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(54) **RE-ERECTABLE RESIDENTIAL HOUSING SYSTEM WITH INTERNAL SUPPORT STRUCTURE**

(57) A re-erectable residential housing system, which comprises a cluster of at least four ISO containers comprising two horizontally adjacent ISO containers positioned on top of two further adjacent ISO containers, each defining a longitudinal extension, a width extension and a height extension, wherein each container comprises a bottom with an outer bottom side and an inner bottom side, a top with an inner top side and an outer top side, a first side wall with an outer wall side and an inner wall side, and two end parts, characterised in that each ISO

container comprises  
- an internal support structure extending within the external boundaries of the container, wherein said internal support structure comprises a number of substantially vertical pillars, a number of substantially horizontal longitudinal beams connected to one or more of the substantially vertical pillars, a number of substantially horizontal crossbeams connected to the substantially horizontal longitudinal beams and/or connected to one or two of the substantially vertical pillars.

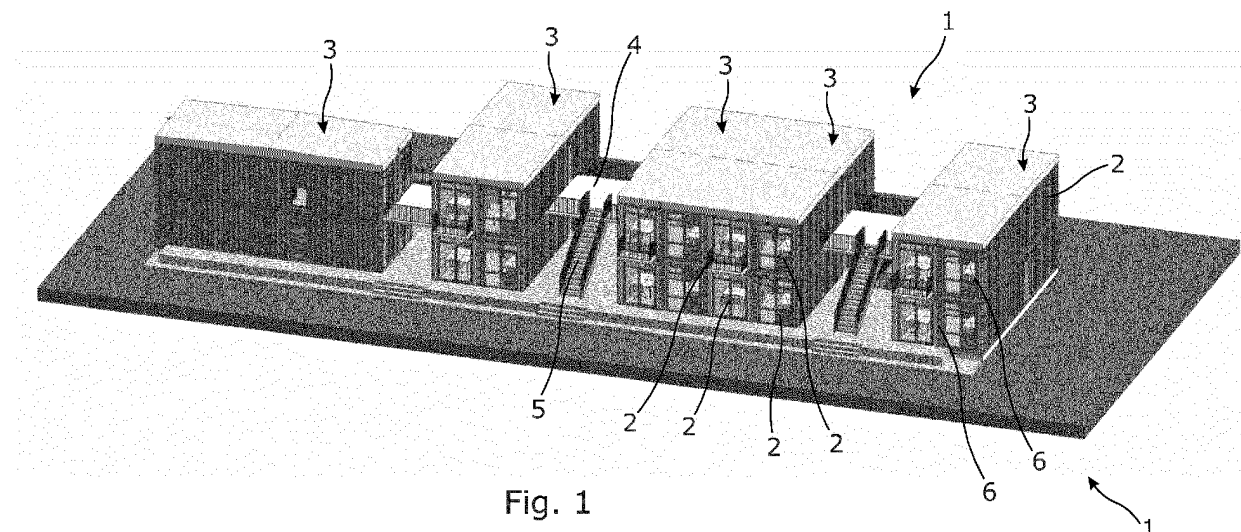


Fig. 1

## Description

### Technical field

**[0001]** The present invention relates to a re-erectable residential housing system, which comprises a cluster of at least four ISO containers comprising two horizontally adjacent ISO containers positioned on top of two further adjacent ISO containers, each defining a longitudinal extension, a width extension and a height extension, wherein each container comprises a bottom with an outer bottom side and an inner bottom side, a top with an inner top side and an outer top side, a first side wall with an outer wall side and an inner wall side, as well as two end parts.

### Background of the invention

**[0002]** Container residences or residential construction based on units having the same dimensions as ISO containers has been known for many years. It has been attempted to use ISO containers for residential construction, because the mass production of containers makes them a cheap provision of a protected volume, which in some locations can be used directly for residences. Furthermore, for their intended application, i.e. the carriage of goods, containers have a limited lifetime, which after use, however, does not make them unsuitable for other purposes where a protected volume is desired. Due to the considerable number of containers and their limited lifetime, used containers have also been very inexpensive to purchase.

**[0003]** Containers have thus been used for residences in a wide variety of ways throughout the world. In many regions of the world, there are very little or no real regulatory requirements for residences. This means that, as a point of departure, the predominant reason for a specific construction being made based on containers is either a specific desire for aesthetics and/or functionality, or that construction costs must be kept low. This has resulted in a wide range of creative uses for containers for residences.

**[0004]** However, some countries, e.g. Denmark, have strict requirements for residences, meaning that a wide range of factors affecting construction must be taken into consideration during erection. These are factors such as insulation, fire protection, daylight, availability, indoor climate etc. The Danish requirements for such factors are seen in other countries as very specific and strict and are quite naturally less relevant in other national countries in relation to the general building stock of such countries. For example, countries having high temperatures do not specify insulation to retain heat, but specify insulation to retain cold, and a specification of requirements for an air-conditioning system might be found more relevant. In line with this, a country with a risk of earthquakes will be more focused on specifying safety measures for such a scenario.

**[0005]** Denmark has building regulations which, at any given time, carefully specify the requirements for residences, such as specified in BR18. These specifications mean that ISO containers cannot directly be used for residences in Denmark. A number of technical modifications and additions to the containers are therefore required in order for the containers to comply with the requirements of the building regulations. The changes are very far from the thinking that typically underlies container residences. Traditional container residences are usually simple structures, and typically only price is decisive, as the vast majority of countries have much more lenient building regulations than Denmark. Therefore, many container residence designs will also be available, but in reality none that comply with the building regulations, and thus in reality none which have solved the inherent technical challenges. Some Danish systems are known, but these are of a 'temporary housing' nature. ISO containers are used in these contexts in temporary connections when a permanent housing stock is not desired. In these contexts, requirements to the residences are usually more lenient. However, this means that such residences, which have been erected during a more lenient regime, can only be used for such temporary housing or for residences with another form of exemption. The lenient regime means that a large number of requirements in e.g. BR18 have been slackened. Not least, the requirements of the building regulations pertain to comfort situations such as cold, heat and sounds, but, much more critically, also fire.

**[0006]** The purpose of the present invention is to provide a re-erectable residence system based on ISO containers, which is inexpensive to produce and easy to erect and disassemble, and which complies with the requirements of the Danish building regulations BR18 and the fire regulations R60.

### Brief summary of the invention

**[0007]** This is achieved with the present invention, which relates to a re-erectable residential housing system, which residential system comprises:

- a cluster of at least four ISO containers, each defining a longitudinal extension, a width extension and a height extension, wherein each container comprises a bottom with an outer bottom side and an inner bottom side, a top with an inner top side and an outer top side, a first side wall with an outer wall side and an inner wall side, as well as two end parts,

**characterised in that** each ISO container comprises:

- an internal support structure extending within the external boundaries of the container, which internal support structure comprises:
- a number of substantially vertical pillars,
- a number of substantially horizontal longitudinal

beams connected to one or more of the substantially vertical pillars,

- a number of substantially horizontal crossbeams connected to the substantially horizontal longitudinal beams and/or connected to one or two of the substantially vertical pillars.

**[0008]** In this way, a structure is achieved which makes the overall design of the support structure and the container sufficiently fire-resistant, cf. R60. Likewise, the support structure ensures that other loads such as snow and wind impact can be counteracted, cf. the Danish Building Regulations BR18. Thus, a building structure is achieved that can be easily erected and disassembled, but which at the same time complies with the Danish requirements for a permanent construction. This is achieved concurrently with the re-erectable residential housing system having the dimensions of standard ISO containers. This allows the use of a structure that meets the requirements of BR18/R60 in critical areas, and in less critical areas, such as outbuildings, bicycle sheds or the like, a cheaper construction can be used that does not comply with BR18 without this standing out or being incompatible with other container clusters or container pairs. Likewise, it is achieved that the individual containers stay within dimensions that do not require special transport. It is thus possible to fully complete the construction of the individual containers in an external location and then move them to the location where they are finally to be used, without special transports. This allows for transport at all hours of the day, but also enables production of the individual containers to be carried out abroad and then transported to an erection point, e.g. in Denmark, without a highly expensive special transport through several countries.

**[0009]** In an embodiment, an ISO container may comprise an opposing second side wall with an outer wall side and an inner wall side. By providing a second side wall on an ISO container with the integrated support structure, it is possible to use a stand-alone ISO container in a setup, such as a residence, wherein the two side walls can close off the internal volume of the ISO container from the outer environment. It is possible to connect one ISO container to a second ISO container using a connection, such as a well or passageway, which is connected to the internal volume of both ISO containers, and wherein the connection is closed off from the outer environment in the area between the two ISO containers.

**[0010]** In an embodiment, two horizontally adjacent containers may have an opening from the one container to the second container, wherein the opening may optionally be defined by an inside of at least one vertical pillar, which stands at an end part of the container, and a longitudinal beam. In an optional embodiment, the opening may be defined by the bottom, top and two end parts of the container. This could mean that two vertically adjacent containers may define a second volume, the second volume being the aggregation of the first volume

of the first container and the first volume of the second container. This may mean that two vertically adjacent containers each have a separate side wall, wherein said side walls are on opposing sides of the two containers and may define a limit for the second volume and/or the first volume of the first container and/or the first volume of the second container.

**[0011]** In an embodiment, one of two horizontally adjacent containers may comprise a number of inclined exchange pillars.

**[0012]** In addition, a vibration-dampening material, e.g. rubber, may be inserted between two vertically adjacent containers.

**[0013]** Furthermore, a vibration-dampening and/or shock-absorbing material may be inserted between two vertically adjacent containers.

**[0014]** The vibration-dampening/shock-absorbing material may be viscoelastic. In this way, it is achieved that the vibration-dampening material reacts differently to shocks and to minor vibrations. In addition, both a vibration-dampening effect and a rigidity is achieved in the construction in the event of shocks.

**[0015]** In an embodiment, the longitudinal beams may be directly connected to the pillars.

**[0016]** In addition, the longitudinal beams of two horizontally adjacent ISO containers may be connected.

**[0017]** Furthermore, the system may comprise a layer (layers) of insulation arranged between the longitudinal beams and the cross supports, respectively.

**[0018]** In an embodiment, shielding may be inserted between two containers positioned above each other. In this way, it is ensured that no rain and pests enter the cavity and thus potentially the insulation extending between two containers. The shielding may comprise one or more drips.

**[0019]** In an embodiment, the crossbeams of the support structure may be H profiles.

**[0020]** In a further embodiment, the support pillars may be square profiles.

**[0021]** In a further embodiment, shock-absorbing material, e.g. rubber or a polymer, may lie between two containers positioned above each other. In this way, it is achieved that transmission of shocks or step sounds from the one container to the second one is minimised.

**[0022]** The interlayer, i.e. the shock-absorbing material, may be a viscoelastic material.

**[0023]** The interlayer may lie above the pillars so that vertical forces are conducted through these. In this way, further control of the vertical force impact is achieved and thus an additional opportunity to reinforce precisely the points in which the force impact is the greatest.

**[0024]** In an embodiment, the re-erectable residential housing system may comprise a rubber membrane between a vapour barrier and an internal insulation. In this way, sound attenuation of the original container structure is achieved.

**[0025]** Furthermore, the support structure may comprise wind braces for reinforcing the sides. In this way, a

strong structure is achieved that does not take up much space.

