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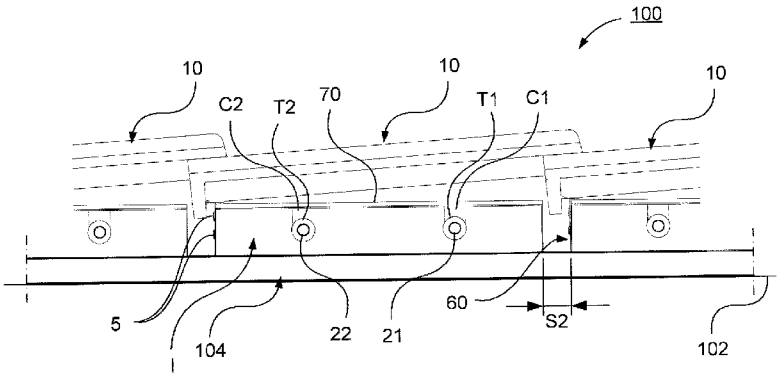

Fig. 3a

(57) Abstract: The present invention relates to a light absorbing unit (I) for heating at least one liquid medium (L) by means of solar energy via a transparent surface layer (10) comprising a channel configuration (21, 22) inside said transparent surface layer (10) in which said liquid medium is arranged to stream for said heating, wherein light absorbing means (30) are present configured to mainly contain said channel configuration (21, 22), which light absorbing unit is intended to constitute an integrated part in a roof construction (100), wherein said transparent surface layer (10) comprises roofing tiles (10) transparently arranged to be supported by means of batten, wherein said batten (60) is arranged to constitute a part of said light absorbing unit (I) in said roof construction (100), wherein said batten (60) is arranged to be applied in said roof construction (100) with said light absorbing unit (I). Said batten (60) is arranged to run and be supported along a long side of said light absorbing unit (I), which long side is intended to run essentially horizontally in said roof construction (100).

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LIGHT ABSORBING UNIT INTEGRATED IN A ROOF CONSTRUCTION

TECHNICAL FIELD

The invention relates to a light absorbing unit according to the preamble of claim 1.

BACKGROUND ART

Light absorbing units exist in a number of designs where a liquid medium, e.g. water or a gaseous medium, e.g. air is heated by light rays from the sun. an advantage with a waterborne system compared to an airborne system is among other that it is easier to connect this to an already existing waterborne system in contrast to interacting between an airborne and a waterborne system. Liquid further has a higher energy density than air wherein higher efficiency is obtained if interaction between air and water can be avoided.

A variant of a light absorbing unit is a so called plane solar collector – a box-like construction with an outer glass sheet allowing light rays through, wherein a liquid medium is circulated in a pipe system in a substantially confined space underneath the glass sheet, wherein the medium is heated by means of said light rays.

Such devices are intended to be stationary placed on house walls/roofs wherein the hot medium may be used for heating the air in the building or for producing hot tap water.

A problem with light absorbing units of that kind is that they are limited in size, have a high price per square meter and are difficult to place on e.g. the roof of a building. Placement of devices of the kind on roofs or walls of

houses is further aesthetically unattractive in that they have a construction and shape differing from the shape of the building.

Due to the fact that they are placed on roofs and thus removable they are where applicable targeted by thieves. In addition they tend to collect dirt, leaves and the like. Due to the fact that they are exposed on the rough or the wall they are subjected to outer tampering such as hail, falling branches or the like. Life expectancy of such devices is also limited.

FR2499693A1 shows a light absorbing unit for heating a liquid medium by means of solar energy via a transparent surface layer comprising a channel configuration in the form of hoses inside said transparent surface layer in which said liquid medium is arranged to stream for said heating, wherein light absorbing means are present in the form of upper and lower plates shaped in accordance with and surrounding the hoses forming thermal contact. The unit further comprises an inner transparent layer for thermally isolating said channel configuration for said liquid medium to the surrounding air. The light absorbing unit is intended to constitute an integrated part of a roof construction. The light absorbing unit is arranged to support roofing tiles.

OBJECTS OF THE INVENTION

An object of the present invention is to provide a light absorbing device for a liquid medium which facilitates easy and time-efficient manufacturing and installation, is easy to apply and has long life expectancy.

SUMMARY OF THE INVENTION

These and other objects, apparent from the following description, are achieved by means of a light absorbing unit which is of the type stated by way of introduction and which in addition exhibits the features recited in the

characterising clause of the appended independent claim 1. Preferred embodiments of the light absorbing unit are defined in appended dependent claims 2-11.

Specifically an object of the invention is achieved by a light absorbing unit for heating at least one liquid medium by means of solar energy via a transparent surface layer comprising a channel configuration inside said transparent surface layer in which said liquid medium is arranged to stream for said heating, wherein light absorbing means are present, configured to mainly contain said channel configuration, which light absorbing unit is intended to constitute an integrated part in a roof construction, wherein said transparent surface layer comprises roofing tiles transparently arranged to be supported by means of batten, wherein said batten is arranged to constitute a part of said light absorbing unit in said roof construction, wherein said batten is arranged to be applied in said roof construction with said light absorbing unit, wherein said batten is arranged to run and be supported along a long side of said light absorbing unit, which long side is intended to run essentially horizontally in said roof construction. Hereby easy and time-efficient installation of the light absorbing unit is achieved by integrating a roof construction in that the batten is already applied on the light absorbing unit by application on battening of the roof construction such that no batten needs to be applied prior to applying the light absorbing unit. Due to the fact that the batten is arranged to be applied in the roof construction with the light absorbing unit and consequently constitute a part of the light absorbing unit no adaption due to deviations on distances between battens which is the case in conventional battens arranged on the roof is required, wherein hereby the light absorbing surface may be optimized for optimized efficiency.

According to an embodiment said light absorbing unit is essentially parallelepipedicly configured.

According to an embodiment of the light absorbing unit said batten comprises an upper portion for storage of roofing tiles arranged to project over an upper

side of said light absorbing unit. Hereby application and support of roofing tiles is facilitated at the same time as the risk of the edge of the roofing tiles at the batten does not risk touching and damage the upper side of the light absorbing unit.

According to an embodiment of the light absorbing unit said batten has en essentially L-shaped cross section transversal to its longitudinal direction and wherein a foot portion of said L-shaped cross section is arranged to constitute a spacer between two adjacent light absorbing units. Hereby installation is further facilitated in that adjacent light absorbing units easily are applied in correct position next to an already applied light absorbing unit. Further optimization of the efficient absorber surface which is included by the upper side of the light absorbing unit is facilitated.

According to an embodiment of the light absorbing unit said upper portion is shorter transversal to the longitudinal direction of the batten than said foot portion. Hereby optimization of the efficient absorber surface which is included by the upper side of the light absorbing unit is facilitated at the same time as space is given for supporting of roofing tiles in connection to the batten.

According to an embodiment of the light absorbing unit said upper portion has a downwardly open essentially U-shaped configuration. Hereby supporting of roofing tiles is facilitated. The U-shaped configuration of the upper portion of the batten further facilitates connection to roofing tiles via a connection member.

According to an embodiment of the light absorbing unit said roofing tiles are intended to be connected to said batten by means of a connection member arranged to act between roofing tile and the batten. Hereby easy connection of batten and roofing tiles is facilitated. Hereby fulfilling of statutory demands on connection of roofing tiles in a roof construction is facilitated. Hereby the

density and walkability of the roof is improved. Further the risk of roofing tiles coming loose by e.g. high winds is reduced.

According to an embodiment of the light absorbing unit said connection member comprises an upper fastening portion arranged to be applied at a roofing tile and a lower fastening portion arranged to be applied at the batten, wherein said fastening portions are arranged to retain said connection member to said roofing tile. Hereby efficient connection between roofing tile and batten is facilitated.

According to an embodiment of the light absorbing unit said lower fastening portion is arranged to interact with said upper portion of said batten. Hereby efficient connection between roofing tile and batten is obtained.

According to an embodiment of the light absorbing unit said lower fastening portion has an upwardly open essentially U-shaped configuration for said interaction. Hereby good connection between roofing tiles and batten is obtained in that the U-shaped configuration of the lower fastening portion hooks in the U-shaped configuration of the upper portion of the batten for said connection.

According to an embodiment of the light absorbing unit said upper side comprises a transparent layer for thermally isolating said channel configuration for said liquid medium against the surrounding air. Hereby efficiency of the light absorbing unit is improved.

