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(54) Titre : CORPS A RIGOLES
(54) Title: DRAINAGE BODY

(57) Abrégé/Abstract:
The invention presents a drainage body which has two substantially identically formed surface-area units, namely a base unit and a substantially identically formed cover unit, which can be connected to one another in an installed state via spacer elements. It is proposed to design the surface-area units such that they can be stacked in a substantially interengaging manner such that the spacing between the surface-area units in the installed state is substantially greater than the spacing therebetween in the stacked state, wherein the spacer elements are substantially in the form of a, for example, truncated cone or truncated pyramid with a circumscribed cross-sectional surface area which decreases as the spacing from the surface-area units increases. As an alternative to this, provision may be made for the spacer elements to be arranged on the surface-area units such that the base units and the cover units can be laid to overlap one another in the manner of a masonrywork assembly. This gives rise to a high level of stability with, at the same time, space-saving storage capability and transportation capability.

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(54) Title: DRAINAGE BODY

(54) Bezeichnung : RIGOLENKÖRPER

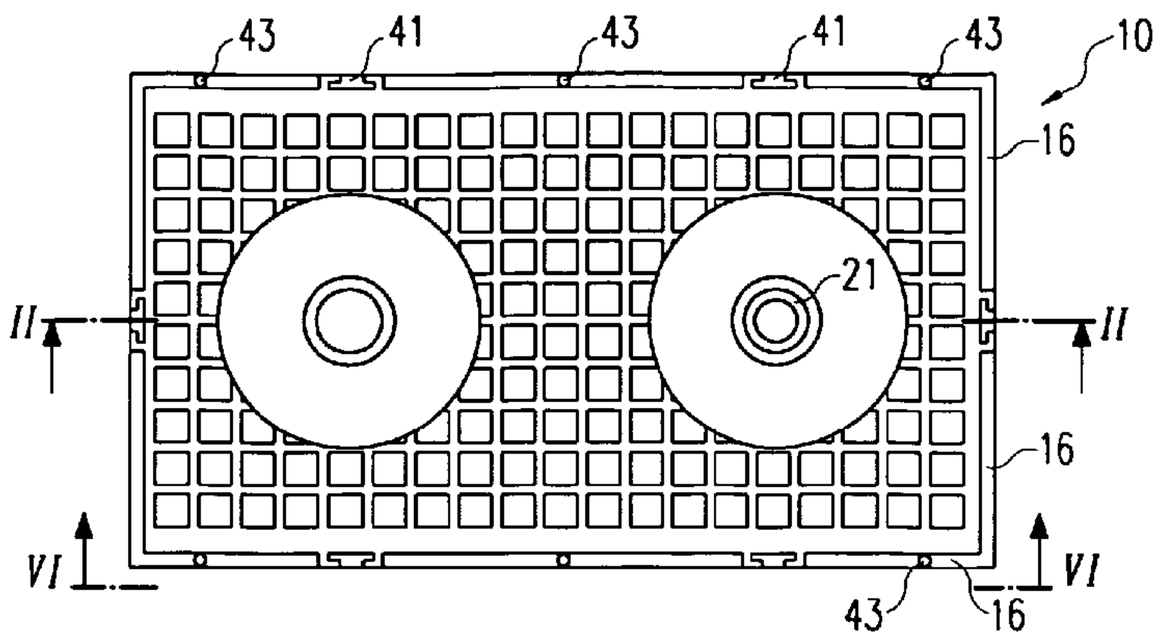


Fig. 1

(57) Abstract: The invention presents a drainage body which has two substantially identically formed surface-area units, namely a base unit and a substantially identically formed cover unit, which can be connected to one another in an installed state via spacer elements. It is proposed to design the surface-area units such that they can be stacked in a substantially interengaging manner such that the spacing between the surface-area units in the installed state is substantially greater than the spacing therebetween in the stacked state, wherein the spacer elements are substantially in the form of a, for example, truncated cone or truncated pyramid with a circumscribed cross-sectional surface area which decreases as the spacing from the surface-area units increases. As an alternative to this, provision may be made for the spacer elements to be arranged on the surface-area units such that the base units and the cover units can be laid to overlap one another in the manner of a masonrywork assembly. This gives rise to a high level of stability with, at the same time, space-saving storage capability and transportation capability.

