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(54) Benævnelse: **REKUPERATOR**

(56) Fremdragne publikationer:
EP-A1- 2 131 133
EP-A2- 0 048 559
EP-A2- 1 361 406
CN-A- 105 241 296
GB-A- 740 380
JP-A- H03 279 793
JP-A- 2002 286 391
JP-A- 2006 250 372

DESCRIPTION

[0001] The invention relates to a recuperator comprising a number of neighbouring hexagonal sheets which extend parallel to each other and which are connected to each other at at least a part of their periphery and wherein flow passages are formed between neighbouring sheets.

[0002] American publication US 2018/0266774 A1 (also published as CN105241296 A) describes a stacked plate heat exchanger having heat exchange plates each comprising a heat exchange sheet to opposing sides of which guide grates and heat exchange frames are injection moulded. The heat exchange frames either have a snap projection or a snap groove.

[0003] Dutch publication NL 1030270 describes a method for producing a heat exchanger having hexagonal sheets which extend parallel to each other. In this case, sheets are stacked on top of each other and then neighbouring sheets are connected to each other at their periphery by means of chemical welding, wherein a solvent is used to partially dissolve the material of the sheets at their periphery. In practice, a housing is subsequently applied in order to the thus obtained stack of sheets welded to each other, which housing is connected to the stack by means of adhesive bonding. The housing ensures that the dimensions of the thus produced heat exchangers are relatively constant and that the heat exchangers are, for example, interchangeable as a result. Moreover, the housing provides mechanical protection to the stack and the possibility of attaching the heat exchanger to air supply and discharge lines which communicate with the flow passages between the sheets.

[0004] Highly specialized assembly devices are needed to carry out the known method in an automated manner. It is an object of the invention to provide a recuperator as known from the prior art, which recuperator can be made in a relatively simply automatable way. To this end, each of the sheets, at its periphery, is at least partially surrounded by and connected to an associated connecting body and neighbouring connecting bodies are connected to each other at at least a part of the periphery of the associated sheets and together the connecting bodies form the wall of a housing, wherein passage openings are provided in the wall which are connected to the flow passages for allowing air into the flow passages via the passage openings, wherein neighbouring connecting bodies are provided with protruding parts and with recesses respectively on sides facing each other, wherein the forms of the protruding parts and of the recesses adjoin each other in order to connect the connecting bodies to each other by a press fit. The use of a connecting body makes it superfluous to connect sheets to each other directly, for example by adhesive bonding or welding, such as in particular chemical welding or ultrasonic welding. Chemical welding and adhesive bonding have the significant drawback that they (may) require solvents which are dangerous and for this reason extra safety provisions are required. Neighbouring sheets of the recuperator according to the invention are connected to each other via the connecting bodies associated with the respective sheets during production of the recuperator. The connecting bodies which are connected to each other further function as a housing in the sense that they protect the sheets. The connecting bodies can further be formed in order to make attachment to supply and discharge

lines possible in a simple manner. It is thus not necessary to use separate housings which are tailor made in advance. This also has the advantage that it is more likely to be cost-effective to produce recuperators in smaller numbers, for example specifically for a certain application or to customer specifications.

[0005] A correct positioning of the connecting bodies with respect to one another and thus of the sheets can readily be achieved by providing the neighbouring connecting bodies with protruding parts and with recesses respectively on sides facing each other, wherein the forms of the protruding parts and of the recesses adjoin each other in order to connect the connecting bodies to each other. The protruding parts and the recesses may also advantageously be used to produce an airtight or at least substantially airtight connection between the neighbouring connecting bodies. The connection between two neighbouring connecting bodies can be airtight with a high degree of reliability due to the press fit by means of which neighbouring connecting bodies are connected to each other. Such a connection by means of a press fit makes the application of welding or bonding neighbouring connecting bodies to each other superfluous, although it is also possible to combine the clamping connection with a welded or adhesive connection to increase the reliability of the connection. The additional welded or adhesive connection can then, for example, have an extra securing effect. The application, in the event of such a combination, of ultrasonic welding has the advantage that it is then not necessary to use any solvents in any case. For securing purposes, a band may also be arranged around the housing, which is optionally connected to each or at least a portion of the connecting bodies.

[0006] The invention is particularly suitable for use in recuperators in which the sheets are made of plastic. In an embodiment, the passage openings are formed between neighbouring connecting bodies. In such a variant, the passage openings are formed by connecting the neighbouring connecting bodies to each other, which enables a relatively simple embodiment of the connecting bodies.

[0007] Alternatively, it is also possible for the passage openings to be formed in, instead of between, connecting bodies.

[0008] The assembly of the connecting bodies with associated sheets can be facilitated if the protruding parts and/or the recesses have a tapered form or at least partially a tapered form, as a result of which it is possible to realize a self-aligning positioning.

[0009] A practical embodiment, at least during assembly and optional disassembly, can be obtained if neighbouring connecting bodies are connected to each other by means of a click-fit connection.

[0010] In order to bring about an at least substantially airtight connection between neighbouring connecting bodies, it may be advantageous if the recuperator is provided with a sealing body between neighbouring connecting bodies at the location where they are connected to each other, wherein it may be further preferred, with a view in particular to

achieving a simple assembly, for the sealing body to be connected to one of the two neighbouring connecting bodies.

[0011] The invention is suitable, inter alia, for recuperators of the membrane type. The sheets of such recuperators are suitable for exchanging moisture. The material of such sheets is not suited or is poorly suited to being welded. The use of adhesive for connecting membrane sheets to each other has the drawback that this is a step which is difficult to control and, partly as a result thereof, expensive, particularly if recuperators are produced in relatively large numbers, and that, depending on the type of adhesive that is used, it also involves the use of harmful solvents. Therefore, at least a portion of the sheets of a recuperator according to the invention may advantageously be permeable to moisture.

[0012] Advantageously, the recuperator may be configured to have sheets which are all provided with a profile. In this case, the connecting bodies can contribute to a correct positioning of the sheets, more specifically the profiles thereof, with respect to each other, since the sheets can behave in a relatively stiff way owing to the connection with the connecting bodies.

[0013] Alternatively, the invention is also suitable for a more traditional way in which sheets can be provided in a recuperator, namely wherein the neighbouring sheets are flat and are provided with a profile in an alternating fashion.