BRIEF DESCRIPTION OF THE DRAWINGS

A better understanding of the present invention will be had upon the reference to the following detailed description when read in conjunction with the accompanying drawings, wherein like reference characters refer to like parts throughout the several views, and in which:

Fig. 1 schematically illustrates a perspective view of a light absorbing unit according to an embodiment of the present invention;

Fig. 2 schematically illustrates a perspective view of light absorbing units according to fig. 1 integrated in a roof construction;

Fig. 3a schematically illustrates a gable view of the light absorbing unit in fig. 1 integrated in a roof construction;

Fig. 3b schematically illustrates a cross sectional gable view of the light absorbing unit in fig. 1 integrated in a roof construction;

Fig. 4 schematically illustrates a cross sectional view of a batten of the light absorbing unit in fig. 1 according to an embodiment of the present invention;

Fig. 5a schematically illustrates a perspective view of a connection member according to an embodiment of the present invention;

Fig. 5b schematically illustrates a side view in its longitudinal extension of the connection member in fig. 4a;

Fig. 5b schematically illustrates a side view transversal to its longitudinal extension of the connection member in fig. 4a;

Fig. 6a schematically illustrates a gable view of the light absorbing unit integrated in a roof construction with said connection member; and

Fig. 6b schematically illustrates a perspective view of the light absorbing unit integrated in a roof construction with said connection member;

Fig. 7 schematically illustrates a perspective view of a light absorbing unit according to an embodiment of the present invention;

Fig. 8 schematically illustrates a perspective view of light absorbing units according to fig. 7 integrated in a roof construction;

Fig. 9a schematically illustrates a gable view of the light absorbing unit in fig. 7 integrated in a roof construction;

Fig. 9b schematically illustrates a cross sectional gable view of the light absorbing unit in fig. 7 integrated in a roof construction;

Fig. 10 schematically illustrates a cross sectional view of a batten of the light absorbing unit in fig. 7 according to an embodiment of the present invention;

Fig. 11a schematically illustrates a cross sectional view of an edge element of the light absorbing unit in fig. 7 according to an embodiment of the present invention;

Fig. 11b schematically illustrates a plan view of the edge element in fig. 11a in a non-assemble state;

Fig. 11c schematically illustrates a plan view of the edge element in fig. 11a in an assemble-ready state and

Fig. 12 schematically illustrates a cross sectional gable view of the light absorbing unit in fig. 7.

DETAILED DESCRIPTION

Fig. 1 schematically illustrates a perspective view of a light absorbing unit I according to an embodiment of the present invention; fig. 2 a perspective view and fig. 3a-b gable views of light absorbing units I integrated in a roof construction 100 and fig. 4 a batten 60 intended to be comprised in the light absorbing unit I.

The light absorbing unit I according to this embodiment is intended to heat a liquid medium L by means of solar energy via a transparent surface layer 10 in the form of roof covering, the roof covering comprising transparent roofing tiles 10. Due to the fact that said roof covering comprises transparent roofing

tiles 10 an aesthetically appealing light absorbing device is facilitated where the light absorbing unit I is integrated in a roof construction 100 and the light absorbing unit I consequently constitutes an integrated part of the roof construction 100, the light absorbing device comprising said light absorbing units I being easy to replace or construct as new.

The light absorbing device I comprises a space 2 inside said roof cover in which said liquid medium L is arranged to stream.

The light absorbing unit I comprises a channel configuration 21, 22 inside said transparent surface layer 10 in which said liquid medium L is arranged to stream for said heating.

The light absorbing unit I comprises alight absorbing means 30 configured to mainly contain said channel configuration 21, 22. The light absorbing means 30 is arranged for generation of thermal energy by allowing solar energy in the form of direct sunlight to be let through the transparent surface layer 10 to the light absorbing means 30 for heating of said liquid medium.

The light absorbing unit I further comprises means, e.g. a pump device (not shown), arranged to provide said streaming of the liquid medium L.

Said light absorbing unit I is essentially parallelepipedically configured. Said light absorbing unit I consequently has a box-shaped configuration.

The light absorbing unit I is elongated and has two long sides 42, 44 running parallel to and at a distance from each other, two short sides 46, 48 running parallel to and at a distance from each other connected to the long sides 42, 44 forming a rectangular shape. Further the light absorbing unit I has an underside 45 connecting the long sides 42, 44 and the short sides 46, 48. The thus connected long sides, short sides and underside hereby form a box unit 40 arranged to receive and contain said channel configuration 21, 22 and said light absorbing means 30.

The underside 45 is intended to face and lie on vertical battens 104, so called battening 104, of a roof as shown in fig. 3a.

The light absorbing unit I comprises a batten 60. Said transparent roofing tiles 10 of said transparent surface layer are arranged to be supported by means of said batten 60.

Said batten 60 is arranged in said roof construction 100 to constitute a part of said light absorbing unit I, wherein said batten is arranged to be applied in said roof construction 100 with said light absorbing unit I.

Said batten 60 is arranged to run and be supported along a long side 44 of said light absorbing unit I, which long side 44 is intended to run essentially horizontally in said roof construction.

As is apparent from among other fig. 1 and 4 said batten 60 has en essentially L-shaped cross section transversal to its longitudinal direction.

Said batten 60 comprises an upper portion 62 as storage for roofing tiles 10. Said upper portion 62 of the batten 60 is arranged to project over an upper side 70 of said light absorbing unit I.

Said batten 60 further comprises a foot portion 64 of said L-shaped cross section. Said foot portion 64 is arranged to constitute a spacer between two adjacent light absorbing units I.

Said upper portion 62 is shorter transversal to the longitudinal direction of the batten 60 than said foot portion 64. Said upper portion 62 consequently has an extension S1 transversal to the longitudinal direction of the batten 60 being shorter than the extension of the foot portion transversal to the longitudinal direction of the batten 60.

Said batten 60 is intended to be fastened at one of the long sides 44 of said light absorbing unit I. Said batten 60 is according to this embodiment intended to be fastened at one of the long sides of said light absorbing unit I

by means of a fastener 5 in the shape of a screw joint, rivet joint such as a pop rivet joint, a snap joint or the corresponding.

Said batten 60 has an intermediate portion 66 intended to run along and be fastened at one of the long sides 44 of the light absorbing unit I.

Said upper portion 62 has a downwardly open essentially U-shaped configuration. Said upper portion 62 comprises a flat top portion 62a arranged to project in a direction from the long side of the light absorbing unit I. Said upper portion 62 further comprises a hook portion 62b directed downwardly with an angle, according to a variant essentially perpendicular, from said flat top portion 62a, running parallel to and at a distance from said intermediate portion 66.

Said foot portion 64 has an upwardly open essentially U-shaped configuration. Said foot portion 64 comprises a flat bottom portion 64a arranged to project outwardly in a direction from the long side of the light absorbing unit I. Said foot portion 64 is intended to lie against a battening 104 of the roof construction 100 running transversal to the batten 60. Said foot portion 64 further comprises a stop portion 64b directed upwardly with an angle, according to a variant essentially perpendicular, from said flat bottom portion 64a, running parallel to and at a distance from said intermediate portion 66.

Said stop portion 64b of the foot portion 64 is arranged to constitute a stop for the adjacent light absorbing unit I.

Said L-shaped cross section of the batten 60 is according to an embodiment arranged to be provided by bending. Said batten 60 is consequently according to this embodiment bent. According to an alternative embodiment said batten is extruded, the batten according to a variant being constituted by polycarbonate.

Fig. 5a-c schematically illustrate different views of a connection member 80 according to an embodiment of the present invention, and fig. 6a-b different views of the light absorbing unit I integrated in said roof construction 100 with said connection member 80.

Said roofing tiles 10 are intended to be connected with said batten 60 by means of said connection member 80. Said connection member 80 is arranged to act between a roofing tile 10 and the batten 60.

Said connection member 80 comprises an upper fastening portion 82 arranged to be applied at a roofing tile 10 and a lower fastening portion 84 arranged to be applied at the batten 60. Said fastening portion 82, 84 are arranged to retain said connection member 80 at said roofing tile 60.

Said lower fastening portion 84 is arranged to interact with said upper portion 62 of said batten 60.

Said connection member 80 has an intermediate portion 86 with an essentially screw-shaped configuration. Said intermediate portion 86 has an upper portion 86a being arranged to run transversal to the longitudinal extension of said batten 60 and consequently in the longitudinal extension of the roofing tiles 10. Said upper portion 86a of the intermediate portion 86 transcend into said upper fastening portion 82. Said intermediate portion 86 has a lower portion 86b being arranged to run in the longitudinal extension of said batten 60. Said lower portion 86b of the intermediate portion 86 transcend into the lower portion 84.

Said upper portion 86a and lower portion 86b of the intermediate portion 86 are consequently screwed about 90 degrees relative to each other for provision of said screw-shaped configuration. By said screw-shaped configuration of the intermediate portion 86 a certain resilience of the connection member 86 is obtained. The connection member 86 is consequently resiliently configured. By the resilient properties of the connection member 80 obtained by means of the screw-shaped configuration

of the intermediate portion 86 a certain variation of the embodiment of the roofing tiles 10 is allowed. Further, due to the resilient properties of the connection member 80, underlying material is allowed to move without tension being built up in the roofing tiles 10.

Said upper fastening portion 82 has a downwardly open essentially U-shaped configuration. Said upper fastening portion 82 is intended to run along an edge portion 10a of a roofing tile 10 transversal to the longitudinal extension of said batten 60 in order to thus connect said roofing tile 10. Said upper fastening portion 82 is according to this embodiment intended to be arranged in connection to a lower portion of the left edge portion 10a of a roofing tile. Said upper fastening portion 82 is arranged to run from said upper portion 86a of the intermediate portion 86 in direction downwardly along the edge portion 10a of the roofing tile. Due to the fact the roofing tile the clamped by means of said upper U-shaped portion 82 overlaps two underlying roofing tiles several roofing tiles are hereby fastened with the batten 60 by the connection member 80, which is apparent from fig. 6b.

Said lower fastening portion 84 has an upwardly open essentially U-shaped configuration for said interaction. Said U-shaped configuration of said lower fastening portion 84 is arranged to run essentially perpendicular to said U-shaped configuration of the upper fastening portion 82.Said lower fastening portion 84 comprises a flat bottom portion 84a arranged to project outwardly in direction from the lower portion 86b of the intermediate portion 86.