**[0026]** In an embodiment, the insulation above the top container may be thicker than the insulation between two containers.

**[0027]** The insulation above the top container may additionally comprise a protective cover layer, i.e. an outermost layer of the building envelope that protects the insulation and thus the residential system from encroaching wind, water and snow etc.

**[0028]** In an embodiment, the cover layer may have a slope of more than 2°.

**[0029]** In an embodiment, the sides of the individual containers may be insulated from the inside and built up with insulation, vapour barrier and an interior finish e.g. plasterboard, OSB or Fermacell.

**[0030]** In a further embodiment, the adjacent side walls of two horizontally adjacent containers may be cut through so as to form a passage from the first container to the second container.

**[0031]** Furthermore, the end parts of the containers may be provided with windows or doorways or combinations thereof.

**[0032]** In an embodiment, the containers may comprise one or more ventilated cavities, e.g. at the corners of the containers. In this way, it is achieved that any condensation can be ventilated away to avoid the formation of moulds.

**[0033]** In a further embodiment, the containers may comprise a vapour barrier. In this way, it is ensured that the container meets the requirements for tightness and dewpoint control. The vapour barrier may be mounted innermost on the insulation or between the outer sides of the insulation. The vapour barrier may be placed 5 mm or more from the inner insulation surface. In this way it is avoided that screws etc. penetrate the vapour barrier.

**[0034]** In an embodiment, a first of two horizontally adjacent containers may comprise a longitudinal beam which abuts the longitudinal beam of a second of two horizontally adjacent containers. This may mean that there is not a first and/or second side wall between the two longitudinal beams.

**[0035]** In an embodiment, a first of two horizontally adjacent containers may comprise a vertical pillar which abuts the vertical pillar of a second of two horizontally adjacent containers. This may mean that there is not a first and/or second side wall between the two vertical pillars.

This may mean that two horizontally adjacent containers may be connected to each other by providing one or more attachment element(s) to connect a longitudinal beam and/or a vertical pillar in a first of two horizontally adjacent containers and a longitudinal beam and/or a vertical pillar in a second of two horizontally adjacent containers. This makes it possible to use the internal support structure to attach the one container to the second container. This also makes it possible to remove the side walls of the sides adjoining each other, thus achieving a common

volume between the internal volume of the first container and the second container.

**[0036]** In an embodiment, an ISO container may have a vertical pillar in one or more areas of the ISO container, wherein the vertical pillar extends from an upper boundary of the ISO container towards a lower boundary of the ISO container. Thus, a vertical pillar may provide the ISO container with increased strength from the upper boundary to the lower boundary, which means that the ISO container can withstand a significantly higher force in the area where the pillar is present.

**[0037]** In an embodiment, an ISO container may have a vertical pillar in one or more corner areas of the ISO container, wherein the vertical pillar extends from an upper boundary of the ISO container towards a lower boundary of the ISO container. In this context, the corner may be an area where a side wall meets an end part and/or a top or bottom. Optionally, an ISO container may have a vertical pillar in each of the four corner areas of the ISO container. By placing a vertical pillar in each corner area of the ISO container, it is possible to provide an ISO container with increased strength in each corner, which allows for a second or several ISO containers to be placed vertically on top of a first or second ISO container, allowing two or more ISO containers to be stacked on top of each other. The vertical pillars provide that the strength and weight of the stacked containers can be transferred to the first container and thus to the ground or a foundation via the vertical pillars, which may extend vertically from the top container to the bottom container in a straight line. This makes it possible to use the vertical pillars as a supporting structure for the overlying ISO containers and substantially remove part of the force that the overlying ISO containers will transfer to the lower ISO containers.

**[0038]** In an embodiment, one or more ISO containers may be provided with one or more spacers, wherein a spacer may be located in a direct vertical extension of one or more of the vertical pillars located in the ISO container on the outside of the container. Thus, a spacer may be used to connect two vertically adjacent ISO containers, wherein the spacer may be used to transfer force from a first vertical pillar of a first ISO container to a first vertical pillar of a second ISO container. Thus, the spacer may be placed e.g. on top of a first ISO container, whereby placing a second ISO container on top of the first ISO container will result in the spacer abutting against a bottom of the second ISO container.

**[0039]** In an embodiment, the spacer may be a vibration-dampening spacer, so that part of the vibration from a first ISO container will be dampened in the spacer, thus preventing part of the vibration from being transferred to a second ISO container, which may e.g. be vertically adjacent to the first ISO container.

**[0040]** A corner of an ISO container may be understood as the area where a side wall meets an end part, and/or where a side wall meets a bottom, and/or where a side wall meets a top, and/or where a bottom meets an end

part, and/or where a top meets an end part. A corner may also mean where a side wall meets an end part and a bottom and/or top, i.e. where three faces of an ISO container meet each other.

#### Brief description of the drawings

**[0041]** The drawings only serve as explanation of the present invention and should in no way be considered as limiting to the description of the present invention. It furthermore applies that shapes and sizes in the drawings of various parts are schematic and intended to provide a better understanding of the invention and should therefore not be used to specifically limit the shapes and sizes of various parts in the present application. Those skilled in this area will be able to select the possible shapes and sizes to implement the invention under the guidance of the present application.

Fig. 1 shows a setup of container residences according to the invention, shown as two-storey buildings,

Fig. 2 shows vertical cross-sections in the longitudinal extension and width extension, respectively,

Fig. 2A shows the internal support structure of a container pair i.e. two horizontally adjacent containers,

Fig. 2B shows the support structure of a container cluster,

Fig. 2C shows a further embodiment of the support structure of a container cluster,

Fig. 3 shows a horizontal cross-section of two containers comprising a support structure as shown in Fig. 2B,

Fig. 4 shows, in a vertical cross-section, the support structure, shown in the junction between two horizontally adjacent containers at a point where the side walls of the two containers have been removed,

Fig. 5 shows, in a vertical section, the support structure in the junction between two container pairs at the central point where all four containers are closest to each other,

Fig. 6 shows a horizontal cross-section of a side wall with a support pillar,

Fig. 7 shows a horizontal cross-section, wherein the end parts of two adjacent containers abut each other,

Fig. 8 shows a vertical cross-section of two containers,

Fig. 9 shows a vertical cross-section of a corner of

a top container with glass section,

Fig. 10 shows a vertical section of the side piece of a top container,

Fig. 11 shows a vertical section of two containers on top of each other with inserted partition walls, and

Fig. 12 shows a vertical section of the top corners of two adjacent containers.

#### Detailed description of the invention

**[0042]** With reference to the accompanying drawings, the present invention will be described in more detail in the following.

**[0043]** Fig. 1 shows a setup of a re-erectable container residence system 1 shown as two-storey buildings. It is clear that a re-erectable residence system may be configured in several ways, and consequently the one shown is only an example of a setup. Since the present invention relates precisely to an internal support structure, this is not visible from the outside. It can be seen from Fig. 1 that the containers 2 are in clusters 3, each cluster 3 consisting of four containers 2 (only a few are marked with a reference numeral). It is shown that the re-erectable container residence system 1 may comprise intermediate plateaus 4 and staircases 5. It is clear that these may have varying sizes and be designed in several ways. Fig. 1 shows a total of five clusters 3, each cluster 3 consisting of two container pairs 6, wherein two containers 2 are adjacent to each other in the horizontal plane.

**[0044]** Fig. 2 shows vertical cross-sections in the longitudinal extension and width extension, respectively, i.e. along the longitudinal axis LA and the width axis BA. It can be seen that the containers 2 have not been applied with materials on the outside, and therefore the containers have the width and length of ISO containers. A container pair 6 is therefore substantially twice the width of a single container 2. It can further be seen from Fig. 2 that a cluster 3 may comprise an internal staircase 10, so that the whole cluster 3 may function as a single residence or office. It is likewise possible that a container pair 6 alone constitutes a residential unit or an office. However, it applies to both a cluster 3 or a container pair 6 that the adjacent containers must have openings to allow access from the one container to the second. Each container comprises a bottom 20 with an outer bottom side 21 and an inner bottom side 22, a top 23 with an inner top side 24 and an outer top side 25, a first side wall 26 with a first outer wall side 27 and a first inner wall side 28, and an opposing second side wall 30 with a second outer wall side 31 and a second inner wall side 32, as well as a first end part 33 and a second end part 34.

**[0045]** Fig. 2A shows an internal support structure 40 for a container pair 6, i.e. two horizontally adjacent containers 2 (the container itself is not shown). Fig. 2B shows two internal support structures 40 placed on top of each

other. This is for illustrative purposes, as in practice, the two support structures 40 would not abut each other in the vertical plane. In the vertical plane, parts of the containers will abut each other substantially in a way that is common for containers. The re-erectable container residence system may thus comprise joining components such as twist-locks or the like. The internal support structure 40 is within the outer boundaries of the container pair 2, i.e. the outer dimensions which make up a standard container. The outer boundaries may mean the outer periphery or edge of one or more of a first side wall, a second side wall, a bottom, a top and or an end part. A container may define a first volume, wherein the first volume may be seen as limited by the structure of an ISO container. In accordance with the description, the internal support structure may be considered to be inside the first volume, and/or may be considered to be completely within the first volume, so that the internal support structure is not outside the first volume. The internal support structure 40 comprises a number of substantially vertical pillars 41 and a number of substantially horizontal longitudinal beams 42 connected to one or more of the substantially vertical pillars 41. The support structure 40 further comprises a number of substantially horizontal cross-beams 43 connected to the substantially horizontal longitudinal beams and/or connected to one or two of the substantially vertical pillars.

**[0046]** Fig. 2B shows schematically how the central load axis CLA is above each other in two support structures 40 that are above each other. In both Figs. 2A and 2B it can be seen that the central load axis CLA, in addition to a substantially vertical pillar 41, also comprises two inclined exchange pillars 45. In this embodiment, the two exchange pillars 45 have the same loading point as the substantially vertical pillar 41. However, it is not necessary for the loading point to be exactly the same. It is furthermore shown that a support structure 40 has central pillars 41', 41" and central longitudinal beams 42', 42", which substantially abut each other. The adjacent sections of the support structure 40 are joined together either by means of bolts, gluing, welding or otherwise. In this way it is achieved that containers 2 can be handled as single containers during transport and installation, but through joining into container pairs, an additional strength is achieved for the overall unit (container pair). In this embodiment, the inclined exchange pillars 45 do not abut a corresponding pillar. In a further embodiment, the inclined exchange pillars may also be double and thus abut corresponding pillars. In an embodiment of the re-erectable container residence system 1, the containers may be individual and thus not built together into container pairs or be joined into a cluster. In Fig. 2B, a distinction has been made between adjacent parts of the support structure 40 by marking these, e.g. as 41' and 41". However, it will be understood that this also applies to Fig. 2A, but has not been indicated to simplify the figures and thus facilitate understanding. The same applies to 42' and 42".

**[0047]** Fig. 2C shows a further embodiment of the support structure, wherein the longitudinal beams 42 lie between the vertical pillars 41. One or more of the vertical pillars 41 is thus through-going. In this way, it is achieved that the vertical pillars may protrude out/up in relation to the longitudinal beams 42. The protruding section 410 is thus easier to locate precisely, making it easier to find the precise positions for support points that pass a load from an overlying container into the support structure of an underlying container via the vertical pillars 41. It can also be seen from Fig. 2C that the vertical pillars 41 stand directly above each other. It is also shown that the protruding section 410 does not extend beyond, in this orientation above, the corners 412 of the container.

