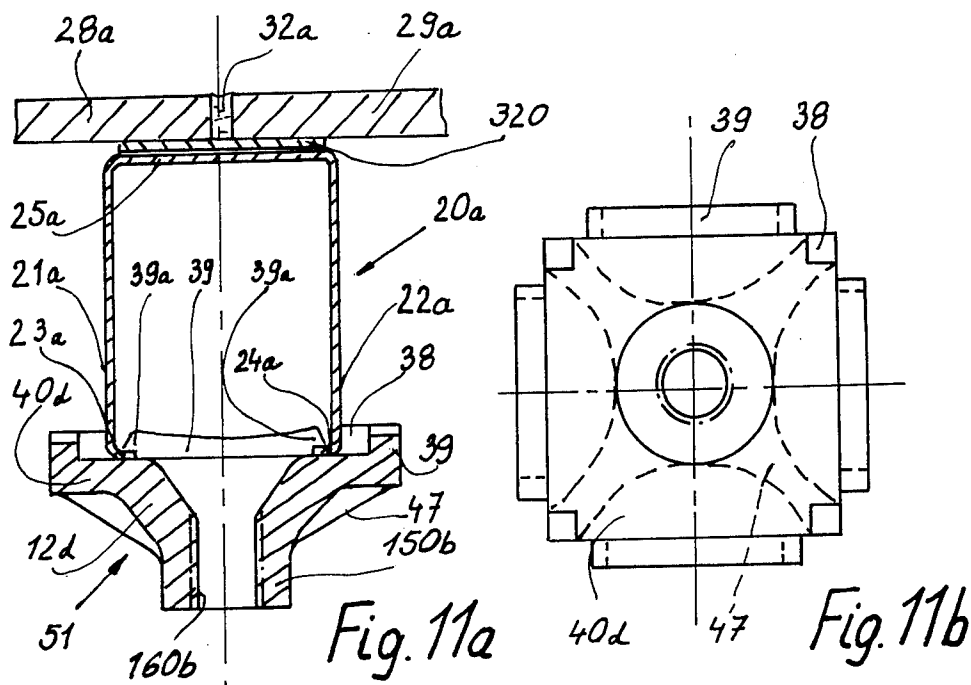


Fig. 10c



ADJUSTABLE SUBSTRUCTURE FOR INSTALLING SHEET ROOF

This is a continuation of application Ser. No. 200,970 filed Nov. 22, 1971, now abandoned.

This invention relates to a substructure for installing roofing sheets on top of a bare ceiling or the like, with supporting bolts and inter-connecting brackets for the roofing sheets.

Such substructures are currently used if a sheet roof must be installed as a so-called second shell, while leaving an air gap through which the moisture from the building can escape and the water vapor from the inside can diffuse.

An existing substructure uses so-called supporting mounts, made of steel, screwed in the bare ceiling with an insulating bottom plate in between and which are provided with, pointed toward the roofing sheet, a slot for a steel templet which serves as mount for the roofing sheet.

On top of these brackets for the roofing sheets are placed, by means of hook screws, resting shoes to which, by means of so-called four-point clamps the corners of four roofing sheets are always attached (roofing sheet support, System Fuchs, Fuchs GmbH & Co., Isolierungen, 6111 Altheim, Industriegebiet).

Experience with this known substructure makes improvements desirable, especially since the fixed length of the supporting mounts makes compensation, with respect to the roofing sheets, of unevenness in the bare ceiling surface more difficult. Furthermore, complications arise if a sheet roof must be installed having a certain slope. Supporting mounts of different lengths are therefore necessary. These, in turn, require corresponding production machinery, separate stocking which can easily be surveyed, corresponding order numbers, a relatively elaborate stocking at the construction site, as well as careful allocation on the bare roof. In addition, the exact aligning of the slots which hold the brackets for the sheet roof makes a safe mounting of the supporting mounts more difficult, since they cannot be screwed to the point of optimum safety into the plugs in the bare roof, but only to the alignment height.