Said lower fastening portion 84 further comprises a hook portion 84b directed upwardly with an angle, according to a variant essentially perpendicular, from said flat bottom portion 84a, running parallel to and at a distance from said lower portion 86b of the intermediate portion 86. Said hook portion 84b of the connection member 80 is arranged to hook into said hook portion 64b of the batten 60 for connecting a roofing tile 10 with the batten 60.

Above a connection member 80 for connecting roofing tiles 10 with said batten 60 of the light absorbing unit I has been described with reference to fig. 5a-c. Corresponding connection members 80 are also applicable for connecting roofing tiles 10 with the batten 160 of the light absorbing unit II.

The light absorbing unit I comprises insulating means 50 with insulating properties. Said insulating means 50 is arranged in said box-shaped unit 40 of the light absorbing unit I.

Said insulting means 50 comprises an insulating layer 52.

The insulating layer 52 is according to a variant constituted by a rock wool rug. The insulating layer 52 is configured to be arranged at the bottom of the box-shaped unit.

Said insulating means 50 comprises side insulating elements 54, 56 arranged for insulating the long sides 42, 44 of the light absorbing unit I. Said side insulating elements 54, 56 comprises a first side insulating element 54 arranged in the box-shaped unit to essentially abut and run along one of the long sides 42 and a second side insulating element 56 arranged in the box-shaped unit to essentially abut and run along the other long side 44 of the light absorbing unit I. The first and second side insulating element 54, 56 has a height essentially corresponding to the height of the first and second long side 42, 44. Said insulating means 50 further comprises according to a variant not shown gable insulating means arranged for insulating the short sides 46, 48.

The insulating layer 52 is arranged to be closely received between the first and second side insulating elements 54, 56.

The light absorbing means 30 forms together with the channel configuration 21, 22 an absorber member 35. The absorber member 35 has an elongated shape. The absorber member 35 has a black, blue or dark surface for said light absorption.

Hereby said liquid medium L is intended to stream in said first and second channel portion for heating. The first and second channel portions 21, 22 are according to a variant constituted by cupper pipes for good heat conduction.

The light absorbing unit I comprises said upper side 70 arranged above said box unit 40. Said upper side constitutes a transparent layer 70 for thermally insulating said channel configuration 21, 22 for said liquid medium L towards the surrounding air.

Said transparent layer 70 is arranged in connection to said channel configuration 21, 22 and consequently absorber member 35 for allowing heating of said liquid medium L by means of solar energy.

The transparent layer 70 may be manufactured in any suitably material. According to an embodiment said transparent layer 70 is constituted by glass.

The transparent surface layer 10, i.e. the roofing tiles 10, provides functionality such as mechanical protection against objects, e.g. falling tree branches or hail, or conditions, e.g. wind forces, etc. and constitutes insulation.

The transparent layer 70 provides among others functionality such as thermal sealing for providing a high energy exchange in the light absorbing unit I.

The transparent layer 70 is according to a preferred embodiment arranged to thermally insulate the channel configuration for the streaming medium L. The transparent layer 70 is thus arranged between the thereby thermally insulated channel configuration 21, 22 and the surface layer 10 in the space 2. Hereby the transparent surface layer 10 in the form of roofing tiles 10 constitutes an outer transparent layer and the transparent layer 70 an inner transparent layer.

According to an embodiment the transparent layer 70 is arranged in the space 2 in such a way that energy transfer according to above described type in the light absorbing unit I per time unit is maximized.

The respective short side 46, 48 of the light absorbing unit I comprises to protrusions U1, U2 arranged at a distance from each other and open from he upper side arranged to receive and support said first and second channel portions 21, 22 of said channel configuration 21, 22.

Further the light absorbing unit I comprises cover elements C1, C2 arranged to seal the respective protrusion when the channel portions 21, 22 have been applied. In addition the light absorbing unit I comprises ring shaped sealing portions T1, T2 arranged to surround the respective channel portion 21, 22 and essentially abut the short side 46, 48 in connection to the channel portion 21, 22.

By means of said sealing portions T1, T2 a good sealing of the light absorbing unit I is obtained. Further stuff such as pollen, leaves or the like is prevented from getting in contact with the light absorbing means 30 such that the absorption is impaired. Further risk of fire due to incoming flammable stuff such as dry leaves is prevented. Further a better heat conservation and consequently a more energy efficient light absorbing unit I is obtained through better sealing. In addition easier assembly is obtained.

According to an alternative, not shown, variant each short side 46, 48 is constituted by a separate part without protrusions but with openings for the channel portions. According to this variant one of the short sides is assembled first, where after the insulating layer and absorber member are assembled, and wherein thereafter the second short side is assembled. Hereby the absorber member is thus contained.

Fig. 7 schematically illustrates a perspective view of a light absorbing unit II according to an embodiment of the present invention; fig. 8 a perspective view and fig. 9a-b gable views of such light absorbing units II integrated in a

roof construction 200 and fig. 12 a cross sectional view of a part of the light absorbing unit II. Fig. 10 illustrates a cross sectional view of a batten 160 intended to be comprised in the light absorbing unit II.

The light absorbing unit II differs from the light absorbing unit I mainly through how the box 140 comprising the batten 160 is configured.

Said transparent roofing tiles 10 of said transparent surface layer is in a corresponding way as in the light absorbing unit I arranged to be supported by means of the batten 160 of the light absorbing unit II.

Said batten 160 of the light absorbing unit II is arranged in said roof construction 200 to constitute a part of said light absorbing unit II. Said batten 160 is arranged to be applied in said roof construction 200 with said light absorbing unit II. The batten 160 is arranged to be comprised in one of the long sides 144 of the light absorbing unit II. The batten 160 is arranged to constitute one of the long sides of the light absorbing unit II.

Said batten 160 is arranged to run and be supported along a long side of said light absorbing unit II, which long side is intended to run essentially horizontally in said roof construction 200.

As is apparent from among others fig. 10 said batten 160 has an essentially L-shaped cross section in its longitudinal direction.

Said batten 160 comprises an upper portion 162 as storage for roofing tiles 10. Said upper portion 162 of the batten is arranged to project over an upper side 70 of said light absorbing unit II.

Said batten 160 further comprises a foot portion 164 of said L-shaped cross section.

Said upper portion 162 is shorter transversal to the longitudinal direction of the batten 160 than said foot portion 164. Said upper portion 162 consequently has an extension S1 transversal to the longitudinal direction of

the batten that is shorter than the extension S2 of said foot portion 164 transversal to the longitudinal direction of the batten 160.

Said batten 160 has an intermediate portion 144 intended to constitute one of the long sides 144 of the light absorbing unit I.

Said upper portion 162 has a downwardly open essentially U-shaped configuration. Said upper portion 162 comprises a flat top portion 162a arranged to project in a direction from the long side 144 of the light absorbing unit I. Said upper portion162 further comprises a hook portion 162b directed downwardly with an angle, according to a variant essentially perpendicular, from said flat top portion 162, running parallel to and a a distance from said intermediate portion 144.

Said foot portion 164 has an upwardly open essentially U-shaped configuration. Said foot portion 164 comprises a flat bottom portion 164a arranged to project in a direction from the long side of the light absorbing unit I. Said foot portion 164 is according to the embodiment illustrated in fig. 5 intended to lie against a lath portion 104 of the roof construction running transversal to the batten 160. Said foot portion 164 further comprises a stop portion 164b directed upwardly with an angle, according to a variant essentially perpendicular, from said flat bottom portion 164a, running parallel to and at a distance from said intermediate portion 144. Said stop portion 164b of the foot portion 164 is arranged to constitute stop for the light absorbing unit I such that it is not displaced.

Said L-shaped cross section of the batten 160 is according to an embodiment arranged to be provided through extrusion.

From the respective long side 142, 144 a support portion 142a, 144a is arranged to project in direction from the long side 142, 144 of the light absorbing unit I towards each other and arranged to run along the respective long side 142, 144. The respective support portion 142a, 144a is arranged to support the translucent layer 70. The translucent layer 70 is consequently

arranged to rest on and be supported by said support portion 142a, 144a. The respective support portion1 42a, 144a further comprises a hook portion 142b, 144b directed downwardly from the respective support portion1 42a, 144a for facilitating retention of said side insulating elements 54, 56.

From the respective long side 142, 144 a bottom fastening portion 142c, 144c is arranged to project in direction from the long side 142, 144 of the light absorbing unit II in direction towards each other and arranged to run in height with the underside 145 along the respective long side 142, 144. The respective bottom fastening portion1 42c, 144c is arranged to constitute fastening portion for the underside 145, the underside being constituted by a bottom plate 145.

The respective bottom fastening portion 142c, 144c has a recess with a height h. The bottom plate 145 is arranged to be fastened by means of fastening elements against said bottom fastening portion142c, 144c, the bottom plate according to a variant having a thickness which essentially corresponds to the height h of said recess of the bottom fastening portion1 42c, 144c. According to a variant said fastening element comprises a tape joint being constituted by double-sided tape. The bottom plate 145 is consequently according to an embodiment arranged to be fastened against said bottom fastening portion 142c, 144c by means of double-sided tape.

According to a variant each short side 146, 148 has a corresponding support portion for supporting of the translucent layer 70 and bottom fastening portion for fastening the bottom plate 145 as the long side 142 has.

Fig. 11a schematically illustrates a cross sectional view of an edge element 180 of the light absorbing unit in fig. 7 according to an embodiment of the present invention, fig. 11b a plan view of the edge element 180 in fig. 11b in a non-assembled state; and fig. 11c a plan view of the edge element 180 in fig. 11a in assemble-ready state.