[0014] Especially as the invention makes it superfluous to directly connect neighbouring sheets to each other, the recuperator according to the invention may also advantageously be used if sheets are made of different materials, for example if neighbouring sheets are made of different materials in an alternating fashion.

[0015] An advantageous application of the invention may be in recuperators wherein a portion of the number of sheets is made of a moisture-permeable material and the other portion of the number of sheets is made of a material which is not permeable to moisture. In traditional recuperators, such materials are difficult to combine.

[0016] In order to produce a good connection between a connecting body and an associated sheet, it may be preferred, in the event that sheets made of different materials are used, for the connecting bodies to be made of different materials. In this case, a fixed combination is formed of the material of the connecting body and the material of the associated sheet.

[0017] In terms of construction, it may be advantageous if each of the sheets is completely surrounded by an associated connecting body.

[0018] It may be preferred for the connecting bodies to be injection moulded, particularly in the case of relatively large production numbers.

[0019] According to a possible embodiment, the periphery of the housing is bar-shaped. The

bar shape of the housing facilitates the attachment of other parts, such as in particular air ducts, to the recuperator. The invention provides the possibility of providing the housing with a bar-shaped periphery in a simple manner, namely by adapting the design of the connecting bodies hereto. Bar-shaped is understood to mean all forms in which six main surfaces are connected to each other at right angles. The definition of bar-shaped therefore also includes the form of a cube.

[0020] The invention further provides a method for producing a recuperator according to the invention, the method comprising the following steps

- providing encircling connecting bodies, and sheets that each are connected to an associated connecting body and extend on the inside of the encircling connecting body,
- connecting connecting bodies to each other by a press fit in such a way that flow passages are formed between neighbouring sheets associated with neighbouring connecting bodies.

[0021] The invention will be explained in more detail below on the basis of the description of a possible embodiment of a recuperator according to the invention with reference to the following figures which are not to scale:

Figure 1 shows a partially exploded perspective view of a recuperator according to the invention;

Figures 2a and 2b show a perspective top view and a perspective bottom view of a layer of the recuperator according to Figure 1;

Figures 3a to 3f diagrammatically show a vertical cross section of part of the layer as illustrated in Figures 2a and 2b during successive steps of the production process thereof;

Figures 4a to 4e show optional subsequent steps after the step according to Figure 3d;

Figure 5 shows a perspective view of an alternative embodiment of a recuperator according to the invention;

Figures 6a and 6b show a perspective top view of two layers of the recuperator according to Figure 5;

Figure 7 shows a partially exploded perspective view of the recuperator according to Figure 5 including attachment parts as may be used in practice.

[0022] Figure 1 shows a recuperator according to the invention which is configured as a heat exchanger 1. Twelve layers 2 of heat exchanger 1 are shown. Each of the layers 2 comprises an encircling hexagonal connecting body 3. The free passage on the inside of the encircling

form of each connecting body 3 is sealed by a sheet 4, as illustrated in Figures 2a and 2b. The connecting bodies 3 are alternately provided in two different geometries 3a, 3b. Connecting body 3b corresponds to a version of connecting body 3a which is mirrored in vertical plane of symmetry 8. The connecting bodies 3a, 3b are alternately connected to each other in a manner which will be explained in more detail below. The connecting bodies 3a, 3b that are connected to each other together form the wall of a housing with six upright wall parts at the respective hexagonal sides 10a to 10f of heat exchanger 1. Where terms such as "upright" or "vertical" are used above, this refers to the situation in the position of use of the relevant heat exchanger.

[0023] In this example, the sheets 4 associated with the different connecting bodies 3, that is with the different layers 2, are made of the same material, namely of polystyrene (PS) that is not permeable to moisture. Alternatively, it is also possible, however, for all of the sheets 4 to be made of another material, typically of a plastic such as, for example, high-density polyethylene (HDPE), but also, for example, of a metal such as aluminium. The material used for the sheets 4 may further be permeable to moisture. It is also possible for the sheets 4 within a heat exchanger, in that case preferably in an alternating fashion, to be made from different materials, for example selected from the materials as mentioned above. The geometries of the sheets 4 differ from one another in an alternating fashion between profiled sheets 4a and flat sheets 4b. Insofar as the distinction is not important, this document uses reference numeral 4 for sheets 4a and 4b, thus irrespective of whether these are flat sheets or profiled sheets. Insofar as the distinction is important, reference numerals 2a and 2b are used for layers with a profiled sheet 4a and a flat sheet 4b respectively. In Figures 1 to 2b, the profiling of sheets 4a is not illustrated for the sake of clarity. Incidentally, it is also conceivable within the context of the invention for all of the sheets 4 to be profiled or for all of the sheets 4 to be flat. The thickness of the sheets 4 may typically vary between 0.05 mm and 2 mm. The width of the passage ducts may correspond to the period of a profile or half of it but also to a number of periods of a profile and even to the dimensions of the sheet seen at right angles to the flow direction.

[0024] Although twelve layers 2 are shown in Figure 1, in reality the number of layers 2 of a heat exchanger 1 may be higher, for example 100 layers, but the number of layers 2 may also be lower, for example 8 layers. The heat exchanger has a sealing cover body 41 on the top side of the stack of layers 2 and a sealing base body 42 on the underside of the stack of layers 2. For the sake of clarity, the height of the layers 2 in the figures is shown to be higher than it actually is. It is mentioned by way of indication that the distance between two diametrically opposed points of the hexagonal form, which points are incidentally truncated, of the connecting bodies 3 is in reality typically between 5 cm and 100 cm, while the height of the layers 2 is typically between 2 mm and 20 mm.

[0025] Flow passages for air are formed between neighbouring sheets 4. During operation of the heat exchanger 1, energy is exchanged between air that flows in opposite directions through adjoining flow passages. To allow air into flow passages, inflow openings 11a are formed between two neighbouring connecting bodies 3a, 3b, more specifically at the location of

hexagonal side 10a of heat exchanger 1. Outflow openings 12a (not visible in Figure 1 owing to the perspective) are formed on the opposite side at the location of hexagonal side 10d. Each of the inflow openings 11a is connected to an associated outflow opening 12a via the flow passages between two neighbouring sheets 4. To allow air flowing in the opposite direction into flow passages, inflow openings 11b (not visible in Figure 1 owing to the perspective) are formed between two neighbouring connecting bodies 3b, 3a, more specifically at the location of hexagonal side 10e. Outflow openings 12b are formed on the hexagonal side 10b between neighbouring connecting bodies 3b, 3a. Each of the inflow openings 11b is connected to an associated outflow opening 12b via flow passages between two neighbouring sheets 4. The flow passages are formed in the rectangular area between the two opposite hexagonal sides 10c and 10f. The triangular areas between said rectangular area and the hexagonal sides 10a, 10b, on one side, or the hexagonal sides 10d, 10e, on the other side, are collection areas in which either the air which flows into the heat exchanger 1 via an inflow opening 11a, 11b is distributed across the flow passages between two sheets 4 before the air flows into these flow passages, or the air which flows out of the flow passages between two sheets 4 is fed to an outflow opening 12a, 12b.

