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(54) **A FIRE PROOF MODULE ARRANGEMENT TO JOIN PANELS**

(57) The disclosure concerns a wall structure, suitable for a cold room obtainable by an embodied wall structure arrangement comprising at least a first module and

a second module as well as at the mating face respective protruding members and recessing parts for a compatible joint in a fireproof manner.

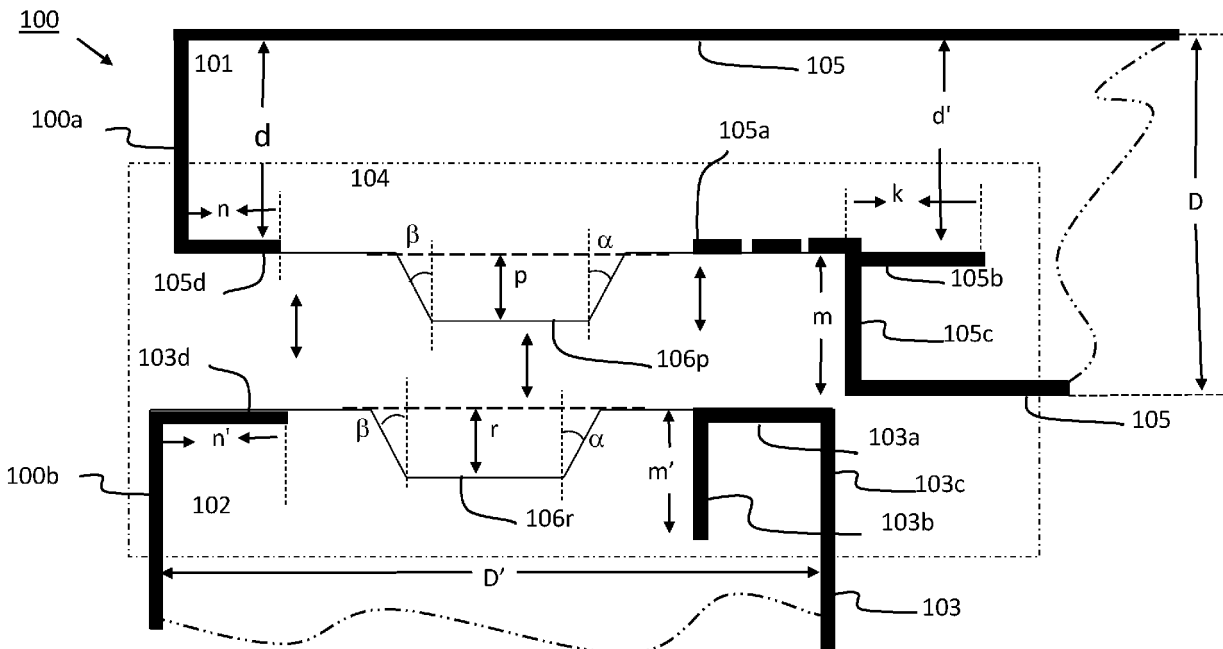


Fig 1

Description

FIELD OF THE INVENTION

[0001] In a very general level the embodiments of the invention disclose a fire proof construction, but in a more specifically speaking disclose a modular arrangement and a structure to make a cold room, in a fire proof manner from modular elements of an arrangement in accordance of independent claim directed to such an arrangement.

BACKGROUND

[0002] Fire proof structures as such are needed in many applications, especially where there are high temperatures present in the operation of such structures continuously or expected to occur although may be not wanted.

[0003] Fireproof materials are used in various place and environments. The material selections are aiming according to the standards to that, at an incident of fire, or a corresponding sudden temperature raise, there would be sufficiently long time preserved, for the persons working in the area for example, for a safe exit from a dangerous developing area.

[0004] In general, operations of cold rooms are based on transferring thermal energy from the temperature of the cold room to outside of the cold room. There is also a hot or warm area near, for dissipating the heat taken from the cold interior of the cold room. This is familiar from household fridges that have a quite hot back area for the thermal energy dissipation.

[0005] Sometimes the insulation of the fireproof structures need to stand the ambient temperature but additionally also to stand against a temperature raise of stochastic nature at the raise. When speaking about a room sized cold rooms, and the related freeze rooms, being considered as cold rooms with temperature even lower than in a cold room, there are also the fire safe issues more highlighted. This is as there might be human beings working in a cold room, or, the cold room may be used as a storage for materials that may be dangerous as released, because of various reasons, as depository, refrigerated to a suitable temperature. Therefore, the cold room structures have to tolerate the heat on one side, but keep cold on another side, to preserve the temperature difference.

[0006] However, in such conditions it were sufficient that the insulations can tolerate also stochastic temperature raise at an incident of fire, even starting from inside. There are standards to define suitable structures and the related materials to be used accordingly, how long and what kind of exposure the structure made from such materials should withstand exceptional conditions; to be accepted to the classification in accordance of a standard, aiming to human safety.

[0007] For the operation of a fireproof structure as such, not only the material choices make a fireproof struc-

ture to such. There are good insulating materials that are made to form polymeric chemical structures, but adding chemicals, such as fire retardants may influence to the capability to isolate.

[0008] That is an important aspect when polymer-type of insulations are used, for example in cold room structures and/or freeze rooms. Although one possibility is to use in the insulation material composition fire retardants, but the massive use of such chemicals may lead to considerable loss of insulation properties in an unpredictable manner, and/or mechanical molding abilities. The wall structures made of poorer insulating materials may be also leading to thicker structures and consequently raises the material expenses, also those of material storage, manufacture, transport as well as the structure being more heavy to mount, if still meets the boundary conditions to fit to the intended place with the required thickness for the thermally isolating properties and simultaneously to follow the required standard norm for fire safety.

[0009] Considering structures to be made of modules, one place where the insulating materials can be exposed to high temperatures in an incident of fire are the joints of the modules for the structure. The joints may provide a passage to the flames or heat into the insulation and the fire can penetrate the join from a side of the insulation to the other side, and can also light up the insulating material itself.

[0010] A standards SFS-EN 14509 certified B-s1 and Bs-2, d0 define for reaction to fire classification for discontinuous cam lock panel specifications are an examples about standards for materials and the structures have to meet for certification.

[0011] One structure according to the traditional of making walls for a cold room uses a double skin metal faced insulating panels, which have being used for making cold rooms by a cut and saw methods, to meet for a self-supporting structure in accordance to SFS-EN 14509, for example.

[0012] However, such cut and saw structures are found weak in the fire tests and even to fail in Reaction to Fire test to meet B-s2, d0 or B-s1, d0 classification. Cut and saw corner and flashings do not cover panel insulation as much as it could and the result in non-desired outcome in test conditions. One aspect of the problems is that the saw-lines may be declined and/or wavy, to make voids to be filled afterwards.

[0013] SFS-EN 14509 is under EU Construction Products Regulation 305/2011. According to the <https://www.vm.fi/en-US/Land use and building/Legislation and instructions/Legislation on building products>

[0014] Accordingly, the aim of the Construction Products Regulation is to ensure the availability of accurate and reliable information on the performance levels and properties of construction products in a unified manner across Europe. The Regulation clarifies the use of the CE marking. A further goal of the regulation is to ensure the free mobility of construction products and remove

trade barriers in the EU internal market. In countries outside it provides also means to compare the specifications to the local standards and so to help certification accordingly in such countries.

[0015] Regulation ((EU) No 305/2011, EUR-Lex) of the European Parliament and Council laying down harmonized conditions for the marketing of construction products and repealing Council Directive 89/106/EEC Building product approval. *Source:*

Standards EN 14509 and EN 13823 define a fire test method of Single-Burning Item (SBI) and fire performance as one critical performance level which is declared in a panel CE marking.

[0016] Normally one-time cast polyurethane panel (PUR) has reaction according to fire classification D-s3, d0 or C-s3, d0. For polyurethane insulations, the building materials are classified as B, C and D for heat production, for smoke production s1, s2 and s3 and for dripping d0-d2. The measurable parameters for heat production are FIGRA (Fire Growing Rate) and THR (Total Heat Release). Measured parameters for smoke output are SMOGRA (Smoke Growing Rate) and TSP (Total Smoke Production).

SUMMARY OF EMBODIMENTS OF THE INVENTION

[0017] The objective is to at least alleviate the problems described hereinabove not satisfactorily solved by the known cut and saw or related structures in the cold room arrangements, and so to provide a new feasible fire proof modular structure that is easy to manufacture and assemble for making a cold room construction in a fire proof manner in accordance to meet at least one of the specifications in relevant standards.

[0018] It is an objective to provide a fireproof structure, especially concerning joining of wall structures, including also corners in such structures that can form fireproof corner structures at wall corners.

[0019] In the disclosure, expression to comprise and its deflected forms are used as an open expression.

[0020] The aforesaid objective is achieved by the embodiments of the invention according to the disclosure of the embodiments in accordance of the claim 1.