The edge element 180 comprises a long side edge portion 182, and a short side edge portion 184, 186 on the respective side of the long side edge portion 182. The respective short side edge portion 184, 186 is connected to the long side edge portion 182. The respective short side edge portion 184, 186 are intended in an assembled state to constitute the short sides 146, 48 of the light absorbing unit II and the long side edge portion 182 constitutes the long side 142 of the light absorbing unit II.

As is apparent from fig. 11b the edge element 180 in the non-assembled state is constituted by an elongated element. In order to form the respective short side edge portion 184, 186 recesses are provided along portions of the edge element 180 in the form of V-shaped perpendicular cuts seen in a plan view, see fig. 11b. Hereby the respective cut is shaped such that the respective short side edge portion 184, 186 connected to the long side edge portion 182 via a thin remnant on the outside of the edge element 180 such that the respective short side edge portion 184, 186 is allowed to be bent relative to the short side edge portion 182.

As is apparent from fig. 11c showing the edge element 180 in an assembled-ready state the respective short edge portion 184, 186 has been folded in such that the edge element 180 forms a U-shape seen in plan view, see fig. 11c, such that the long side 142 and the short sides 146, 148 of the light absorbing unit II are formed.

Then the batten 160 and the bottom plate 145 are connected for forming of the box 140 of the light absorbing unit II.

Fig. 11b illustrates a cross section A1-A1 of the ling side portion 182, cross section A2-A2 of one of the short side portions 146 and cross section A3-A3 of the other short side portion 148, the respective cross section having the same cross sectional profile as illustrated for the edge element 180 in fig. 11a.

Consequently the respective short side 146, 148 hereby gets the corresponding support portion 146a, 148a for supporting of the translucent layer 70 and the bottom fastening portion 146c, 148c for fastening the bottom plate 145 as the long side 142 has.

Fig. 3a shows the light absorbing unit I with a part of a roof construction 100 and fig. 9 show the light absorbing unit II with a part of a roof construction 200. The roof construction 100; 200 comprises a bottom layer 102 which according to a variant comprises conventional roofing felt.

On the bottom layer 102 conventional vertical lath portions 104, so called battening or battening portions 104, are arranged at a distance from each other. With vertical lath portions are intended lath portions running along the roof construction from roof eave to roof ridge perpendicularly to the horizontal direction.

Said light absorbing unit I is arranged such that said channel portions 21, 22 run essentially parallel to each other and parallel to the horizontal battens 60; 160 and at such a distance that the battens 60; 160 do not shade the channels 21, 22. Hereby more efficient heating of the liquid medium L is obtained.

Said batten 60; 160 is arranged to run along a long side of said light absorbing unit I; II. Said batten 60; 160 is arranged to be supported along a long side 44; 144 of said light absorbing unit I; II. The long side 44; 144 is intended to run essentially horizontally in said roofing construction 100; 200.

A light absorbing unit is connectable at its gable portion via the protruding channel portions 21, 22 by connecting channel portions of one of the light absorbing units ! with channel portions of an additional light absorbing unit in the longitudinal extension of each other.

A set of joined light absorbing units integrated in a roof construction has at least one inlet and at least one outlet. Consequently the liquid medium L is

arranged to stream between the inlet and the outlet of the configuration channels 21, 22 for heating of the same.

The light absorbing unit I; II according to the present invention may be used for heating of one or more liquid media for any desired purposes. For example the light absorbing unit I; II may be used to heat water for hot tap water, heat water in accumulator tanks for run against heating systems such as radiators, liquid-air convectors or underfloor heating, and regenerating energy wells and/or heating pool water.

The light absorbing unit I; II according to above have two channel portions 21, 22 running parallel to each other and at a distance from each other in the longitudinal extension of the light absorbing unit I; II. The light absorbing unit I could alternatively have one channel portion or more than two channel portions running in the longitudinal direction of the light absorbing unit I; II.

Above an embodiment of a light absorbing means 30 has been described for heating of the liquid medium. The light absorbing means may however have any suitable shape for heating by means of solar energy and is not limited to the light absorbing means 30 according to the described embodiments.

The foregoing description of the preferred embodiments of the present invention has been provided for the purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise forms disclosed. Obviously, many modifications and variations will be apparent to practitioners skilled in the art. The embodiments were chosen and described in order to best explain the principles of the invention and its practical applications, thereby enabling others skilled in the art to understand the invention for various embodiments and with the various modifications as are suited to the particular use contemplated.

CLAIMS

1. A light absorbing unit (I; II) for heating at least one liquid medium (L) by means of solar energy via a transparent surface layer (10) comprising a channel configuration (21, 22) inside said transparent surface layer (10) in which said liquid medium (L) is arranged to stream for said heating, wherein light absorbing means (30) are present, configured to mainly contain said channel configuration (21, 22), which light absorbing unit is intended to constitute an integrated part in a roof construction (100; 200), wherein said transparent surface layer (10) comprises roofing tiles (10) transparently arranged to be supported by means of batten, **characterized in that** said batten (60; 160) is arranged to constitute a part of said light absorbing unit (I) in said roof construction (100; 200), wherein said batten (60; 160) is arranged to be applied in said roof construction (100; 200) with said light absorbing unit (I; II), wherein said batten (60; 160) is arranged to run and be supported along a long side of said light absorbing unit (I; II), which long side is intended to run essentially horizontally in said roof construction (100).

2. A light absorbing unit according to claim 1, wherein said light absorbing unit (I; II) is essentially parallelepipedicly configured. .

3. A light absorbing unit according to claim 1 or 2, wherein said batten (60; 160) comprises an upper portion (62; 162) for storage of roofing tiles (10) arranged to project over an upper side (70) of said light absorbing unit (I; II).

4. A light absorbing unit according to any of claims 1-3, wherein said batten (60; 160) has en essentially L-shaped cross section transversal to its longitudinal direction and wherein a foot portion (64; 164) of said L-shaped cross section is arranged to constitute a spacer between two adjacent light absorbing units (I; II).

5. A light absorbing unit according to claim 4, wherein said upper portion (62; 162) is shorter transversal to the longitudinal direction of the batten (60; 164) than said foot portion (64; 164).

6. A light absorbing unit according to any of claims 3-5, wherein said upper portion (62; 162) has a downwardly open essentially U-shaped configuration.

7. A light absorbing unit according to claim 6, wherein said roofing tiles (10) are intended to be connected to said batten (60; 160) by means of a connection member (80) arranged to act between roofing tile (10) and the batten.

8. A light absorbing unit according to claim 7, wherein said connection member (80) comprises an upper fastening portion (82) arranged to be applied at a roofing tile (10) and a lower fastening portion (84) arranged to be applied at the batten (60; 160), wherein said fastening portions (82, 84) are arranged to retain said connection member (80) to said roofing tile (10).

9. A light absorbing unit according to claim 8, wherein said lower fastening portion (84) is arranged to interact with said upper portion (62; 162) of said batten (60; 160).

10. A light absorbing unit according to claim 9, wherein said lower fastening portion (84) has an upwardly open essentially U-shaped configuration for said interaction.

11. A light absorbing unit according to any of claims 3-10, wherein said upper side (70) comprises a transparent layer (70) for thermally isolating said channel configuration (21, 22) for said liquid medium (L) against the surrounding air.