**[0048]** In this embodiment, a shock-absorbing material 411, e.g. a polymer, is inserted between the overlying container and the underlying container (only the support structures are shown). The location of the shock-absorbing material 411 is shown in an enlarged section. The shock-absorbing material 411 absorbs shocks, step sounds and other impacts that may travel from the one container to the second. In this embodiment, the shock-absorbing material 411 is on top of the protruding section 410 of the vertical pillars 41. Since the entire residential housing system must be able to be disassembled and erected elsewhere, all containers may be prepared with a number of protruding sections 410, so that an overlying container may be used as an underlying container in another setup. Therefore, it is shown in Fig. 2C that the vertical pillars 41 of the overlying support structure also have protruding sections 410. Likewise, the re-erectable residential housing system according to the invention may also comprise more storeys than in the embodiments shown.

**[0049]** Fig. 3 shows a horizontal cross-section of two containers forming a container pair 6, which comprises a support structure 40 as shown in Fig. 2A. It can be seen how the pillars 41 are located in the side walls 26, 30. Two adjacent pillars 41', 41" are located in the end parts 33, 34 and a further two in the central load axis CLA. Furthermore, it can be seen that the inclined exchange pillars 45 are located slightly offset from the central longitudinal axis. The pillars 41, 41', 41" may be H profiles and/or square profiles, but also, as in this embodiment, a mixture of H profiles and square profiles.

**[0050]** Fig. 4 shows a more detailed vertical cross-section of the support structure in a cluster. The cross-section is shown in the junction between two horizontally adjacent containers 2 at a point where the one side wall of the two containers has been removed. Furthermore, the cross-section is shown in a cluster, so a section of four containers 2 is thus shown. In this way, a wider residence is obtained. The longitudinal beams 42', 42" may be held together either with bolts or with welding or gluing. The upper container pair has bottom insulation 50 mounted on the outer bottom side 21 of the bottom 20 of the container 2. The lower container pair has ceiling insulation 51 mounted on the inner top side 24 of the top 23.

The outer top side 25 thus faces the outer bottom side 21 of the overlying container pair 6.

[0051] Fig. 5 shows, in a vertical section, the support structure in the junction between two container pairs 6 at the central point where all four containers 2 are closest to each other. It can be seen that the longitudinal beams 42', 42" are substantially located above each other. It can further be seen that insulation 54 has been inserted in the central point between the upper container pair 6 and the lower container pair 6. It can further be seen that a joint 55 lies between the top corners of the two containers 2 in the lower container pair 6, closing the gap between the two containers in the longitudinal extension. In this way, a substantially enclosed area is achieved between the outer walls 26, 30 of the two containers 2 in a container pair 6 as well as between the two container pairs 6. On the inside of the vapour barrier 60 is a rubber membrane 56. The rubber membrane may be from 2-20 mm or 5-15 mm. The rubber membrane counteracts noise transported from the top of the container. Furthermore, the rubber membrane 56 may act as levelling of the pressings found in the original top 23 of the container.

[0052] Fig. 6 shows a horizontal cross-section of a side wall with a support pillar 41. It can be seen that the support pillar 41 is located within the side wall 26 of the container 2. It can be further seen that a vapour barrier 60 is located at a distance inside the side insulation 61.

[0053] Fig. 7 shows a horizontal cross-section wherein two adjacent containers 2 abut each other. In this embodiment, the two containers are offset in the horizontal plane. In this way, easier access is achieved to build balconies on one of the containers. It can be seen that the vertical pillars 41 in this embodiment are H profiles. It is further shown that the end parts 34 comprise windows and/or doors 70. It can again be seen that the pillars 41 are within the side walls. The pillars 41 stand at a distance from the original side wall 71 of the container, so that there is room for insulation 72 between the pillar 41 and the original side wall 71 of the container. Between the insulation 72 and the original side wall 71 is a cavity 73 that serves as ventilation.

[0054] Fig. 8 shows a vertical cross-section through two containers 2 near the end parts 34 of the containers. Between the two containers is an insulation layer 80, which extends from the bottom 20 of the upper container to the top 23 of the lower container. In order to close off against the surrounding environment, the insulation 80 between the containers 2 is sealed off with a cover 82. The cover 82 has one drip 83, but may have several. It can be seen that the crossbeams 43 are substantially located above each other. To fireproof the beam 43 in the lower container, it is packed behind two layers of plaster 81. There is a vapour barrier 60 between the two layers of plaster 81 and the crossbeam 43. The cavity 84 in which the crossbeam of the lower container is located, is filled with insulation. In this way it is prevented that the crossbeam becomes a thermal bridge.

[0055] Fig. 9 shows a vertical cross-section of a corner

of a top container 2. It can be seen that this corner is designed in the same way as the corner of the bottom container referred to in Fig. 8. In order to protect against encroaching water, e.g. heavy rain, a cover 82 is fitted.

5 The cover extends over the top 23 of the container, partially down over the end part 34 of the container 2. On the top 23 of the container is top insulation 90. The top insulation 90 has a cover layer 91 that ensures the necessary weather resistance against rain, sun, snow etc.  
10 The top insulation 90 and thus also the cover layer 91 have a slope, typically of 2° or more so that water runs off.

[0056] Fig. 10 shows a vertical section of the side wall of a top container. The figure shows that, like Fig. 9, which showed an end part, a cover 82 has been inserted along the entire the length of the side wall. The original structure of the container 2 comprises a square profile 100. The square profile 100 has an outer ventilation hole 101 and an inner ventilation hole 102, whereby the square profile 100 acts as ventilation, indicated by the ventilation arrow VP, for the cavity 73 behind the original side wall of the container and the internal insulation 72. The outer ventilation hole 101 is protected by the cover 82, so that no water can enter the square profile 100.

[0057] Fig. 11 shows a vertical section of two containers placed on top of each other with light partition walls 110 inserted. It can be seen that since there is insulation between the containers, the partition walls 110 can extend right up to the original top 23 of the container. This achieves freedom in work planning as to whether the partition walls 110 are erected before or after internal insulation of the containers is carried out. This can furthermore facilitate work planning when, as shown, there is a lowered ceiling 112 in one room and a ceiling in e.g. plywood 114 at full height in the adjacent room. Likewise, it is an advantage in connection with the establishment of wet rooms 116 and thus waterproof flooring 117 that work can be performed from the outset in a defined room rather than having to wait to apply the specialised waterproof layers, e.g. wet room membrane, tiles and the like.  
30 Finally, a better step sound dampening is achieved when the floors are not through-going.

[0058] Fig. 12 shows a vertical section of the top corners of two adjacent containers 2. It can be seen that the top insulation 90 is continuous over the two containers 2. The top insulation 90 thus fits tightly at each of the top corner points 121, 122 of the two containers, and it is therefore not necessary to joint between the side walls of the two containers, as this intermediate cavity 123 is closed off by insulation at the bottom (shown in Fig. 5 with reference numeral 54).

[0059] A person skilled in the art will understand that the figures shown are exemplary embodiments shown more or less schematically.

## Claims

1. A re-erectable residential housing system (1), com-

prising:

- a cluster of at least four ISO containers comprising two horizontally adjacent ISO containers positioned on top of further two adjacent ISO containers, each defining a longitudinal extension, a width extension and a height extension, wherein each container comprises a bottom (20) with an outer bottom side (21) and an inner bottom side (22), a top (23) with an inner top side (24) and an outer top side (25), a first side wall (26) with an outer wall side (27) and an inner wall side (28), as well as two end parts,

**characterised in that** each ISO container comprises

- an internal support structure (40) extending within the external boundaries of the container, wherein said internal support structure comprises:

- a number of substantially vertical pillars (41),  
 - a number of substantially horizontal longitudinal beams (42) connected to one or more of the substantially vertical pillars,  
 - a number of substantially horizontal cross-beams (43) connected to the substantially horizontal longitudinal beams and/or connected to one or two of the substantially vertical pillars.

2. The re-erectable residential housing system according to claim 1, wherein at least one of two horizontally adjacent containers comprises a number of inclined exchange pillars (45).

3. The re-erectable residential housing system according to claims 1 or 2, wherein the longitudinal beams are directly connected to the pillars.

4. The re-erectable residential housing system according to claims 1, 2 or 3, wherein the longitudinal beams of two horizontally adjacent ISO containers are connected.

5. The re-erectable residential housing system according to claims 1-4, wherein the system comprises a layer (layers) of insulation arranged between the longitudinal beams and the cross supports, respectively.

6. The re-erectable residential housing system according to any one of the preceding claims, wherein the insulation above the top container is thicker than the insulation between two containers.

7. The re-erectable residential housing system according to claims 1-6, wherein the insulation above the top container comprises a protective cover layer

(91), an outer most layer of the building envelope, to protect the residence system against water and snow etc.

8. The re-erectable residential housing system according to claims 1-6, wherein the cover layer may have an inclination of more than 2°.

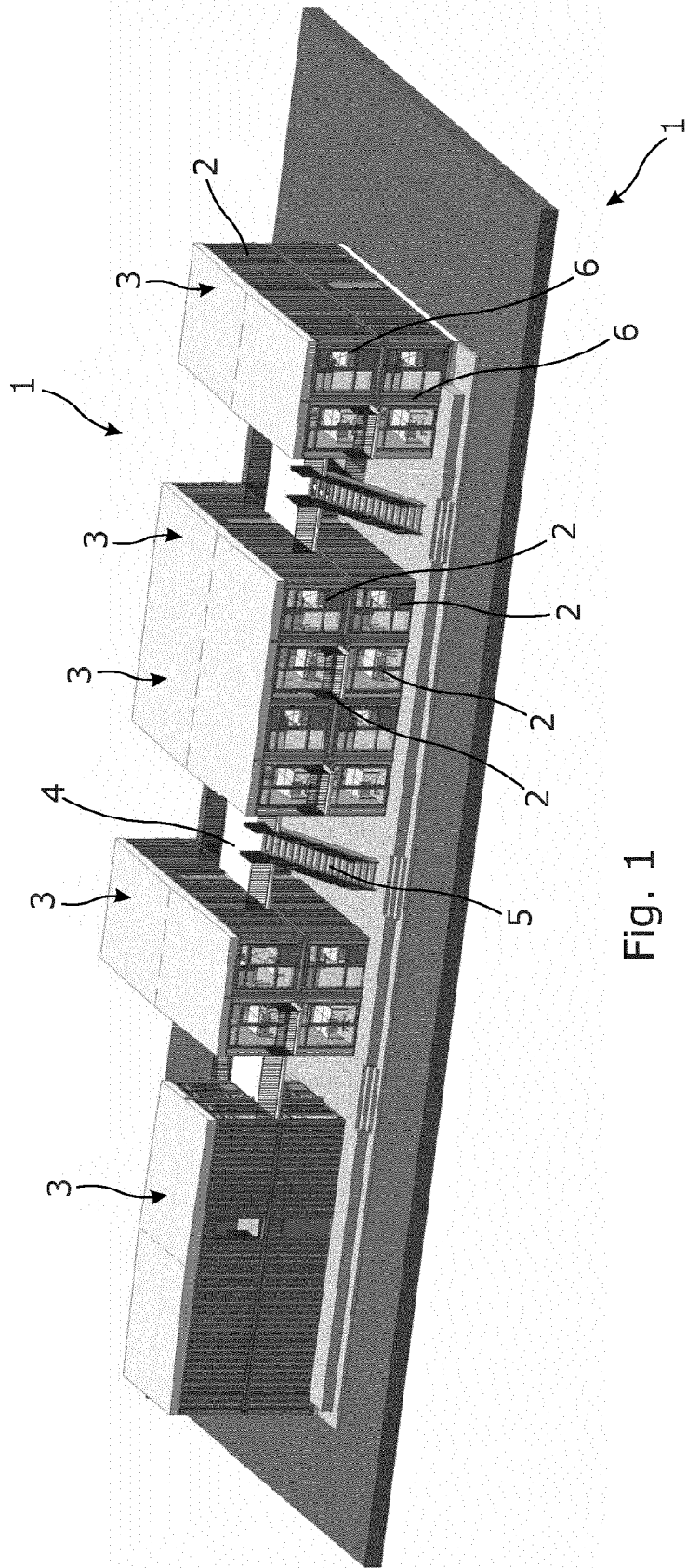
9. The re-erectable residential housing system according to claims 1-7, wherein the sides of the individual containers are insulated from the inside and constructed using insulation (61), vapour barrier (60) and an interior finish, e.g. plasterboard, OSB or Fermacell.