[0021] According to one aspect of the present invention, the disclosure concerns a modular fireproof cold room wall arrangement to be formed between

- a first module having at least a first module end formation and
- a second module having at least a second module end formation

to join them together at said first module end formation and said second module end formation at a mutual mating face forming the joining area, comprising in each said first and second module, between respective two metal foils a therebetween laminat-

ed thermally isolating material layer, wherein the mating face comprises,

- at said first module end formation, a line formation with a protruding member at a first side of said first module to be joined,
- at said second module end formation, a line formation with a recessing part at a second side of the second module to be joined,

wherein the protruding member at the first module end formation and the recessing part at the second module end formation have such a mutually compatible formation pair to form a matching pair so that the protruding member is dimensioned to fit into the recessing part at the mating face, and wherein at the first module a first module end formation at the mating face comprises

- a first metal foil part with its length, at the protruding member, at a distance from an aligning metal foil at the opposing side of said first module end formation, and
- a second metal foil part of the metal foil being as twisted into a deepness by a length of a part of the metal foil part into the isolating material,

wherein at the second module a second module end formation at the mating face comprises

- a third metal foil part with its length at the recessing part and
- a fourth metal foil part of the metal foil being as twisted into a deepness by a length of a part of the metal foil part into the isolating material.

[0022] According to an embodiment, the arrangement has modules to provide a fireproof corner structure.

[0023] According to an embodiment, the mating faces are selected to the first module end to the side of the module panel for a wall corner formation when the second module end is selected to the end side of the second module panel.

[0024] According to an embodiment, the mating faces are selected to the respective end sides of the first module and the second module for wall modules to form a wall module joint for a cold room wall on another location than a wall corner.

[0025] According to an embodiment, the arrangement has modules to provide a fireproof structure that comprises at least one of the following: a floor structure, a ceiling structure, a wall structure and a combination of just mentioned with a corner structure.

[0026] According to an embodiment of the disclosure the arrangement has in its geometry such a length n of said first metal foil part that is less than the distance from

said protruding member to end of the said first module end, advantageously less than $\frac{3}{4}$ of said distance, more advantageously less than $\frac{1}{2}$ of said distance, and even more advantageously less than $\frac{1}{4}$ of said distance.

[0027] In such embodiments the metal foil forms on one hand a thermal bridge into the isolating structure, but on another hand equals temperature differences, if such would occur at the particular side of the module with the first metal foil.

[0028] According to an embodiment of the disclosure, the arrangement can comprise a third metal foil part that has equal length n' as the length n of said first metal foil part. In such embodiments, the metal foil to another metal foil contact has been achieved with the foil, but the extra foil on either side would make the thermal bridge longer by one of said metal foils.

[0029] According to an embodiment of the disclosure, the arrangement can comprise such a second metal foil part of the metal foil that comprises such a metal foil part being as it were twisted at a certain deepness of the metal foil part into the isolating material by the length wherein the length of the part is equal or greater than the length of at least one of the following metal foil parts: length of said first metal foil part, length of said third metal foil part.

[0030] According to such an embodiment, the thermal bridging in the parallel direction of the metal foils in the isolating material can conduct heat and equalize the temperature to be conducted along the metal foil, especially in a corner such would also have a cooling effect in temperature rise locally, but would also conduct heat into the insulation materials, in suitable part.

[0031] According to an embodiment, a length of a fourth metal foil part of the metal foil being as twisted into a deepness of a length of the metal foil part, into the isolating material by the length of the part being greater than the length of the second metal foil part.

[0032] According to an embodiment, a part of the fourth metal foil part has been arranged into contact with an extension part to said second metal foil part. In this embodiment, the thermal conduction can be improved at the extension part contacting parts of the structure.

[0033] According to an embodiment, the protruding member has as a tapering form, the tapering form being defined by a first tapering side with an angle and a second tapering side with an angle in respect to the length dimension of the protruding member, when the cross section is concerned. According to an embodiment, the protruding member has an elongated shape such like a ridge. According to an embodiment variant, the protruding member can be one of such in an ensemble of similar ones in an aligned linear arrangement at an end of the module.

[0034] According to an embodiment, the recessing part has as a tapering form, the tapering form being defined by a first tapering side with an angle and a second tapering side with an angle in respect to the length dimension of the recessing member, when the cross section is concerned. According to an embodiment, the recessing part

has an elongated shape such like an elongated gorge or recess. According to an embodiment variant, the recessing member can be one of such in an ensemble of similar ones in an aligned linear arrangement at an end of the module. According to an embodiment, the recessing member is arranged to match to the protruding member geometry for making a mating joint at the mating face. The protruding member and the recessing part as such are arranged in the respective modules on a mating face to join respective modules.

[0035] According to an embodiment, said first tapering angle is equal to said second tapering angle, for a protruding member and the corresponding recessing part, so to provide certain symmetry for mounting freedom of the sides, if the fire proof structure could be provided without a dedicated sides of the modules as such for a wall for certain sides out and in.

[0036] According to an embodiment, when the first tapering angle is different from the second tapering angle, compatibly with the joining first and second modules, they could be mounted in a certain way guiding the mounting professional to provide a tight joint between the modules in question in a predetermined way more strictly than in a symmetrical tapering angles.

[0037] According to an embodiment, the protruding member comprises a dimension as a height equal to the dimension of deepness of the recessing part for forming a mating joint between the modules with respective protruding member and recessing part.

[0038] According to an embodiment, the protruding member comprises an ensemble of protrusions forming a sectional protrusion member to be fitted to a correspondingly to an ensemble of sectional recesses to form a sectional recessing part.

[0039] According to an embodiment, a module comprises as thermal isolation material that has in the composition polymer that is an ester or alike.

[0040] According to an embodiment, a module comprises as thermal isolation material that has in the composition PUR.

[0041] According to an embodiment, a module comprises as thermal isolation material that has in the composition polymer that is an ether or alike.

[0042] According to an embodiment, a module comprises as thermal isolation material that has in the composition of PIR (Polyisocyanurate).

[0043] According to an embodiment, an embodied module of the arrangement comprises a layer of fire retardant material and/or extinguishing gas-forming material on a side of the module. According to an embodiment, the material comprises gypsum and/or a carbonate as a respective layer in a sandwiched structure. A skilled person knows from the embodiments that in case of sandwiched structure, not necessarily all the sandwiched layers as such need to be in contact with the module's metal foil surface directly although the stack of the layers as the wholeness would be in contact. The sandwiched layers are considered to be on the surface anyhow in such

an embodiment.

[0044] According to an embodiment, an element of the embodied arrangement is a module in accordance of said first module having at least a first module end formation, comprising between two metal foils a therebetween laminated thermal isolation material layer.

[0045] According to an embodiment, an element of the embodied arrangement is a module in accordance of said second module having at least a second module end formation, comprising between two metal foils a therebetween laminated thermal isolation material layer.

[0046] According to an embodiment, an element of the embodied arrangement is compatible to mount to an embodied element of the arrangement, wherein the element is a middle element having at least at one end side a protruding member and on another side a recessing part to match to said either first module or second module having a compatible mating face.

[0047] According to an embodiment, an element of the embodied arrangement comprises for the mating face a metal foil formation according to the mating face assembly for at least at one end side a protruding member and on another side recessing part to match to said either first module or second module according to the mating face structure to match the modules to join together.

[0048] According to an embodiment, an element of the embodied arrangement comprises a fire proof layer on inside side of the element, to form, when mount to another such element of said arrangement or a compatible element to mount, a contact to between such elements when mount.

[0049] The inside side of the element is denoting to such a structure that is arranged to form a closure or a similar room with a door, such as an accessible cold room.

[0050] According to an embodiment, the cold room comprises a freezer room.

[0051] According to an embodiment, an element of the embodied arrangement comprises in the module in the fireproof layer further comprises a fire extinguishing gas releasing material.

[0052] A cold room according to an embodiment comprises an element of the embodied arrangement.

[0053] The utility of the present invention follows from a plurality of factors depending on each particular embodiment.

[0054] The structure is lightweight, and the joint between the modules of the structure members is technically strong with ability to conduct and equalize temperature differences by the thermal conduction enhancement at the mating face areas at the joint.

[0055] Especially in wall-corner joints, the corner structure is technically stronger against fire, due to corner design and for example, gypsum boards as in embodiments and leads to improved results in SBI test achieving B-s1, d0 classification.

[0056] Specimen structure is approved to fulfill panel standard SFS-EN 14509 requirements. Embodiments

provide fire safety B-s1, d0 classification panels for Cold and Freezer Rooms. Economical advantages to the end user of such elements with the module structure utilizing entity can also have lower insurance. SFS-EN 14509 defines regulation for sandwich panels with different production technologies.