In addition, much manual labor is necessary for manufacturing, stocking, shipping and installing of the resting shoes, hook screws and the four-point clamps, which increases the expense. The purpose of this invention is to create a substructure for installing of sheet roofs, of which the parts can more simply be manufactured, stocked and installed. The invention will also achieve an effect similar to that of a prefabricated building system having only a few basic building elements, such that simple and difficult situations can be handled well at the building site and it enables the installation of flat and sloping sheet roofs with equal simplicity.

These results will be achieved, in accordance with the invention, in a simple manner because the brackets for the roofing sheets are U-shaped frames or channels with their open sides down, which, by means of mounting and locking pieces, are connected with the supporting bodies which can be put on support bolts and can be locked to these bolts at any desirable height.

The U-shaped frames show many advantages. They can easily be manufactured, shipped and installed as well as constructed with a light weight and a high resistance to bending.

They also allow optimum vertical adjustment of the substructure since the ends of the supporting bolts can, if need be, reach close to the bottom side of the roofing sheets. The mounting and locking pieces are so designed, that the roofing sheet brackets can easily and safely be mounted to the supporting mount, with simple manipulations even by unskilled labor. These pieces are simple to manufacture and easy to mount to the supporting bolts to which they can be locked at any desired height.

The lower edges of the brackets are bent inwards or outwards. This will increase the firmness and simplify the assembling and the connecting with the mounting pieces, since the arrangement is chosen so, that the roofing sheet brackets enclose the mounting pieces and the bent edge protrusions clamp into the mounting pieces.

In order to prevent the bottom edges of the roofing sheet brackets from moving outwardly due to the load, the locking pieces are designed like a thrust bearing for the bottom edges of the roofing sheet brackets and are located at a small distance opposite the protrusions of the mounting pieces.

Although the supporting mounts can be attached to the supporting bolts in many ways, for example glued or clamped, each supporting bolt is, in accordance with the invention, designed with an outside thread fitting the inside thread of a connecting supporting mount. An intolerable torsion of the supporting mounts in installed condition, for example due to shocks or similar, is not anticipated since the roofing sheet brackets are, in accordance with the invention, designed to be torsion resistant. Locknuts or similar devices are, in accordance with this invention, unnecessary.

In one embodiment of the invention the internal thread is applied to an extension pipe for the support mount.

In this case, the support mount is designed as a support plate with a center hole for the support bolt. These support plates are preferably made out of metal, such as sheet metal so that the mounting and locking pieces can in a simple manner be stamped out of the blank plate and then shaped by bending.

In this design the roofing sheet brackets are pushed in sideways, between mounting and locking pieces.

In another embodiment of the invention the mounting pieces have bevels which snap over the bent edges of the roofing sheet brackets and whereby the locking pieces can only be brought into their position after the bevels are snapped over the edges. In many cases this method considerably simplifies the installation. According to the invention there are many advantageous detail designs possible to adapt the substructure to given conditions. For instance, in one application the support plate is placed on top of the extension pipe and has braces which extend so far toward the center hole that their inside edges are in contact with the rim of the support bolt. This connection between the single elements of the invention is not only easy to install, it only needs elements which are very simple to manufacture. The support plate, for instance, can be stamped and shaped out of the sheet metal blanks in two steps.

The shape of the support plate also can continue into a tubelike cone which, at the end, will represent a mounting hub for the extension pipe.

In another embodiment of the invention a support plate can be mounted to a tubelike cone which, in it-

self, ends in a mounting hub for the extension pipe. Both embodiments are designed for extremely simple manufacturing and stocking.

In both cases the mounting hub can be placed on a rim of the extension pipe. The mounting hub also can be put into the flanged end of the extension pipe. In many cases the connection between the mounting hub and extension pipe is flexible. Therefore the support plate can be rotated with respect to the extension pipe.

In other cases the mounting hub can also be attached to the extension pipe. In other embodiments of the invention the support plate is connected to a tubelike cone which itself continues into an extension pipe with internal threads. In this case, the extension pipe is manufactured in a separate step and subsequently connected to the support plate. In addition, the upper edge of the cone can be bent and mounted to the support plate.