[0026] The layers 2 are connected to each other via the connecting bodies 3 by means of a clamping connection. To this end, the connecting bodies 3 are each provided with a hexagonal part 14 with an encircling rib 15 on its upper side and in which hexagonal part 14 an encircling groove 16 is provided on the underside. For connecting bodies 3a, the encircling rib 15 is interrupted at the location of the hexagonal sides 10a and 10d in order to form an inflow opening 11a and an outflow opening 12a, respectively. For connecting bodies 3b, the encircling rib 15 is interrupted at the location of the hexagonal sides 10b and 10e in order to form an outflow opening 12b and an inflow opening 11b, respectively. Furthermore, at the location of hexagonal sides 10b and 10e the hexagonal part 14 of connecting bodies 3a is provided on the underside with recesses 18b, 18a, respectively, as a result of which the groove 16 is interrupted in these areas and in order to form inflow opening 11b and outflow opening 12b. In a similar way, at the location of hexagonal sides 10a and 10d, the hexagonal part 14 of connecting bodies 3b is provided on the underside with recesses 19a, 19b (not illustrated), as a result of which groove 16 is interrupted in these areas and in order to form inflow opening 11a and outflow opening 12a.

[0027] The encircling form and the cross sections of the ribs 15 and the grooves 16 are dimensioned with respect to each other in such a way that they can engage with each other by a press fit in a clamping, airtight or at least substantially airtight manner. The ribs 15 are provided with aligning edges 17a, 17b in order to facilitate engaging with each other during assembly. In order to produce the press-fit connection between neighbouring connecting bodies 3, the connecting bodies 3 are pressed onto each other, wherein the flanks of the ribs 15 of one connecting body 3 slide along the flanks of the grooves 16 with friction. This results in the situation wherein the ribs 15 and the grooves 16 fit into each other without play and the respective flanks of the ribs 15 and the grooves 16 adjoin one another in a clamping manner, which clamping force provides the connection between the connecting bodies 3. Alternatively or in combination, the ribs 15 and the grooves 16 may also have a slightly tapered form,

without departing from the principle of a press fit as explained above. Alternatively, it is then further possible to use a soft seal between the ribs 15 and grooves 16, which could optionally be connected to the ribs 15 or the grooves 16 as will be explained below with reference to Figures 4a to 4e. It is also possible to make the connection airtight by, in addition to the press-fit connection, welding neighbouring connecting bodies 3, for example chemically or by ultrasound, or bonding them.

[0028] The above-mentioned cover body 41 of heat exchanger 1 has a hexagonal plate-shaped part 43, the periphery of which is the same as that of hexagonal part 14. The plate-shaped part is provided on the underside with an encircling (interrupted) groove similar to groove 16 for adjoining to the rib 15 of the top layer 2. The above-mentioned base body 42 of heat exchanger 1 has a hexagonal plate-shaped part 45, the periphery of which is also similar to that of hexagonal part 14. On the top side of the plate-shaped part 45, the base body 42 is provided with an encircling (interrupted) rib 46 similar to rib 15 for adjoining to groove 16 of the bottom layer 2. Incidentally, the cover body and the base body could alternatively also have a differently shaped periphery, for example for the purpose of attachments to air supply and air discharge facilities.

[0029] In the form used, two air supply ducts (not shown in more detail) are attached to hexagonal sides 10a and 10e of heat exchanger 1 in an airtight manner, via which two air flows are supplied to the flow passages on one side which adjoin the inflow openings 11a and 11b. Furthermore, two air discharge ducts (not shown in more detail) are attached to the hexagonal sides 10b and 10d of heat exchanger in an airtight manner so that the outflow openings 12b, 12a open into such an air discharge duct and the air flows leave the heat exchanger 1 again after they have passed through the flow passages. The various attachments and connections between the connecting bodies 3 with respect to each other and between the connecting bodies 3 on the one hand and the sheets 4 on the other hand are such that at least 97% of the air which flows into the heat exchanger 1 via inflow openings 11a, 11b flows out of the heat exchanger 1 again via outflow openings 12a, 12b. During operation, energy will be exchanged between, on the one hand, the air which flows through the flow passages that adjoin inflow openings 11a and, on the other hand, the air which flows through the flow passages that adjoin inflow openings 11b.

[0030] For the sake of completeness, it should be noted that the hexagonal sides of the recuperator could also differ from each other in terms of their length. More specifically, for example, the hexagonal sides 10c and 10f may be longer than the remaining hexagonal sides 10a, 10b, 10d and 10e. In that case, the hexagonal form of the recuperator is thus not rotationally symmetrical, as is illustrated in the figures. Although the inflow openings and outflow openings are now surrounded by two neighbouring connecting bodies 3, it is also possible to provide the inflow openings and/or the outflow openings in a single connecting body. Each of the inflow openings and/or the outflow openings are then fully surrounded by material of an associated connecting body. It is furthermore possible that the connecting bodies are not fully encircling or in fact consist of two or even more parts which are each provided on just a part of the periphery of a sheet, wherein use is possibly made of separate

seals to prevent leakage of air.