[0057] Embodiments according to the invention can replace for example in wall-corner joints the cut and saw corner type in standardized specimen according to SFS-EN 14509 self-supporting double skin metal faced insulating panels. The elements with the modular structure can be factory made products in beforehand. This is especially advantageous, when the module dimensions can be selectable stepwise to match together. Specifications can be embodied in sub-standard EN 13501 Fire classification of construction products and building elements in suitable part for embodiments. Classification using data from fire resistance tests, excluding ventilation services and test method SFS-EN 13823 Reaction to fire tests for building products can be met. Building products can be made, excluding floorings exposed to the thermal attack by a single burning item.

[0058] In the implemented panel production like new PIR raw material polyol is used in production foaming equipment's, panel press mold temperatures can be raised and wall-corner technical solution is used in embodied element system with embodied modules. Gypsum boards can be pre-cut in correct dimension and stored next to production line where it is easy and fast add during the production process to provide such modules as elements of the arrangement.

[0059] In sandwich insulation panels as the embodied modules of the arrangement, fire performance is an important performance level for customers and end-users due to the stricter legislation on construction products.

[0060] For discontinuous one-time cast panels joined together with fast cam locks, B-s1, d0 classification has not been available before the date of the priority date of the outstanding patent document. In this case a PIR foam composition, the corner design and in option, gypsum boards together made it possible to achieve such good results.

[0061] The expression "a number of" refers herein to any positive integer starting from one (1), e.g. to one, two, or three.

[0062] As used herein, unless otherwise specified, the use of the ordinal adjectives "first," "second," "third," etc., to describe a common object, merely indicates that different instances of like objects are being referred to and are not intended to imply that the objects so described must be in a given sequence, either temporally, spatially, in ranking, or in any other manner.

[0063] The expression "a plurality of" refers herein to any positive integer starting from two (2), e.g. to two, three, or four.

[0064] The word "exemplary" is used herein to mean "serving as an example, instance, or illustration." Any embodiment described herein as "exemplary" is not nec-

essarily to be construed as preferred or advantageous over other embodiments.

[0065] Conditional language, such as, among others, "can," "could," "might," or "may," unless specifically stated otherwise, or otherwise understood within the context as used, is generally intended to convey that certain implementations could include, while other implementations do not include, certain features, elements, and/or operations. Thus, such conditional language is not generally intended to imply that features, elements, and/or operations are in any way required for one or more implementations or that one or more implementations necessarily include logic for deciding, with or without user input or prompting, whether these features, elements, and/or operations are included or are to be performed in any particular implementation.

[0066] Different embodiments of the present invention are disclosed in the dependent claims.

BRIEF DESCRIPTION OF THE RELATED DRAWINGS

[0067] In the following, embodiments of the invention according to the disclosure is described in more detail with reference to the appended drawings in which

FIG. 1 illustrate an ensemble of examples of a modular arrangement for joining embodied modules as a cross sectional view, in accordance with one or more example embodiments of the present disclosure.

FIGs. 2 and 3 illustrate further ensembles of examples of modular arrangement modules for joining embodied modules as a perspective view, in accordance with one or more example embodiments of the present disclosure.

FIGs. 4 and 5 schematically illustrate examples of optional mating face details of an embodied module in the embodied arrangement for joining them together, in accordance with one or more example embodiments of the present disclosure.

FIG. 5A illustrates optional mating face geometries for a module of an embodied arrangement in an embodied corner module to be mounted normal position of an embodied wall module corner, as a floor corner module or a ceiling corner module, in accordance with one or more example embodiments of the present disclosure.

FIG. 6 illustrates optional mating face geometries for a module of an embodied arrangement in an embodied wall module, in accordance with one or more example embodiments of the present disclosure.

FIG. 7 illustrates as schematic cross section optional mating face geometries for embodied modules of the

embodied arrangement, at the mating face to join embodied modules, in accordance with one or more example embodiments of the present disclosure

FIG 8 illustrates as schematic cross section optional mating face geometries for embodied modules of the embodied arrangement, at the mating face to join embodied modules for continuing the structure from a middle wall, in accordance with one or more example embodiments of the present disclosure

FIG 9 illustrates as schematic cross section optional mating face geometries for a cold room to be embodied by using embodied modules of the embodied arrangement with options of mating face geometries in the joining area to join embodied modules, in accordance with one or more example embodiments of the present disclosure. The view can be a ground plan layout view, and a view from a wall direction, in accordance with one or more example embodiments of the present disclosure,

FIG 10 illustrates a layered structure of an example of embodiments in accordance with one or more example embodiments of the present disclosure, and

FIGs 11 and 12 illustrate examples of embodiments in accordance with one or more example embodiments of the present disclosure.

[0068] Same reference numerals are used in the FIGs to refer in the examples to similar objects, which however need not to be exactly the same. A skilled person in the art can understand such differences on the basis of the embodiments of the disclosure and the reference numeral use in the context therein.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0069] The arrangement 100 in FIG 1 illustrates an ensemble of examples on modular arrangement modules 100a and 100b for joining them together at a mating face 104, comprising also the individual mating faces for the modules for a fireproof join, in accordance with one or more example embodiments of the present disclosure. In examples of Fig 1, the embodiments are used for providing a fireproof corner structure by the two wall modules a first module 100a and a second module 100b with their respective end formation examples. The modules can be embodied in the example by a sandwiched-structure, which has been achieved by a thermal isolation material 102 and 101 respectively for the thermal isolation between two pairs of metal foils, the metal foils being cited as foils 103 and 105.

[0070] The foil 103 and the foil 105 were distinguished from each other mainly for clarity reasons for facilitating reference to first and second modules, although in theory, they can be embodied preferably with same foil material

with even thickness, but according to an embodiment variant by a different material, even with different thickness of the foils. The metal foils at the sides of a single module should be separated for thermal insulation purposes by a thermal isolation material, in addition so that there would not be bridging of metal or similar thermal conductor weakening locally the thermal isolation.

[0071] According to an embodiment, the wall structure can provide in addition to a cold room also electromagnetic protection, when the floor and the ceiling are made of similar sandwiched structure comprising metal foil. According to the embodiment of the cold room with electromagnetic protection, the protection can be manufactured to be double protected cold room, because of the sandwiched module structure. This can be important for such applications, which are sensitive for coupling signals from outside that could interfere fire alarm systems in the volume of disclosed closure made by the modules of the embodied arrangement.

[0072] In an example of FIG 1, the embodied metal foil 105 is arranged as to turn around the module 100a end, the end having a dimension d , and to bend by a first metal foil part 105d towards the protruding member 106p in alignment of the metal foil 105 on the other side of the module 100a. The module 100a as a panel 100a has a thickness D illustrated in Fig 1. According to an embodiment, the first metal foil part 105d is bent at distance d by a length n towards the protruding member, at the mating face 104.

[0073] According to an embodiment, the thickness of the first module 100a D can have a thickness 80 mm, 100 mm, 150mm, 200 mm, 300 mm or 400 mm. The thickness D' of the second module 100b can be selected for match at the mating face 104 at the mating face 104, but also to equal the thickness D for a smooth outer wall structure, compatibly to provide galvanic contact between the first metal foil part 105d and the second metal foil part 103d of the respective modules. Such contact confirms also thermal conduction between the first module and second module so to distribute heat and thus lower the temperature at a location near the joint region. This arrangement also provides time for the warming and heating, up to critical temperatures, before the structure would be suffering damages in an incident of fire.

[0074] According to an embodiment, the length n of said first metal foil part 105d is less than the distance from said protruding member 106p to end of the said first module end 100a, advantageously less than $\frac{3}{4}$ of said distance, more advantageously less than $\frac{1}{2}$ of said distance, and even more advantageously less than $\frac{1}{4}$ of said distance

According to an embodiment the length n' for the part 103d can be chosen to equal the length n for the part 105d according to an embodiment. This can be decided so to correspond the thermal conditions at the joint for avoidance to make a thermal bridge for an unnecessary long into the isolating material.

[0075] The different embodiments with the n (and n')

values are representing different insulation requirements with the metal foil as thermal bridge at the mating face, so that the desired insulation depth can be gained despite of the thermal bridging by the metal foil parts with embodied lengths into the isolating material. In addition, the bended metal foil ends at the mating face 104 also protects the joint against mechanical wear out at the joining line, to prevent the exposure of the isolating material, also in an incident of fire.

[0076] According to an embodiment of the mating face formation 104 in FIG 1, the length m along the part 105c equals the difference of D and d as a positive value, so providing an example depicted and embodied end structure at one side of the first module end. According to an embodiment variant, there can be also more similar mating faces 104 at the opposite side of the first module. Selecting the m so to correspond the difference of D and d indicates also rectangular geometry at the mating face 104 for joining the second module 100b to 90° angle, provided that the end of the module 100b is also rectangular in the cross section as in Fig 1.

[0077] According to an embodiment, such modules can embody cold rooms that have a rectangular geometry, and/or such cold rooms that are provided as an aggregate of rooms with rectangular geometry cold room sections.

