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(54) **Heating device and hot plate used thereby**

Heizgerät und dabei verwendete Heizplatte

Dispositif de chauffage et plaque chauffante utilisé dans celui-ci

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Description

[0001] The present invention concerns a heating device as well as hot plates which can be used thereby.

[0002] In particular, the invention concerns heating devices which are in the first place designed for drying products, for example powders, seeds and all sorts of organic or inorganic matter, such as sludge and the like, but which in the second place can also be used for other applications, such as for example the toasting of products.

[0003] More in particular, the invention concerns a heating device of the type which at least consists of a treatment space equipped with a number of hot plates, either or not composed of several partial plates, formed of a hollow sandwich structure with at least two plates in between which can circulate a heating medium, as well as with means, for example spreaders or the like, to move a product to be heated over the hot plates.

[0004] It is known that the hot plates are hereby provided horizontally on top of one another in order to form a heating device with several levels. The hot plates are hereby made such that the product to be treated can be moved radially outward over a first hot plate by means of the spreaders or the like, after which it drops from the edge of this hot plate onto an underlying second hot plate, over which said product is then moved radially inward by means of spreaders or the like, to subsequently end up on an underlying hot plate via central openings, after which this cycle is repeated as many times as necessary to develop a total heating surface, sufficient to exchange a certain amount of heat, in order to dry, toast, etc. the product until it has reached a certain state.

[0005] A general problem with such hot plates or partial plates is exaggerated bending due to external loads and own weight on the one hand, and that, due to occurring temperature differences, it is often difficult to absorb and to exclude unequal expansions on the other hand, especially when hot plates with large dimensions are used. The bending and deformation must remain very restricted, as no greater gap may be formed between the spreaders and the hot plates than the one that is maximally admitted and set at the time of the initial assembly.

[0006] In order to minimise this problem, as described in Belgian patent No. 1,013,426, it has already been suggested to erect the support of the hot plates as much as possible outside an insulated casing. Although this leads to good results, especially to oppose deformations resulting from temperature differences, the bending problem remains.

[0007] The preamble of claim 1 is derived from BE-A-502895.

[0008] In general, the present invention aims a heating device which has been improved in relation to the embodiments known until now, and which offers an optimal solution to the above-mentioned problem.

[0009] To this end, the invention concerns a heating device of the above-mentioned type, **characterised in that** the supporting structure comprises a positioning ring with a ring-shaped collar which fits in a groove provided on the hot plates or partial plates.

[0010] As every hot plate concerned is lying mainly freely on the above-mentioned supporting structure, the risk of deformations is less great. Thus, for example, there will be no differential tension between the supporting structure and the hot plates, so that at least deformations which might occur as a result thereof are already excluded.

[0011] Preferably, the supporting structures concerned are also placed mainly freely on supporting points, preferably rollers or the like, so that also the risk for such a supporting structure to deform as such becomes less large.

[0012] It should be noted that by a 'predominantly free support' of the hot plates and/or supporting structure is meant that every hot plate and/or supporting structure concerned is supported in an entirely loose manner, or is merely fixed to a limited extent, for example at a single spot. As far as the supporting structure is concerned, this may be for example in a single supporting point, whereas for the hot plate, this can be realised by means of a fastening in the centre alone.

[0013] According to another preferred characteristic of the invention, the above-mentioned supporting structure is made out of a frame of struts, which offers the advantage that this supporting structure is light and solid.

[0014] Preferably, the supporting structure is hereby at least composed of concentrically extending struts and/or strut parts as well as radially directed struts and/or strut parts. In this manner is obtained a very stable structure. As all these struts are at all times situated in a temperature zone levelled by vapour vortex convection currents, there will be a uniform expansion. In this manner, the loads can be absorbed by a supporting structure according to the most advantageous concept for the load transmission.

[0015] According to yet another preferred characteristic of the invention, the underlying supporting structure is provided with a meticulously flattened top side, which offers the advantage that the load of the hot plate and the usual external load is optimally transmitted to the supports of the enveloping body or the enveloping structure. As the supporting structure has a large stiffness, this also guarantees that the bending due to the load of the hot plates and due to its own weight will stay restricted to a minimum.

[0016] The underlying supporting structure is preferably composed of different independent parts which form a single supporting structure per hot plate thanks to special mutual connections.

[0017] Every supporting structure or partial supporting structure concerned is preferably fixed in a single point on the outer perimeter onto one of the supports which is part of the supporting frame, and it is placed freely on the other supports. Every hot plate or partial plate concerned is kept in place with the underlying supporting structure in relation to the centre of the supporting struc-

ture by means of a positioning ring. The latter has a ring-shaped collar which fits in a groove with sufficient play, provided centrally in the hot plate or partial plates. Moreover, the hot plates or partial plates are placed freely on the supporting structure. This offers the advantage that there is no stress between the hot plates, the underlying supporting structure and the enveloping body, and that at the same time, at least in a general way, a mutual fixed positioning remains.

[0018] According to its most preferred embodiment, the invention aims the following objectives:

- a maximal bending of the plates and their supporting structure under the influence of the self-weight and under the influence of the usual external load, whose order of magnitude may vary between 1/1750 and 1/2500, depending on the diameter of the plates;
- a construction which is such that no differential stress occurs in the separate components due to load or heat;
- a connection between the components which is such that the stress caused by load and heat is fluently transmitted to the assembly as a whole;
- a circulation pattern for the heating medium which is designed such that all the parts of the used hot plates are being flown through and heated by the medium in an almost identical manner, such that a uniform expansion is obtained, also during the heating.

[0019] In order to optimally meet one or several of these objectives, apart from the above-mentioned main characteristic, hot plates will further be preferably used in the device according to the invention whose construction is characterised by a radial structure. Thanks to the application of a radial structure or radial character, the device will be more stable than with the known embodiments, it becomes possible to realize hot plates with large diameters without any impermissible bending and material stress occurring, and there will be a uniform expansion during the heating.

[0020] The radial structure is preferably realised by dividing the hot plate and/or the partial plates out of which it is composed in radial sub sectors, whereby every sub sector covers an angle which is smaller than 90°, and better still smaller than 30°. Further, the hot plate is divided in at least two and possibly more independent partial plates existing as such.

[0021] In the hot plates are preferably provided struts, such as partitions, moulded edges and the like, which provide for a division in sectors, which struts further preferably also coincide with radially directed struts of the underlying supporting structure, so that a direct support is so to say obtained.

[0022] According to another aspect of the invention, the hot plate has a canalisation for the heating medium which generally provides for a radial circulation, i.e. from the centre to the outside, or from the outside to the centre in the case where steam is used as a heating medium, according to any path whatsoever.

[0023] According to the most preferred embodiment, partitions are provided between the aforesaid two plates providing for a radial zigzag pattern in order to obtain a more even heating with slight temperature differences between the centre and the outer edge of the hot plate.

[0024] According to a special characteristic of the invention, the hot plates, as mentioned before, each consist of two or more partial plates having the shape of circular sectors, which makes it possible to transport the partial plates separately and to mount them next to one another on the spot where the heating device is to be erected. In this manner can be set up very large hot plates with diameters larger than 7 metres and even up to 8 metres and larger, whereby the partial plates can be transported in a normal manner over the public roads.

[0025] Preferably, the hot plate and the underlying supporting structure in this case consist of two semicircular sectors. It is clear, however, that according to a variant, it is also possible to realise partial plates covering a smaller sector, for example a quarter of a circle or less. The use of parts covering a sector of a circle not only offers the advantage that the hot plate can be transported in pieces, but also that, when setting up relatively large hot plates, they can be easily composed in a systematic manner.

[0026] Also the underlying supporting structure can be formed of sector-shaped parts.

[0027] In order to obtain an optimal heat distribution in the hot plate and the underlying supporting structure, every hot plate concerned or every sector is provided with a canalisation consisting at least of a feed pipe running under the sandwich structure; a circular distribution pipe provided on the top side near the centre of the hot plate; openings connecting the distribution pipe with the intermediate space of the sandwich structure; a circular collecting pipe provided near the outer perimeter of the hot plate on the bottom side of the sandwich structure and which is connected to the aforesaid intermediate space via openings; and at least one discharge pipe connected to the circular collecting pipe.

[0028] A major secondary characteristic of the invention consists in that, in the case of large hot plates, in other words the plates as mentioned above which are provided with clearance openings near their centre, heating means are not only present at the height of the part situated radially inside the clearance openings, but also at the height of the part situated radially outside the clearance opening, as a result of which the entire plate structure is heated in a uniform manner.

[0029] It should be noted that the invention also concerns hot plates having the above-mentioned construction with a radial structure, irrespective of whether they either or not have a loose bearing and irrespective of the way in which they are supported.

[0030] In order to better explain the characteristics of the invention, the following preferred embodiments ac-

cording to the invention are described as an example only without being limitative in any way, with reference to the accompanying drawings, in which:

figure 1 schematically represents a heating device according to the invention;
figure 2 shows a top view of the underlying supporting structure represented with F2 in figure 1;
figure 3 shows a bottom view of one of what are called the small hot plates, for example those indicated with F3 in figure 1;
figure 4 represents the part indicated with F4 in figure 3, represented to a larger scale and into greater detail;
figure 5 shows a bottom view of one of what are called the large hot plates, for example those indicated with F5 in figure 1;
figure 6 shows the part indicated with F6 in figure 5 to a larger scale;
figure 7 shows a section of the hot plate from figure 5, according to line VII-VII, whereby also the accompanying part of the underlying supporting structure is represented;
figures 8, 9 and 10 represent the parts indicated with F8, F9 and F10 in figure 7 to a larger scale;
figures 11, 12, 13 and 14 represent sections according to lines XI-XI, XII-XII, XIII-XIII and XIV-XIV in figure 6 to a larger scale;
figure 15 shows a top view of a hot plate consisting of four partial plates.