(57) Zusammenfassung:

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— *mit internationalem Recherchenbericht (Artikel 21 Absatz 3)*

Es wird ein Rigolenkörper aufgezeigt, der zwei im Wesentlichen identisch geformte Flächeneinheiten, nämlich eine Bodeneinheit und eine im Wesentlichen identisch geformte Deckeleinheit aufweist, die über Abstandselemente miteinander in einem Bauabstand miteinander verbindbar sind. Es wird vorgeschlagen, die Flächeneinheiten derart im Wesentlichen ineinandergreifend stapelbar auszubilden, dass der Einbauabstand der Flächeneinheiten wesentlich größer ist als ihr Abstand im gestapelten Zustand, wobei die Abstandselemente im Wesentlichen eine, z.B. kegelstumpf- oder pyramidenstumpfförmige Formgestalt mit einer umschriebenen Querschnittsfläche aufweisen, die in zunehmendem Abstand von den Flächeneinheiten kleiner wird. Alternativ dazu kann vorgesehen sein, dass die Abstandselemente derart auf den Flächeneinheiten angeordnet sind, dass die Bodeneinheiten und die Deckeleinheiten einander überlappend nach Art eines Mauerwerksverbandes verlegbar sind. Dadurch wird eine hohe Stabilität bei gleichzeitig Platz sparender Lagerbarkeit und Transportierbarkeit geschaffen.

Drainage Body

Description

The invention relates to a drainage body according to the preamble of claim 1.

It should be mentioned at this point that the invention also relates to a drainage unit that comprises a plurality of such drainage bodies and in addition to further structures associated herewith.

The sealing of surfaces significantly impairs the groundwater balance. In addition to this, the surface and groundwater runoff must be diverted and fed to sewage treatment plants. Seepage structures, which are comprised of such drainage elements, are constructed to counteract this problem. Such drainage elements are disclosed, for example, in the following printed documents: DE 20 2005 010 090 U1; DE 202 21 567 U1; DE 10 2005 056 131 A1; EP 1 260 640 B1; DE 43 04 609 A1, EP 0 787 865 B1; EP 09 43 737 B1; EP 1 416 099 B1; DE 697 00 174 T2; DE 299 24 050 U1; EP 1 469 133 A2; EP 1 887 145 A1; EP 1 452 653 B1. These known drainage elements or seepage systems are only stable to a limited extent. Moreover, there exists a considerable problem with regard to transport and storage, as on the one hand the drainage units should have a reservoir volume that is as large as possible but on the other hand it is precisely this that increases the storage and stacking volume.DE 201 05 694 U1 discloses a water reservoir and retention system that is constructed from perforated bowls with side walls extending in a frusto-pyramid shape. This ensures good stackability. However, the disclosed system is then and only then suitable to take higher loads if the individual elements are relatively small. Moreover, it is not possible to construct units that conduct water from a plurality of such water reservoir boxes.

From EP 0 612 888 A1 discloses the use of specific moulds or casting equipment for the construction of water drainage systems. However, the method described therein is expensive and complex.

The object of the invention is to develop a drainage body according to EP 1 452 653 B1 to the effect that a high level of stability is assured.

This object is achieved by a drainage body according to claim 1.

In particular, this object is achieved by a drainage body having at least two substantially identically shaped surface units, that is a base unit and a substantially identically shaped top unit, which are combinable with one another an installation spacing by way of spacers, whereby the spacers are disposed on the surface units in such a manner that the base units and the top units can be laid overlapping one another in the manner of a masonry bond.

This special moulding of the spacers ensures that the surface units stand considerably more stably on top of one another. As a result, not only is it possible for higher loads to be absorbed from the surface but it is also possible to construct seepage systems that are still stable and which (temporarily) store a larger volume of water.

Preferably, the spacers essentially have, for example, a frusto-conical or frusto-pyramid shape with a circumscribed cross-sectional area which becomes smaller as its distance from the surface units increases.

It is particularly advantageous if a plurality of surface units are interlockingly stackable. Moreover, due to the formation of the surface units in such a manner that base and top consist of identical components, storage and transport is in turn improved and the effort involved in manufacture is reduced.

The spacers are preferably formed as hollow bodies having an internal cross-section that is congruent with the external cross-section in such a way that the spacers are insertable inside one another when stacking. Thus when stacked the spacers do not sit adjacent to one another but rather inside one another such that larger groups of surface units form stable packages. Preferably, the spacers are formed as hollow bodies and are moulded

integrally with the surface units.

The spacers preferably have plug/socket fastening sections distributed in such a manner that they engage in one another in the installed condition. This brings about a further increase in the stability of surface units stacked on top of one another. In this case, the surface units are interlockingly stackable in such a manner that the installation spacing of the surface units is considerably larger than their spacing in the stacked condition. Alternatively, the one, e.g. the socket fastening sections, may also be provided in the surface units while the other fastening sections are located on the spacers.

The spacers preferably have locking devices for mutual interlocking of the spacers with one another or for interlocking of the spacers with the surface units in the installed condition. As a result, one each of a base and an associated top already form stable units which can thus be constructed into larger “double bases”.