[0031] Figures 3a to 3d show successive steps during the production of a layer 2a with a profiled sheet 4a. The profiling of sheet 4a is such that the profiling does not extend up to the outer periphery of sheet 4a. There is thus a flat area 21 there. The flat area 21 is accommodated in a clamping manner between two mould parts 22, 23. Mould parts 22, 23 define between them a mould cavity 24, the form of which corresponds to that of the connecting part 3a. The flat area 21 of sheet 4a extends into the mould cavity 24. Liquid thermoplastic, such as polystyrene or polyethylene, is supplied to the mould cavity 24 via injection-moulding channels 25, which each open into the mould cavity 24 and a number of which are distributed over the periphery of the mould cavity 24, by means of injection moulding so that it completely fills said mould cavity 24 (Figures 3c and 3d). Subsequently, the liquid plastic solidifies, during which solidification the plastic adheres to (the flat area 21 of) sheet 4a insofar as sheet 4a extends into the mould cavity 24. The selection of the material of the connecting parts 3 may be adapted to that of sheet 4 in order to promote sufficient adhesion. For an even stronger connection between a sheet 4 and the solidified plastic material, it is also conceivable to arrange holes in sheet 4 so that the plastic material can extend through these holes and can also ensure mechanical anchoring. After solidification, the mould parts 22, 23 are opened by moving them apart from each other. The thus created product is a layer 2a (Figure 3e).

[0032] It will be clear to those skilled in the art that a layer 2b with a completely flat sheet 4b can also be produced in a similar way. The layers 2a and 2b can be alternately clamped on top of one another (Figure 3f), with the peaks 9 of the profiling of sheet 4a adjoining an adjacent flat sheet 4b, as a result of which flow passages are formed between neighbouring sheets 4a and 4b. Clamping layers 2a and 2b on top of one another may be done manually but optionally also in an automated manner, for which purpose a relatively simple assembly machine may be sufficient. This machine may be suitable for heat exchangers of different dimensions, with no or only limited re-setting being required.

[0033] Figures 4a to 4c show successive steps of an alternative method for producing a layer 2, wherein, after solidification of the plastic material as explained with reference to Figures 3a to 3e, an extra mould cavity 26 is formed at the underside of the connecting body 3 by moving injection duct body 27, which extends over the entire length of groove 16, downwards with respect to the bottom mould body 23'. Subsequently, liquid plastic material is supplied to the extra mould cavity 26 via injection duct 28 in injection duct body 27. The material of this plastic differs from the plastic material in mould cavity 24 in the sense that it behaves resiliently in solidified form, like a rubber. After solidification of the plastic material in the extra mould cavity 26, it is adhered to the plastic material in mould cavity 24 and forms a seal 29. The product thus produced is denoted as layer 2a'. It is of course also possible to provide layer 2b with a seal in a similar way as seal 29. This layer is denoted by reference numeral 2b'. The seal 29 serves to promote an airtight attachment of neighbouring layers 2a', 2b' (Figure 4e).

[0034] Figures 5 to 7 relate to a heat exchanger 51 which can be considered as a variant to

heat exchanger 1. The wall parts 61c and 61f on the opposite hexagonal sides 60c and 60f of heat exchanger 51 are (viewed from above) extended at both ends with respect to the corresponding wall parts of heat exchanger 1. As a result, heat exchanger 51, or at least the outside thereof, has the form of a bar with a rectangular, more specifically square, top view. The sheets in the heat exchanger 51 are hexagonal, analogously to sheets 4 in heat exchanger 1. The ends 64a, 64b of the parts of the connecting bodies 62a, 62b of layers 52a, 52b which form the wall parts 61c and 61f, which wall parts 64a, 64b in Figure 5 are situated at the front of heat exchanger 51, are aligned with each other and are situated with the truncated points 64c between the parts of the connecting bodies 62a, 62b of layers 52a, 52b which are situated on the hexagonal sides 60a and 60b. These ends 64a, 64b, points 64c together with cover body 71 and base body 72 thus form a contact surface which has the form of a lying, block-shaped figure eight.

[0035] Figure 7 shows how funnel-shaped flow bodies 81, 82 adjoin the two opposite contact surfaces of heat exchanger 51 in a clamping manner. Gaskets 83, 84 are provided between the flow bodies 81, 82 and the two associated contact surfaces. At the location of the two openings in the figure eight shape of the contact surfaces, both the gaskets 83, 84 and the flow bodies 81, 82 are also provided with identical openings. In order to separate the air flows, the flow bodies 81, 82 comprise a partition 85 between the openings. The flow bodies 81, 82 clamp heat exchanger 51 between them with the aid of draw bars 86 which, for example, may be threaded and which extend through holes in the flow bodies 81, 82.

REFERENCES CITED IN THE DESCRIPTION

Cited references

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Patent documents cited in the description

- US20180266774A1 [0002]
- CN105241296A [0002]
- NL1030270 [0003]

PATENTKRAV

1. Rekuperator (1) omfattende et antal af tilstødende, heksagonale plader (4), der strækker sig parallelt med hinanden, og som er forbundet med hinanden ved mindst en del af deres periferi, og hvor strømningspassager er dannet mellem tilstødende plader (4), hvorved hver af pladerne (4), ved periferien, er mindst delvist omgivet af og er forbundet med et tilhørende forbindelseslegeme (3), og tilstødende forbindelseslegemer (3) er forbundet med hinanden ved mindst en del af periferien af de tilstødende plader (4) og sammen danner væggen af et hus, hvor passageåbninger (11, 12) er tilvejebragt i den væg, der er forbundet med strømningspassager til at lade luft trænge ind i strømningspassagerne via passageåbningerne (11, 12), hvor tilstødende forbindelseslegemer (3) er forsynet med fremstående dele (15) og med indskæringer (16) henholdsvis på sider, der vender ind mod hinanden, hvor formerne af de fremstående dele (15) og af indskæringerne (16) støder op til hinanden for at forbinde forbindelseslegemerne (3) med hinanden ved en prespasning.

2. Rekuperator ifølge krav 1, hvor hver af pladerne (4), ved periferien, er helt omgivet af det tilhørende forbindelseslegeme (3).

3. Rekuperator ifølge krav 1, hvor et forbindelseslegeme (3) er forsynet med både en fremstående del (15) såvel som en indskæring (16), hvor den fremstående del (15) og indskæringen (16) strækker sig på modstående sider af pladen (4) forbundet med forbindelseslegemet (3).

4. Rekuperator ifølge krav 1, 2 eller 3, hvor pladerne er fremstillet af plastic.

5. Rekuperator ifølge et af de foregående krav, hvor passageåbningerne er dannet mellem tilstødende forbindelseslegemer.

6. Rekuperator ifølge et af de foregående krav, hvor det fremstående dele og/eller indskæringerne har en tilspidset form eller mindst delvist tilspidset form.