[0031] As is generally represented in figure 1, and into greater detail in the different views of figures 2 to 14, the invention concerns a heating device 1 of the type which at least consists of a treatment space 2 which is equipped with a number of hot plates 3-4 on the one hand, formed of a hollow sandwich structure with at least two plates 5-6 with an intermediate space 7 in between which a heating medium, for example steam or heated liquid such as oil, can circulate, and which is provided with means 8 to move a product to be heated over the hot plates 3-4 on the other hand.

[0032] The hot plates 3, which may also be called small hot plates, make it possible to move the product to be dried over the top side of these hot plates 3 from the centre to the outer perimeter, where it drops over the outer edge, each time onto the underlying hot plate 4. The hot plates 4, which may also be called large hot plates, are provided with clearance openings 9, such that the product can be moved over the top side of said hot plates 4 from the outer perimeter to the centre, until this product drops through the clearance openings 9 onto the small hot plate 3, situated each time underneath it.

[0033] The above-mentioned means 8 consist of a spreader mechanism 10 with a central shaft 11 on the one hand, extending through central openings 12 and 13 in the hot plates 3 and 4 and which is equipped with spreaders 14 moving over the hot plates 3-4, and of a drive element 15 on the other hand, such as an electric motor, to drive the shaft 11.

[0034] According to the present invention, at least a number of the above-mentioned hot plates 3-4, partial plates respectively of which they may be composed, are placed mainly freely on a continuous supporting structure 16 situated each time underneath it.

[0035] Every supporting structure 16 as such is also placed mainly freely on supporting points 17 situated on the perimeter of the treatment space 2 and which are part of a supporting frame 18. In the given example, the support is provided via roller bearings, in particular rollers 19 or the like.

[0036] As represented in figure 2, such a supporting structure 16 is made of a frame of struts, especially radially directed struts, in this case main struts 20-21, as well as concentric struts, in this case ring-shaped struts 22 on the one hand and intermediate struts 23 extending according to a mainly concentric path on the other hand.

[0037] The supporting structure 16 is made out of two semicircular partial constructions 24-25 or, according to a variant which is not represented, out of several sector-shaped partial constructions.

[0038] The above-mentioned radial main struts 20-21 hereby consist of a series of radial IPN or HEB struts 20 on the one hand, and, along the dividing side, i.e. the side edges of the partial constructions 24-25, of U-shaped struts 21 on the other hand, whereby the core plates 26 of the opposite struts 21 are connected to one another in pairs by means of bolt connections 27 to thus form a whole per level. The above-mentioned ring-shaped struts 22 consist of U-shaped struts. With these struts 22 are formed four ring-shaped structures 28-29-30-31, one of which is situated on the inner perimeter and another one on the outer perimeter. The two outermost ring-shaped structures 29-30 are formed of U-shaped DIN 1026 struts, while the ring-shaped structure 28 consists of U-shaped DIN 1029 struts. In the given example, the intermediate struts 23 consist of HEB cross beams or U-shaped struts, depending on the diameter of the hot plates.

[0039] The top surface of the supporting structure 16 as a whole has been meticulously flattened. In this manner is obtained a perfect support for the hot plates 3-4.

[0040] The partial constructions 24-25 are preferably also fixed to one another per level by means of non-represented fishplates which, after the partial constructions 24-25 have been joint, are welded onto the far ends of the struts 21 situated against one another.

[0041] It should be noted that every supporting structure 16 and/or partial structure or partial construction 24-25 concerned is preferably fastened in a single point on the outer perimeter on one of the supports 17 in a fixed manner and is placed freely on the other supports 17, either or not by means of roller bearings 19. It should be noted that every hot plate 3-4 concerned, or in case it consists of partial plates, for example 3A, 3B, etcetera or 4A, 4B, etcetera, as will be explained hereafter, every

partial plate is preferably positioned mainly centrally on the accompanying supporting structure 16 and moreover, according to the present invention, rests on the supporting structure such that it can freely move. The positioning of the hot plate 3-4 or of the partial plates 3A-3B, 4A-4B on the supporting structure 16 can be obtained, according to figure 8, by connecting a positioning ring 51 to a central construction 50, in particular a bush construction, of the supporting structure, carrying a ring-shaped collar 52 which fits in a groove 53 with much play, provided centrally in the hot plate or partial plates concerned, and which thus maintains the latter in position in relation to the supporting structure 16. The positioning attachment of the hot plates 3-4, 3A-3B, 4A-4B in relation to the supporting structure 16 is designed to keep the plates in place and to avoid that they shift unintentionally, for example by making contact with the spreaders 14, or due to differential expansion in relation to the supporting structure 16. A mutual attachment between partial hot plates may consist of common fishplates which are not represented in the figures, but which may be situated on the common connection side of the partial plates, on the outer perimeter and centrally.

[0042] In an analogous manner, every supporting structure 16 is preferably attached in a fixed manner in a single point to one of the supporting points 17.

[0043] Although, according to the invention, hot plates 3-4 of any construction whatsoever can be applied, preference is given to hot plates of a construction as will be described hereafter by means of figures 3 to 14.

[0044] The represented hot plates 3-4 each consist of two semicircular partial plates 3A-3B, 4A-4B respectively, which, as will be described hereafter, are supported mainly freely next to one another. However, it is clear that, according to a variant which is not represented, a number of the characteristics described hereafter can also be applied to multipart hot plates 3-4 with sectors, for example multipart as in figure 15, or which are for example made in one piece.

[0045] First, the general construction is illustrated, which is applicable both to hot plates 3 and 4, with reference to figures 3-4 as far as the small hot plate 3 is concerned, and with reference to figures 5 to 14 as far as the large hot plate 4 is concerned.

[0046] As represented in the figures, every hot plate 3-4 consists of a hollow sandwich structure formed of plates 5-6. Every partial plate 3A-3B, 4A-4B respectively, is confined over the entire perimeter by laths 32 which are connected to the plates 5 and 6 by means of welded joints.

[0047] A major characteristic of the hot plates 3-4 consists in that they, and thus also the partial plates 3A-3B, 4A-4B respectively, have a construction with a radial structure, whereby this radial character can manifest itself in different ways, as will be explained hereafter.

[0048] According to a first possibility, said radial character is obtained in the given embodiment in that the hot plates 3-4 are divided in radial partial sectors 33, which each cover an angle A which is smaller than 90° and preferably amounts to 30° or less. This is obtained by dividing the intermediate space by means of partitions 34.

[0049] Another major characteristic of the hot plates 3-4 in which the radial character is revealed, consists in that they have a canalisation for the heating medium which generally provides for a radial circulation, in particular separately per partial sector 33. This radial circulation is indicated by means of the arrows 35 in figures 4 and 6.

[0050] By the aforesaid is meant that the heating medium generally flows per sector either from the inside to the outside, as is the case in the given example, or according to a variant, from the outside to the inside in the intermediate space 7, preferably according to radially extending canalisation parts.

[0051] As represented in figures 4 and 6, partitions 36 are preferably provided as well between the plates 5 and 6 which not only influence the radial flow, but which also make sure that it follows a radial zigzag pattern in order to obtain a more uniform heating.

[0052] As is shown among others in figures 11 and 12, the partitions 34 and 36 consist of laths formed of single, rectangular struts placed on their vertical side.

[0053] In the given example, the partitions 34 and the radially directed laths 32 situated on the side edges of the partial plates 3A-3B, 4A-4B respectively, are positioned such that they are situated above, or mainly above the radial main struts 20 and 21 of the supporting structure 16.

[0054] As is indicated in figures 4 and 6, additional local spacer sleeves 37 can also be provided between the plates 5 and 6.

[0055] Every partial plate 3A-3B, 4A-4B respectively, has a canalisation which at least consists of a feed pipe 38 running under the sandwich structure; a circular distribution pipe 39 which is provided near the centre of the partial plate concerned, on the top side; openings 40 which connect the distribution pipe 39 to the intermediate space 7 of the sandwich structure; a circular collecting pipe 41 provided near the outer perimeter of the partial plate concerned on the bottom side of the sandwich structure and which is connected to the above-mentioned intermediate space 7 via openings 42; and at least one discharge pipe 43 connected to the circular collecting pipe 41.

[0056] In the embodiment of the small hot plate 3, every part of the intermediate space 7 formed per partial sector 33 extends continuously from the circular distribution pipe 39 up to the circular collecting pipe 41.

[0057] The distribution pipe 39 and the collecting pipe 41 are preferably made in the shape of semicircular pipes which, as represented among others in figures 7 to 10, are connected with their flat sides against the sandwich structure, as a result of which a restricted overall height is obtained.

[0058] From the figures can be derived that the aforesaid also goes for each of the partial plates. Hence, in

case use would be made of a one-piece hot plate 3-4, it is clear that the pipes 39-41 can possibly cover a full circle instead of a semi-circle and that use can either or not be made of more than one feed pipe 38, discharge pipe 43 respectively.

[0059] While the heating device 1 is operational, the hot plates 3-4 are heated by guiding a heating medium via the feed pipes 38 into the partial plates 3A-3B, 4A-4B respectively. The heating medium hereby flows via the distribution pipes 39 and the groove-shaped openings 42 in the intermediate space 7, from where it is guided in a zigzag manner per partial sector 33 to the openings 42. Via these openings 42, the medium is collected in the collecting pipes 41, from where it can be discharged via the discharge pipes 43.

[0060] As far as described above, the construction of the small hot plates 3 corresponds to that of the large hot plates 4. A number of differences are described hereafter.

[0061] A first constructional difference consists in that the small hot plates 3 have a smaller outer diameter. This is also the case for the corresponding supporting structure 16, whose outer edge 44 also entirely disappears under the hot plate 3. In fact, the supporting structure 16 for the small plates can be made identical to that of the large plates, with as an only difference that the ring-shaped structure 29 is then situated closer to the ring-shaped structure 30. The clearance opening 45 in the treatment space 2 of the heating system is thus entirely free, apart from the supports 17 which depart from the supporting frame 18. It should be noted that the supports 17 are also situated under the supporting structure 16 at a lower level. There are no clearance openings in the hot plates 3, whereas clearance openings 9 are indeed provided in the large hot plates 4, whose position coincides with the clearance openings 46 in the supporting structure 16.