[0078] The dashed line is used in Fig 1 for indicating the mating face 104 in an illustrative manner, indicating joining geometry examples in accordance of the disclosure for mating faces 104 to match the mutually compatible modules. However, it is not intended to limit embodiments only to the shown example geometries of the Fig 1 at the mating face 104, for the mating face for a joint between the modules, but rather show examples for an implementation with exemplified measures and/or geometrical ratios to be used in the modules.

[0079] In Fig 1, the foil 105 at the inner side of the first module (when joined with the second module to form a corner) has the second metal foil part 105c and 105b, that comprises the parts 105c and 105b, the last mentioned part 105b to be in the structure of the first module as twisted into the thermal insulation material 101 According to an embodiment the second metal foil part can comprise also an extension part 105a, to provide a galvanic connection as improved to the second module 100b at the fourth metal foil part 103a and 103c. The deepness m' of the turned back metal foil 103, part 103b of the module 100b, the part 103b has the deepness m' .

[0080] According to an embodiment the deepness m' equals to the measure of m , i.e. also equals the distance $D-d$ in the mutually compatible module 100a, in the mating face area 104. According to an embodiment, the distance is determined for preventing the disruption of the foil 103 from the insulating material 102 at the inner corner intended location.

[0081] According to an embodiment, the length k of said second metal foil part 105b is less than the distance from said protruding member 106p to end of the said first

module end 100a, advantageously less than $\frac{3}{4}$ of said distance, more advantageously less than $\frac{1}{2}$ of said distance, and even more advantageously less than $\frac{1}{4}$ of said distance. This can be preferably kept that short as the metal foil parts can conduct thermally cold from the metal foil 105 side in question into the insulation and thus the length to be kept limited for avoidance of thermal bridging more than embodied by the length exemplified.

[0082] In FIG 1, the first module 100a has been embodied with a protruding member 106p at the mating face 104 area. The protruding member 106p has been embodied as an elongated ridge as cross sectional illustration in Fig 1, but in perspective example in FIG 2. Further example embodiments with a protruding member 106p has been embodied in FIGs 4, FIG 5 and FIG 5A. In FIGs 4 and 5, in respective illustrations, embodied protruding members 106p and recessing part 106r are embodied. A single black line denotes to the embodiment as a continuous ridge (FIG 4) along the module side length or an ensemble of shorter ridges by the dashed single line in line (FIG 5) along the module side length. In a similar way the FIGs 4 and 5 also illustrate recessing parts 106r, to be mated to the respective protruding members at a mating face 104 (FIGs 6 to 9 for example) by a module with a compatible mutual mating face for forming a wall structure of a cold room.

[0083] In Fig 1, the second module 100b has been embodied with a recessing part 106r, with a deepness r from the second module 100b end. For a mating fit with a compatible protruding member 106p, the deepness r should not be shallower than the protruding member's 106p height p. The double-sided arrows there between the first module 100a and the second module 100b are indicative that protruding member 106p and the recessing part 106r are to be mated, for a corner structure of a cold room wall to be embodied for example. For a fit the side angles of protruding member 106p and recessing part 106r should be pairwise equal for a match so that the parts 105d and 103 as well as the parts 103c and 105c but also 103a and 105a can make a galvanic contact therebetween for thermal conduction at the respective contacting areas in the mating face 104.

[0084] The foil part 103b can be as twisted into the thermal insulation material by the deepness m'; at a distance similar distance as the length n' (i.e. 103d part of the outer side foil), but from the intended inner side of the second module foil 103.

[0085] The protruding members 106p, as well as recessing parts 106r are further embodied as examples in Fig 9, being used at the mating faces 104 at the joints, for making a cold room with compatible modules 100a and 100b for wall structures. In Fig 9, there are shown more examples, to embody the protruding member 106p and the recessing part 106r implementation examples in accordance of the disclosure, when the metal foils in the modules 100a and 100b are in suitable part according to the example Fig1, for the cold room wall structure embodied.

[0086] In Fig 1, the protruding member (106p) has been illustrated as having a tapering form, the tapering form being defined by a first tapering side with an angle (α) and a second tapering side with an angle (β) in respect to the length dimension of the protruding member (106p). According to an embodiment, the recessing part (106r) has as a tapering form, the tapering form being defined by a first tapering side with an angle (α) and a second tapering side with an angle (β) in respect to the deepness dimension of the recessing part (106r).

[0087] For a symmetric protruding member 106p as well as for a symmetric recessing part 106r, the corresponding first tapering angles (α) are equal to said second tapering angles (β). The feature "tapering" refers to the feature of the tapering sides to be sides of a cut triangular, for the recessing part 106r and the protruding member 106p, as embodied.

[0088] Figs 2 and 3 illustrate further ensembles of examples of modular arrangement modules for joining embodied modules, by a perspective view illustration, in accordance with one or more example embodiments of the present disclosure. According to the example of FIG 2, the module 100a can be embodied for a corner also with such mating face 104 that has the recessing part 106r for the joining to another module with a compatible protruding member 106p at its mating face. The panel measures T, D and D' are shown for the examples with the optional thicknesses of the modules in the embodiments exemplified in Fig 1.

[0089] In Fig 3 illustrates a schematic example of a module 100b having a mating face 104 with a recessing part 106r on the mating face 104 at an end side of the module 100b. The module 100b can have at the opposite end side a mating face in accordance of Fig 6 options, for a wall of a cold room structure.

[0090] Fig 4 illustrates schematically protruding member 106p and recessing part 106r respectively as a continuous filled thick line (106p) and as continuous double line (106r), for embodiment variants, especially as illustrated in Fig 5A.

[0091] Fig 5 illustrates schematically protruding member 106p and recessing part 106r respectively as a dashed filled thick line (106p) and as dashed double line (106r), for embodiment variants, especially as illustrated in Fig 5A.

[0092] Fig 5A illustrates schematically an example of a module 100ac as a module element to get joint to an embodied corner, formed from a first module 100a, and a second module 100b, as embodied in Fig 1 with the compatible mating faces 104 for joining. According to an embodiment, the module element 100ac can be an end element to form a floor and/or a ceiling to a wall corner of modules 100a and 100b.

[0093] FIG. 6 illustrates optional mating face 104 geometries for a module as a second module 100b of an embodied arrangement in an embodied wall module, in accordance with one or more example embodiments of the present disclosure. The mating face 104 options are

illustrated in accordance of the second module 100b in Fig 1 with options of a protruding member 106p and recessing part 106r.

[0094] The panel measures T, D and D' are shown for the examples with the optional thicknesses of the modules in the embodiments, in suitable part as exemplified in Fig 1. The measure T can be embodied as an indentation measure at the mating face, to match a module with thickness of D or D', in suitable part, in accordance of one or more embodiments of the disclosure.

[0095] In Fig 6 illustrates a schematic example of a module 100b having a mating face 104 with a recessing part 106r on the mating face 104 at an end side of the module 100b. The module 100b can have a mating face in accordance of Fig 3 options at the opposite end side, for a wall of a cold room structure.

[0096] Figs 7 and 8 illustrate detailed examples as schematic cross sections of use of optional mating face 104 geometries for embodied modules 100a, 100b of the embodied arrangement, for joining the first and second modules 100a, 100b at the mating faces 104 for wall structures, in accordance with one or more example embodiments of the present disclosure. In Fig 7, a corner joint example has been embodied. A cam lock connector, which can be a pair to form the cam lock connection, has been embodied in the example, to be used in accordance with one or more example embodiments of the present disclosure, where applicable. In Fig 8, a double corner joint for an inner middle wall of a cold room for dividing the cold room to sections, as illustrated in Fig 9. The three black dots in Fig 8 are illustrative to continue the structure with optional structures of embodied panels in accordance of the cold room to be finally formed with the wall structure embodied.

[0097] FIG 8 illustrates as schematic cross section optional mating face 104 geometries for embodied modules 100a, 100b of the embodied arrangement, at the mating face to join embodied modules for continuing the structure from a middle wall, in accordance with one or more example embodiments of the present disclosure.

[0098] FIG 9 illustrates as schematic cross section optional mating face 104 geometries for a cold room to be embodied by using embodied first and second modules 100a and 100b respectively, of the embodied arrangement with options of mating face 104 geometries in the mating face to join the embodied modules, in accordance with one or more example embodiments of the present disclosure. As illustrated in Fig 9 embodiment examples, an embodied first module 100a having at least one first module 100a end formation (Fig 1) at a first end can have also an end formation of a second module 100b end at a second end of said first module 100a, to join a first module 100a and a second module 100b at the mating face 104 to have compatible mating to join a first module and a second module. The view in Fig 9 can illustrate a ground plan layout view for the walls and their joining by the modules. The Fig 9 can also illustrate such an optional view from a wall direction, in accordance with one or more

example embodiments of the present disclosure. In such the Fig 9 view there are two ends formed by the modules 100a, of which the right hand side has two mating faces at same side at the opposite ends on the side for the receiving a second modules 100b to each mating face 104. In the optional view, the upper second modules 100a and 100b are illustrated as forming a ceiling and the lower second modules 100b are illustrated as forming a floor, with the joints in accordance of suitable embodiments shown as examples in the Figs.