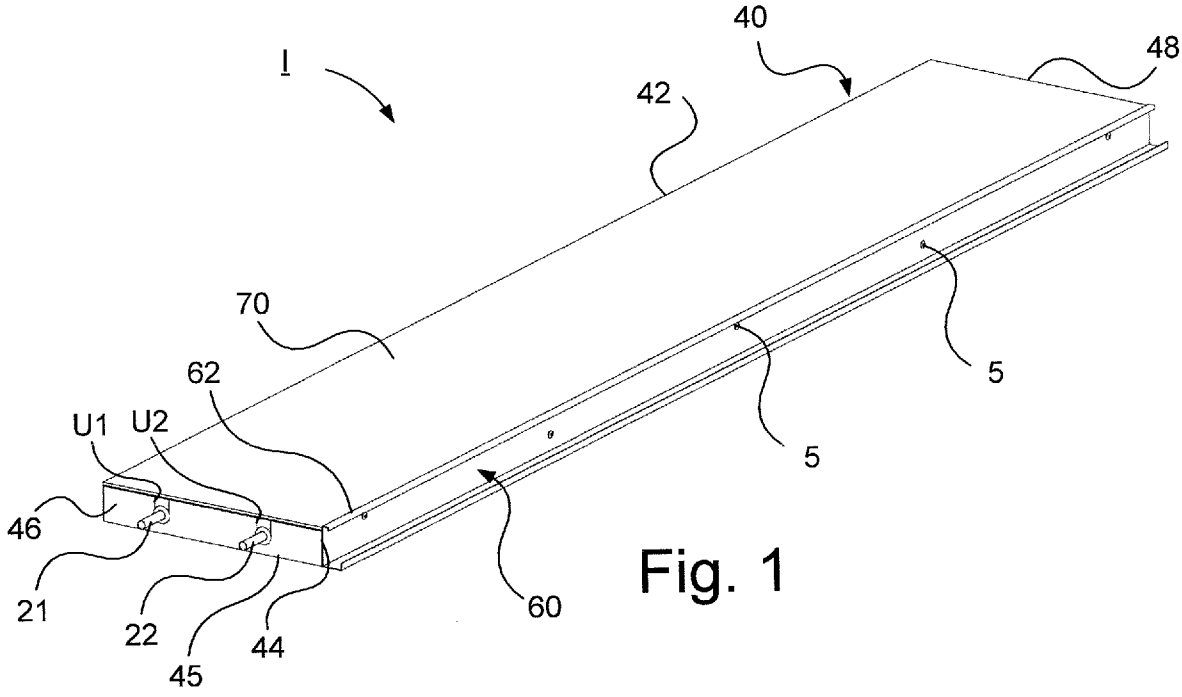

Fig. 1

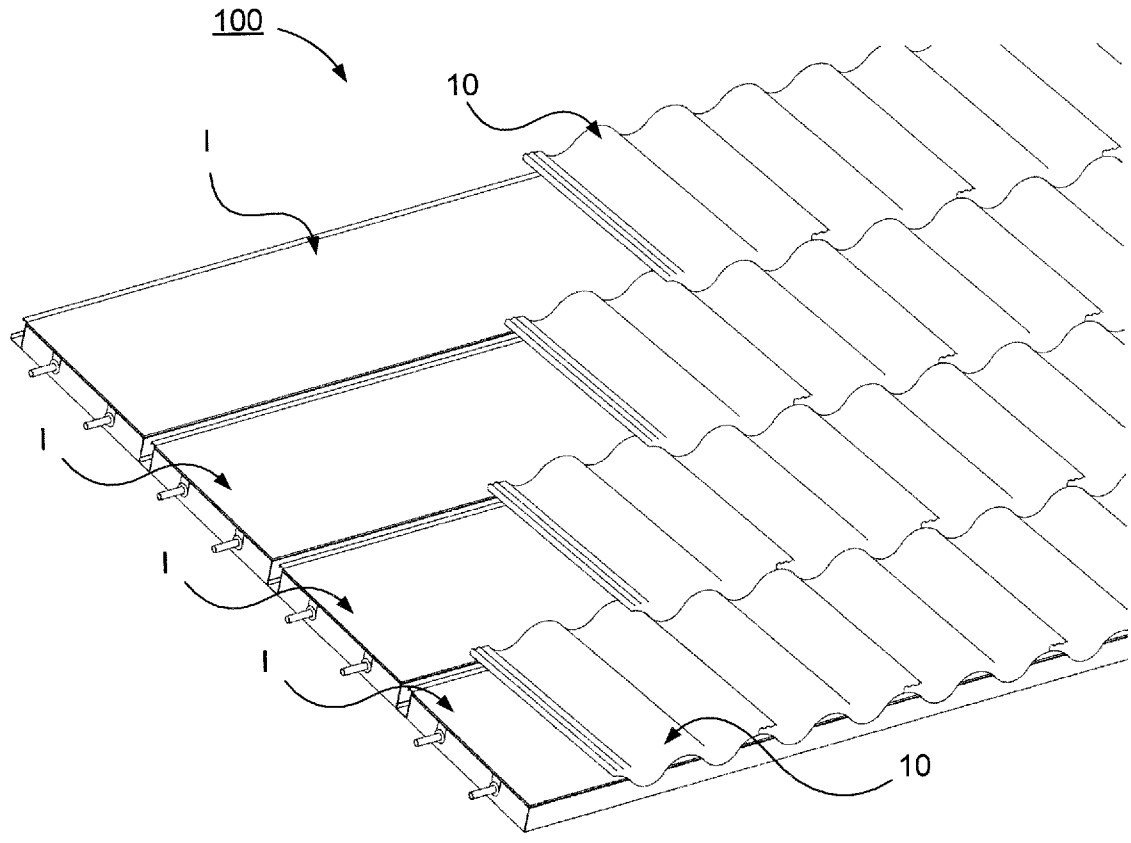

Fig. 2

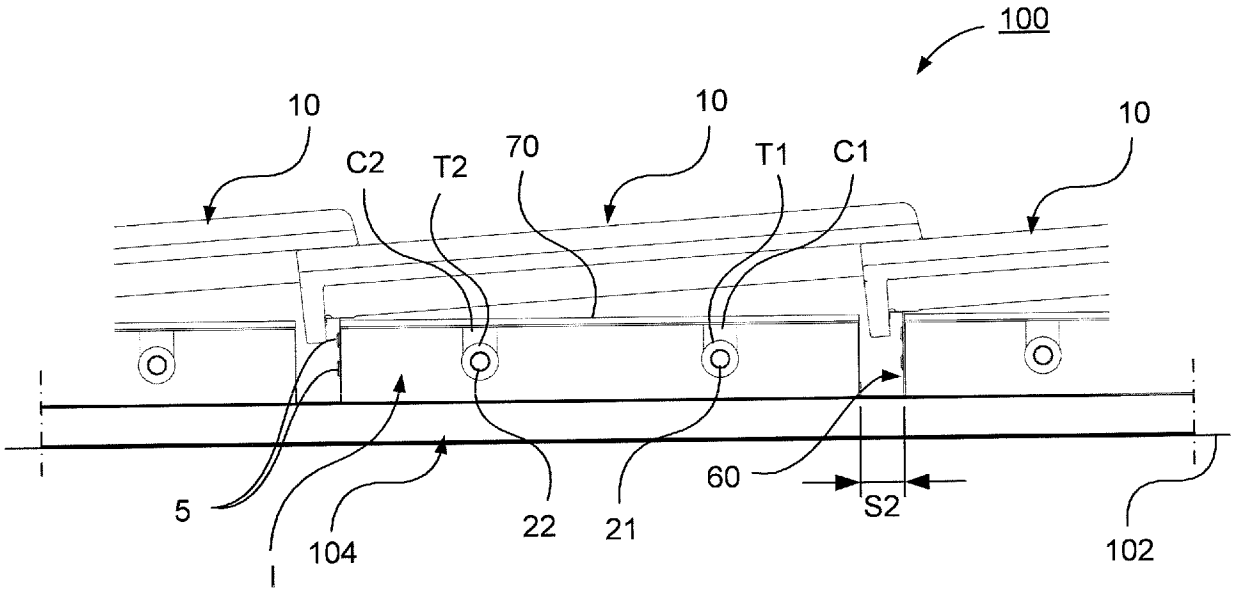
100
10
C2
T2
70
10
T1
C1
10
5
104
22
21
60
S2
102

Fig. 3a

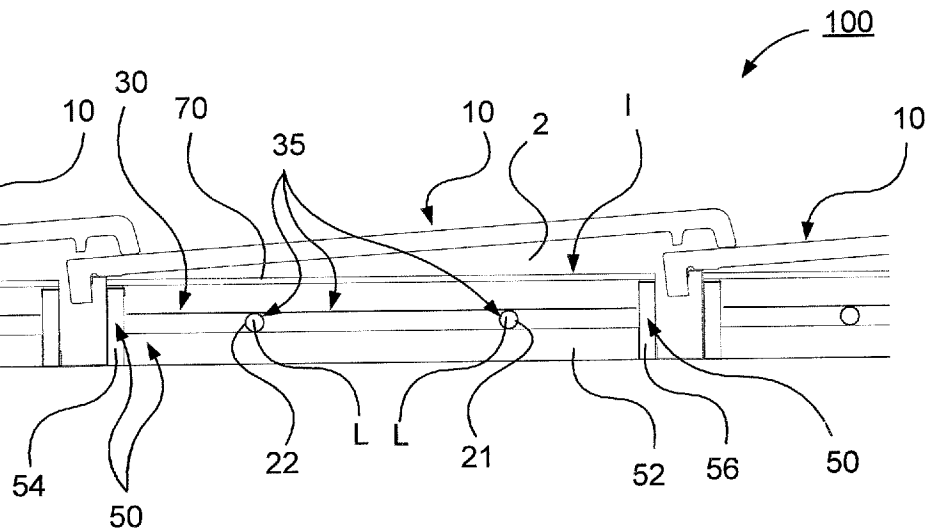
100
30
10
70
35
10
2
10
54
50
22
L
L
21
52
56
50