7. Rekuperator ifølge et af de foregående krav, hvor rekuperatoren er forsynet med et tætningslegeme (29) mellem tilstødende forbindelseslegemer på stedet, hvor de er forbundet med hinanden, hvilket tætningslegeme fortrinsvis er forbundet med ét af de to tilstødende forbindelseslegemer.

8. Rekuperator ifølge et af de foregående krav, hvor mindst en del af pladerne er gennemtrængelige for fugt.

9. Rekuperator ifølge et af de foregående krav, hvor samtlige af pladerne er forsynet med en profil.

10. Rekuperator ifølge et af kravene 1 til 8, hvor de tilstødende plader er flade og er forsynet med en profil på en vekslende måde.

11. Rekuperator ifølge et af de foregående krav, hvor pladerne er fremstillet af forskellige materialer, fortrinsvis på en vekslende måde, fortrinsvis er en del af antallet af plader fremstillet af et fugtgennemtrængeligt materiale, og den anden del af antallet af plader er fremstillet af et materiale, der ikke er gennemtrængeligt for fugt.

12. Rekuperator ifølge et af de foregående krav, hvor husets periferi er stangformet.

13. Rekuperator ifølge et af de foregående krav, hvor forbindelseslegemerne er sprøjtestøbte, hvor fortrinsvis pladerne er overstøbte med et materiale af forbindelseslegemerne langs den første del af periferien af forbindelseslegemerne under sprøjtestøbningen af forbindelseslegemerne ved pladernes periferi.

14. Fremgangsmåde til fremstilling af en rekuperator ifølge et af kravene 1 til 13, og som omfatter følgende trin

- tilvejebringelse af omsluttende forbindelseslegemer (3) og plader (4), der hver er forbundet med et tilhørende forbindelseslegeme (3) og strækker sig på indersiden af det omsluttende forbindelseslegeme (3),
- forbindelse af tilstødende forbindelseslegemer (3) med hinanden ved en prespasning på en sådan måde, at strømningspassager dannes mellem tilstødende plader (4) forbundet med tilstødende forbindelseslegemer (3).