[0099] The hexagonal like formations are illustrative of the options at the mating faces 104 in the Figs 7 to 9, to illustrate uses of protruding members 106p and/or recessing parts 106r at the corresponding mating faces 104 of the embodied modules for making a joint.

Example 1

[0100] In embodiments of the invention there was used instead of Polyurethane (PUR), a newly developed PIR foam as isolation material in an embodied arrangement for an embodied wall-corner solution according to the embodiments of the disclosure.

[0101] In a known corner design as there has being used cut panels covered by flashings and build in 90-degree angle as in EN 14509 instructed, but such a corner design is weak against SBI test 30 kW flame.

[0102] According to the embodiments, the SBI specimen was modified regarding to the corner structure as embodied by the module arrangement according to the disclosure. The module arrangement has been embodied with panels, but molded wall-corner joint designs as being used according to embodiments with the embodied mating faces 104 to join mutually compatible panels of the arrangement by using at the joining area embodied mating faces of the panels. In this example for instance, in a Wall-Corner joint design, first and second wall modules has been made with molded joint profiles to make 90-degree angle according to an embodiment.

[0103] According to an embodiment, a wall panels goes one inside another, with the protruding member 106p and the recessing part 106r, in the example, about 20 mm (embodied in Fig 1 by p and r, to denote to the protruding member (106p) by the p, and to the recessing part (106r) by the r) in an embodied corner design by means of the protruding member 106p and the recessing part 106r (cf. FIGs 1, Fig2, Fig 3, Fig 4, Fig 5 for alternative joints at the mating face 104). The modules have also a normal roll-formed and bended sheet metal facings to provide the metal foils as such in the manufacture, also with the embodied twistings providing the ends by the metal-to-metal contacts, in a thermally conductive way. According to an optional embodiment of the disclosure, gypsum boards are added to the intended inside of the modules, when being mounted, onto the steel facings next to the edge of sheet metal and joint. Gypsum board width is embodied as 180 mm and height depends on the room and panel height to be manufactured. Also other

widths of the Gypsum can be embodied, according to embodiment variants up to the widths of the modules. According to an embodiment there is a gypsum board for the entire height of the panel on the metal sheet. According to an embodiment, on the inside intended side, but according to an embodiment variant on inside and outside sides of the panel on the metal sheet.

[0104] An embodied structure is approved by the standard and notified instance. This type of embodied panels with the modules of the arrangement for a Wall-Corner joint together with PIR insulation and optionally with gypsum boards makes possible to achieve B-s1, d0 classifications.

Example 2

[0105] The thermally isolating material is made in a known process as such of a polyoil to form PIR as the thermally isolating material in embodiments according to one or more of the disclosure.

Example 3

[0106] The isolating material is made in a known process as such of a polyoil to form PUR as the thermally isolating material in embodiments according to one or more of the disclosure.

Example 4

[0107] With reference to Fig 10, the first module 100a and/or the second module 100b has on a metal foil surface a layer of Gypsum 1001 for further isolation, also for use at the wall structure joint. According to a further variant, on the Gypsum there is additionally a fire retardant gas-forming layer 1002 of material, such as carbonate for example. According to an embodiment the layers 1001 and 1002 are not intended to be used in the mating face's 104 (Fig 1) metal surfaces (103a, 103b, 103c, 103d at the second module 100b, and surfaces of 105a, 105b, 105c, 105d at the first module 100a) to form a thermally conductive contact between the modules 100a and 100b.

Example 5

[0108] According to an embodiment, the cold room embodied in accordance of the disclosure, can comprise a freeze room part. According to such an embodiment, an embodied cold room is a morgue. According to an embodiment, an embodied cold room comprises a depository part, which can be embodied optionally as a freeze room. According to an embodiment the cold room comprises a chemical and/or biological storage. According to an embodiment the cold room comprises a foodstuff storage. According to an embodiment, the cold room comprises a storage for flammable and/or explosive materials.

Example 6

[0109] According to the example in Fig 11 the modules according to disclosure are used as panels to form a corner structure 1100 as embodied for an example of such. In the example the joining of the panels is strengthened by cam locks and their counter part joints at the mating face 104. According to an embodiment, the joining as such can be made according to the normal cam lock panel standards and recommendations as such. Suitable adhesive can be used at the mating faces 104, in addition the cam-lock and the counter part joining in suitable part to join the modules together. According to an optional embodiment the corner has been also strengthened by an internal corner flashing at the mating face 104. According to an embodiment, Fig 11 illustrates also as an option an external corner flashing being used to strengthen the structure for improved fireproof properties. The expressions "outside" with the metal sheet 103, 105 and "inside" with metal sheet 103, 105 denote to the sides of a disclosure made by the space disclosed by using embodied panels as modules to form a cold room for example, in accordance of the Fig 9 for example.

[0110] In the example of Fig 11 according to embodiments of the disclosure, there are shown panel widths (W1, W2, W3). Panel W1 is a short width panel as a module being made according to the modular compatibility to form a match to the other dimensions, such as the thickness D to form a system in which the widths, including W2 as an extension module to form a structure with width $W1+W2+D$, (also W3) are chosen to form a room as embodied in Fig 9 for example.

[0111] According to an embodiment according to the disclosure, the panel lengths as illustrated in Fig 12 are chosen to correspond the disclosure of the cold room wall height (H). The panels can be manufactured so, that the W1, W2 and W3 are chosen according to the dimension D by a multiplied by a non-zero positive integer, to form a modulo D panel system. A skilled person in the art realizes from the embodiment examples that also other criteria can be used to combine panel widths to match for a rectangular disclosure with a certain panel thickness of modules D. Consequently, a skilled person may apply, on the basis of this disclosure and general knowledge, the provided teachings in order to implement the scope of the present invention as defined by the appended claims in each particular use case with necessary modifications, deletions, and additions.

[0112] Many modifications and other implementations of the disclosure set forth herein will be apparent having the benefit of the teachings presented in the foregoing descriptions and the associated drawings. Therefore, it is to be understood that the disclosure is not to be limited to the specific implementations disclosed and that modifications and other implementations are intended to be included within the scope of the appended claims. Although specific terms are employed herein, they are used in a generic and descriptive sense only and not for pur-

poses of limitation.

Claims

1. A modular fire proof cold room wall arrangement (100) to be formed between

- a first module (100a) having at least a first module end formation (100a) and
- a second module (100b) having at least a second module end formation (100b) to join them together at said first module end formation (100a) and said second module end formation (100b) at a mutually compatible mating face (104),

comprising in each said first and second module (100a, 100b), between respective two metal foils (103, 105) a therebetween (103,103; 105,105) laminated thermal isolation material layer (101), (102), wherein at the mating face (104) it comprises,

- at said first module end (100a) a line formation with a protruding member (106p) at a first side of said first module (100a) to be joined,
- at said second module end (100b) a line formation with a recessing part (106r) at a second side of the second module (100b) to be joined,

wherein the protruding member (106p) at the first module end formation and the recessing part (106r) at the second module end formation have such a mutually compatible formation pair to form a matching pair (106p, 106r) so that the protruding member (106p) is dimensioned (r, p, α , β) to fit into the recessing part (106r) at the mating face (104), and **wherein** at the first module a first module end formation (100a) at the mating face (104) comprises

- a first metal foil part (105d) with its length (n) at the protruding member (106p) at a distance (d) from an aligning metal foil (105) at the opposing side of the first module end formation (100a), and
- a second metal foil part (105c, 105b) of the metal foil (105) partly (105b) being twisted into a deepness (k) into the isolating material (101) by the length (k) of a part (105b) of the metal foil part (105b, 105c) and

wherein at the second module a second module end formation (100b) at the mating face (104) comprises

- a third metal foil part (103d) with its length (n') at the recessing part (106r) and
- a fourth metal foil part (103a, 103b) of the metal foil (103), partly (103b) being as twisted into a

deepness (m') into the isolating material (102) by the a length (m') of a part (103b) of the metal foil part (103b, 103c).