In contrast, the upper edge of the cone can be bent and then connected by means of notches, which protrude from the support plate downward and surround the bent edge of the cone. It is an advantage if the thread piece is pressed into the extension pipe in which the internal thread is also pressed. Finally, the supporting mount can also be furnished with internal thread itself. In this embodiment the support mount consists of two halves which are joined by gluing, riveting, spot-welding or similar methods to form a support plate, a tubelike cone, and an extension pipe with pressed internal thread.

In another embodiment the support mount is so designed that it consists of a support plate, a tubelike cone, and a thread piece with internal thread made of one solid piece, preferably plastic.

It is an advantage if opposite roofing sheet brackets support edges of neighboring roofing sheets over their entire length.

In one embodiment the surfaces of the roofing sheet brackets at the side of the roofing sheets are even and suitable for the application of an adhesive which attaches itself to the roofing sheets. In the simplest case, the adhesive is applied in the form of a doublesticking tape which is put on the upper surface of the sheet bracket and, after removing the protective foil, the two adjacent roofing sheets are placed on top.

The surfaces of the roofing sheet brackets at the side of the roofing sheet can also have notches for aligning and/or mounting of the roofing sheets. The roofing sheets can already be aligned during installation. After installation, the notches will be bent in such a manner that they connect the suitably shaped edges of the roofing sheets with the roofing sheet brackets.

Because of the design of the roofing sheet brackets, in accordance with the invention, it is possible that the sheet joints can be sealed with a sealing compound which can be protected with finishing ledges or with the edges of the roofing sheets against the effects of Ozone or UV rays. In addition, the supporting mounts of the substructure are simple to manufacture and they make it possible to utilize the substructure as a modular building system. The support mounts, for instance, can be used as junctures of the substructure. The apt arrangement of the locking pieces on the support mounts make it possible for four roofing sheet brackets to be connected at only one support mount. If the roofing sheet brackets used as supports reach over more than one support mount, the support mounts are only to be

used to support the roofing sheet brackets. The support mounts also allow one side of a bracket to be connected to a beam-like continuous bracket.

By installing a sheet roof with the substructure in accordance with the invention, one proceeds in such an order that one mounts the support bolts after drilling holes and inserting plugs into the bare roof. Subsequently, the support mounts are placed on the support bolts and adjusted to the desired height. This installation forms an essential part of the substructure, requires little work, and is carried out with inexpensive identical parts which can be easily manufactured. Subsequently, the brackets are pushed in between the mounting and locking pieces. In the other case the brackets can simply be installed from the top by snapping them over the mounting pieces. Subsequently, the locking pieces are then bent into proper position. Exemplary embodiments of the invention are described by means of the enclosed drawings.

FIG. 1 shows a layout drawing of the invention in cross section.

FIG. 2 shows a first embodiment of a support mount.

FIG. 3 shows a second embodiment of a support mount.

FIG. 4a shows a roofing sheet bracket in top view.

FIG. 4b shows the roofing sheet bracket in accordance with FIG. 4a in side view.

FIG. 5 shows the support mount in accordance with FIG. 2, in cross section.

FIG. 6 shows a modified embodiment.

FIG. 7 shows another modified embodiment.

FIG. 8 shows the support mount in accordance with FIG. 3, in cross section.

FIG. 9 shows a modified embodiment.

FIG. 10a shows a third embodiment of a support mount, in front view.

FIG. 10b shows the support mount in accordance with FIG. 10a, in side view.

FIG. 10c shows the support mount in accordance with FIG. 10a, in top view.

FIG. 11a shows a fourth embodiment of a support mount in cross section, with another embodiment of a roofing sheet bracket.

FIG. 11b shows the support mount in accordance with FIG. 11a, in top view, and

FIG. 12 shows a schematic top view of an installed substructure.