10. The re-erectable residential housing system according to claims 1-8, wherein the adjacent side walls of two horizontally adjacent containers may be cut through so as to form a passage from the first container to the second container.

11. The re-erectable residential housing system according to any one of the preceding claims, wherein the end parts (33, 34) of the containers are provided with windows or doorways or combinations thereof.

12. The re-erectable residential housing system according to any of the preceding claims, wherein each ISO container comprises an opposing second side wall with an outer wall side (27) and an inner wall side (28).





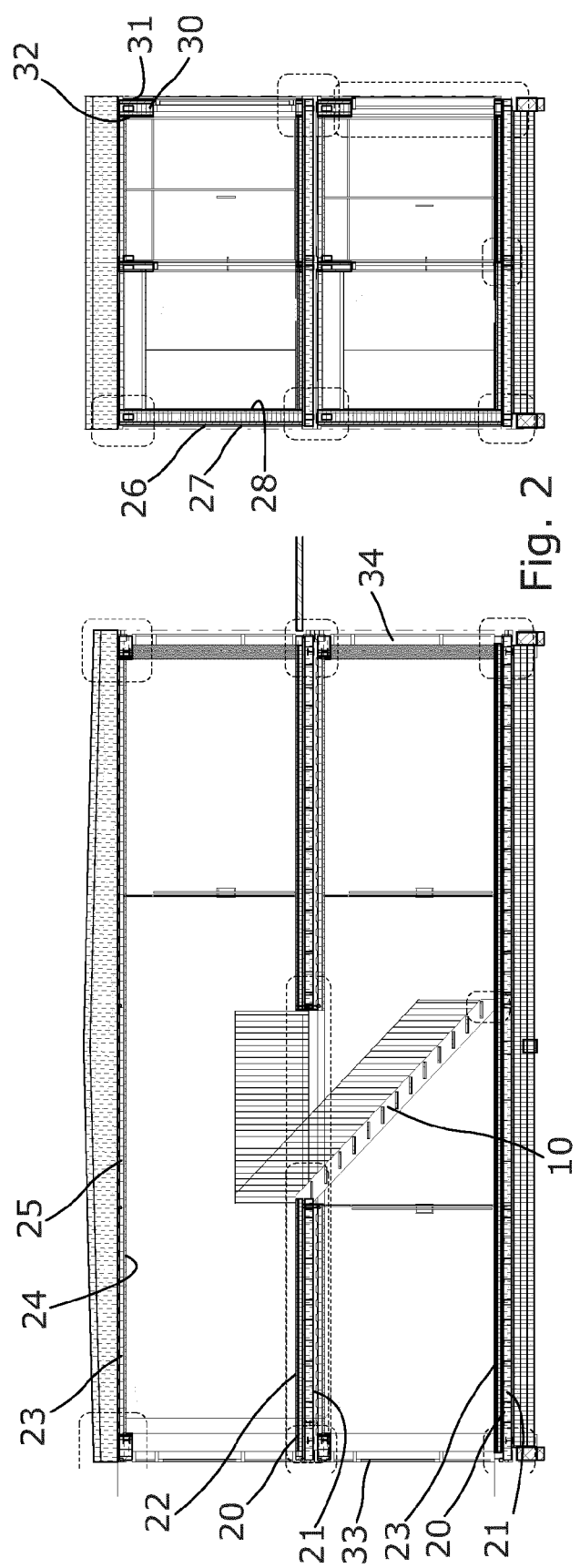
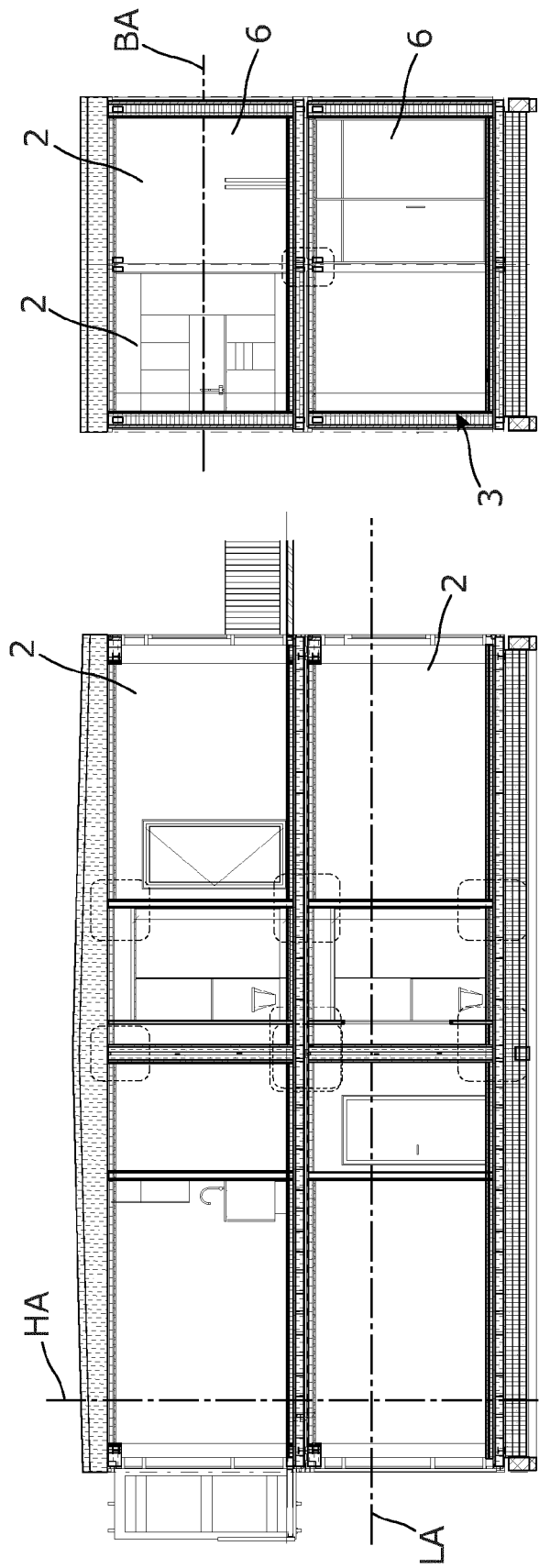
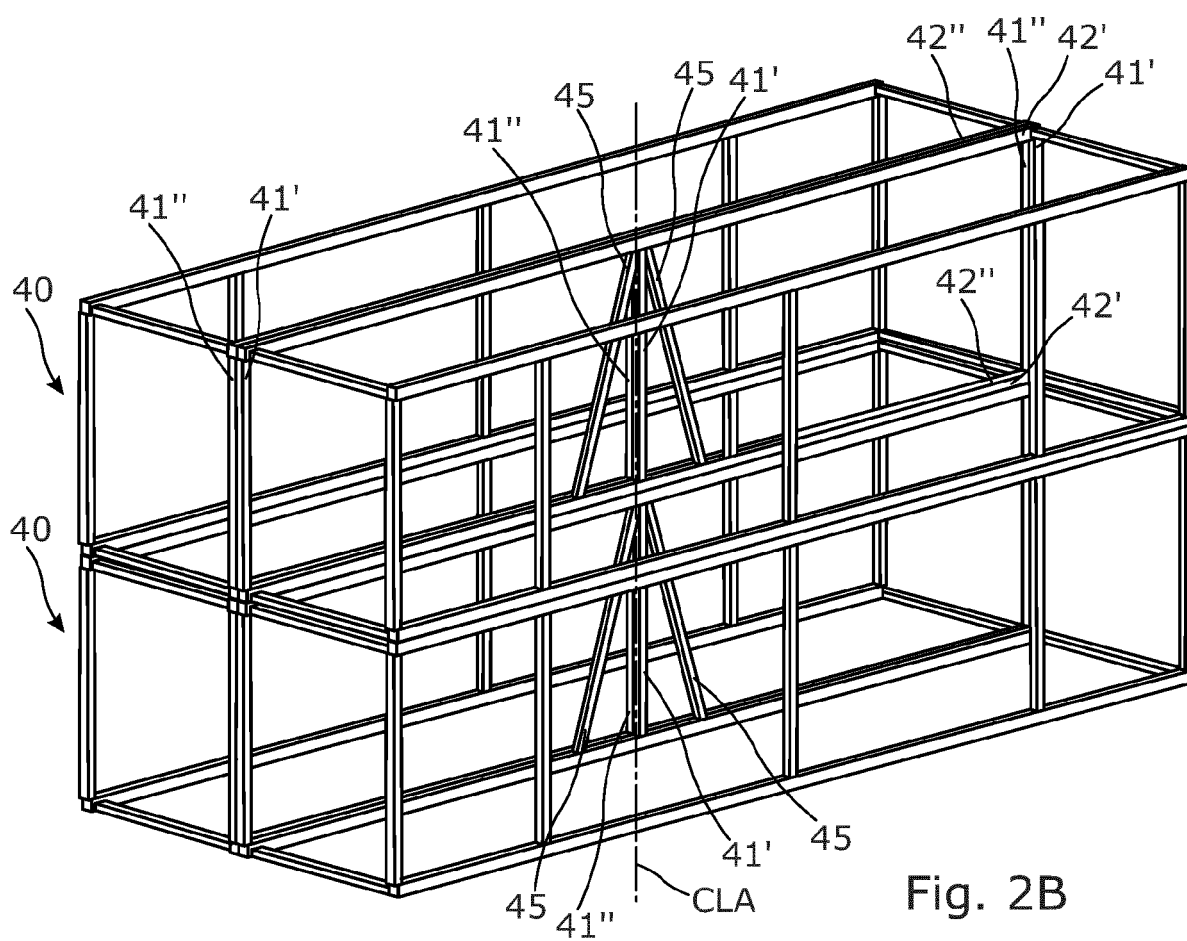
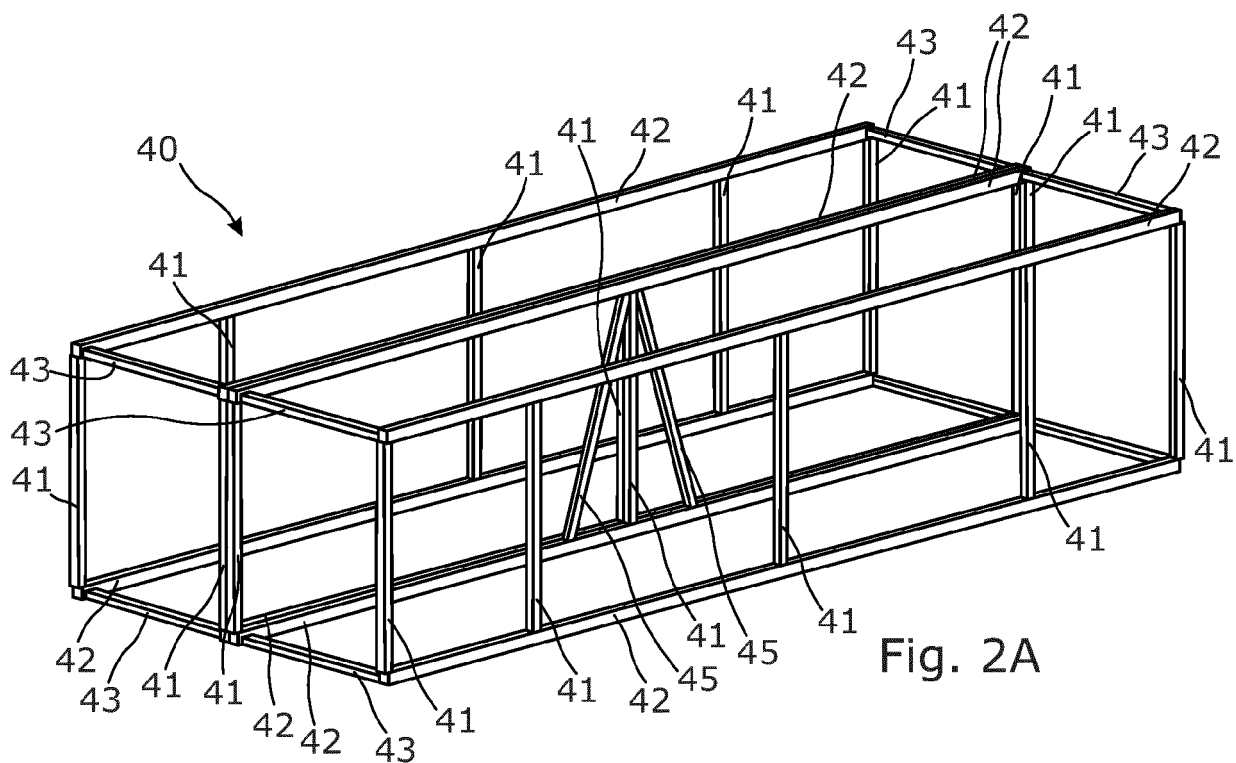