2. The arrangement of claim 1, **wherein** the length (n) of said first metal foil part (105d) is less than the distance from said protruding member (106p) to end of the said first module end (100b), advantageously less than $\frac{3}{4}$ of said distance, more advantageously less than $\frac{1}{2}$ of said distance, and even more advantageously less than $\frac{1}{4}$ of said distance.
3. The arrangement of claim 1 or 2, **wherein** said third metal foil part (103d) has equal length (n') as the length (n) of said first metal foil part (105d).
4. The arrangement of claim 1, 2 or 3, **wherein** the second metal foil part (105c, 105b) of the metal foil (105) comprises a metal foil part (105b) being as twisted at a deepness (m) of the metal foil part (105c) into the isolating material (101) by the length (k) wherein the length (k) of the part (105b) is equal or greater than the length of at least one of the following metal foil parts: length (n) of said first metal foil part (105d), length (n') of said third metal foil part (103d).
5. The arrangement according to anyone of the previous claims, **wherein** the length (m') of a fourth metal foil part (103a, 103b) of the metal foil (103) being as twisted at a deepness (m') of the metal foil part (103b) into the isolating material (102) by the length (m') of the part (103b) being greater than the length (m) of the second metal foil part (105b).
6. The arrangement according to anyone of the previous claims, **wherein** a part (103a) of the fourth metal foil part (103a, 103b) has been arranged to be into contact with an extension part (105a) to said second metal foil part (105b, 105c).
7. The arrangement according to anyone of the previous claims, **wherein** the protruding member (106p) has as a tapering form, the tapering form being defined by a first tapering side with an angle (α) and a second tapering side with an angle (β) in respect to the length dimension of the protruding member (106p).
8. The arrangement according to anyone of the previous claims, **wherein** the recessing part (106r) has as a tapering form, the tapering form being defined by a first tapering side with an angle (α) and a second tapering side with an angle (β) in respect to the deepness dimension of the recessing part (106r).
9. The arrangement according to claim 8, **wherein** said first tapering angle (α) is equal to said second tapering angle (β).

10. The arrangement according to anyone of the previous claims, **wherein** the protruding member (106p) comprises a dimension as a height (p) equal to the dimension of deepness (r) of the recessing part (106r). 5
11. The arrangement according to anyone of the previous claims, **wherein** the protruding member (106p) comprises an ensemble of protrusions forming a sectional protrusion member (106p) to be fitted to a correspondingly to an ensemble of sectional recesses to form a sectional recessing part (106r). 10
12. The arrangement according to anyone of the previous claims, **wherein** the isolating material (101), (102) comprises a composition of an ester and/or the isolating material (101), (102) comprises a composition of an ether. 15
13. An element of the arrangement of claim 1, **wherein** said element is at least one of 20
- said first module (100a) having at least a first module end formation (100a) comprising between two metal foils (105) a therebetween laminated thermally isolating material layer (101) or 25
 - said second module (100b) having at least a second module end formation (100b) said second module (100b) comprising between two metal foils (103) a therebetween laminated thermally isolating material layer (102). 30
14. An element compatible to mount to an element of the arrangement of claim 1, **wherein** the element is a middle element having at least at one end side a protruding member (106p) and on another side recessing part (106r) to match to said either first module or second module. 35
15. The element of claim 14, **wherein** the element comprises for the mating face metal foil formation according to the mating face assembly for at least at one end side a protruding member (106p) and on another side recessing part (106r) to match to said either first module or second module. 40 45
16. The element according to anyone of the claims 13 to 15, **wherein** the element comprises a fire proof layer on inside side of the element, to form, when mount to another such element of said arrangement or a compatible element to mount, a contact to between such elements when mount. 50
17. The element according to claim 16, **wherein** the fire-proof layer further comprises a fire extinguishing gas-releasing material. 55
18. A cold room **comprising** an element according to
- any of the claims 13 to 17.
19. The arrangement according to claim 1, **wherein** the first element and the second element are configured together to form a corner.