FIG. 1 shows a cross-section of the general view of the main elements of a support 8 in accordance with the invention. A supporting bolt 5 is placed in the customary manner on a lower ceiling, preferably a bare ceiling 1. In the illustrated embodiment a plug 2 with an over-hanging rim 3 on top is provided to support a circular washer 4, on which stands a shoulder 7 at which terminates an external screw thread at the bottom which can run either over a part or over the complete length of the supporting bolt 5 which protrudes from the bare ceiling.

The over-hanging rim 3 serves on the one hand for taking up the load and on the other hand for isolating the supporting bolt 5 from the bare ceiling 1. The supporting bolt 5 is tightly screwed into the plug, so that its brim or shoulder 7 rests on the circular washer 4 and the part of the weight of the flat roof which is carried by the supporting bolt 5 is securely transmitted to the bare ceiling 1.

On the supporting bolt 5 is placed a supporting body 11 which has a supporting plate 40a containing a center hole 41 for the supporting bolt 5 and which changes into a tubelike cone 12 which in turn ends in an extension adapter 13 for an extension pipe 14. FIG. 1 shows that the extension adapter 13 rests on the outside shoulder 17 of extension pipe 14.

The supporting body 11 can be fastened at an arbitrary height to the supporting bolt 5, for instance by means of gluing, welding or clamping. If the bolt has no external thread in FIG. 1, however, the supporting body 11 is in effective contact with an internal thread 16, on the extension pipe 14.

The inside diameter of extension pipe 14 is larger than the outside diameter of supporting bolt 5 so that it is unnecessary to provide internal thread over the total length of extension pipe 14. It is at its lower end that threaded portion 15 is provided with an internal thread 16 to engage the external thread 6 of the supporting bolt 5. This device can be technically manufactured by squeezing or drawing portion 15 of pipe 14 simultaneously form the internal threads 16. However, every other practical method of applying the internal thread at the lower end of the extension pipe 14 may also be used without changing the essence of the invention.

The supporting sheet 40a is provided with mounting portions 33 and 34 and locking portions 35 for roofing sheet brackets 20, which are U-shaped frames or channels with their open sides down; a detailed explanation will follow. The channels each consist of an upper surface or web 25 in contact with the roofing plates 28 and 29 and sides 21, 22 having lower edges which are bent inwards. FIG. 1 shows, that roofing sheet channel bracket 20 connects to the mounting portions 33 and 34, whereby the inward bent edges 23 and 24 catch the ledges 33a and 34a in the locking parts 33 and 34. The locking parts 35 serve thereby as end guides and prevent the sides 21 and 22 of the channels 20 from spreading apart because of their load. The distance between the mounting pieces 33 or 34 and the opposite locking pieces 35 corresponds to the wall thickness of the channel sides 21 and 22.

In the example of FIG. 1, the roofing sheet brackets or channels 20 are moved lengthwise to install them between the mounting pieces 33 and 34 and the locking pieces 35.

Turned edges of adjacent roofing sheets 28 and 29 lie facing each other on the sheet bracket 20. FIG. 1 shows that the roofing sheet 28 is provided with a slanting edge. The opposite sheet 29 has normally a corresponding slanting edge 30 which, however, is not shown in FIG. 1. A sealing material 32 is brought between the opposite edges, which can be protected by a cover strip, not illustrated, against ultra-violet rays, ozone or atmospheric influences. The opposite edges of neighboring roofing sheets 28 and 29 can also be provided with a clamping edge 31 which is shown on sheet 29.

For alignment and mounting of the roofing sheets 28 and 29, cutouts or tabs 26 and 27 are provided in the web surface 25 of the roofing sheet channel brackets which are bent after the sheets 28 and 29 are installed. FIG. 4 shows the details of the roofing sheet channel brackets which are illustrated in a general view in the drawing of FIG. 1. FIG. 4a shows a top view wherein the cutout tabs 26 and 27 which, with respect to the

center line, are made alternately from the right or left half of the channel web surface 25. The upward-bent cutouts or tabs 26 and 27 lie along the center line. In accordance with the invention, the roofing sheet brackets 20 support the opposite edges of neighboring roofing sheet 28 and 29 over their total length. One can see that the roofing sheet brackets 20, in accordance with this invention, have not only a light weight but also can be easily manufactured, transported, stored and installed. They have, in addition, a considerable resistance against bending.