DRAWINGS

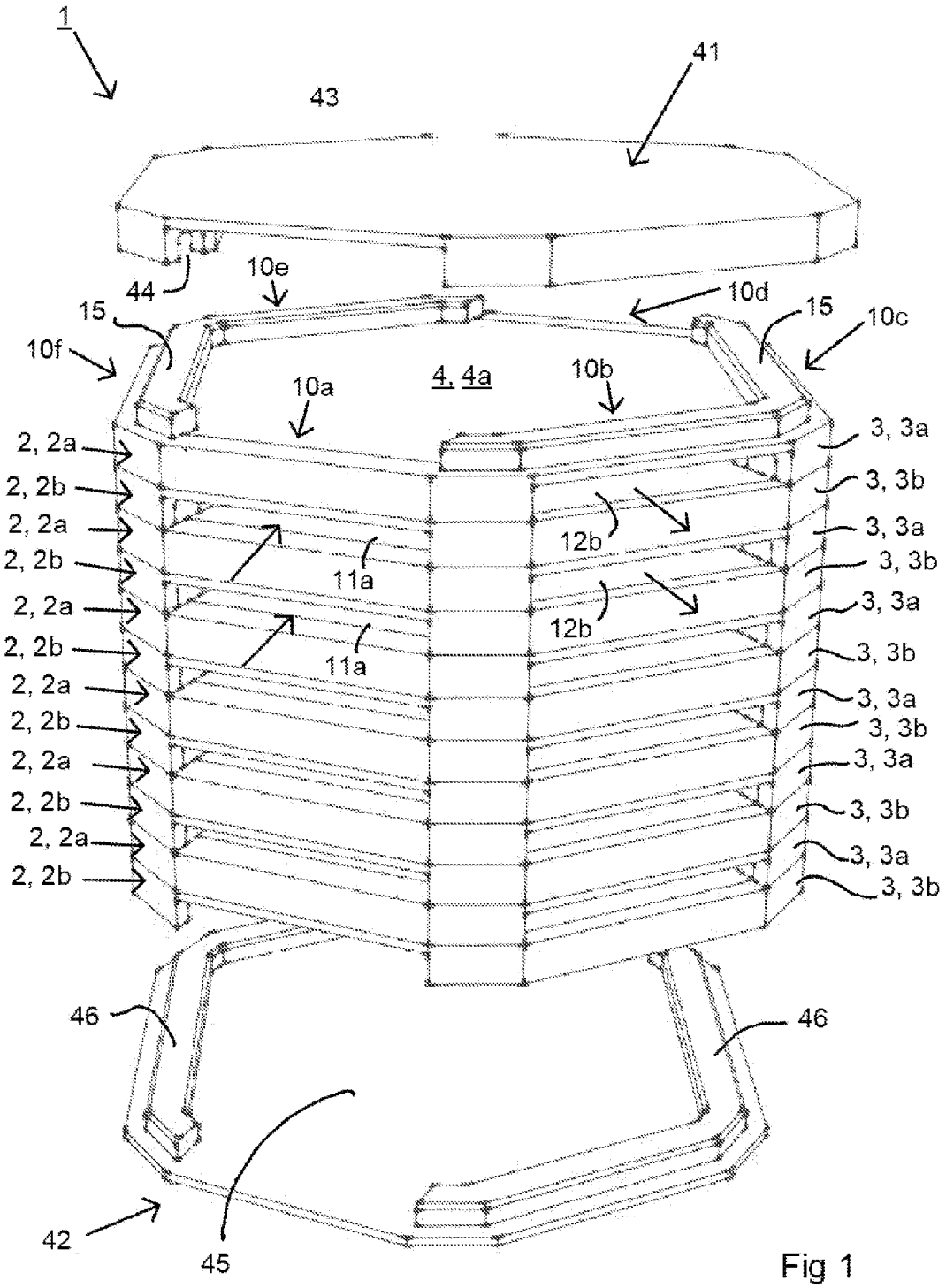

Fig 1

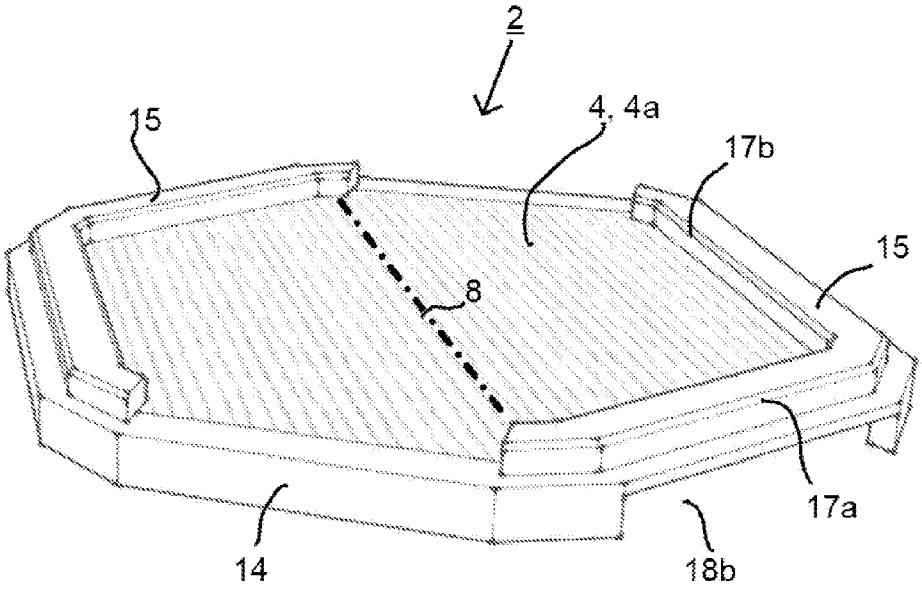

Fig 2a

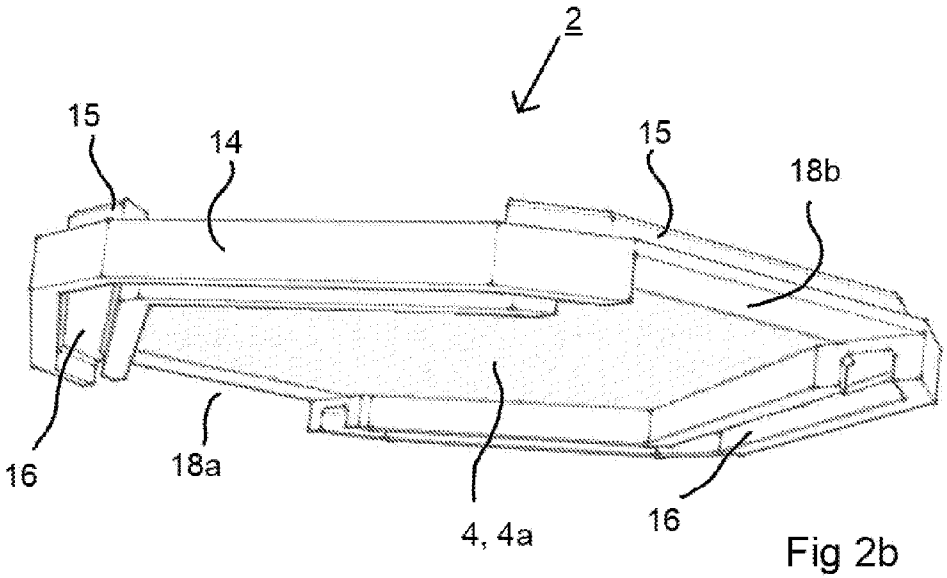

Fig 2b

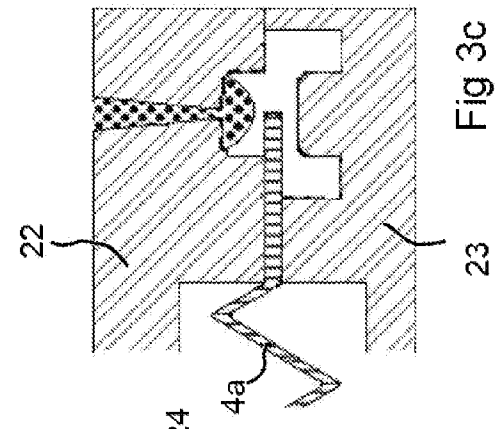

Fig 3c

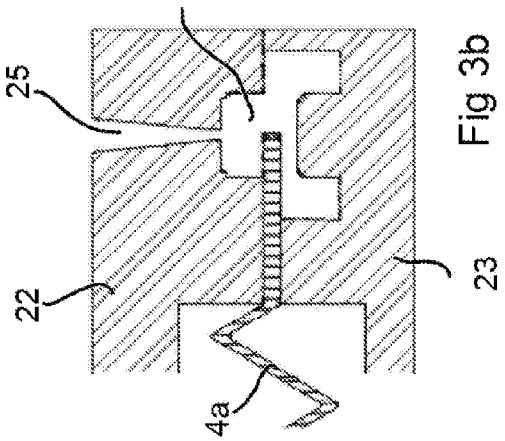

Fig 3b

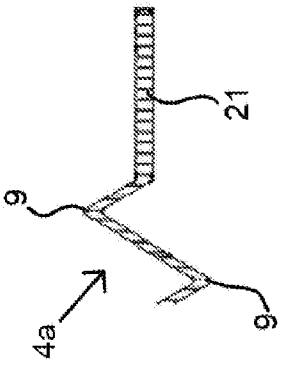