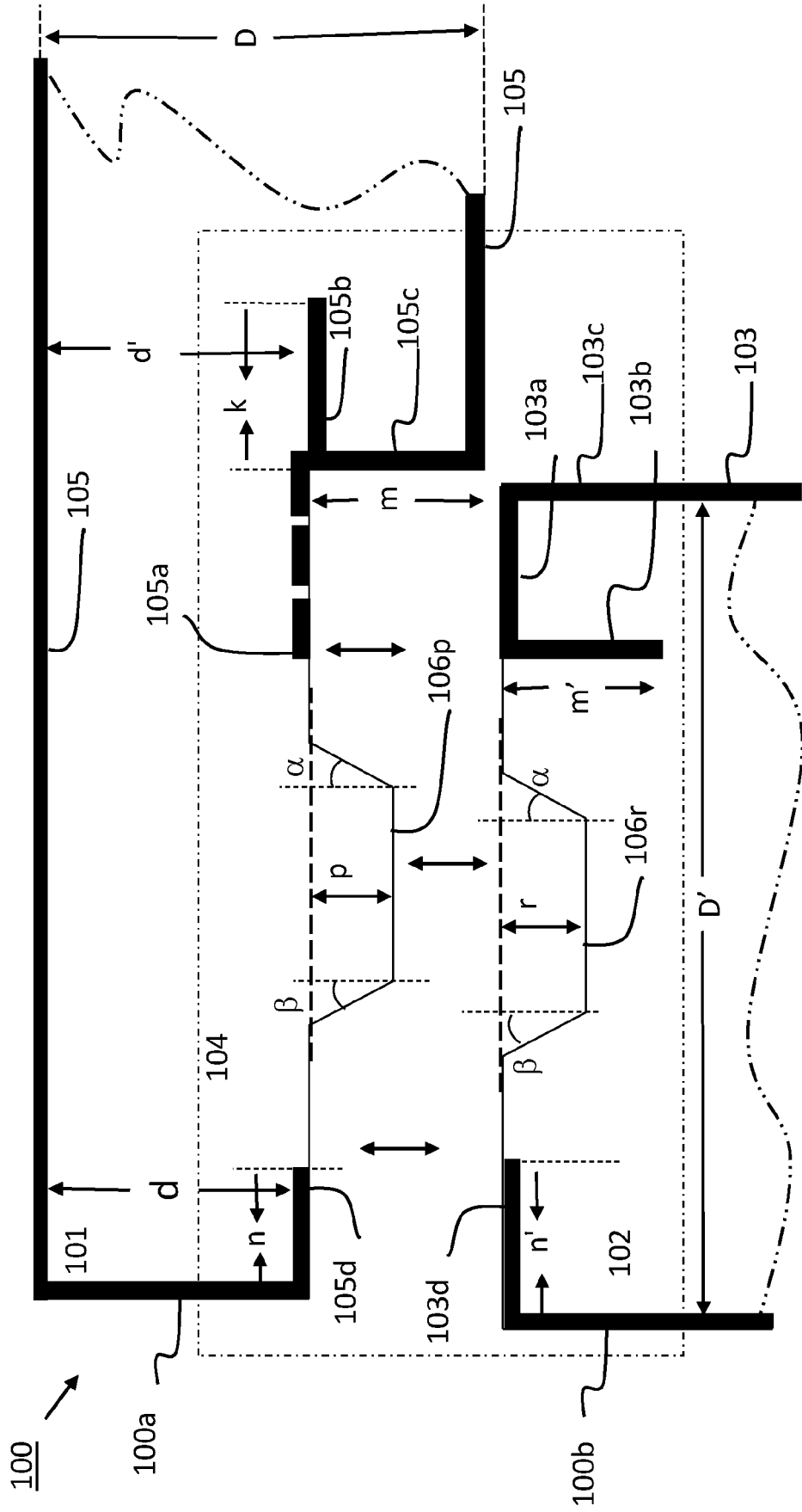


Fig 1

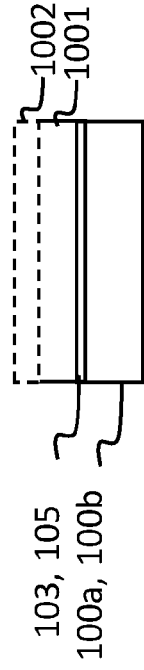


Fig 10

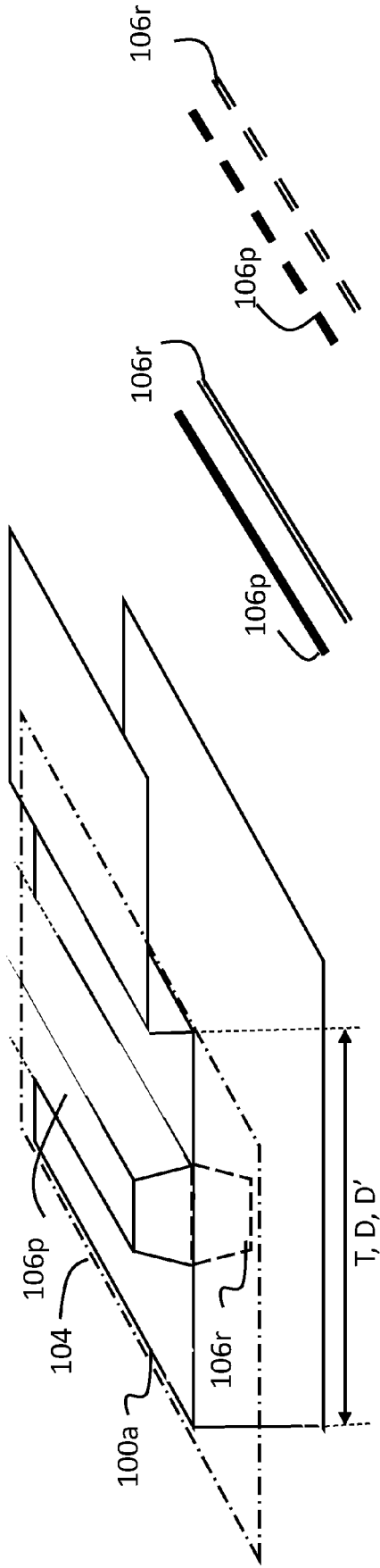


Fig 2

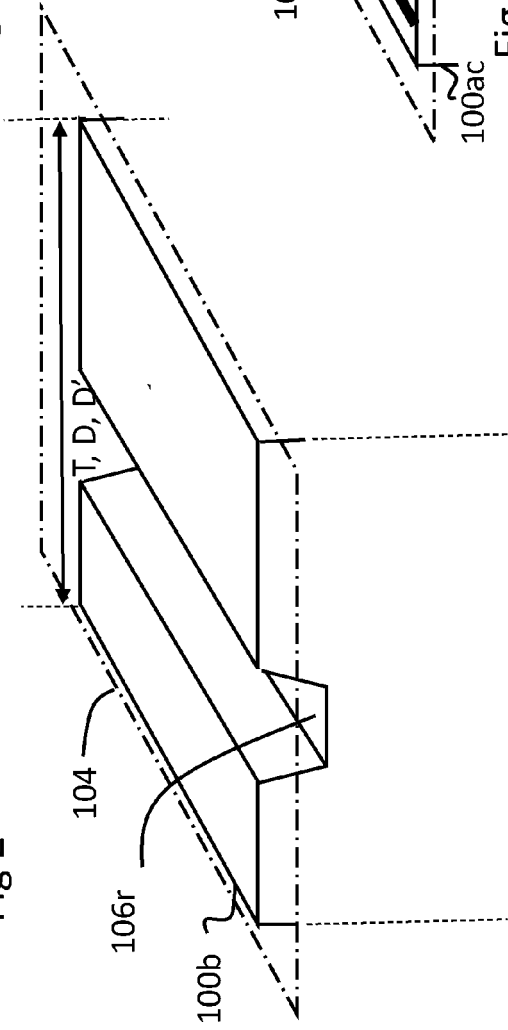


Fig 3

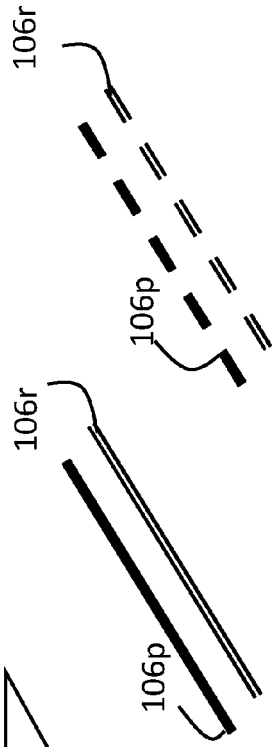


Fig 4

Fig 5

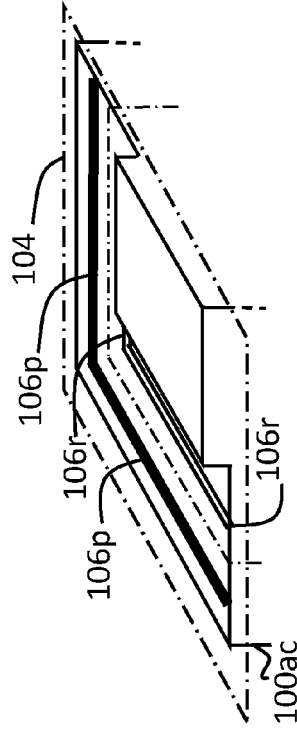


Fig 5A

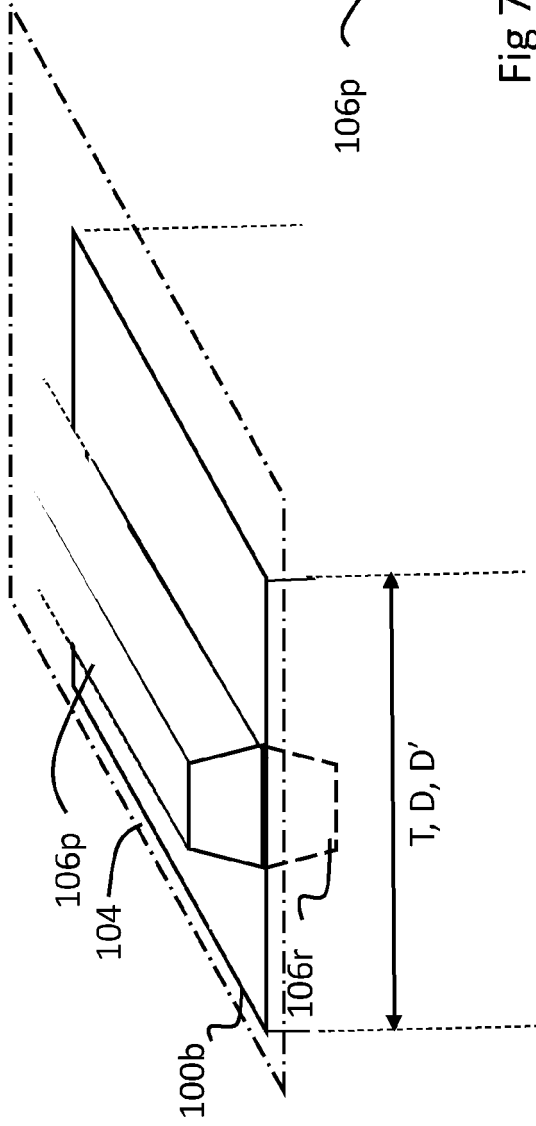


Fig 6

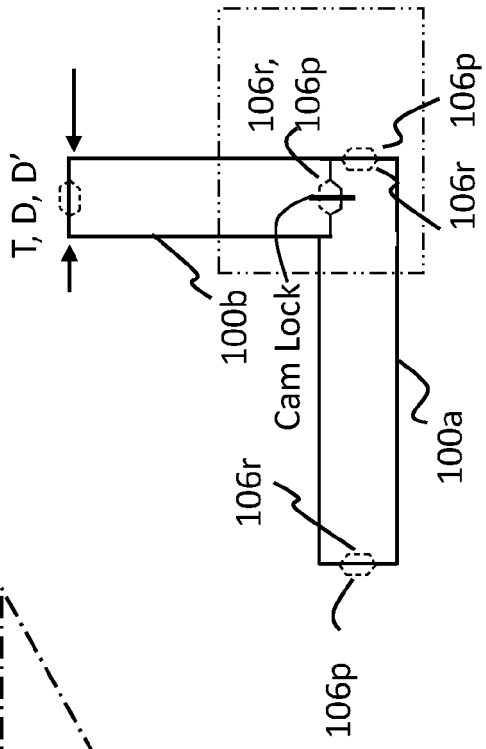


Fig 7

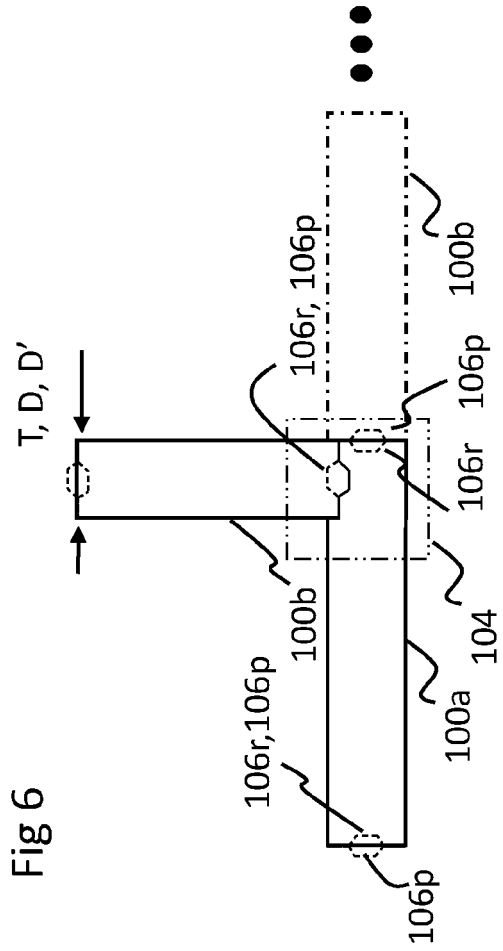


Fig 8

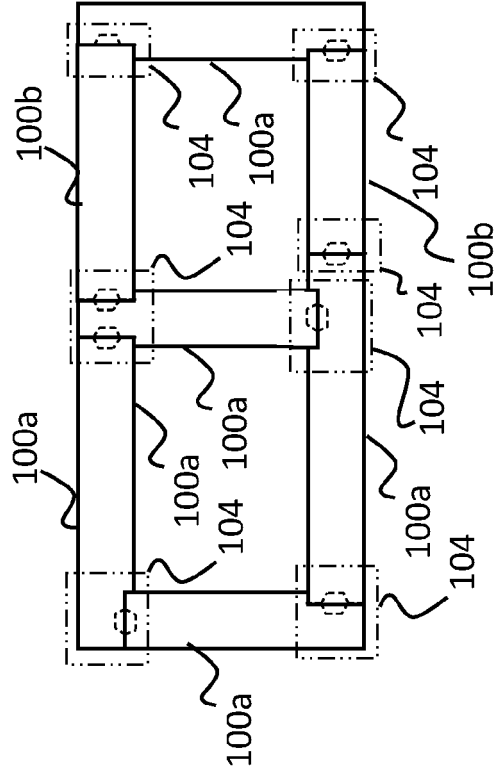


Fig 9

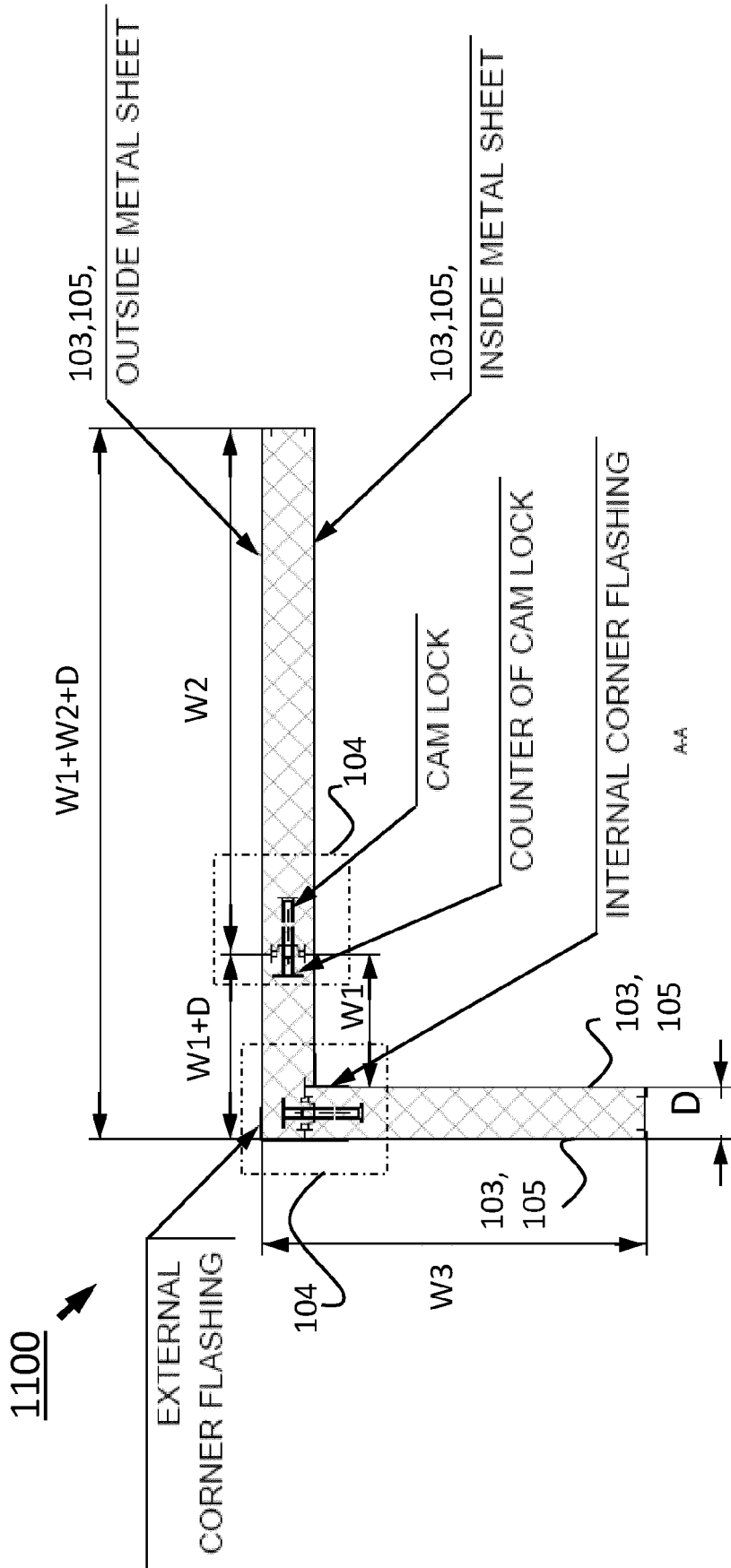


Fig 11