FIG. 1 clearly shows that the combination of the support bolts 5 and the support bodies 11 connected with the roofing sheet brackets 20 allow an extremely large adaption to roof slopes such as unevennesses of the bare ceiling. If the upper end of the support bolt 5 nearly hits against the inside of surface 25 adjustment is made to the smallest distance between roofing sheet 28 or 29 and the bare ceiling. When the internal thread 16 is near the upper end of the support bolt 5 the largest possible distance between the roofing sheets 28 or 29 and the bare ceiling 1 has been reached.

FIG. 2 shows in top view the mounting and locking pieces 33, 34 and 35. They are pressed from the blank of support sheet 40 and formed by bending. FIG. 2 shows in the upper right hand corner the original condition of a corner of the support sheet 40. It is manufactured by cutting out two holes 42 and subsequently upward bending of the locking piece 35 and the mounting pieces 33 and 34. The locking piece 35 reaches a position at the upward bending in which its external edge lies behind the original edge of the support sheet 40. The cut holes 42 are arranged in such a way that the ledges 33a and 34a, which can be seen in FIG. 1, are formed during the upward bending of the locking pieces 33 and 34. FIG. 1 shows an embodiment in which the support sheet 40a changes into a tubelike cone 12 which ends in an extension adapter 13 for the extension pipe 14. Such a structure can be manufactured very easily.

Another support sheet is illustrated in the embodiment of FIG. 2. This support sheet can, as is shown in the cross-section view of FIG. 5, simply be placed on the upper edge of the extension pipe 14. The support sheet 40 is provided with reinforcement braces 44 which extend so far into the center hole 41, that their inside edges 44a touch the outside wall of the extension pipe 14. FIGS. 2 and 5, show that the reinforcement braces 44 are triangular in cross section in which the top of the triangle faces the outside. The mounting pieces 33 and 34 alternate. In each case, both mounting pieces 33 and 34 are necessary to hold a sheet bracket.

FIG. 3 shows another embodiment of a support sheet 43 with a center hole 41a. It also consists of sheetlike material, for instance sheet-iron, and can in the same way as support sheet 40 in FIG. 2, also be provided with reinforcement braces 44 which are, however, not drawn in FIG. 3.

The support sheet 43 possesses mounting pieces 37 with ledges 37a for catching, by means of edges 23 and 24 which are bent inward, a roofing sheet bracket 20, and locking pieces 36. The T-like mounting pieces 37 are found on the sides of the support sheet 43, while the flange-like locking pieces are provided at the corners. Dotted lines show that the mounting pieces 37 as well as the flange-like locking pieces 36 are formed from the blank of support sheet 43. The mounting pieces 37 are

bent upward, while the locking pieces 36 are only bent upwards after the installation of the roofing sheet brackets 20 and 200. FIG. 8 shows a support sheet 43a in which only the mounting pieces 37 are bent upward. FIG. 9, on the other hand, shows locking pieces 36 which are bent upward after installing a roofing sheet bracket 20.

The mounting pieces 37 are provided with taperings 37b. The roofing sheet channel brackets 20 can be placed from above on the mounting pieces 37 by means of these taperings. The inwardly bent edges 23 and 24 of the channels snap over the taperings 37b and press into the space under the ledges 37a. The locking pieces 36 are only then bent upward.

FIG. 3 illustrates how a continuous first roofing sheet bracket 200 and other roofing sheet brackets 20, which meet the first one in a right angle, can be connected with one support sheet 40 such as 43. Equivalent constructions can be made in all execution examples if the sides 21 and 22 of the roofing sheet brackets 20 are bent to the outside. The support sheets 40 and 43 can also be attached, as for instance, is illustrated in FIG. 8 for a support sheet 43, to a tubelike cone 12b which terminates in an extension adapter 13b for the extension pipe 14. The extension adapter 13b rests on the outside edge 17a of the extension pipe 14 which has flared ends 14b for mounting the tubelike cone 12b on the extension pipe 14.