[0062] A second major difference consists in that, with the large hot plates 4, the intermediate space 7 per partial sector 33 is divided in two parts 47 and 48 due to the presence of the clearance openings 9, and that the hot plate 4 is provided with passages 49 which connect the above-mentioned first part 47 of the intermediate space 7 to the second part 48.

[0063] It should be noted that a bush construction 50 has been built in the centre of the supporting structure 16 and has been fixed to it, as represented in figures 7 and 8, consisting of a bush 52 with two welded-on flanges 54, which surround the composed ring-shaped structure 28 of the partial constructions 24 and 25, formed of U-shaped struts, which flanges 54 have been welded onto the radial balcony 20 and 21 of the supporting structure 16. The partial supporting constructions 24 and 25 can be connected to one another by means of overlapping strips 55 limited in size, welded on the U-shaped parts of the ring-shaped structure 28 at the height of the division of the partial constructions 24 and 25. The positioning ring 51 for the hot plates 3-4 is connected to the top flange 54.

[0064] The heating device 1 mainly works as will be described hereafter.

[0065] The product to be heated is moved over the hot plates 3-4 by means of the spreaders 14, whereby this product is moved in the known manner on the small hot plates 3 from the middle towards the outer edge, and from the outer edge to the middle on the large hot plates 4. During this movement, the product drops from the one hot plate lying on top onto the next hot plate lying underneath it, and thus follows a zigzag path through the heating device 1.

[0066] When operational, the heating medium is guided in the circular distribution pipe 39 via every feed pipe 38 concerned, from where said heating medium ends up in the intermediate space 7 via the openings 40. After the medium has flowed through said intermediate space 7 according to the above-described zigzag pattern, it leaves this space via the openings 42 to be collected in the collecting pipe 41 and to be discharged via the discharge pipe 43, for example to a device for heating the medium.

[0067] Since, in the case steam is used as a heating medium, less large amounts of condensing steam have to be supplied per sector, it is easier to switch to a simpler construction, and it is more advisable to not use the zigzag pattern. It is better for the steam to be supplied via a circular distribution pipe along the outer perimeter of the hot plates 3-4, and for the condensates to be removed via a centrally erected circular discharge pipe.

[0068] Finally, it should be noted that by a general radial circulation' is meant that the heating medium flows from the outside to the inside, or vice versa, per sector. Within each sector, however, the progress can be arbitrary, and it must not necessarily follow arrow 35 from figure 6.

[0069] By a 'continuous supporting structure 16' according to the invention must be understood every supporting structure extending underneath a hot plate 3 or 4, as opposed to for example local supports provided exclusively on the edges, as described in Belgian patent No. 1,013,426, irrespective in what manner this supporting structure 16 has been built as such.

[0070] It is clear that, thanks to the specific construction of the invention, there is a large degree of freedom between the different components, as a result of which expansion differences are optimally absorbed, whereas in every component as such, in particular in every hot plate 3 or 4 and in every supporting structure 16, is obtained a uniform expansion, such that these components as such will not bend in an unwanted manner.

[0071] From figure 15, it is also clear that the above-mentioned hot plates must not necessarily consist of two partial plates, but that they can also be made of four or more partial plates.

Claims

1. Heating device of the type which at least consists of a treatment space (2) equipped with a number of hot plates (3-4), either or not composed of several partial plates (3A-3B, 4A-4B), formed of a hollow sandwich structure with at least two plates (5-6) in between which can circulate a heating medium, as well as with means (8) to move a product to be heated over the hot plates (3-4), whereby at least a number of the above-mentioned hot plates (3-4), partial plates (3A-3B, 4A-4B) respectively, are placed mainly freely on a continuous supporting structure (16) situated each time underneath them **characterized in that** the supporting structure (16) comprises a positioning ring (51) with a ring-shaped collar (52) which fits in a groove (53) provided on the hot plates (3-4) or partial plates (3A-3B, 4A-4B).

2. Heating device according to claim 1, **characterised in that** every supporting structure (16) concerned is placed mainly free on supporting points (17), preferably rollers.

3. Heating device according to claim 1 or 2, **characterised in that** the supporting structure (16) is made of a frame of struts.

4. Heating device according to any of the preceding claims, **characterised in that** the supporting structure (16) is at least composed of concentrically extending struts (22-23) and/or strut parts as well as of radially directed struts (20) and/or strut parts whose top sides are situated in one and the same plane.

5. Heating device according to any of the preceding claims, **characterised in that** every supporting structure (16) is mainly fixed in a single point on one of the supporting points (17) of a supporting frame (18) and is moreover erected freely moveable on the other supporting points (17).

6. Heating device according to any of the preceding claims, **characterised in that** it comprises one or several hot plates (3-4) having a construction with a radial structure.

7. Heating device according to claim 6, **characterised in that** the above-mentioned hot plates (3-4) have a canalisation for the heating medium which generally provides for a radial circulation.

8. Heating device according to claim 6 or 7, **characterised in that** partitions (36) are provided in the hot plates (3-4) providing for a radial zigzag pattern.

9. Heating device according to any of claims 6 to 8, **characterised in that** the above-mentioned hot plates (3-4) are divided in radial sectors, in particular partial sectors (33).

10. Heating device according to any of claims 6 to 9, **characterised in that** it comprises hot plates (3-4) which are composed of one or several partial plates (3A-3B, 4A-4B), in particular in the shape of circular segments which each form half or a quarter or less of a hot plate (3-4).

11. Heating device according to any of the preceding claims, **characterised in that** the hot plate (3-4) or every partial plate (3A-3B, 4A-4B) is provided with a canalisation which at least consists of a feed pipe (38) running under the above-mentioned hot plate (3-4); a circular distribution pipe (39) provided on the top side near the centre of the hot plate (3-4); openings (40) connecting the distribution pipe (39) with the intermediate space (7) of the sandwich structure; a circular collecting pipe (41) provided near the outer perimeter of the hot plate (3-4) on the bottom side of the hot plate (3-4) and which is connected to the aforesaid intermediate space (7) via openings (42); and at least one discharge pipe (43) connected to the circular collecting pipe (41).

12. Heating device according to any of the preceding claims, **characterised in that** the hot plates (3-4) comprise struts providing for a division in partial sectors (33), which struts coincide with radially directed struts (20) of the above-mentioned supporting structure (16).

Patentansprüche

1. Heizvorrichtung des Typs, der mindestens aus einem Behandlungsraum (2) besteht, der mit einer Anzahl von Heizplatten (3-4), die entweder aus mehreren Teilplatten (3A-3B, 4A-4B) zusammengesetzt sind oder nicht, welche Heizplatten aus einer hohlen Sandwichstruktur mit mindestens zwei Platten (5-6) gebildet sind, zwischen denen ein Heizmedium zirkulieren kann, sowie mit Mitteln (8) zum Bewegen eines zu erhitzenden Produkts über die Heizplatten (3-4) ausgerüstet ist, wobei mindestens eine Anzahl der besagten Heizplatten (3-4) beziehungsweise Teilplatten (3A-3B, 4A-4B) im Wesentlichen frei auf eine jeweils darunter befindliche, durchlaufende Stützstruktur (16) aufgelegt sind, **dadurch gekennzeichnet, dass** die Stützstruktur (16) einen Positionierring (51) mit einem ringförmigen Kragen (52), der in eine an den Heizplatten (3-4) oder Teilplatten (3A-3B, 4A-4B) angebrachte Nut (53) passt, umfasst.

2. Heizvorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** jede betreffende Stützstruktur

(16) im Wesentlichen frei auf Stützpunkte (17), bevorzugt Rollen, aufgelegt ist.

3. Heizvorrichtung nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die Stützstruktur (16) aus einem Gestell aus Profilen hergestellt ist.

4. Heizvorrichtung nach einem der vorgenannten Ansprüche, **dadurch gekennzeichnet, dass** die Stützstruktur (16) mindestens sowohl aus sich konzentrisch erstreckenden Profilen (22-23) und/oder Profilteilen als auch aus radial gerichteten Profilen (20) und/oder Profilteilen zusammengesetzt ist, deren Oberseiten sich in der gleichen Ebene befinden.

5. Heizvorrichtung nach einem der vorgenannten Ansprüche, **dadurch gekennzeichnet, dass** jede Stützstruktur (16) im Wesentlichen in einem einzigen Punkt an einem der Stützpunkte (17) eines Stützgestells (18) befestigt ist und im übrigen frei beweglich an den anderen Stützpunkten (17) aufgestellt ist.

6. Heizvorrichtung nach einem der vorgenannten Ansprüche, **dadurch gekennzeichnet, dass** sie eine oder mehrere Heizplatten (3-4) umfasst, die eine Konstruktion mit einer radialen Struktur aufweisen.

7. Heizvorrichtung nach Anspruch 6, **dadurch gekennzeichnet, dass** die vorgenannten Heizplatten (3-4) eine Kanalisation für das Heizmedium aufweisen, die generell für eine radiale Zirkulation sorgt.

8. Heizvorrichtung nach Anspruch 6 oder 7, **dadurch gekennzeichnet, dass** Trennwände (36) in den Heizplatten (3-4) angebracht sind, die ein radiales Zickzackmuster vorsehen.

9. Heizvorrichtung nach einem der Ansprüche 6 bis 8, **dadurch gekennzeichnet, dass** die vorgenannten Heizplatten (3-4) in radiale Sektoren, insbesondere Teilsektoren (33), unterteilt sind.