The surface units preferably also have breakaway sections for the formation of inspection openings, whereby preferably load distribution elements are provided in the inspection opening for fitting and supporting an inspection cover. In this way even major seepage systems can be cleaned from time to time in such a manner that the sludges and fine materials which prevent seepage can be flushed out and extracted by means of suction.

The spacers due to their conical shape already have a very high stability in respect of bending and buckling. Preferably, stiffening portions are attached to the spacers on their circumferential surfaces, however, which further increase stability. In particular, the outer surfaces are provided with corrugations which run parallel to the longitudinal axes of the spacers. As a whole, wave-like surface units are created similar to a “pudding mould”. A significant increase in the stability of the spacers is thereby achieved in a simple manner, particularly in relation to shearing forces.

Preferably, side walls are provided which are designed such that they may be attached to combine with each other at the base units and at the top units. Thus, structures

completely enclosed circumferentially up to water penetration openings may be formed which can be installed as hollow bodies in the ground.

Especially advantageous is when the side walls have side wall supports which become engaged with the spacers after joining the side walls to the base units and to the top units to support the side walls. Forces acting on the side walls are thereby passed to the spacers so that a significant stiffening of the side walls can be achieved via the spacers already present.

The surface units preferably have in particular joining devices on the margins for horizontal and/or vertical joining to other surface units and/or for attaching side walls. These joining devices are preferably designed such that, for example, two surface units may be placed on top of one another and joined to one another so that it is possible to construct systems of any height. Moreover, the surface units may be joined to one another horizontally such that it is essentially possible to construct surfaces of any size and any shape. Finally, walls may be inserted on the margins such that overall large-volume hollow bodies are created. The wall elements may also be used for stabilisation in the vertical direction.

The joining devices are preferably formed in this case such that the surface units have margins free from protrusions. This ensures that said systems are constructed without gaps which improves the stability of the systems.

The spacers may be provided as separate elements. Preferably, however, the spacers are formed as hollow bodies and are moulded integrally with the surface units. This measure opens up a particularly cost-effective opportunity for manufacturing the drainage bodies in plastic using manufacturing processes known per se.

Preferably, a plurality of additional elements is provided with which the drainage bodies may be constructed into drainage systems. These include in particular cover elements that are provided for covering openings in the surface units. These, for example, are openings in the region of the supporting elements formed as hollow bodies. That is to

say, if the spacers formed as hollow bodies have openings for allowing water that is intended to seep away to pass through, then the cover elements provided for them are also provided with openings such that the water that is intended to seep away can also penetrate through these covers into the surrounding soil.

It is then possible to construct individual, box-shaped drainage bodies and to assemble these bodies into larger units via the joining devices located on their margins. Increased stability, however, arises in particular when the base and top units are assembled in a bond in the manner of a masonry bond. For this the spacers and/or the plug fastening sections and the socket fastening sections are disposed in such a manner on the surface units that the base units and the top units may be laid so as to be overlapping one another. It is possible to lay the individual units under an angle of 90°. The advantages of such a manner of laying correspond to those which are known from the construction of masonry bonds. Such an arrangement arises in particular if the following rules are observed:

a) The arrangement of fastening sections each identically formed on one half of the surface unit is laterally reversed in respect of a diagonal of this half of the surface unit;

b) The arrangement of the fastening sections is mirrored in respect of a first area bisector of the surface unit;

c) In respect of a second area bisector of the surface unit, the arrangement of the fastening sections is inverted such that in each case the other fastening section is located in a mirrored position.

It emerges from the above that a drainage system is also claimed which includes a plurality of drainage bodies of the type described. This drainage system comprises base units which are combined with top units so as to overlap one another in the manner of a masonry bond.

Preferred embodiments of the invention will be explained subsequently in greater detail on the basis of drawings. The drawings show:

Fig. 1 a view from above onto a surface unit in a view corresponding to line I-I from Fig. 2,

Fig. 2 a section through the surface unit according to Fig. 1 along line II-II from Fig. 1,

Fig. 3 a view from below onto a surface unit according to Fig. 1 in a view along line III-III from Fig. 2,

Fig. 4 a view from above onto a cover for covering an opening as it is shown in Figs. 1 to 3,

Fig. 5 a partial view of a wall element,

Fig. 6 a view onto the surface unit according to Figs. 1 to 3 in a view along line VI-VI from Fig. 1,

Figs. 7 to 9 sectional views corresponding to Fig. 2 on to two surface units in various conditions, that is to say stacked (Fig. 7) in a condition shortly before assembly (Fig. 8) and in the assembled condition (Fig. 9),

Fig. 10 an enlarged view of region X from Fig. 9,

Fig. 11 a diagrammatic illustration for the assembly of top units on base units in a bonded manner,

Fig. 12 a view from above corresponding to that according to Fig. 1 but on to a different embodiment of the invention,

Fig. 13 a lateral view of a load distribution element,

Fig. 14 a view from below according to Fig. 13 along line XIV-XIV from Fig. 13.