FIG. 6 shows an example with a tubelike cone 12a, whose extension adapter 13a is placed in the flared ends 14a of the extension pipe 14. The flared portions 14a and 14b can contact the corresponding extension adapters 13a and 13b in such a way, that an easy turning of the tubelike cone 12 is possible in the extension pipe 14. In other embodiments, a solid contact between the extension adapters 13, 13a or 13b and the extension pipe 14 can be obtained, for instance, through gluing or point-welding.

FIGS. 7 and 9 show that the support plate 40b or 43b can be connected to a tubelike cone 120 which changes into an extension pipe 140 with internal thread 160. This internal thread 160 is pulled in or pushed in at the lower end of the extension pipe 140. The extension pipe 140, the tubelike cone 120, and the internal thread 160 can be manufactured rather simply in one piece. In the example of FIG. 7, the support sheet 40b is tightly connected by a bent edge of the tubelike cone 120. In the example of FIG. 9 on the other hand, cut-outs or tabs 45 are provided in a support sheet, for instance 43b, which protrude downward from the support sheet and hold the upper flange of the cone 120. This connection can be fixed or rotatably movable.

The FIGS. 10a, 10b and 10c show another embodiment of the invention in which a support body 50 consists of two longitudinal halves 500 which can be joined by means of gluing, riveting, point-welding, etc., and which form a support sheet 40c, a tubelike cone 12c as well as an extension pipe 14c with an internal thread 160a in a thread extension 150a. The support body itself is, in this case, provided with an internal thread. The connecting places between the two longitudinal halves are indicated by circles. The mounting and locking devices 33, 34 and 35 in this embodiment are also pressed from the blank of the support body 50 and formed. The places of attachment 46 for gluing, point-welding or riveting are drawn relatively large. These

places 46 can also have any other suitable form without changing the essence of the invention.

In another example illustrated in FIGS. 11a and 11b, a support body 51 consisting of a support sheet 40d, a tubelike cone 12d and a thread extension 150b with internal thread 160b is entirely made of plastic. The support body 51 can, of course, in the same way as in the above described examples, also be combined with an extension pipe.

Supporting braces 47 are provided between the bottom of the support sheet 40d and the threaded portion 150b.

The mounting and locking parts are, in this example, constructed in a slightly different form. A mounting part 39 has ledges 39a which are caught by the inwardly bent flanges 23a and 24a of the sides 21a and 22a of the roofing sheet channel bracket 20a. The locking pieces 38 are constructed as simple dice-like or cubical attachments at the corners of the support plate 40d.

The channel 20a is constructed in a slightly different way from the heretofore described roofing sheet channel brackets. The surface 25a, under the roofing sheets 28a and 29a, is flat and provided with adhesive tape 320 to fasten the roofing sheets. A sealing material 32a is provided between the neighboring edges of the roofing sheets 28a and 29a. After installation of the roofing sheet brackets adhesive tape 320 is applied on the surface 25a which is on the side of the roofing sheets, on which, after peeling off the protective paper-strip, the sides of roofing sheets 28a and 29a are placed. This method not only enables a simplified manufacturing process for the roofing sheets brackets 20a but also an extremely fast installation of the roofing sheets which saves expense.

The external thread 6 of the support bolt 5 can be constructed with a coarse thread as is known from experience. However, a finer thread is preferred if a very precise adjustment in height is required. However, in many instances it is an advantage if the external thread of the support bolt 5 has a large thread. The roofing sheet brackets can be constructed with such a length that the opposite edges of neighboring roofing sheets rest completely on the brackets. In other instances the roofing sheet brackets are cut precisely to such a length that they overlap the distance between two neighboring support bolts.