10. Heizvorrichtung nach einem der Ansprüche 6 bis 9, **dadurch gekennzeichnet, dass** sie Heizplatten (3-4) umfasst, die aus ein oder mehr Teilplatten (3A-3B, 4A-4B) zusammengesetzt sind, spezieller in Form von Kreissegmenten, die jedes die Hälfte oder ein Viertel oder weniger einer Heizplatte (3-4) bilden.

11. Heizvorrichtung nach einem der vorgenannten Ansprüche, **dadurch gekennzeichnet, dass** die Heizplatte (3-4) oder jede Teilplatte (3A-3B, 4A-4B) mit einer Kanalisation versehen ist, die mindestens aus einer unter der vorgenannten Heizplatte (3-4) verlaufenden Zufuhrleitung (38) besteht; einer kreisförmigen Verteilerleitung (39), die an der Oberseite in Nähe des Zentrums der Heizplatte (3-4) angebracht ist; Öffnungen (40), die die Verteilerleitung (39) mit dem Zwischenraum (7) der Sandwichstruktur verbinden; einer kreisförmigen Sammelleitung (41), die in Nähe des Außenumfangs der Heizplatte (3-4) an der Unterseite der Heizplatte (3-4) angebracht ist und die mittels Öffnungen (42) mit dem vorgenannten Zwischenraum (7) in Verbindung steht; und mindestens einer, an die kreisförmige Sammelleitung (41) angeschlossenen Abfuhrleitung (43).

12. Heizvorrichtung nach einem der vorgenannten Ansprüche, **dadurch gekennzeichnet, dass** die Heizplatten (3-4) Profile umfassen, die eine Unterteilung in Teilsektoren (33) vorsehen, welche Profile mit radial gerichteten Profilen (20) der vorgenannten Stützstruktur (16) zusammenfallen.

Revendications

1. Dispositif de chauffage du type qui est au moins constitué d'un espace de traitement (2) équipé d'un certain nombre de plaques chauffantes (3-4), composées ou non de plusieurs plaques partielles (3A-3B, 4A-4B), formée d'une structure creuse en sandwich comprenant au moins deux plaques (5-6) entre lesquelles peut circuler un milieu chauffant, ainsi que des moyens (8) pour déplacer un produit à chauffer par-dessus les plaques chauffantes (3-4), au moins un certain nombre des plaques chauffantes susmentionnées (3-4), des plaques partielles (3A-3B, 4A-4B), respectivement, sont placées principalement librement sur une structure de support continue (16) située à chaque fois en dessous d'elles, **caractérisé en ce que** la structure de support (16) comprend un anneau de positionnement (51) comprenant une bague de forme annulaire (52) qui s'emboîte dans une rainure (53) prévue sur les plaques chauffantes (3-4) ou sur les plaques partielles (3A-3B, 4A-4B).

2. Dispositif de chauffage selon la revendication 1, **caractérisé en ce que** chaque structure de support (16) concernée est placée principalement librement sur des points de support (17), de préférence des galets.

3. Dispositif de chauffage selon la revendication 1 ou 2, **caractérisé en ce que** la structure de support (16) est constituée d'un cadre d'entretoises.

4. Dispositif de chauffage selon l'une quelconque des revendications précédentes, **caractérisé en ce que** la structure de support (16) est au moins composée d'entretoises (22-23) et/ou de parties d'entretoises s'étendant en direction concentrique, ainsi que d'entretoises (20) et/ou de parties d'entretoises orientées en direction radiale, dont les côtés supérieurs sont situés dans un seul et même plan.

5. Dispositif de chauffage selon l'une quelconque des revendications précédentes, **caractérisé en ce que** chaque structure de support (16) est fixée principalement en un seul endroit sur un des points de support (17) d'un cadre de support (18) et est en outre monté pour être librement mobile sur les autres points de support (17).

6. Dispositif de chauffage selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**il comprend une ou plusieurs plaques chauffantes (3-4) possédant une construction comprenant une structure radiale.

7. Dispositif de chauffage selon la revendication 6, **caractérisé en ce que** les plaques chauffantes susmentionnées (3-4) possèdent une canalisation pour le milieu chauffant, qui procure en général une circulation radiale.

8. Dispositif de chauffage selon la revendication 6 ou 7, **caractérisé en ce qu'**on prévoit des parois de séparation (36) dans les plaques chauffantes (3-4) procurant un modèle radial en zigzag.

9. Dispositif de chauffage selon l'une quelconque des revendications 6 à 8, **caractérisé en ce que** les plaques chauffantes susmentionnées (3-4) sont subdivisées en secteurs radiaux, en particulier en secteurs partiels (33).

10. Dispositif de chauffage selon l'une quelconque des revendications 6 à 8, **caractérisé en ce qu'**il comprend des plaques chauffantes (3-4) qui se composent d'une ou plusieurs plaques partielles (3A-3B, 4A-4B), en particulier sous la forme de segments circulaires qui forment chacun la moitié ou un quart d'une plaque chauffante (3-4) ou moins.

11. Dispositif de chauffage selon l'une quelconque des revendications précédentes, **caractérisé en ce que** la plaque chauffante (3-4) ou chaque plaque partielle (3A-3B, 4A-4B) est munie d'une canalisation qui est au moins constituée d'un tuyau d'alimentation (38) s'étendant en dessous de la plaque chauffante susmentionnée (3-4) ; d'un tuyau de distribution circulaire (39) prévu sur le côté supérieur à proximité du centre de la plaque chauffante (3-4) ; d'ouvertures (40) reliant le tuyau de distribution (39) à l'espace intermédiaire (7) de la structure en sandwich ; d'un tuyau de récolte circulaire (41) prévu à proximité du périmètre externe de la plaque chauffante (3-4) sur le côté inférieur de la plaque chauffante (3-4) et qui est raccordé à l'espace intermédiaire susmentionné (7) via des ouvertures (42) ; et d'au moins un tuyau d'évacuation (43) raccordé au tuyau de récolte circulaire (41).

12. Dispositif de chauffage selon l'une quelconque des revendications précédentes, **caractérisé en ce que** les plaques chauffantes (3-4) comprennent des entretoises procurant une subdivision en secteurs partiels (33), lesdites entretoises coïncidant avec des entretoises (20) orientées en direction radiale de la structure de support susmentionnée (16).