Fig. 3b

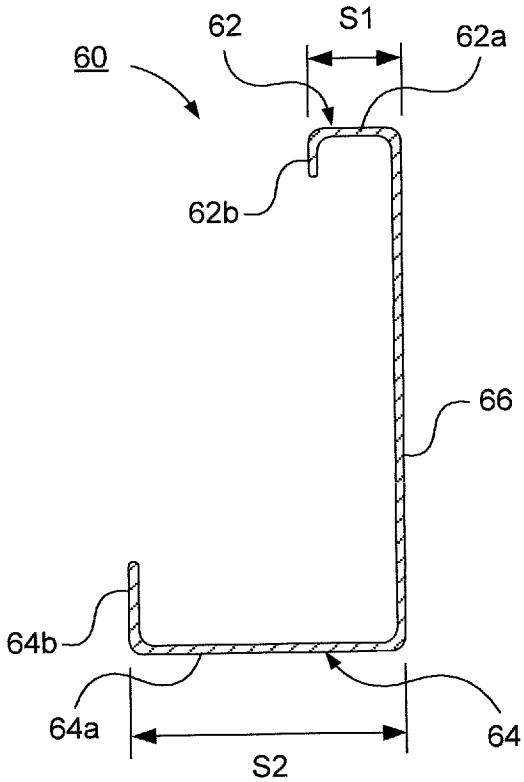

Fig. 4

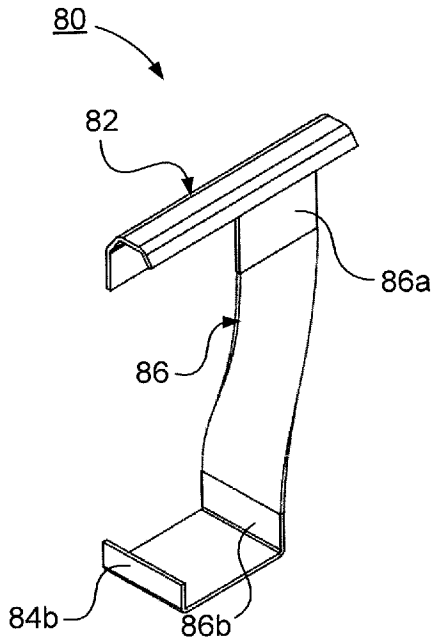

Fig. 5a

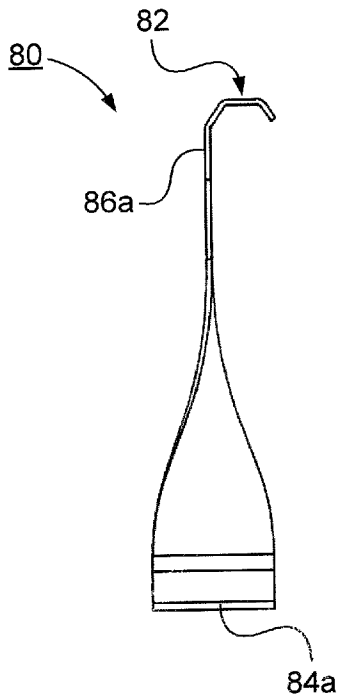

Fig. 5b

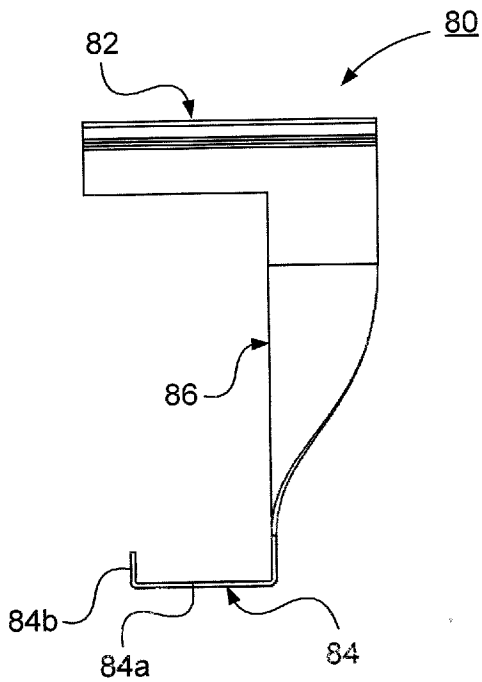

Fig. 5c

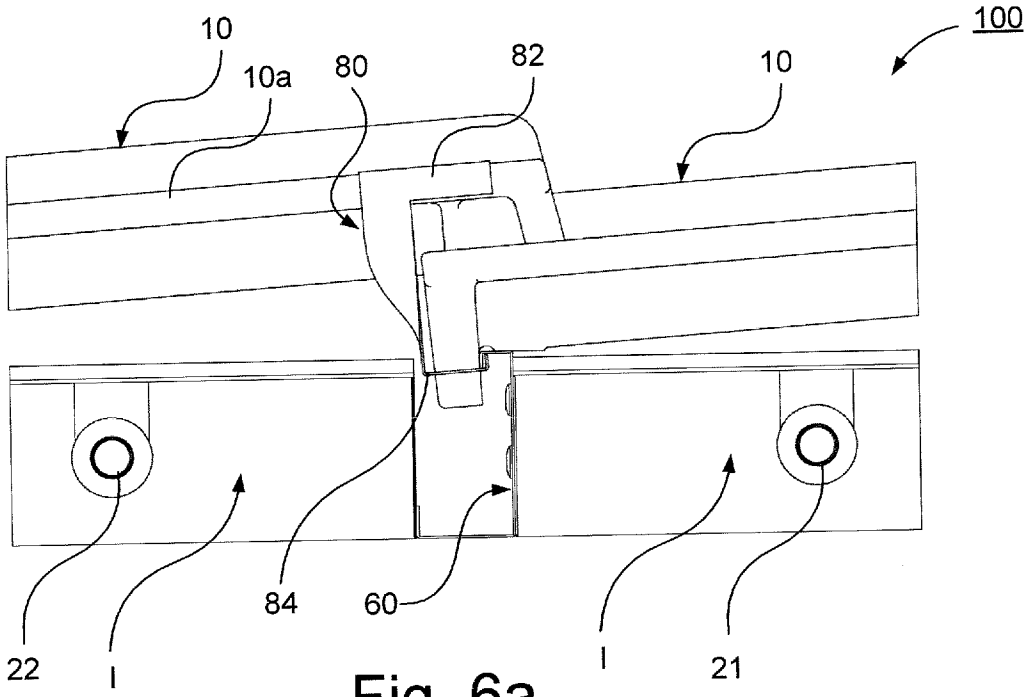

Fig. 6a

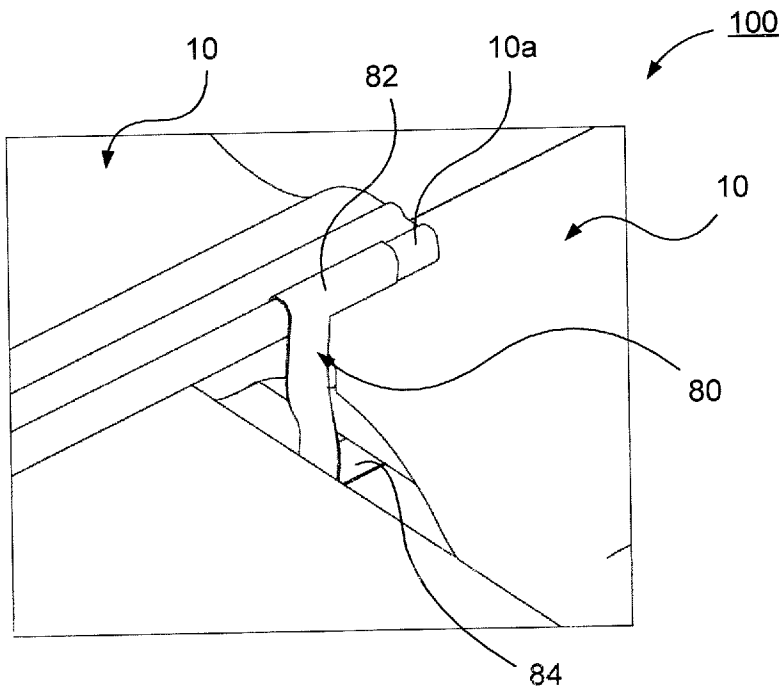

Fig. 6b

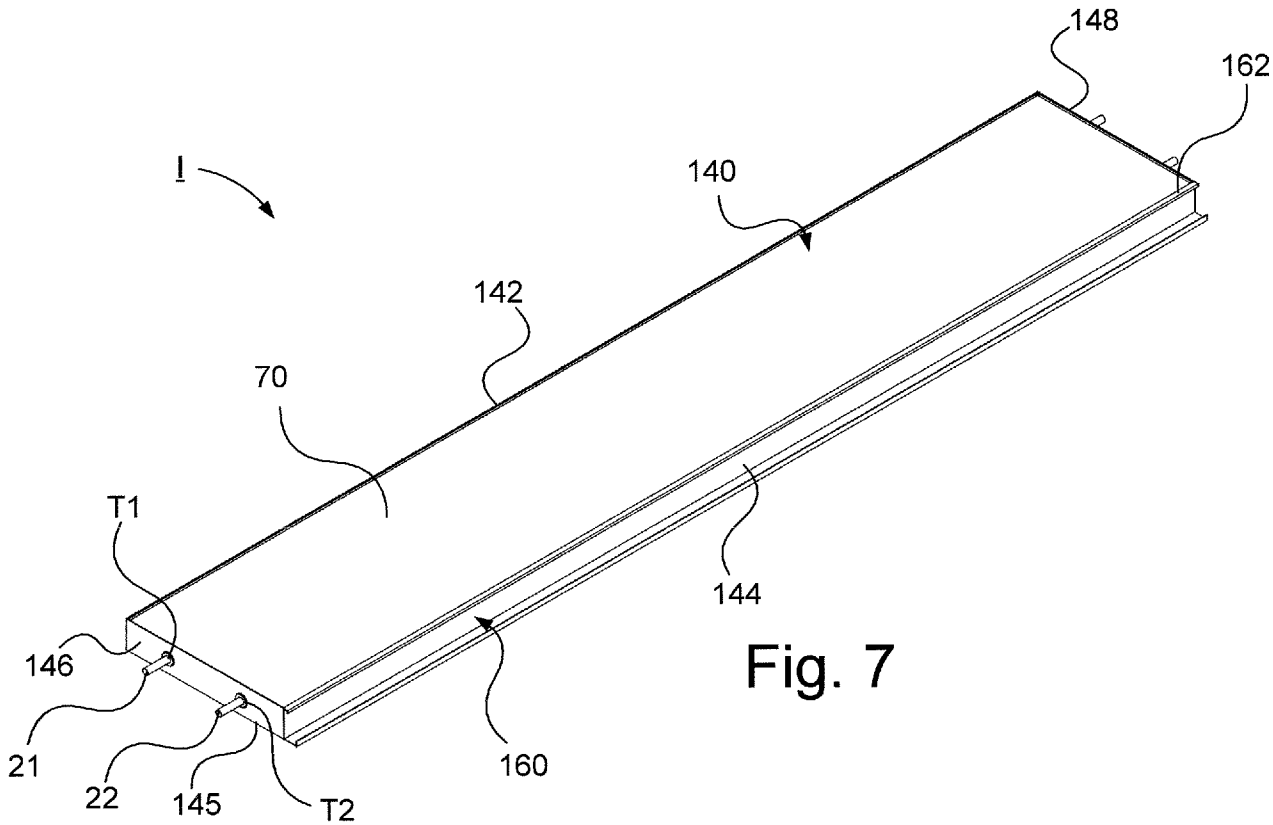
148
162
I
140
142
70
T1
144
146
160
21
22
145
T2