I will now explain by means of FIG. 12 the installation of a sheet roof. First, the supporting bolts 5 are shot or plugged in the lower ceiling such as the bare ceiling 1, at the desired places for instance by means of stencils. The invention enables the absolute tightening of the support bolts in the bare ceiling. Subsequently, the support bodies 11 such as 50 and 51 are directly or, with the addition of the extension pipe, screwed up to the desired height. The height of the individual support mounts can, for instance, be adjusted by means of a spirit level. Subsequently, the sheet channel brackets are put in place. They are either slid lengthwise into the spaces between the mounting and locking pieces or, as was explained in connection with FIGS. 3, 8 and 9, are lowered from above and snapped onto the mounting pieces 37. The locking pieces 36 must then be bent upwards. FIG. 12 shows continuous sheet brackets 20a and connecting sheet brackets 200a; the sheet brackets 200a push tightly against the continuous brackets. In case the distance between the individual support bolts

are too large, supporting substructures 8 can also be provided in the middle between two supporting bolts which are far apart. Extension parts which, for instance, connect the sheet roof with partitions or walls can, instead of sheet brackets, also be placed on the support mounts of the invention. After placing the roofing sheet brackets on the support mounts the roofing sheets are installed and connected with the roofing sheet brackets either in accordance with the method illustrated in FIG. 1 or in accordance with the method of FIG. 11.

I claim:

1. In apparatus for mounting exterior roofing sheets above a sub-roof including a plurality of generally horizontally-extending downwardly-facing channel members each adapted to support abutting edges of a respective pair of roofing sheets and a plurality of vertically-extending bolts with the lower end of each of said bolts being embedded in said sub-roof and an upper portion of each of said bolts being externally threaded, the combination of: a plurality of support bracket means each mounted atop a respective one of said bolts and each supporting one of said channel members at a respective place along the length of said one of said channel members, each of said support bracket means comprising an integral assembly having an upper generally horizontal upper sheet portion connected to the downwardly-extending sides of a respective one of said channel members, a generally-conical intermediate portion, and a tubular lower portion adjustably mounted atop a respective one of said bolts at a desired elevation, each of said support brackets means comprising a first piece of metal sheet formed to provide part of said horizontal upper sheet portion, part of said conical intermediate portion, and part of said tubular lower portion, and a second piece of metal sheet formed to provide part of said horizontal upper sheet portion, part of said conical intermediate portion, and part of said tubular lower portion, said first and second pieces of metal sheet being fixedly attached to each other.

2. In apparatus for mounting exterior roofing sheets above a sub-roof including a plurality of generally horizontally-extending downwardly-facing channel members each adapted to support abutting edges of a respective pair of roofing sheets and a plurality of vertically-extending bolts with the lower end of each of said bolts being embedded in said sub-roof and an upper portion of each of said bolts being externally threaded, the combination of: a plurality of support bracket means each mounted atop a respective one of said bolts and each supporting one of said channel members at a respective place along the length of said one of said channel members, each of said support bracket means comprising an integral assembly having an upper generally horizontal upper sheet portion connected to the downwardly-extending sides of a respective one of said channel members, a generally-conical intermediate portion, and a tubular lower portion adjustably mounted atop a respective one of said bolts at a desired elevation, at least one of said support bracket means including a cylindrical length of pipe with internal threads adjacent its lower end engaging the external threads of a respective one of said support bolts and the upper end of said length of pipe engaging said tubular lower portion of said one of said support bracket means.

3. The combination according to claim 2 wherein said downwardly-extending sides of said channel members have horizontally-extending flanges, and wherein said horizontal upper sheet portion of each of said support bracket means is cut to provide a plurality of tab portions bent away from said sheet portion to grip said horizontally-extending flanges of one of said channel members.

4. The combination according to claim 3 wherein a pair of said tab portions are bent upwardly to engage said downwardly-extending sides of one of said channel members.

5. The combination according to claim 3 wherein each of said support bracket means includes a pair of said tab portions which are offset upwardly from said sheet portion and extend generally horizontally to prevent upward movement of said horizontally-extending flanges of said one of said channel members.