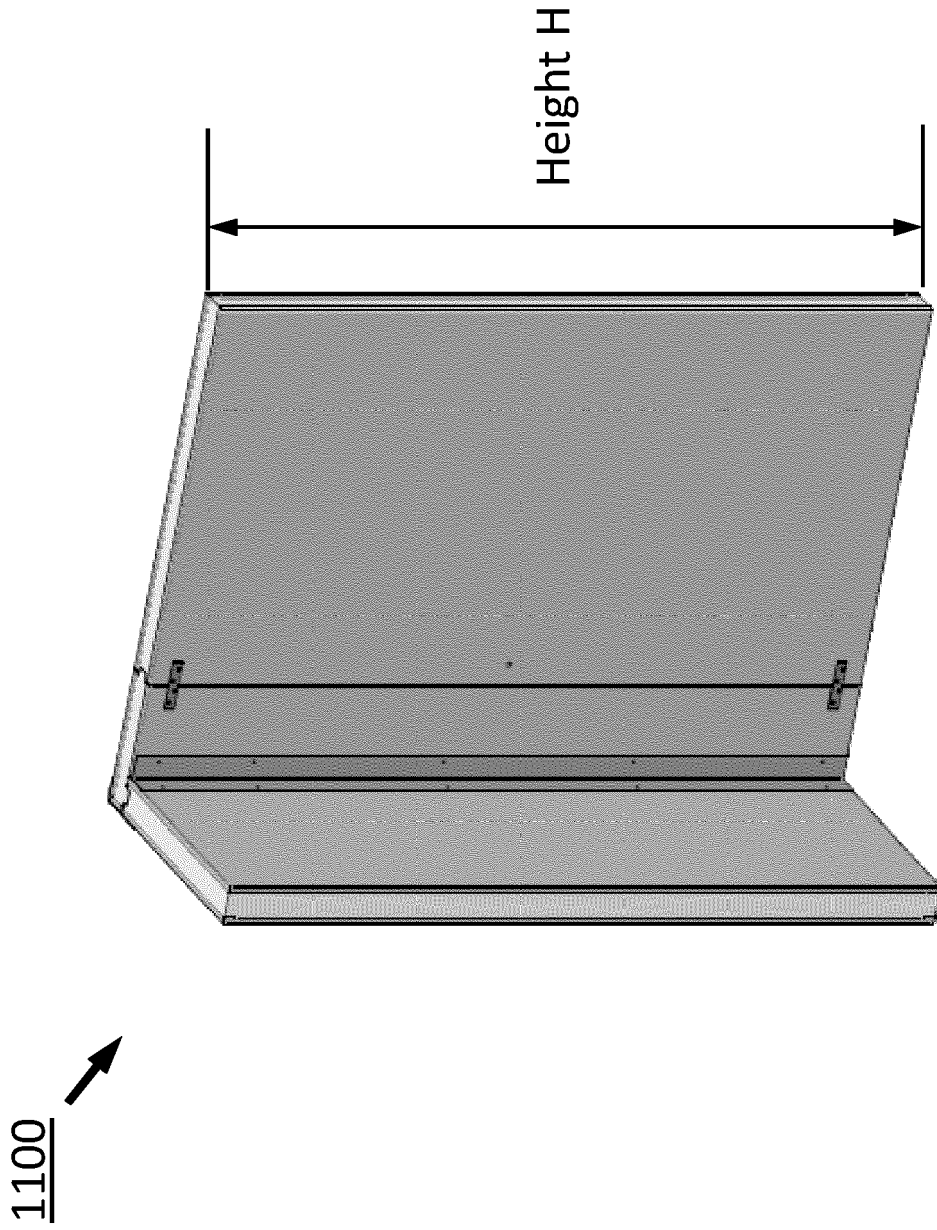


Fig 12



EUROPEAN SEARCH REPORT

Application Number
EP 21 15 7049

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| DOCUMENTS CONSIDERED TO BE RELEVANT | | | |
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| | | | E04B |
| The present search report has been drawn up for all claims | | | |
| Place of search The Hague | | Date of completion of the search 7 July 2021 | Examiner Couprie, Brice |
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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