Fig. 7

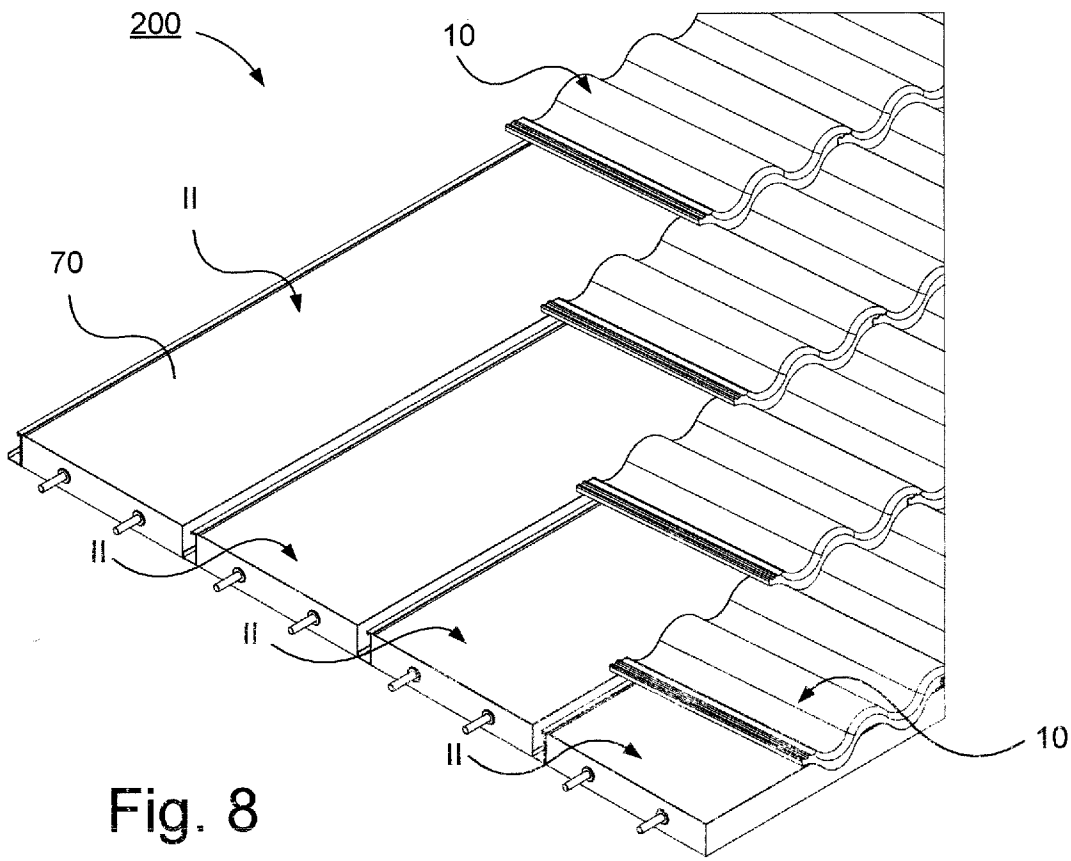
200
10
II
70
II
II
II
10

Fig. 8

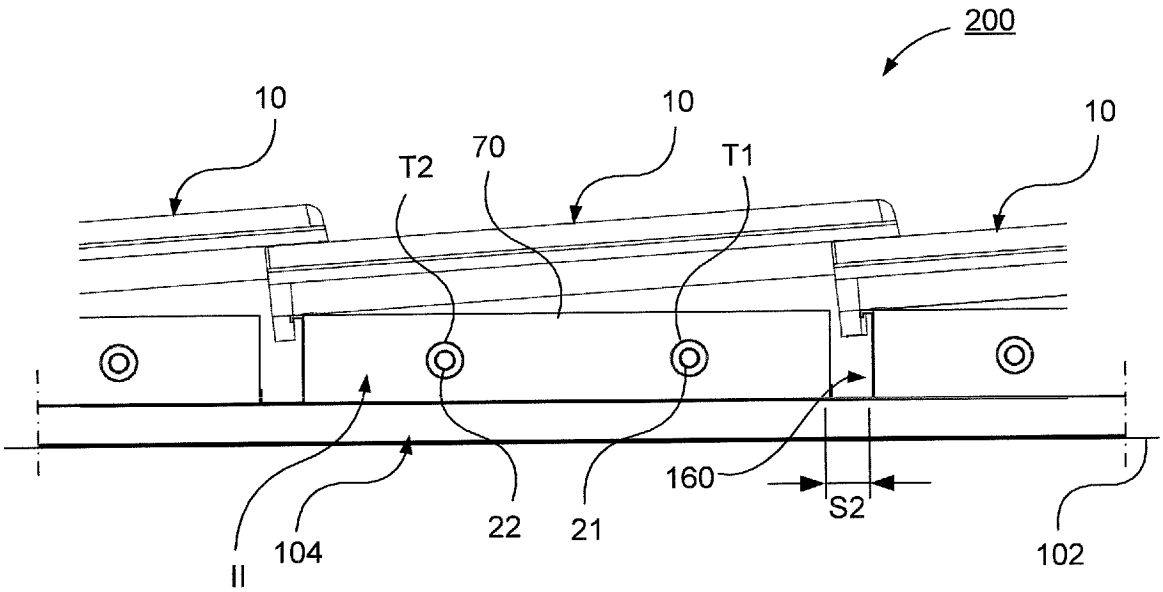
200
10
10
10
T2
70
T1
160
S2
II
104
22
21
102

Fig. 9a

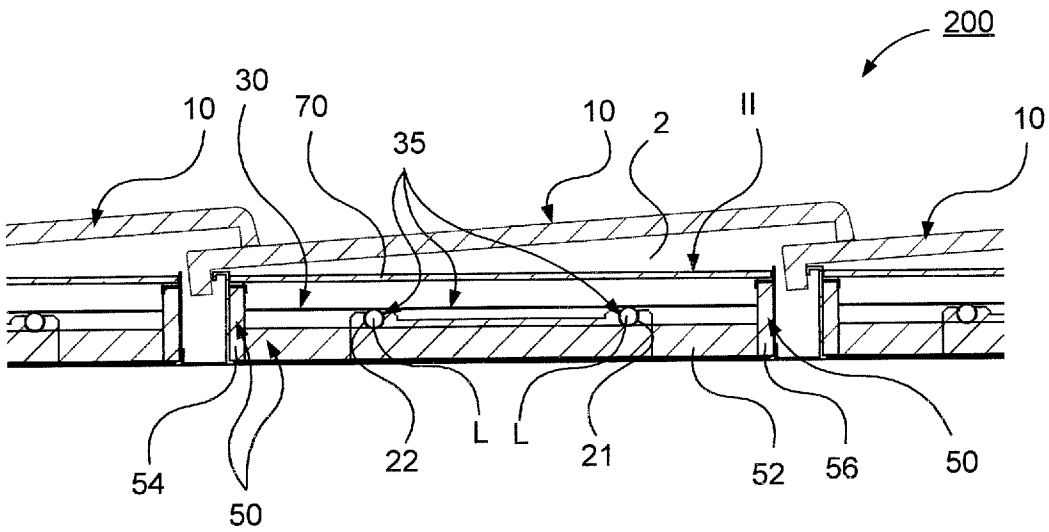
200
30
10
70
10
2
II
10
35
L
L
54
50
22
21
52
56
50