6. The combination according to claim 2 wherein said horizontal upper sheet portion of each of said support bracket means includes a central hole through which the upper end of a respective one of said support bolts may protrude to a space between the legs of a respective one of said downwardly-facing channel members.

7. The combination according to claim 2 wherein said horizontal sheet upper portion of each of said support bracket means is substantially rectangular and includes a pair of holes cut adjacent each corner and said tab portions bent to grip said flanges of said channel member comprise said corners of said horizontal sheet upper portion.

8. A support bracket assembly for carrying a roofing sheet at a desired elevation above a sub-roof, comprising, in combination: a vertically extending externally-threaded mounting bolt embedded in said sub-roof, first and second pieces of metal sheet fixedly attached to each other to provide an integral bracket having a generally horizontal upper plate portion and a tubular vertically-extending lower portion, each of said pieces of metal sheet being formed to provide a respective half of said upper plate portion, and a respective half of said tubular lower portion; and a structural member resting atop said upper plate portion and carrying said roofing sheet, portions of said first and second metal sheets forming said respective halves of said tubular lower portion of said bracket being formed to provide internal threads adapted to engage the external threads of said mounting bolt.

9. An assembly according to claim 8 wherein said first and second metal sheets are formed to provide a hollow generally-conical portion in between said upper plate portion and said tubular lower portion.

10. A support bracket assembly for carrying a roofing sheet at a desired elevation above a sub-roof, comprising, in combination: a vertically extending externally-threaded mounting bolt embedded in said sub-roof, first and second pieces of metal sheet fixedly attached to each other to provide an integral bracket having a generally horizontal upper plate portion and a tubular vertically-extending lower portion, each of said pieces of metal sheet being formed to provide a respective half of said upper plate portion, and a respective half of said tubular lower portion; and a structural member resting atop said upper plate portion and carrying said roofing sheet, each of said pieces of metal sheet comprising a vertically-extending portion and a horizontally-

11

extending portion, each of said vertically-extending portions comprising a pair of flat surfaces on opposite sides of a depression which forms a respective half of said tubular vertically-extending lower portion of said bracket, and each of said horizontally-extending portions including at least one tab bendable upwardly to grip a flange of said structural member.

11. A support bracket assembly for carrying a roofing sheet at a desired elevation above a sub-roof, comprising, in combination: a vertically-extending externally-threaded mounting bolt embedded in said sub-roof, first and second pieces of metal sheet fixedly attached to each other to provide an integral bracket having a generally horizontal upper plate portion and a tubular vertically-extending lower portion, each of said pieces of metal sheet being formed to provide a respective half of said upper plate portion, and a respective half of said tubular lower portion; and a structural member resting atop said upper plate portion and carrying said roofing sheet, each of said pieces of sheet including a pair of flat surfaces on opposite sides of a respective depression which forms a respective half of said tubular lower portion of said bracket, each of said flat surfaces of said first piece of metal sheet being fixedly attached to a respective one of the flat surfaces of said second piece of metal sheet.

12. An assembly according to claim 11 wherein the

12

vertically-extending lower portion of each of said pieces of metal sheet is provided with a depression extending the entire height of said vertically-extending portion, whereby said mounting bolt may be arranged to extend entirely through said tubular lower portion to a level above said horizontal upper plate portion of said bracket.

13. An assembly according to claim 11 in which said horizontal upper plate portion of said bracket comprises a first portion of said first piece of metal sheet bent to extend generally horizontally away from said second piece of metal sheet, and a first portion of said second piece of metal sheet bent to extend generally horizontally away from said first piece of metal sheet.

14. An assembly according to claim 13 wherein said first portions of said first and second pieces of metal sheet include T-shaped corner portions bendable upwardly to grip said structural member.

15. An assembly according to claim 11 wherein said first and second pieces of metal sheet are fixedly attached to each other by rivet means passing through holes in said flat surfaces.

16. An assembly according to claim 11 wherein said first and second pieces of metal sheet are fixedly attached to each other by spot welding together respective pairs of said flat surfaces.

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