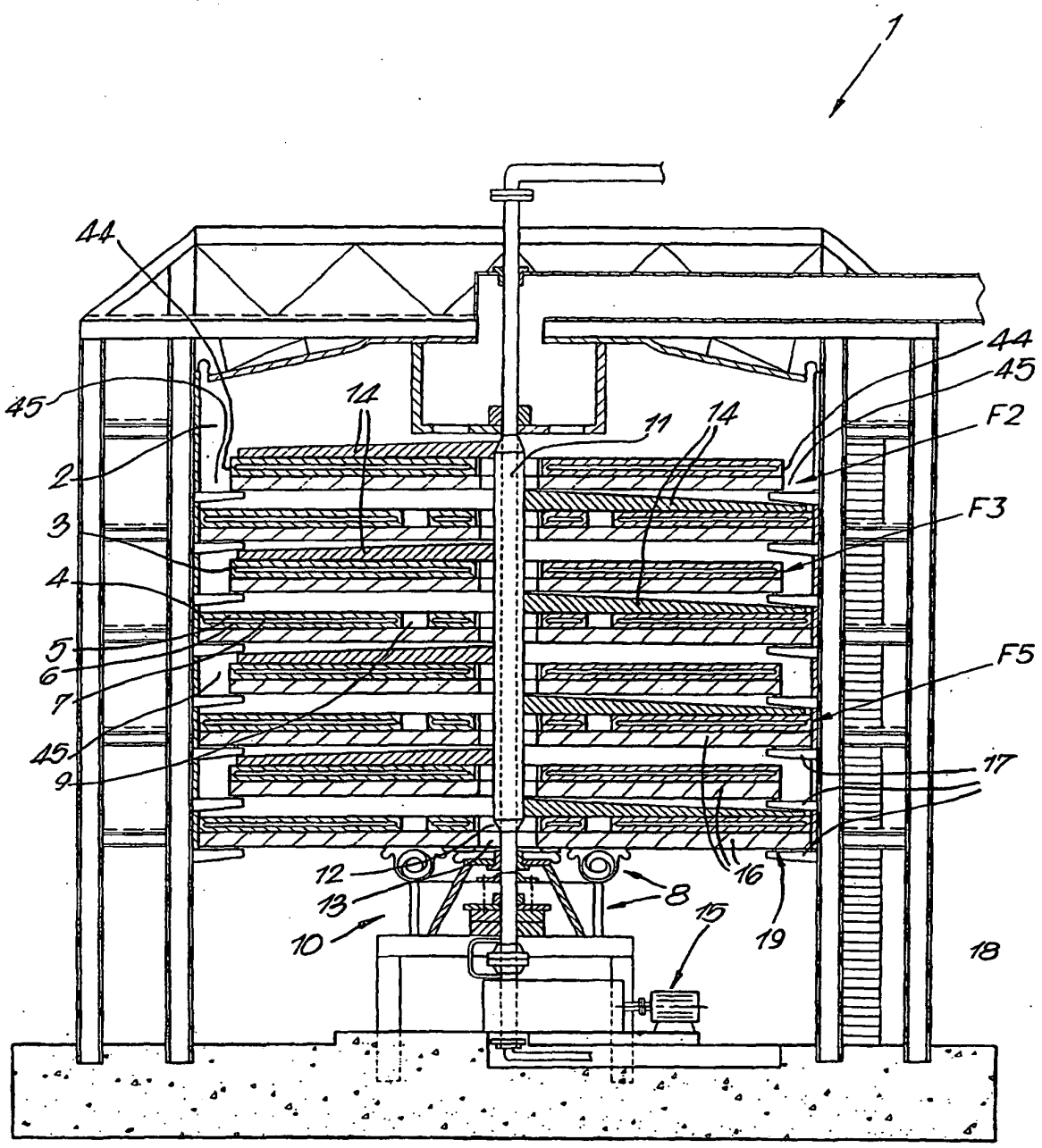


Fig. 1

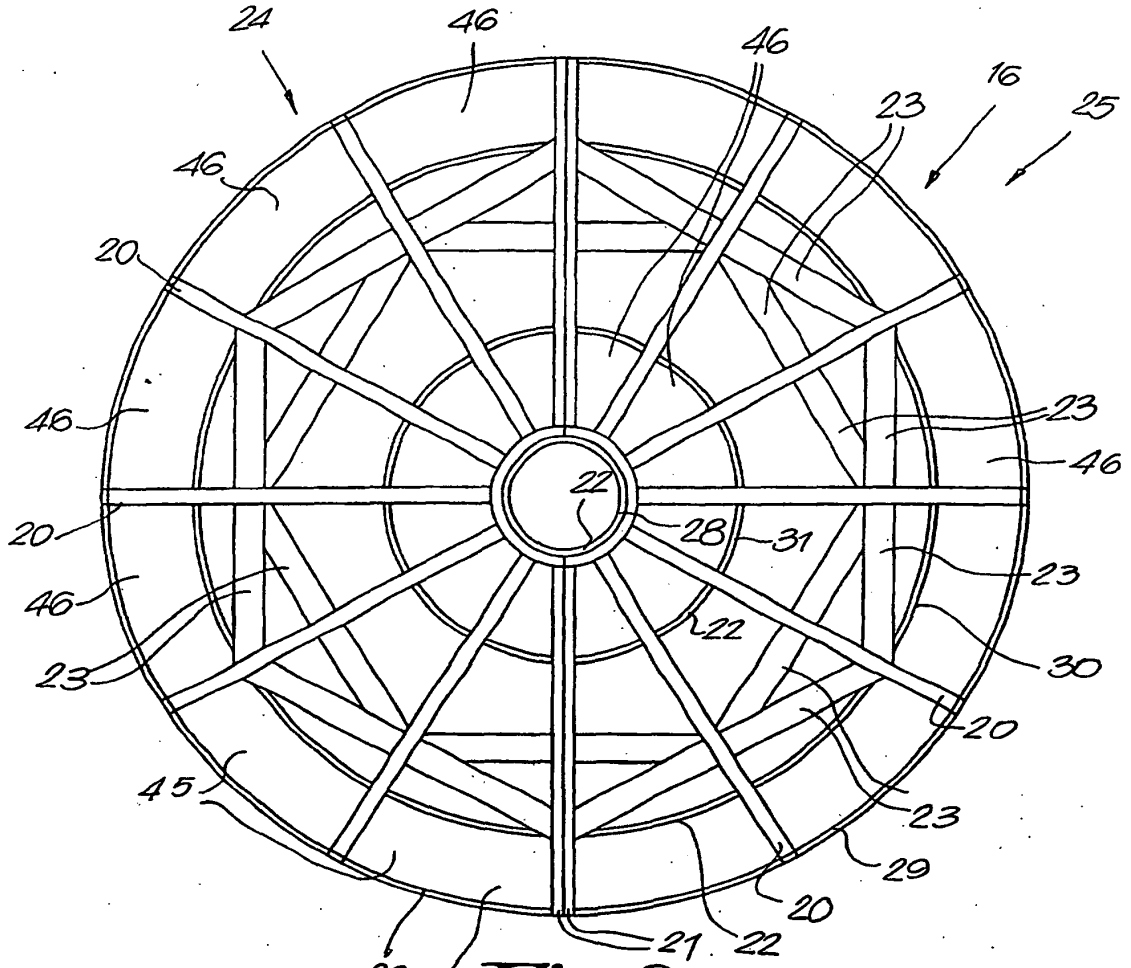

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Fig.2

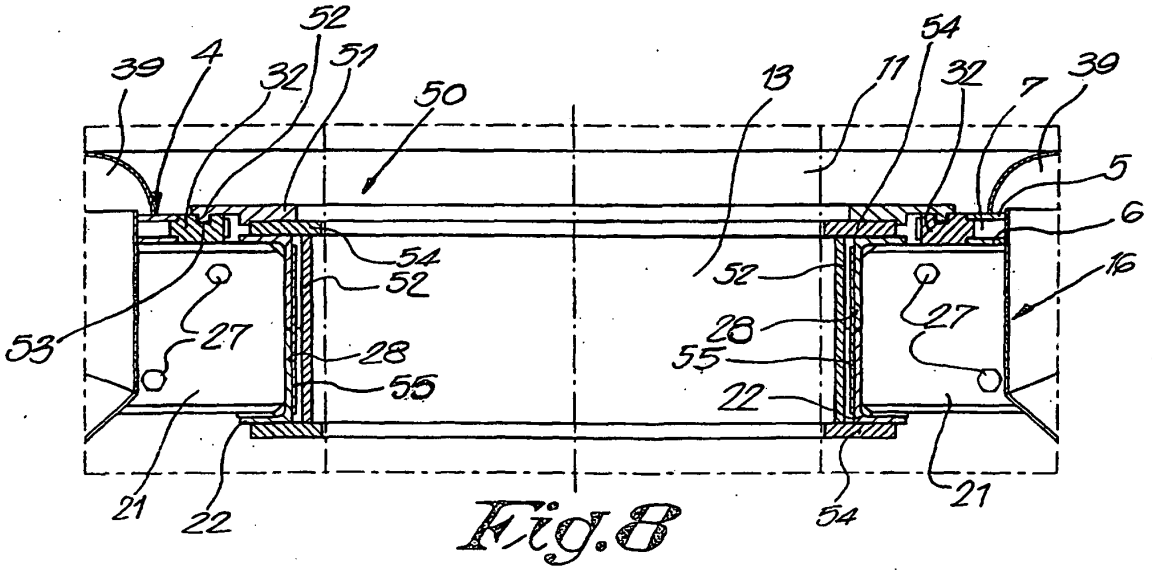

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Fig.8

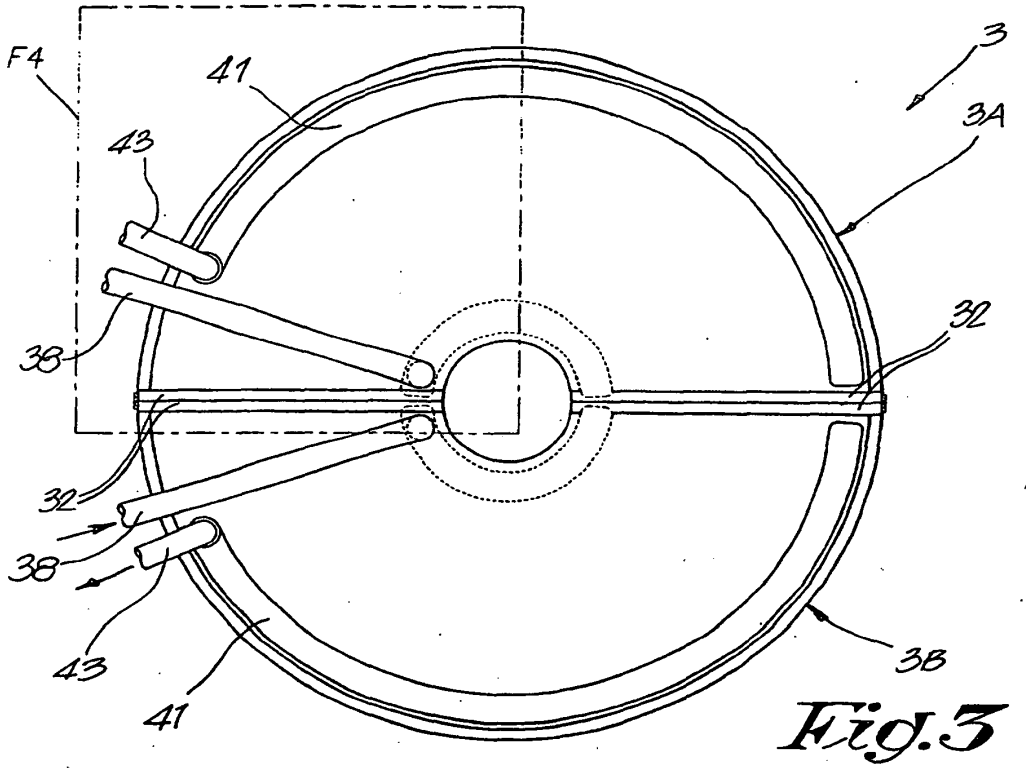

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Fig.3