Fig. 2



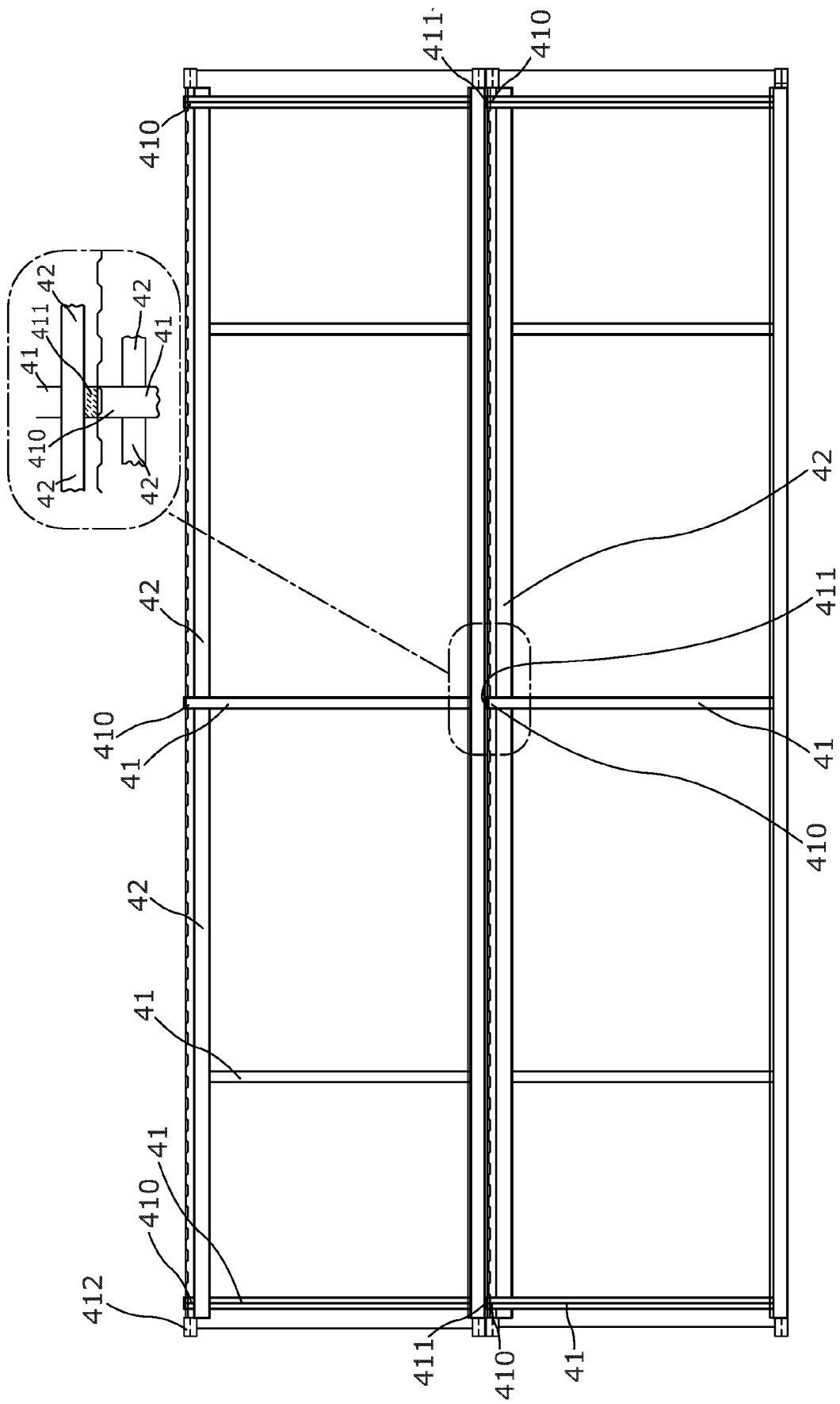


Fig. 2C

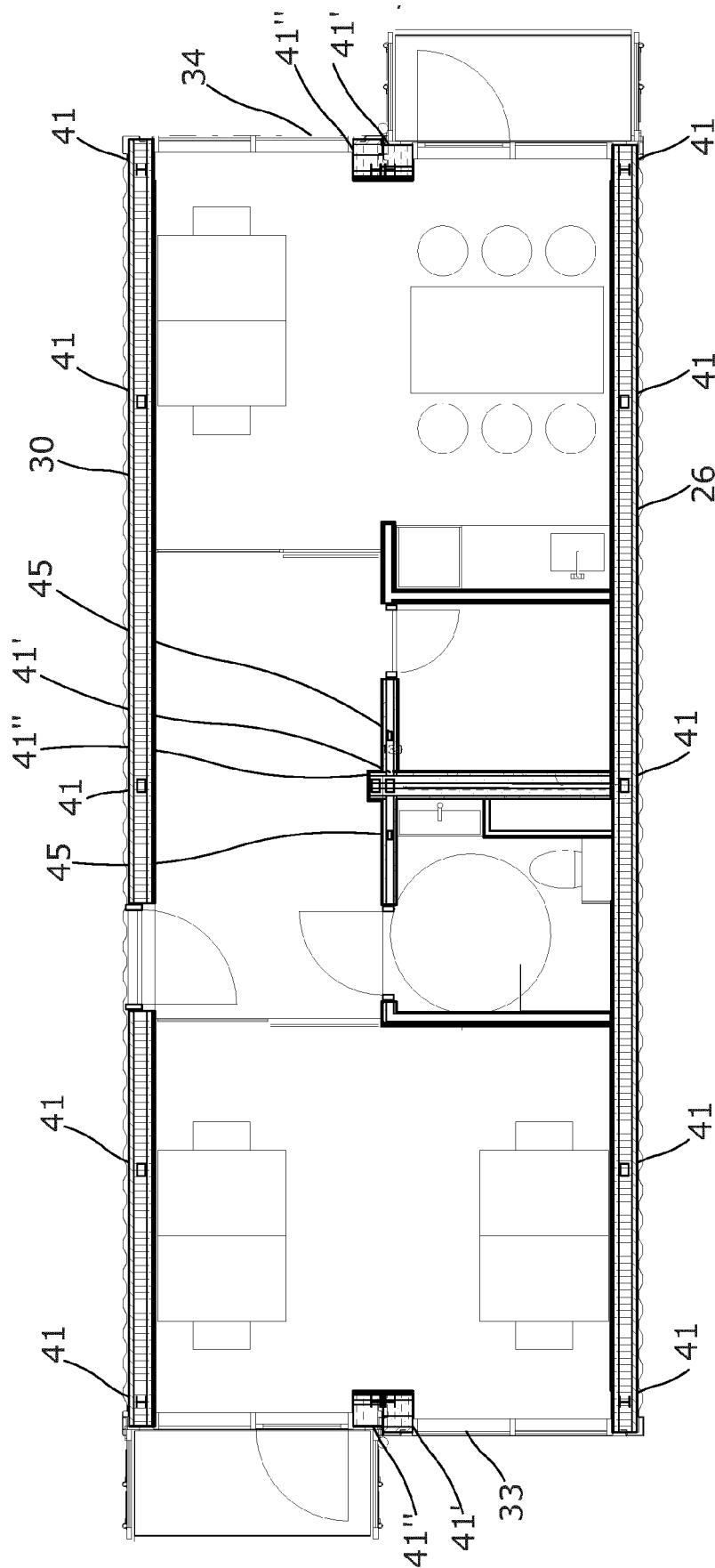


Fig. 3

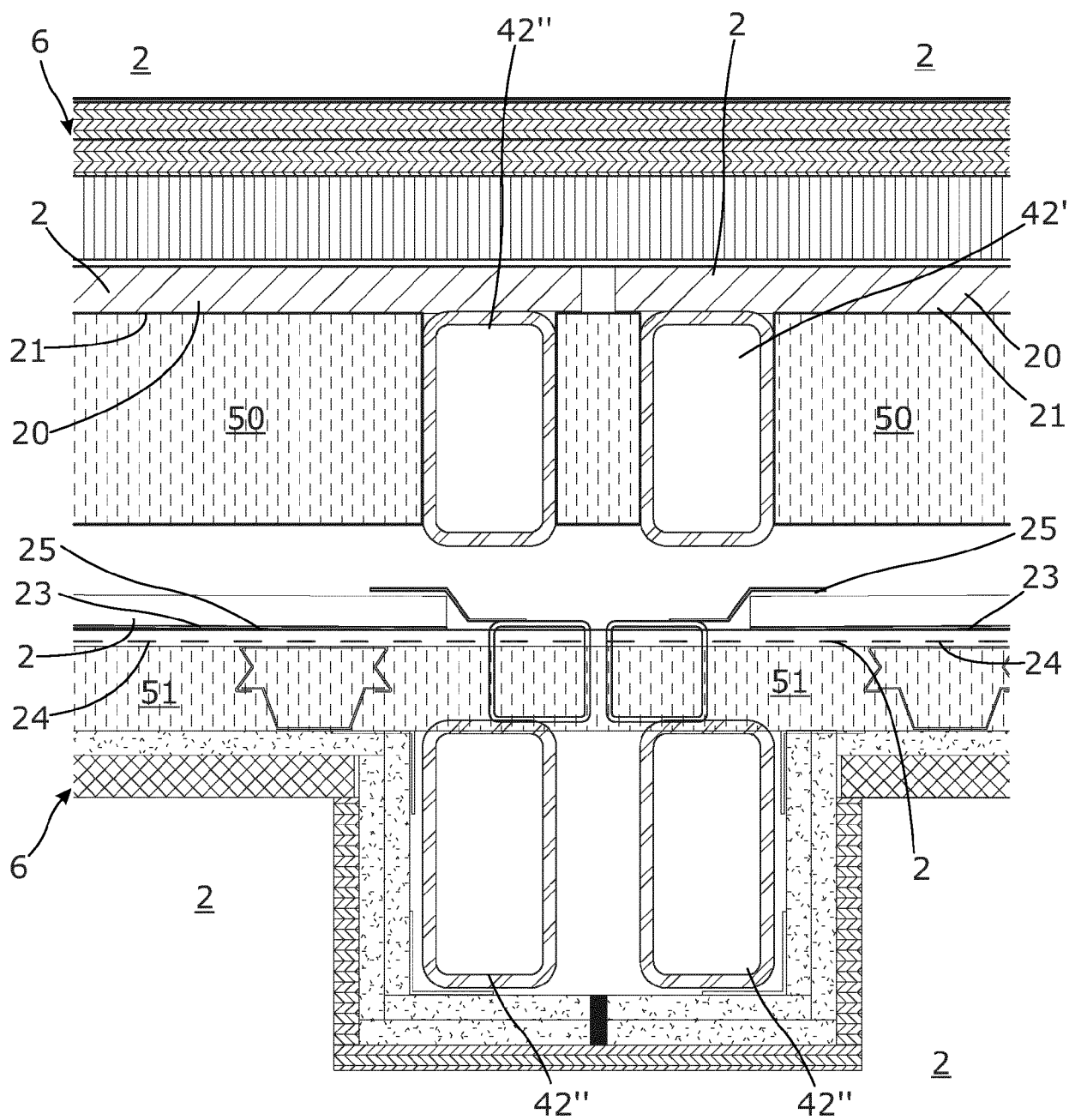


Fig. 4

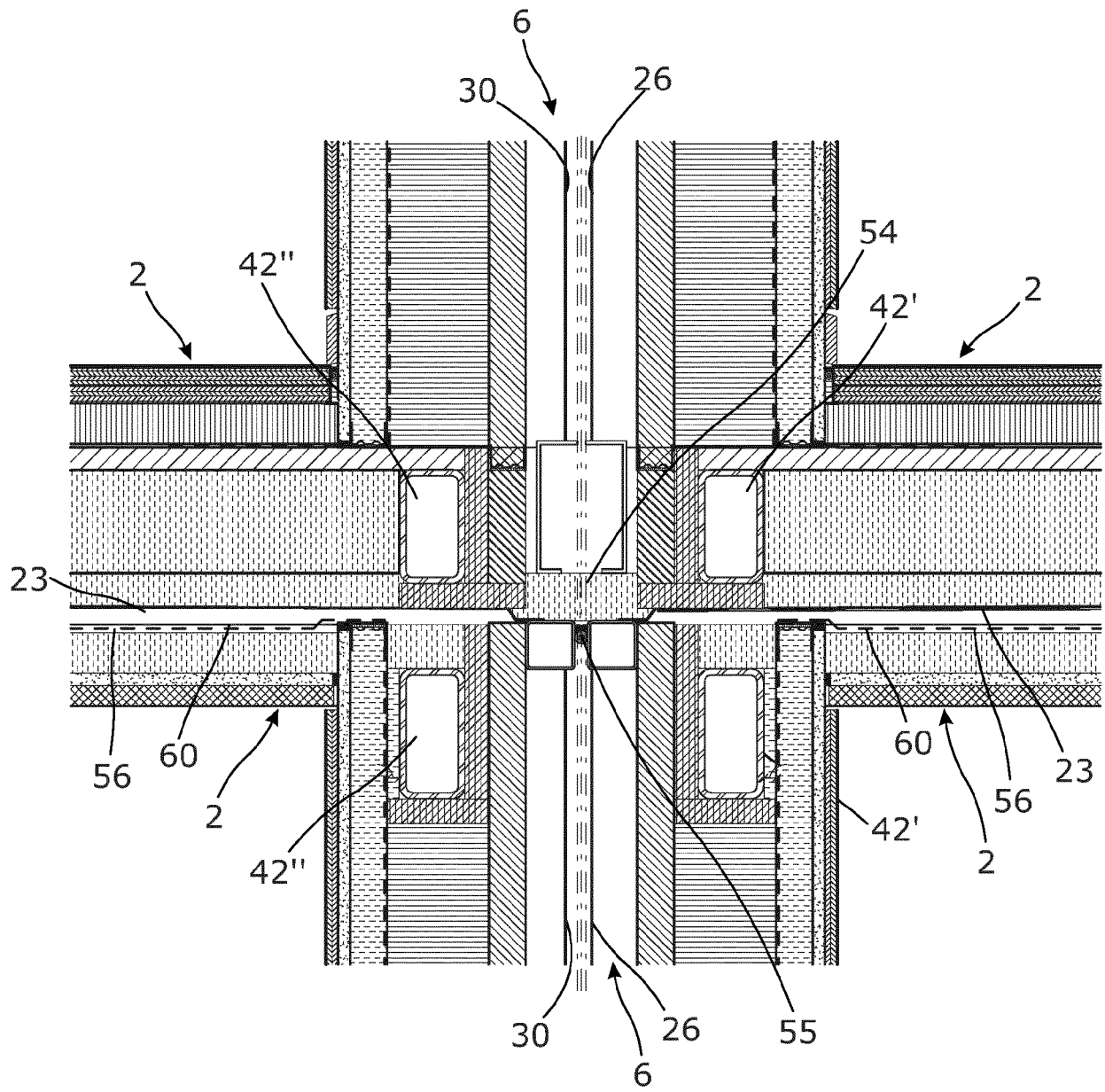


Fig. 5

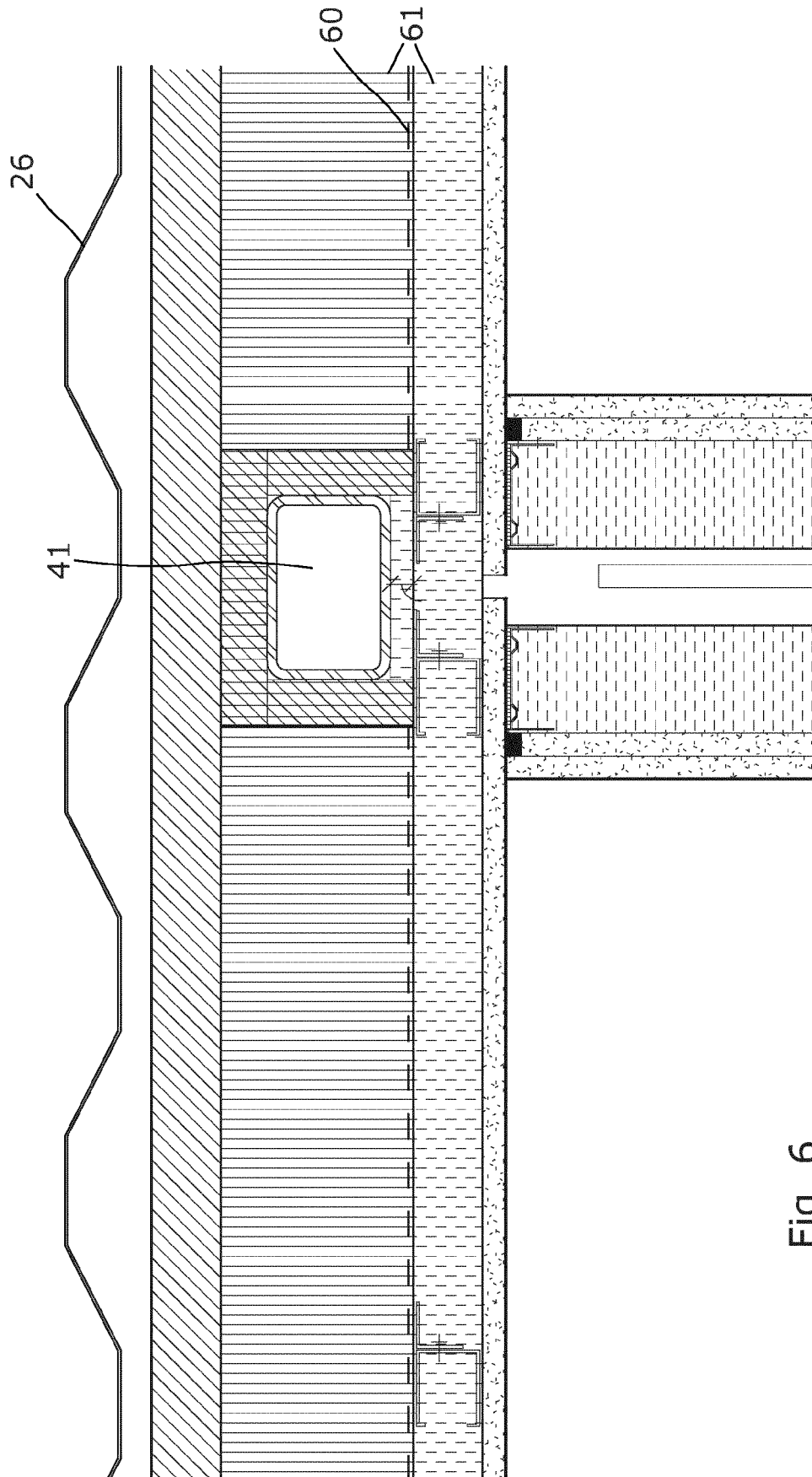


Fig. 6



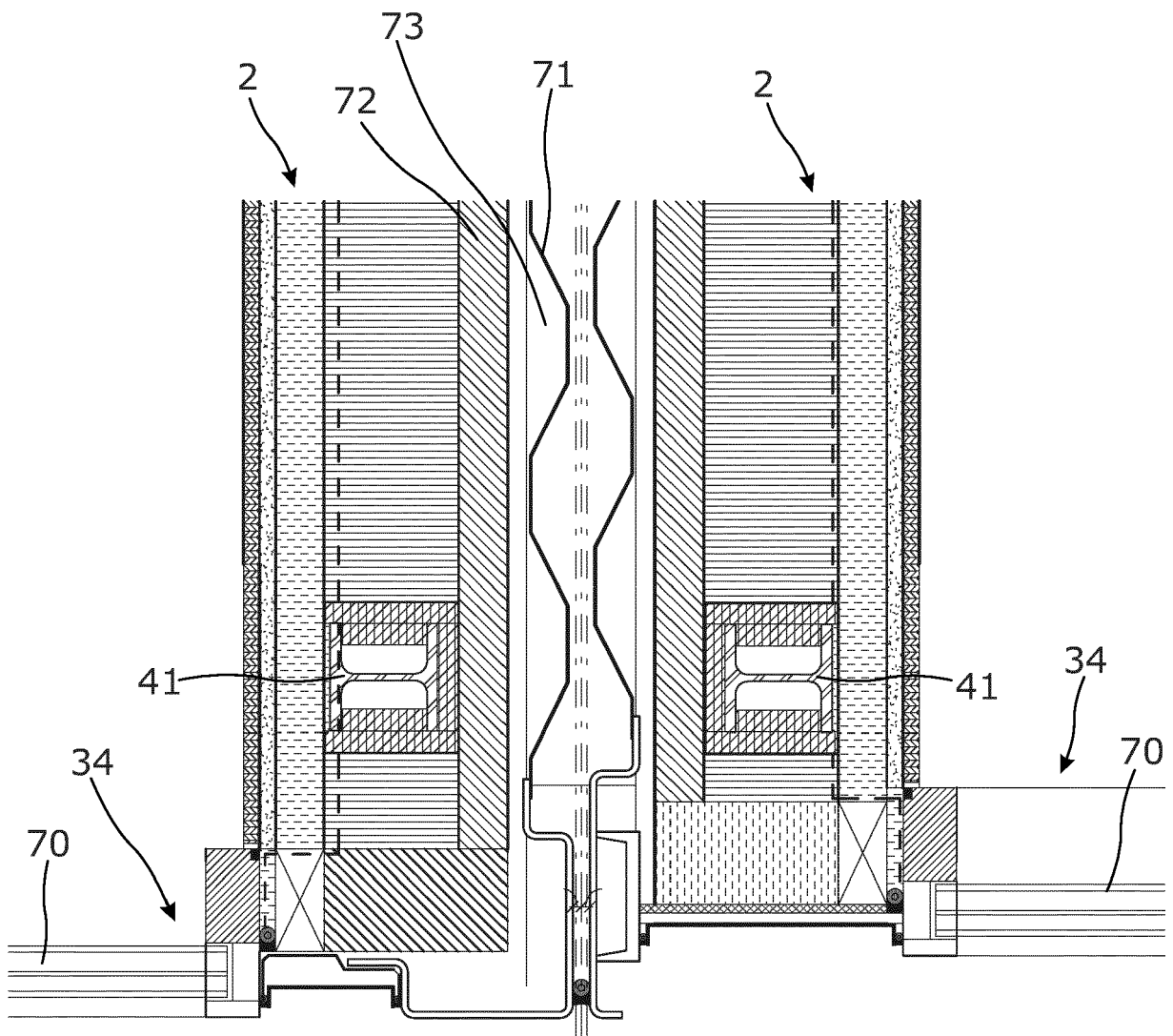


Fig. 7

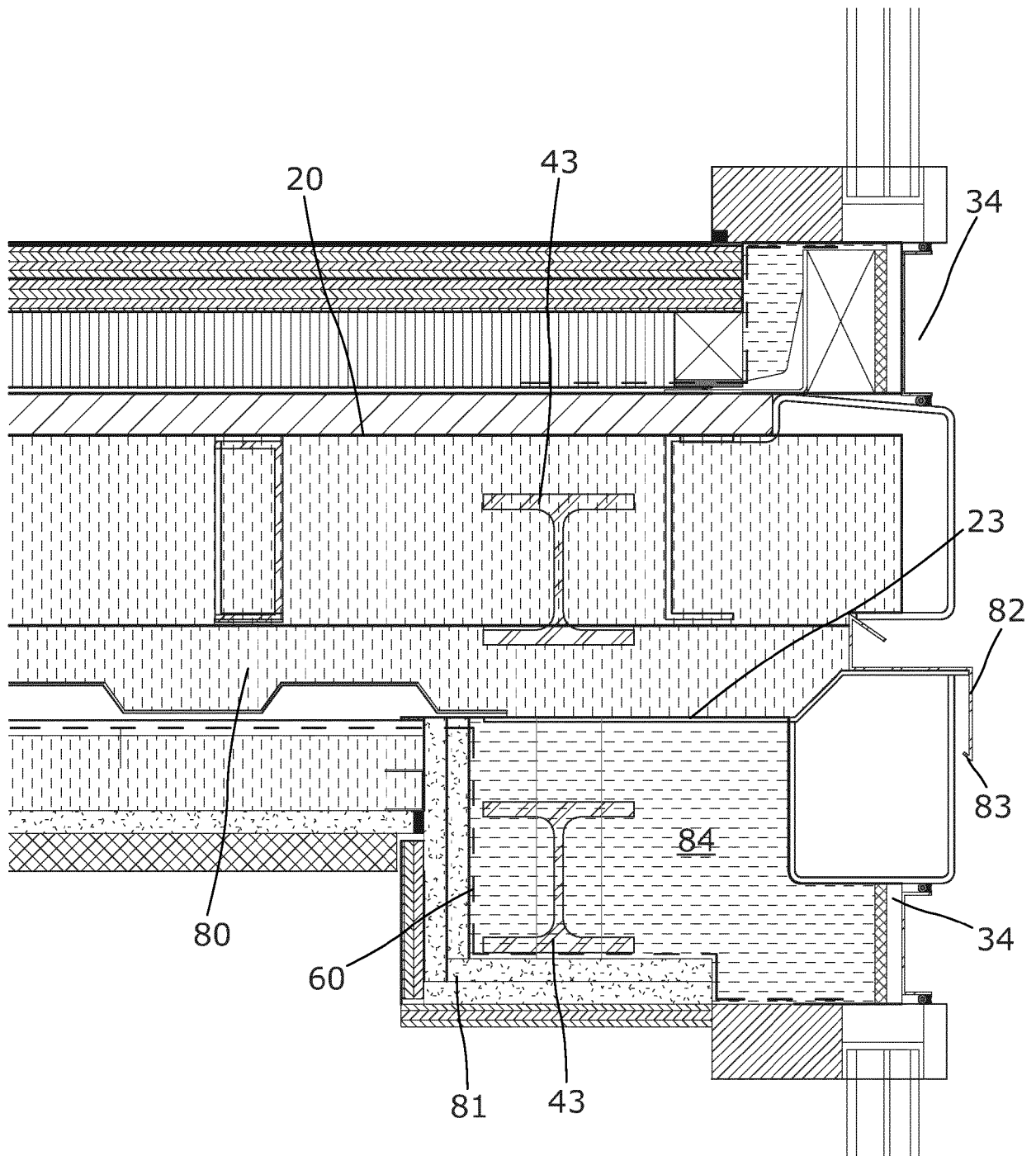


Fig. 8

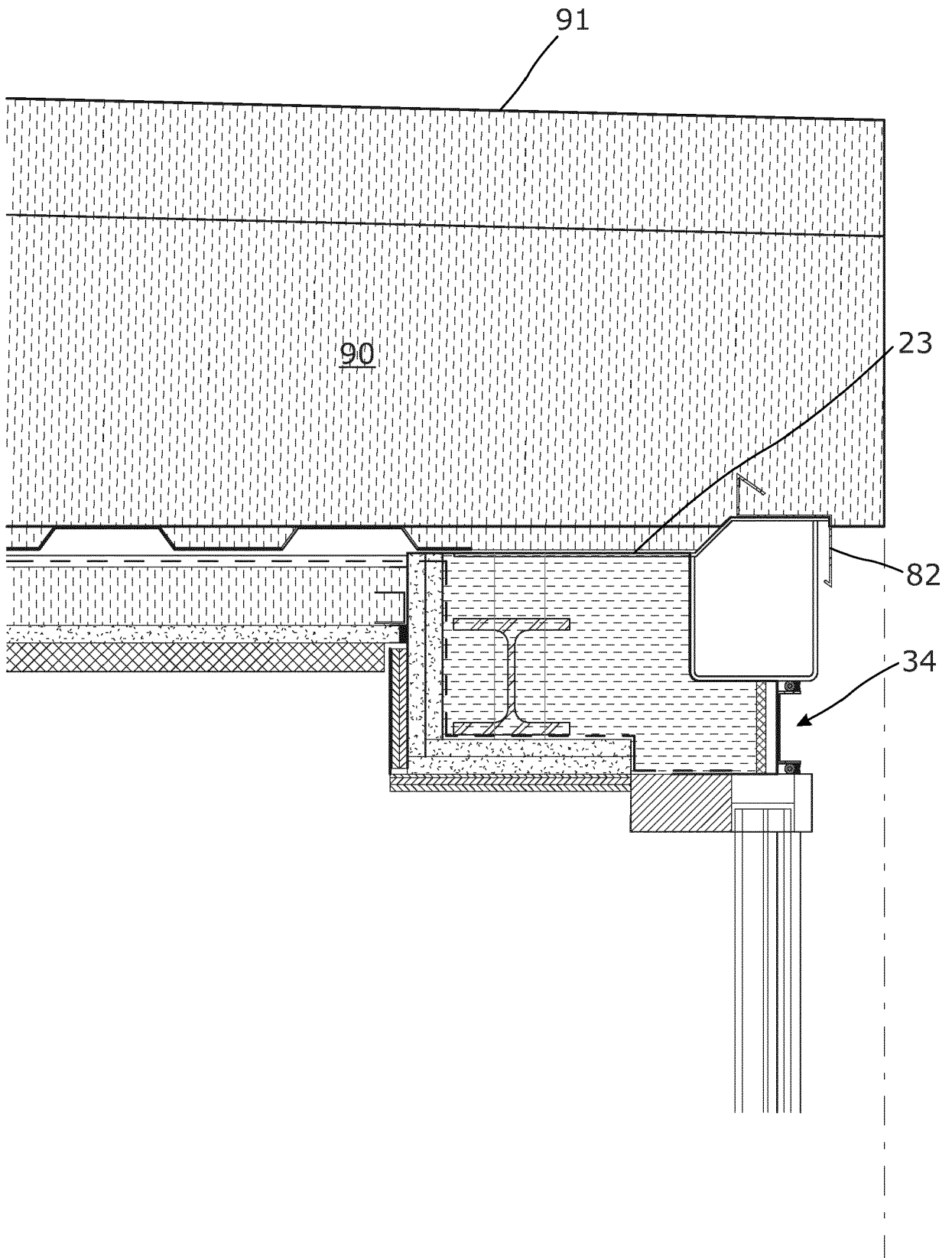


Fig. 9

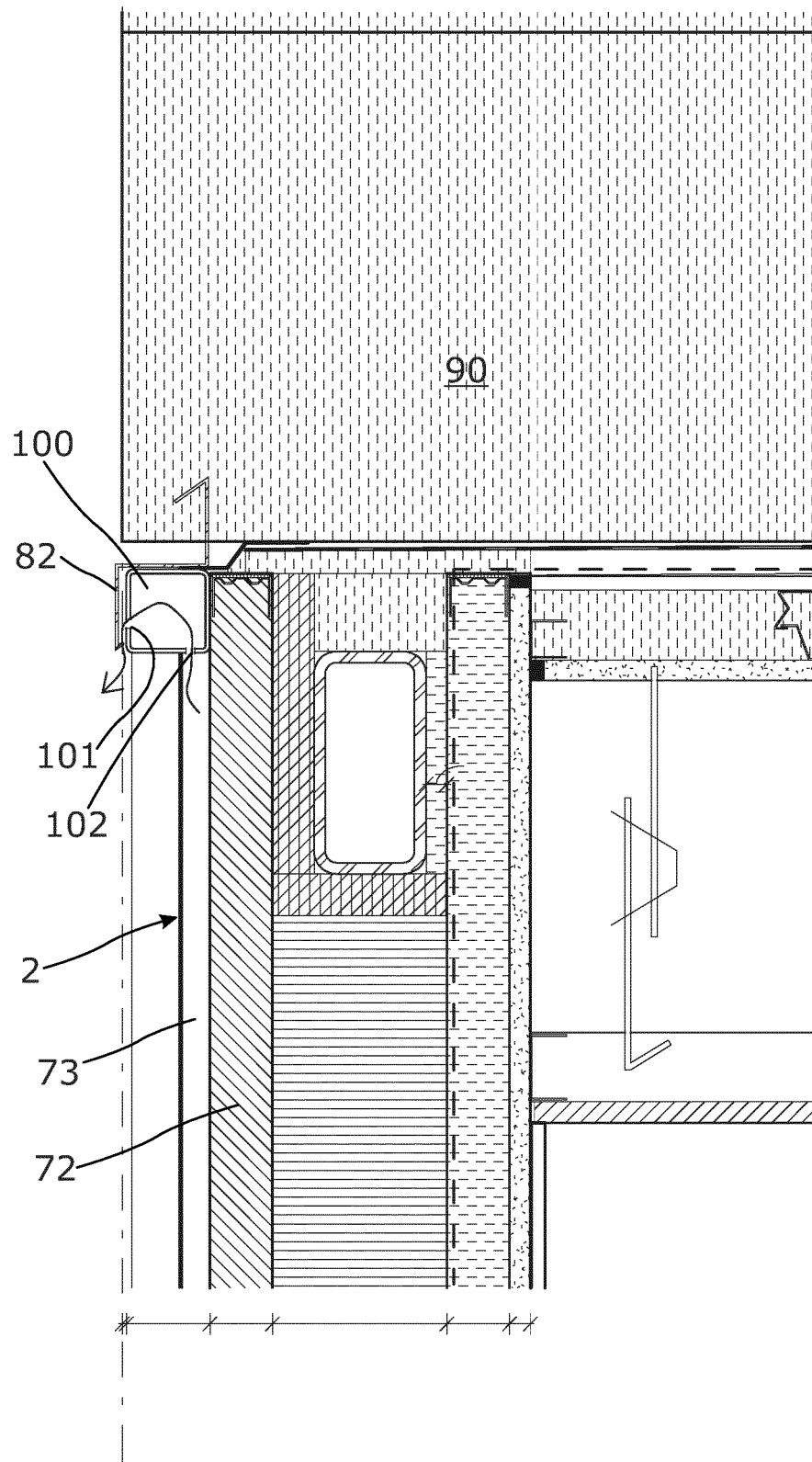


Fig. 10

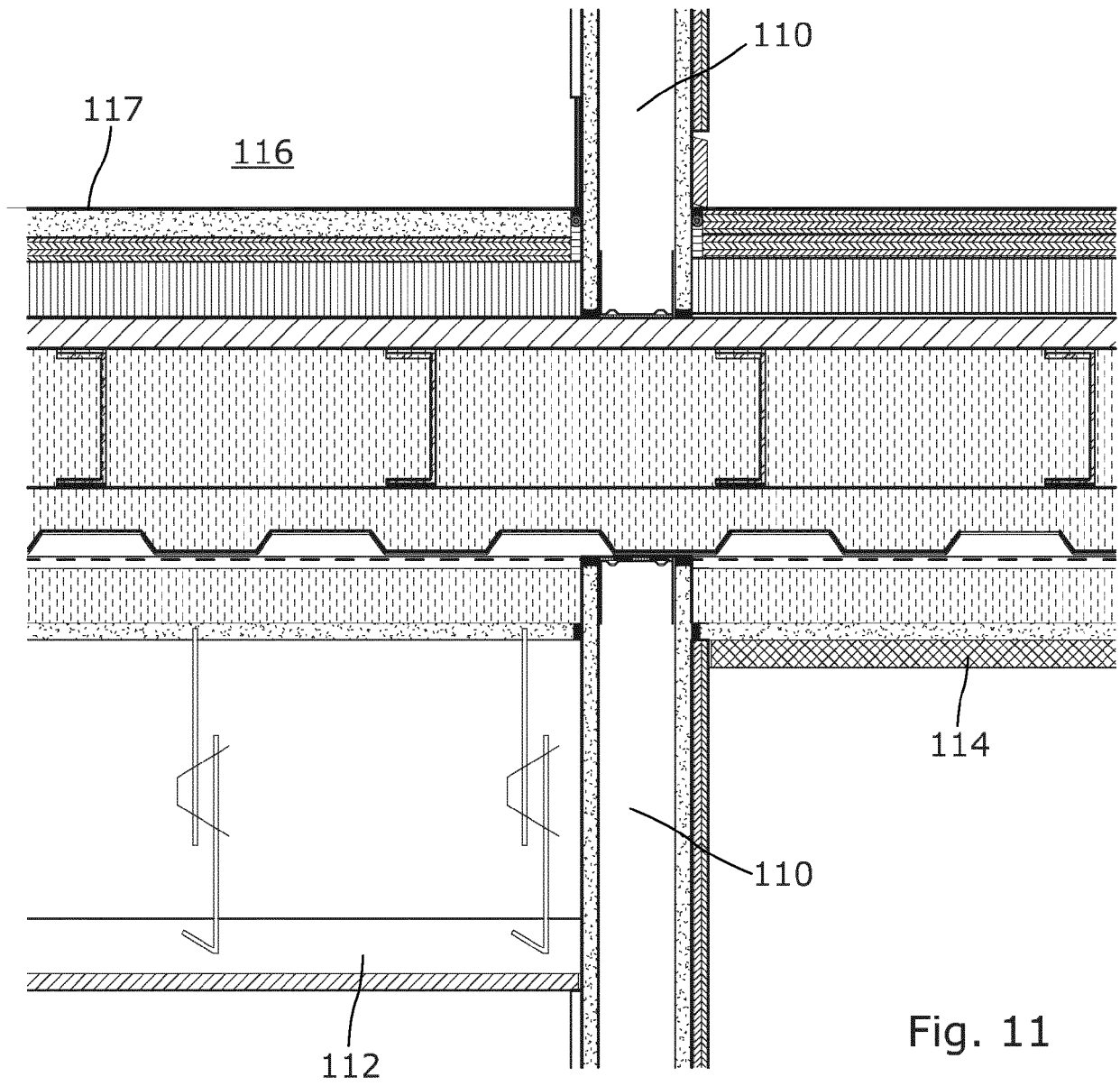


Fig. 11

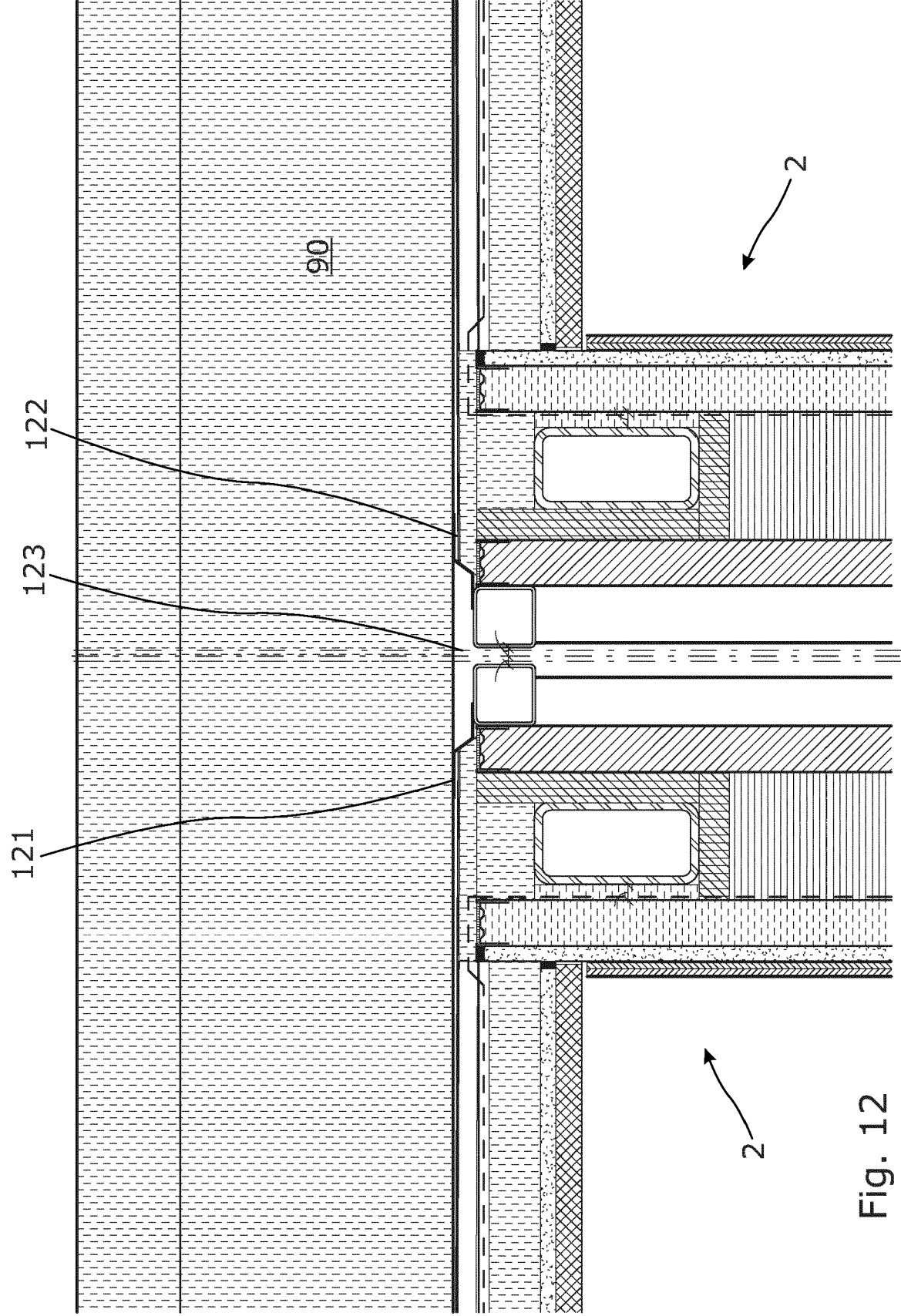


Fig. 12



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| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                    |                                                                                                                 |                                                                                                                                                                                                                                                                              |                                            |
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| The present search report has been drawn up for all claims                                                                                                                                                                                             |                                                                                                                 |                                                                                                                                                                                                                                                                              |                                            |
| Place of search<br><b>Munich</b>                                                                                                                                                                                                                       |                                                                                                                 | Date of completion of the search<br><b>8 February 2021</b>                                                                                                                                                                                                                   | Examiner<br><b>Brucksch, Carola</b>        |
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