Fig 3a

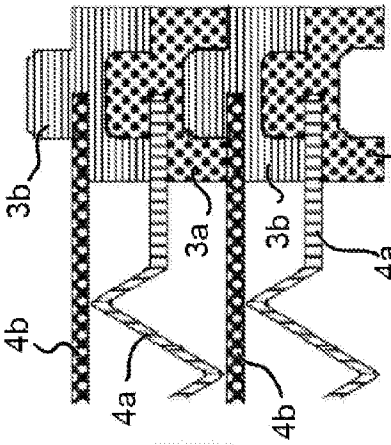

Fig 3f

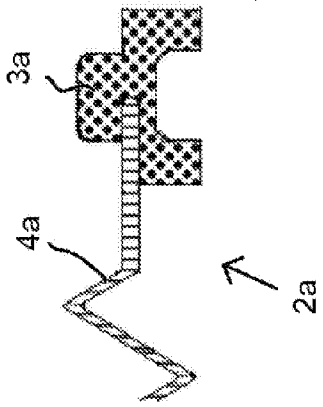

Fig 3e

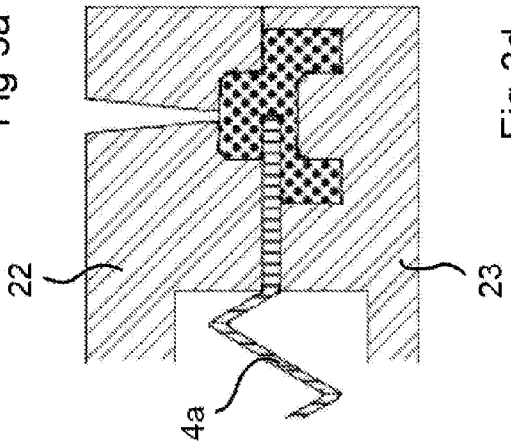

Fig 3d

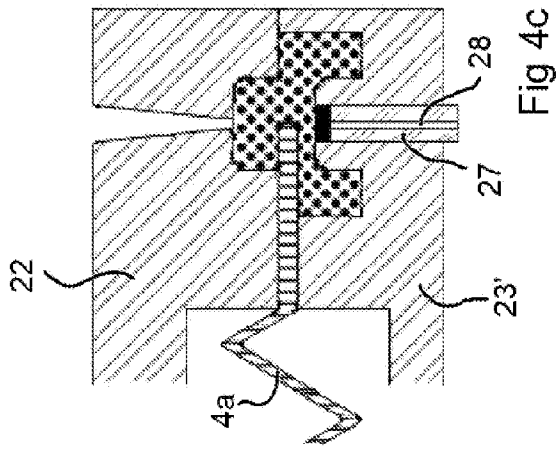

Fig 4c

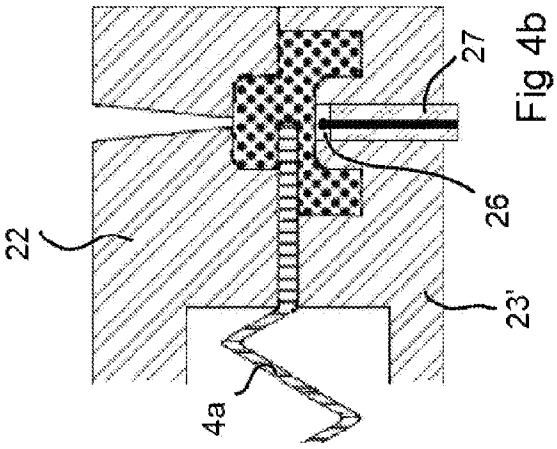

Fig 4b