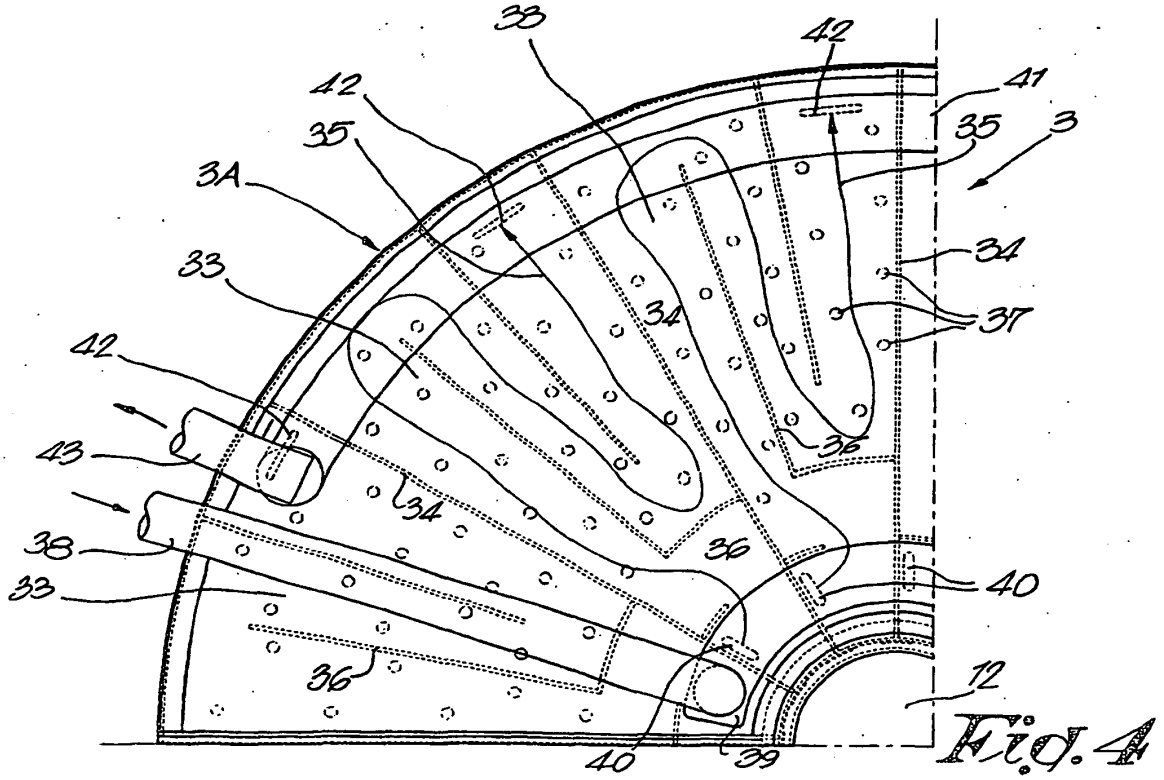

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Fig.4

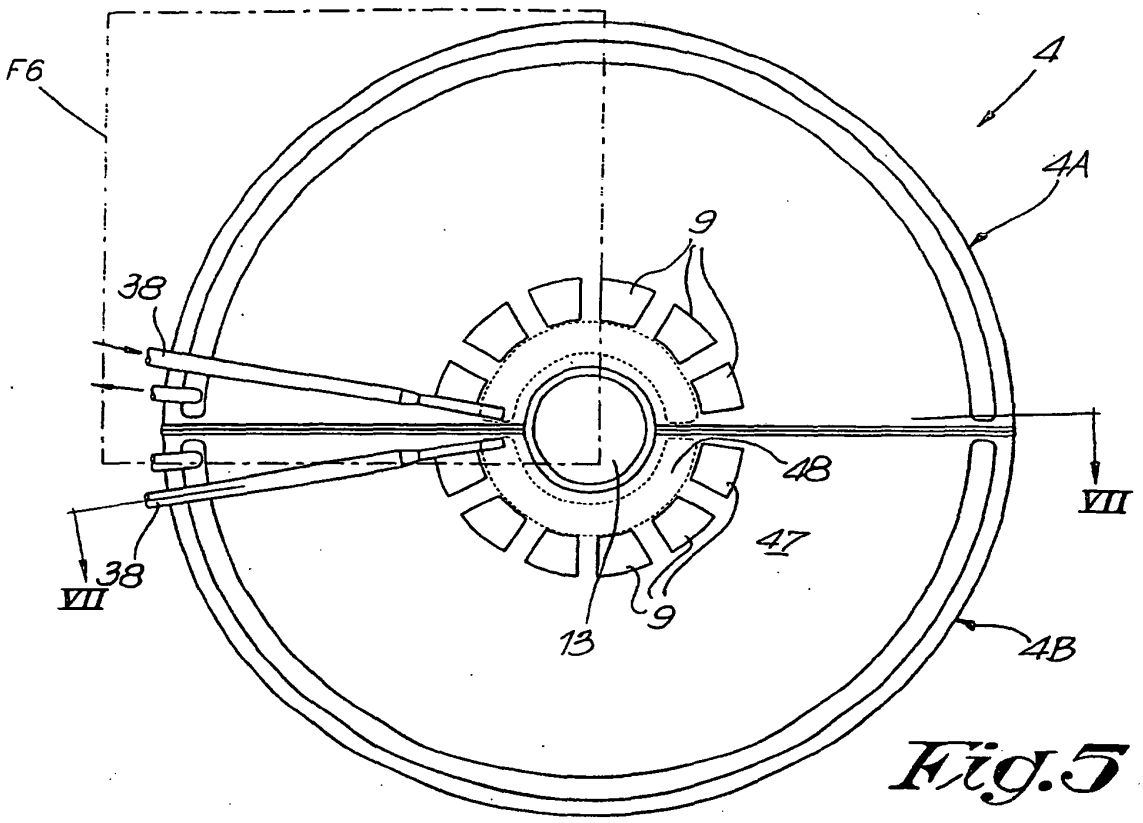

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Fig.5

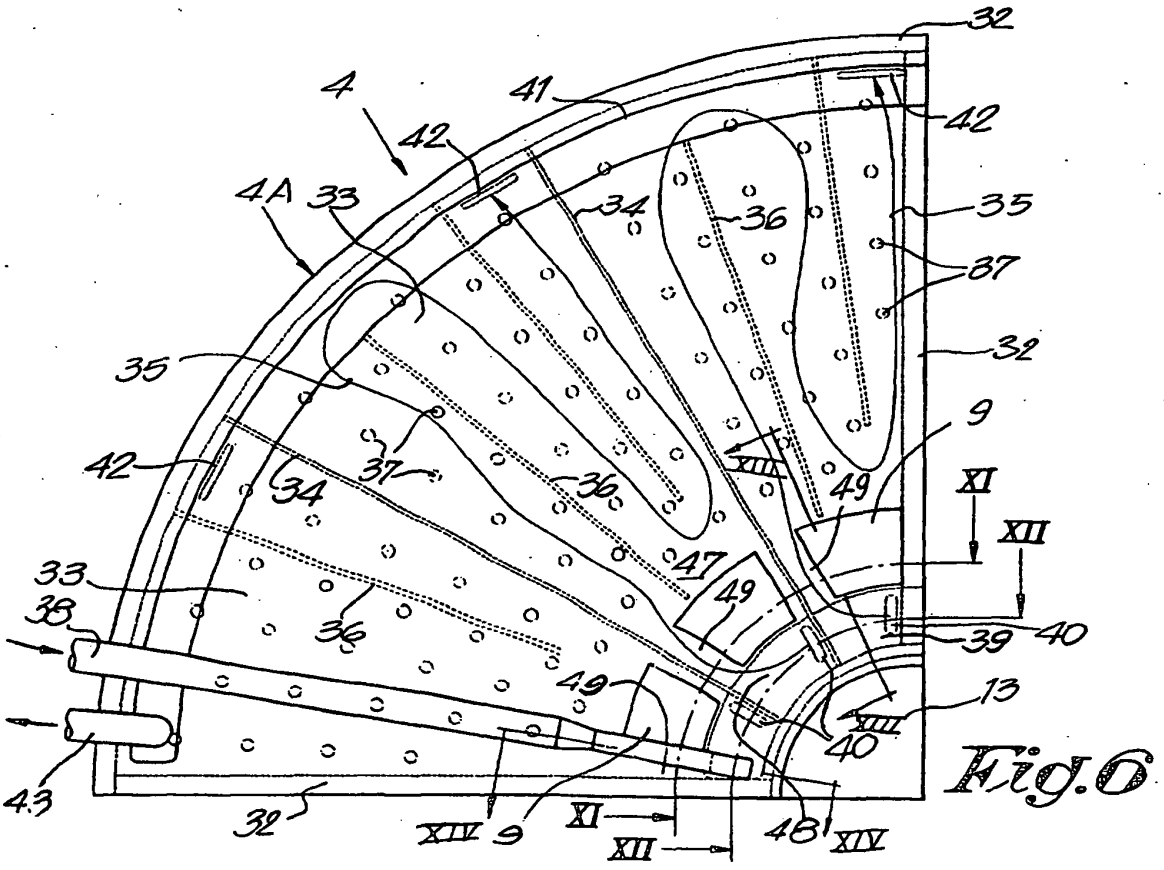

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Fig.6

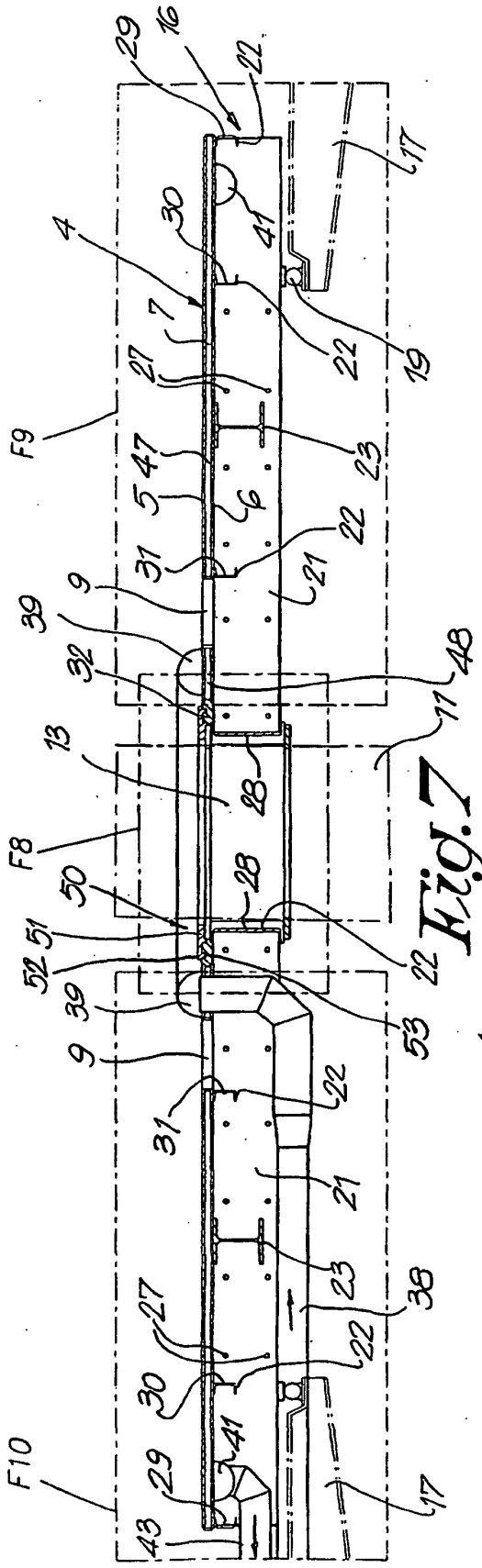