Fig. 9b

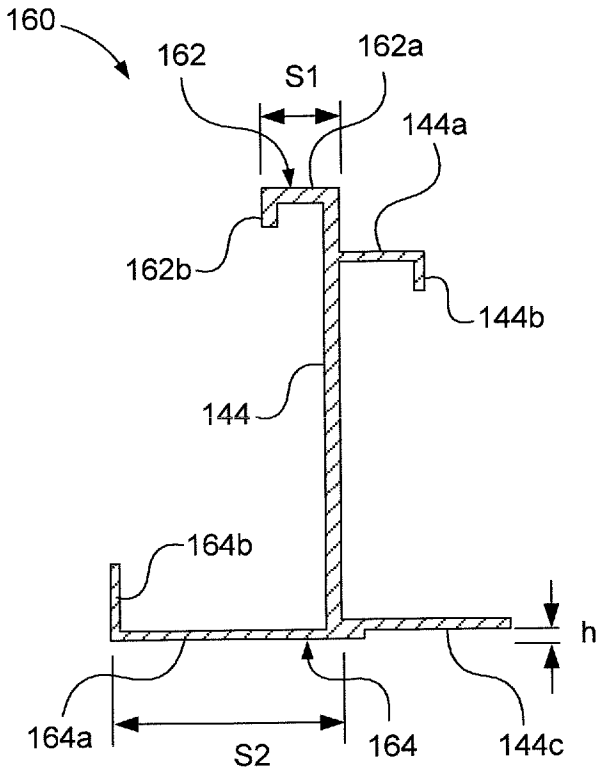

Fig. 10

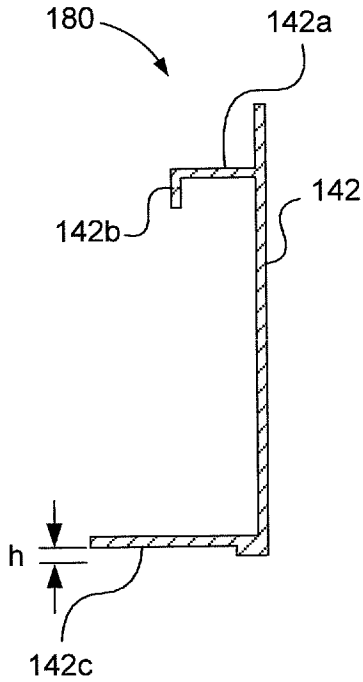

Fig. 11a

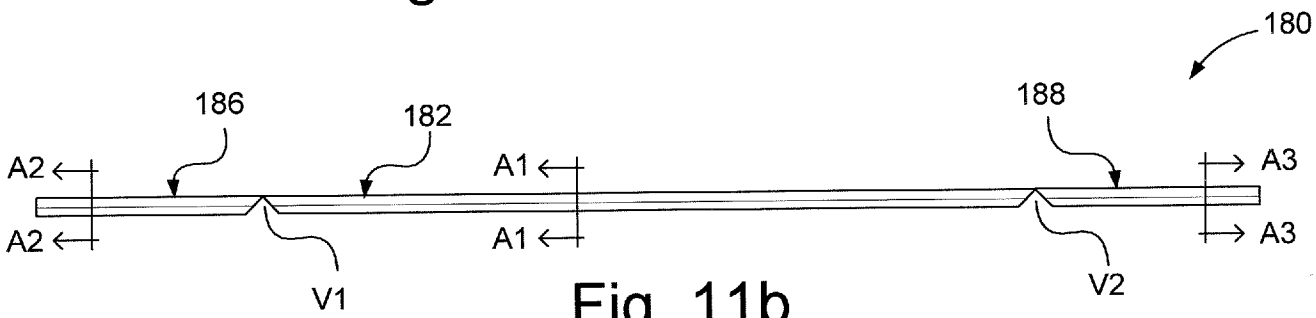

Fig. 11b

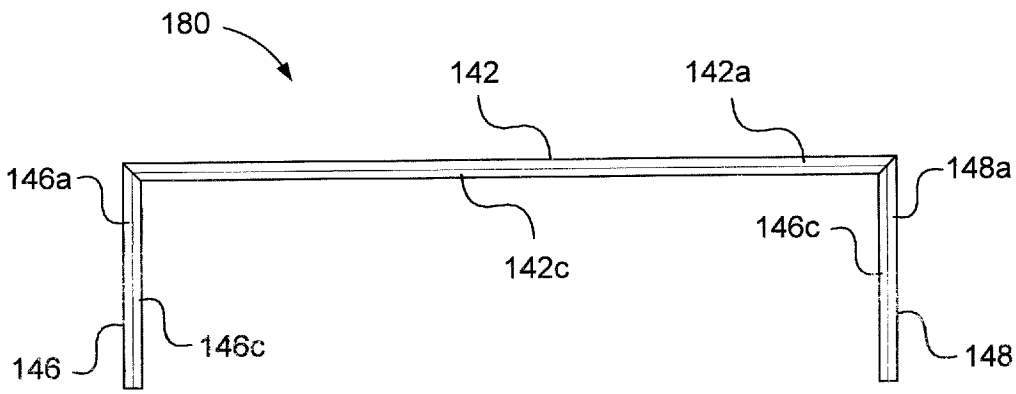

Fig. 11c

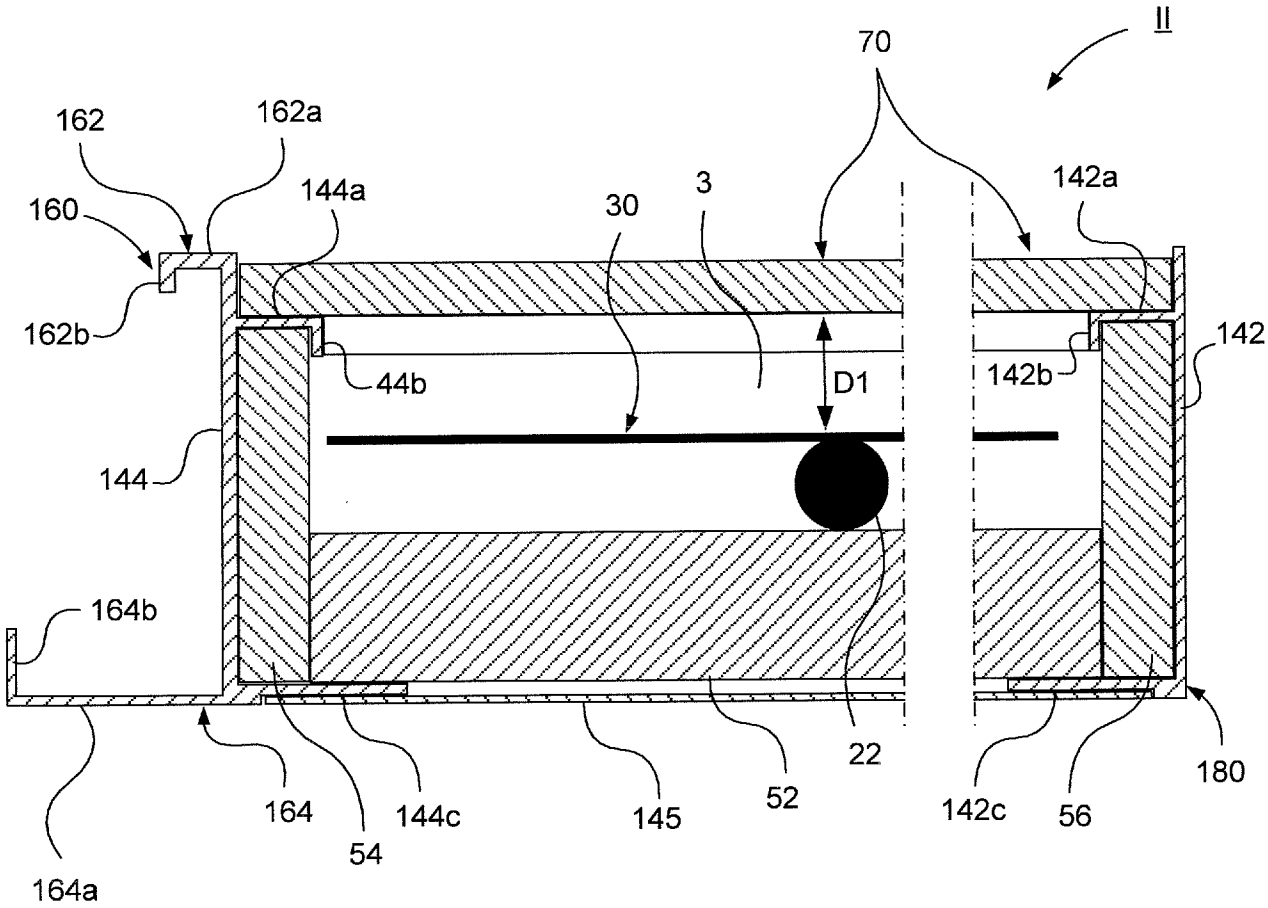
II
70
162
162a
160
144a
30
3
142a
162b
44b
D1
142b
142
144
164b
22
180
164
144c
145
52
142c
56
54
164a

Fig. 12

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2013/051573

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: F24J, H02S

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE, DK, FI, NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, PAJ, WPI data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 0231415 A1 (BROATCH PETER MARTIN), 18 April 2002 (2002-04-18); whole document; page 1, line 3 - line 4; page 6, line 13 - line 25; figures --	1-11
A	FR 2499693 A1 (LEMAIRE JEAN MARC), 13 August 1982 (1982-08-13); abstract; figure 1 --	1-11
A	FR 2920452 A1 (BERRET JEAN THOMAS), 6 March 2009 (2009-03-06); abstract; page 9, line 33 - page 11, line 29; figure 1 --	1-11

☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
21-05-2014	21-05-2014

Name and mailing address of the ISA/SE
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2013/051573

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4111188 A (MURPHY JR JOHN A), 5 September 1978 (1978-09-05); abstract; column 1, line 27 - line 43; column 4, line 7 - line 49; figure 2	1-11
	--	
A	JP 2001164713 A (MISAWA HOMES CO), 19 June 2001 (2001-06-19); (abstract) Retrieved from: EPODOC and WPI database; original document: abstract; paragraph [0014]; figure 5	1-11
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International application No.
PCT/SE2013/051573

Continuation of: second sheet

International Patent Classification (IPC)

F24J 2/24 (2006.01)
F24J 2/04 (2006.01)
F24J 2/52 (2006.01)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/SE2013/051573

WO	0231415	A1	18/04/2002	AT	325317	T 15/06/2006
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				CN	1468355	A 14/01/2004
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				EP	1332322	B1 03/05/2006
				ES	2264988	T3 01/02/2007
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				US	20040098932	A1 27/05/2004
				US	7299591	B2 27/11/2007
FR	2499693	A1	13/08/1982	NONE		
FR	2920452	A1	06/03/2009	NONE		
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