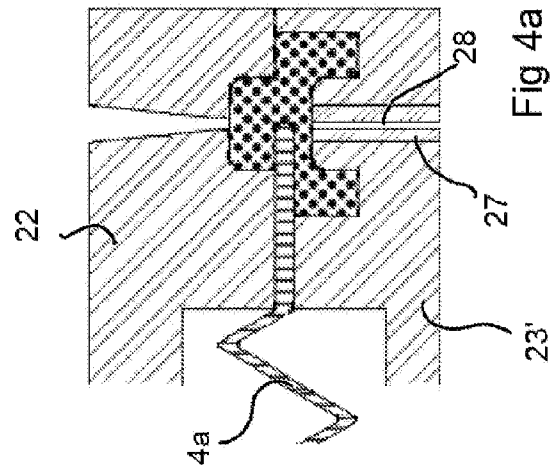

Fig 4a

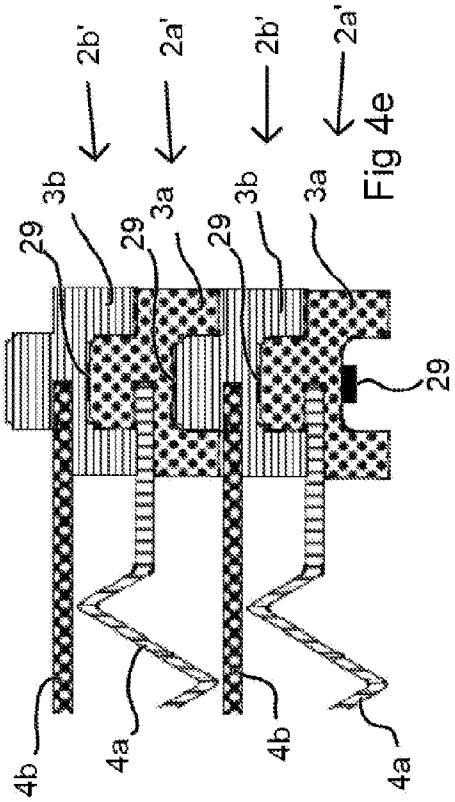

Fig 4e

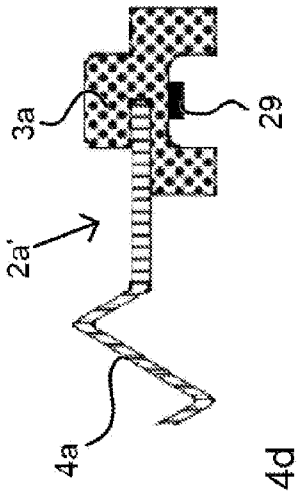

Fig 4d

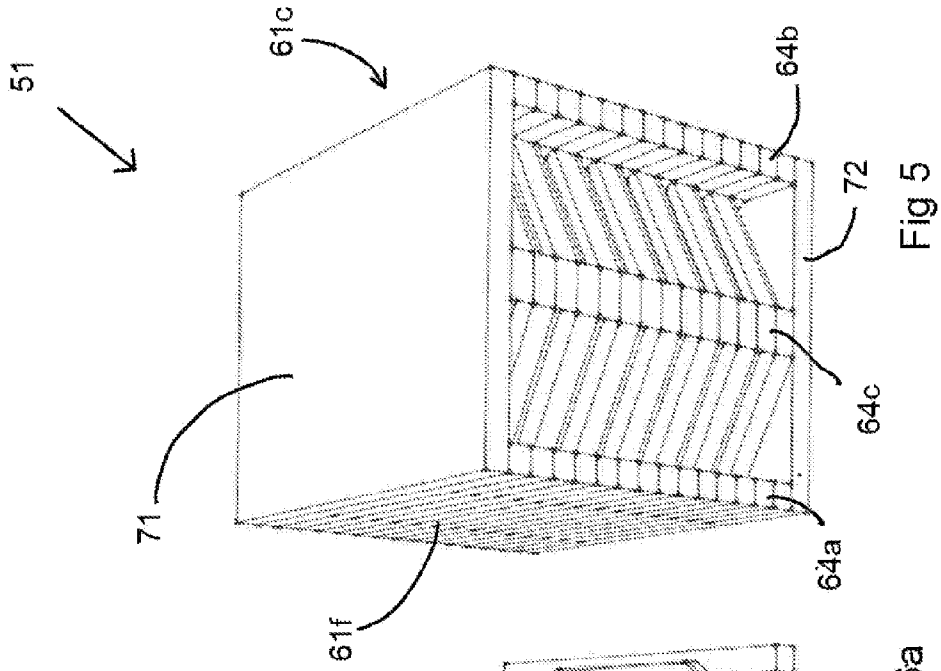

Fig 5

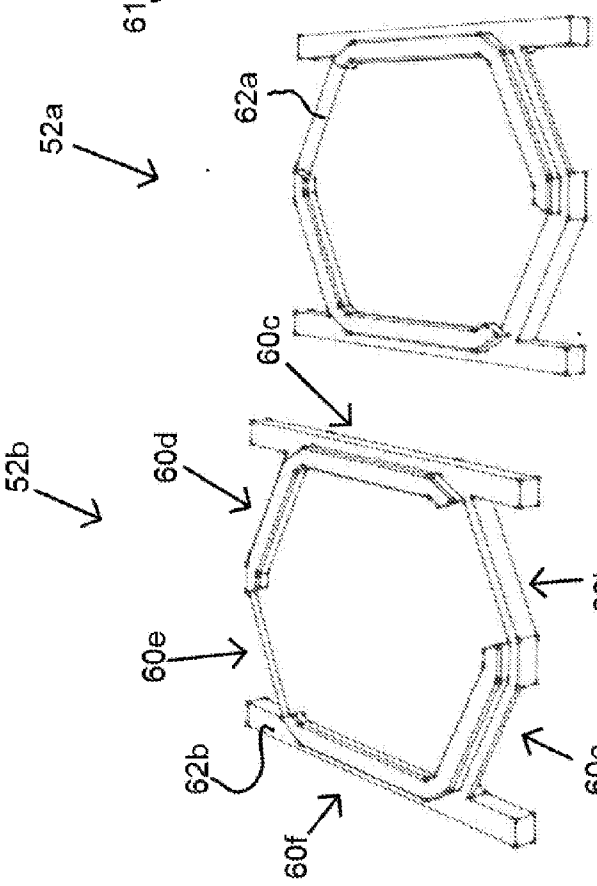

Fig 6a

Fig 6b

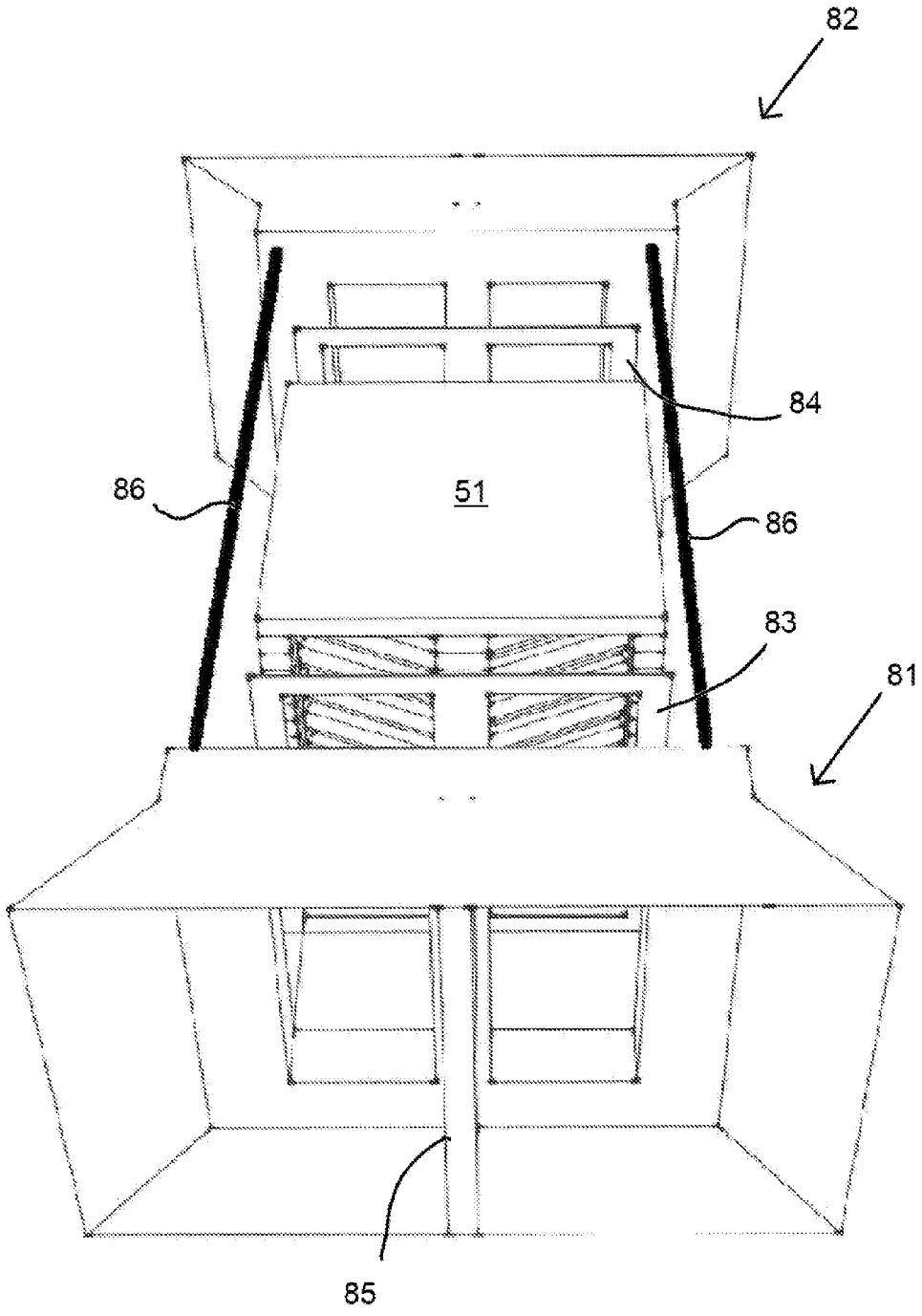

Fig 7