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Fig.7

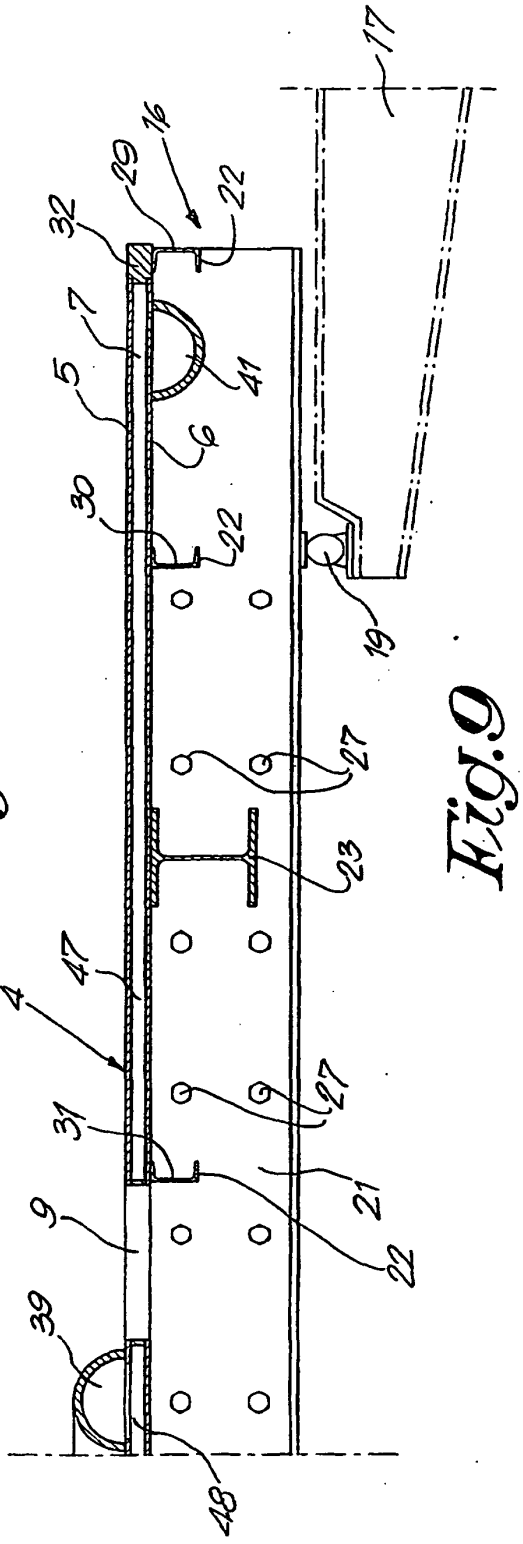

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Fig.9

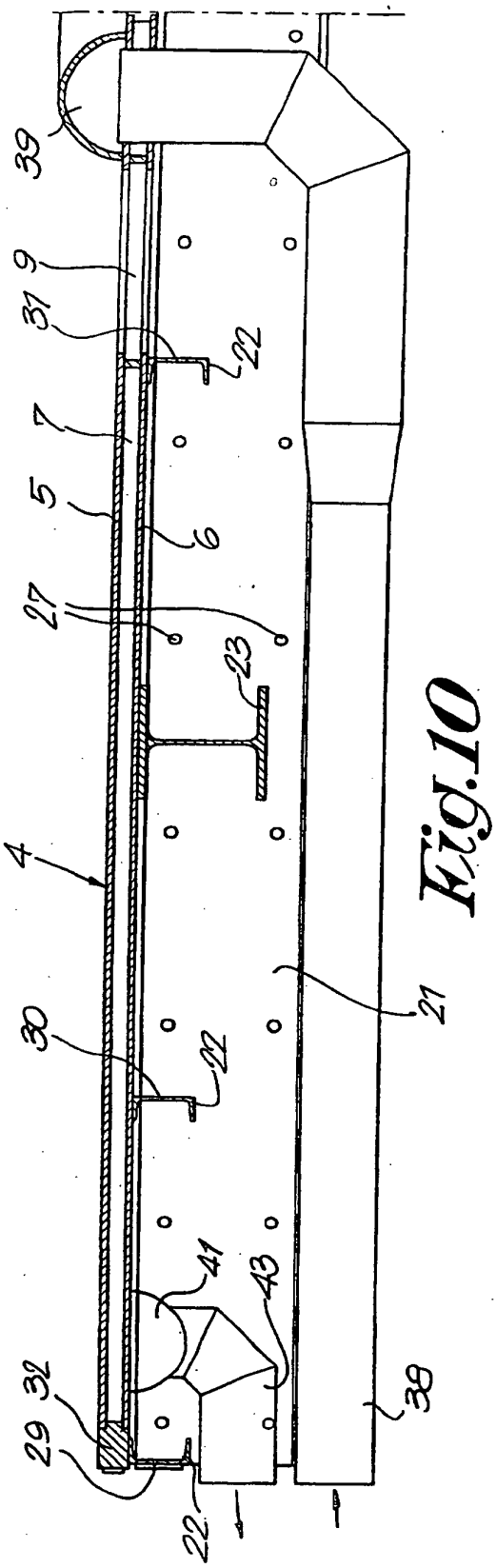

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Fig.10

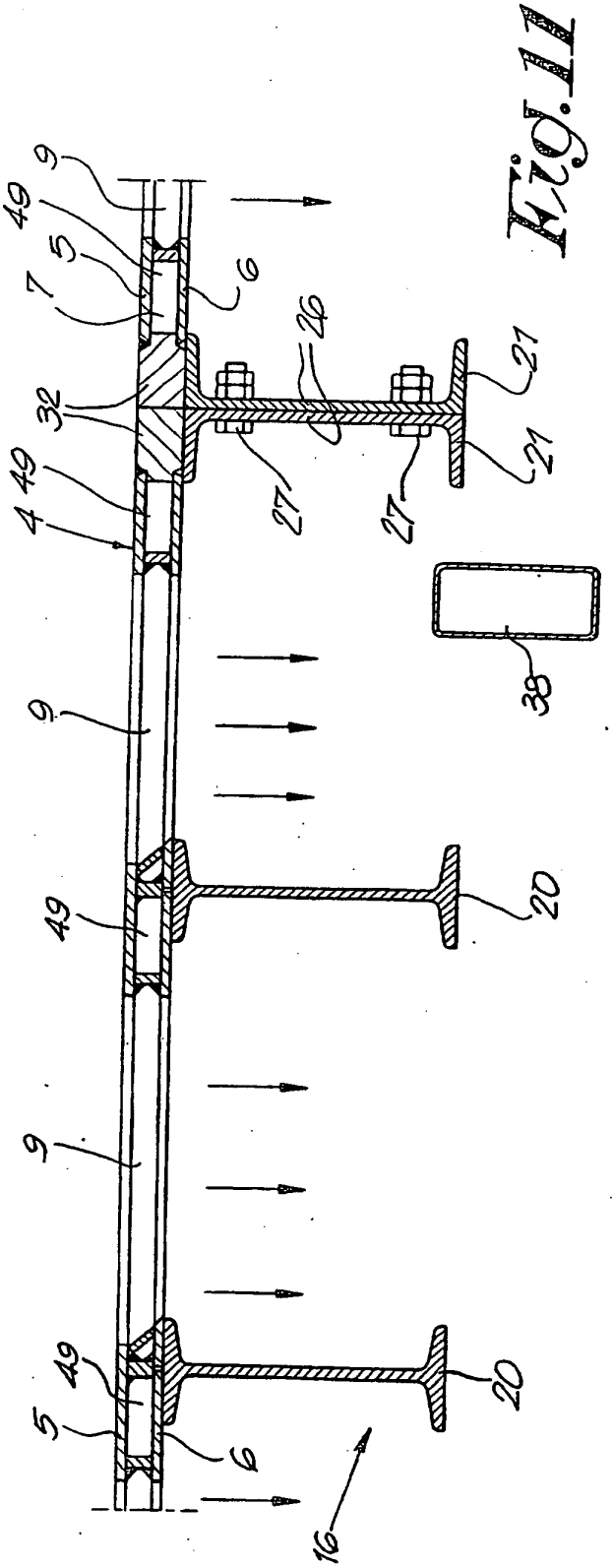

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Fig.11

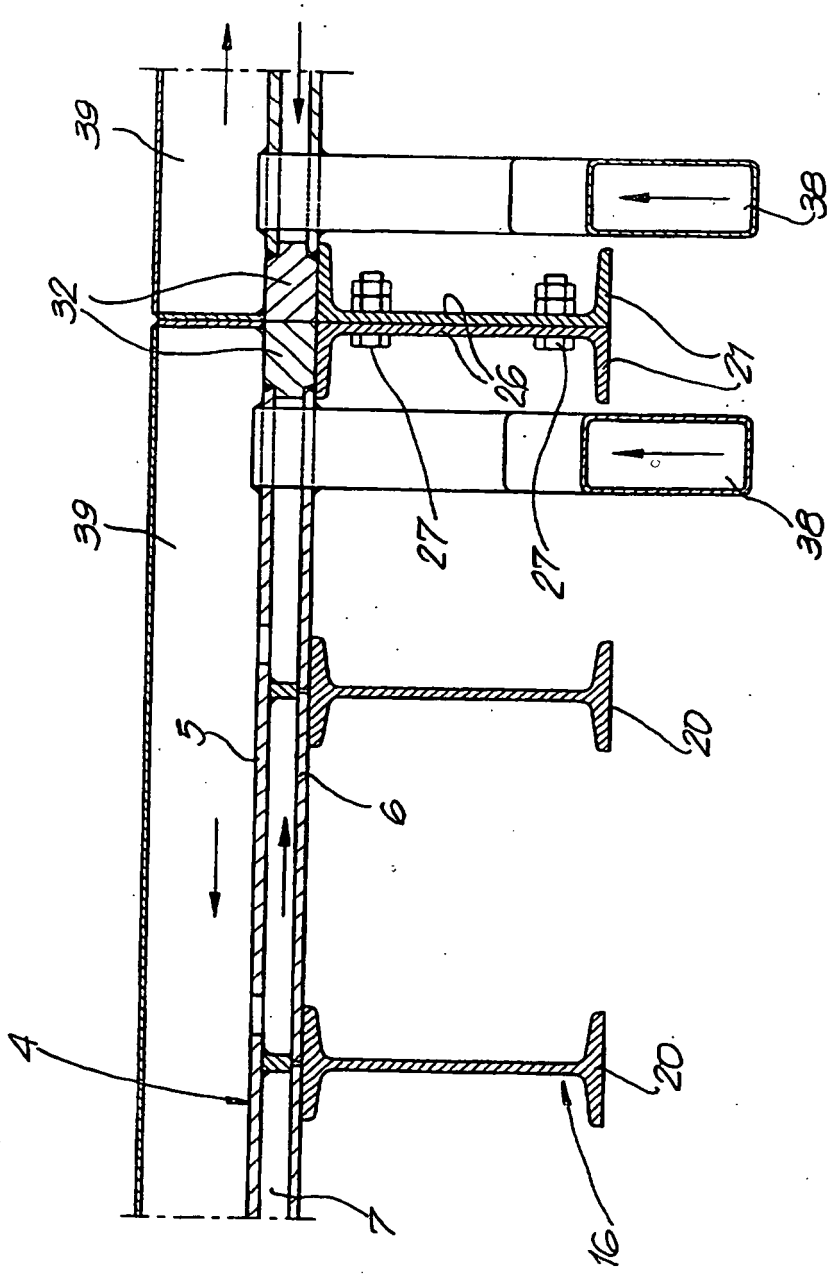


Fig.12

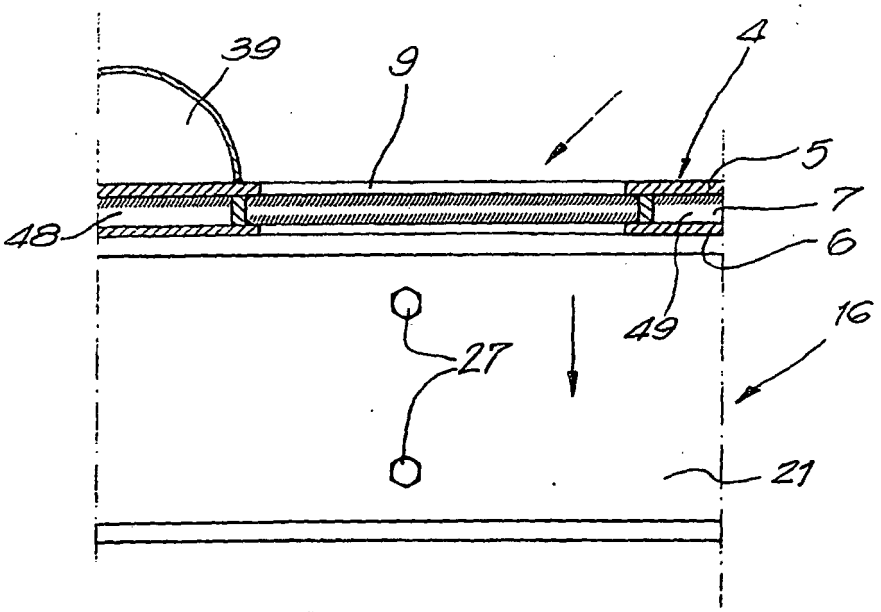


Fig. 13

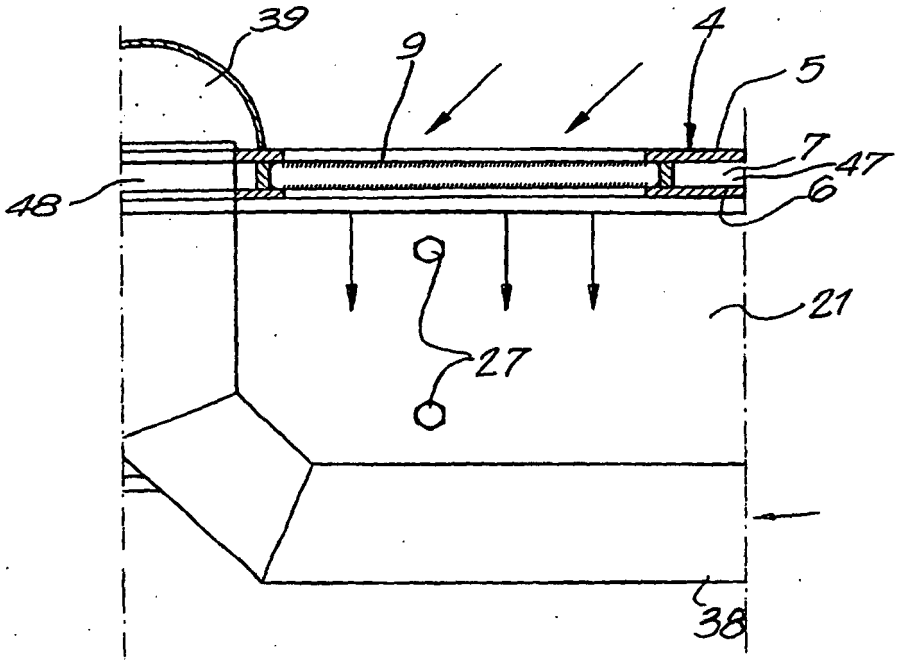


Fig. 14

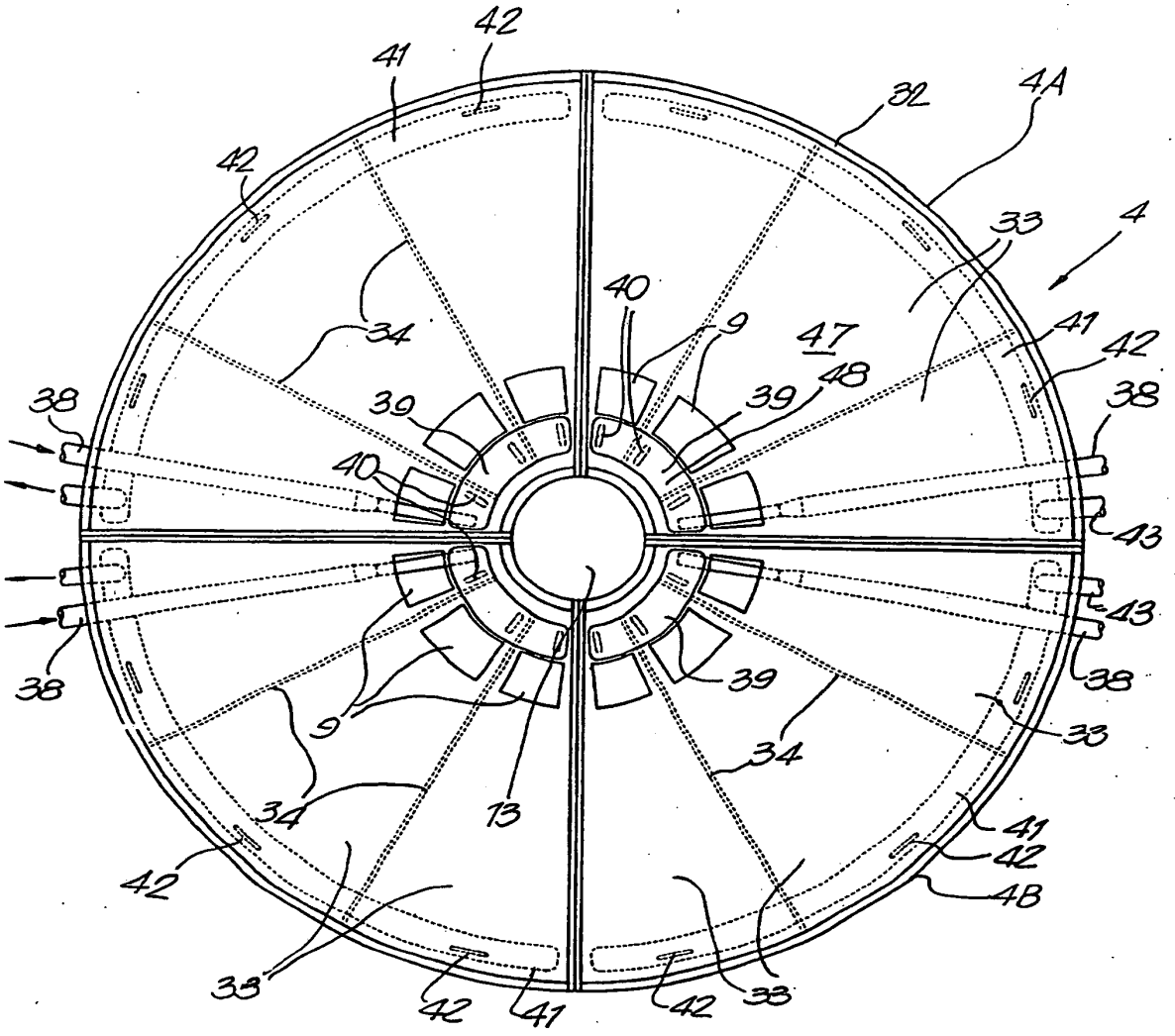

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Fig. 15

REFERENCES CITED IN THE DESCRIPTION

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