Fig. 15 a view from above onto a group of surface units according to Fig. 12 that have been assembled into a base unit and a group of such surface units that have been assembled into a top unit and may be flipped over onto the base unit,

Figs. 16 to19 schematic illustrations of arrangements of plug and socket fastening sections.

Figs. 20 and 21 to perspective views of a further embodiment of the surface units,

Fig. 22 a completed drainage body with two open side walls and

Fig. 23 a partially cut drainage body similar to that of fig. 22.

The same reference numerals are used in the following description for identical parts and parts acting in an identical manner.

The surface unit illustrated in Figs. 1 to 6 is so to speak a “minimum element”, which, as surface unit 10, has a grid structure projecting from which frusto-conical spacers 20, 20’ are provided. These spacers 20, 20’ have differently shaped end sections. Spacer 20 has a plug end section 21 und spacer 20’ a socket end section 22. In this case, these end sections are dimensioned such that a plug end section 21 is insertable into socket end section 22 so as to fit.

Moreover, spacers 20, 20’ have congruent internal and external cross-sections such that they are insertable into one another.

Moreover, surface units 10 have margins 17 which are continuously moulded in such a manner that on placing surface units 10 next to one another they lie adjacently substantially without a gap.

In order to combine adjacently positioned surface units 10 with one another, retaining grooves 41 are provided in the marginal regions of the surface units into which joining studs 42 (see Fig. 3) are insertable. A joining stud 42 thus sits in two retaining grooves 41 that are adjacent to one another when two adjacent surface units 10 are in the assembled condition. So that it is also possible to place two surface units 10 on top of one another (whereby spacers 20 then project in opposing directions), further joining studs 42 (not shown in the Figures) are illustrated, having only half the cross-section of a joining stud 42 illustrated here, such that the joining stud does not then protrude beyond margin 17 of surface units 10 lying on top of one another. If two such groups of surface units 10, which are lying on top of one another, are to be joined to one another on all sides, then joining studs are provided for this purpose having twice the height of those joining studs which are used merely for "horizontal joining" of surface units 10.

So as to be able to attach side walls 15 (see Fig. 5), surface units 10 have marginal grooves 16 on one hand and insertion pins 44 on the other, which are insertable in insertion holes 43 of side walls 15. In this case, the margins of side walls 15 are moulded in such a way that side wall 15 does not project beyond margin 17 of surface unit 10 when a side wall 15 is joined to a surface unit 10.

Covers 35 (see Fig. 4) are provided so that openings 23, 23' (see Figs. 2 and 3) can be sealed.

The surface units illustrated in Figs. 1 to 3, 5 and 6 are presented again in section as schematic diagrams in Figs. 7 to 10 (similar to Fig. 2). In this case, Fig. 7 illustrates two surface units 10 inserted into one another. Height D_S thus arising, that is to say the stacking height, is only slightly greater relatively than the height of a single surface unit plus the height of spacers 20, 20'.

In order to attach two surface units 10 to one another to form a drainage body, one surface unit 10 is turned relative to the other surface unit 10 such that the arrangement illustrated in Fig. 8 is created. Thus in this case, a spacer 20, having a plug end section 21 on its upper margin, opposes a spacer 20', having a socket end section 22. These end sections may - as illustrated in Fig. 9 - be inserted into one another such that then surface units 10 form a base unit 11 on the one hand and a top unit 12 on the other. Here, teeth 24 on the one hand and notches 25 on the other are provided in plug end sections 21 and socket end sections 22, which - as illustrated in Fig. 10 - interlock such that base unit 11 is joined to top unit 12 by way of spacers 20, 20'. Thus two surface units 10, when joined to one another by way of spacers 20 and interlocking devices 24, 25, already form stable bodies, the stability of which is guaranteed in all directions. In this case, installation distance D_E is considerably larger than stacking distance D_S.

Fig. 11 illustrates how the various surface units may be assembled in the manner of a bond. It is apparent from this diagram that top units 12 are installed on base units 11 in an offset manner such that the arrangement of three surface units 10, 10', 10'' illustrated on the right in Fig. 11 is joined into a single body, which (extending to the left in Fig. 11) can be continued indefinitely. This contributes to a significant increase in the stability of such an overall arrangement.

The surface unit illustrated in Fig. 12 in a view from above similar to that according to Fig. 1 differs from the surface unit previously described in that it is not a "minimum surface unit" but is rather constructed from a total of four such surface units (formed integrally).

Moreover, a series of breakaway sections 13 is provided in surface unit 10 according to Figs. 12 to 14 which, although covered by way of grids like remaining surface unit 10, can nevertheless be broken away from the surrounding material. Such openings are used as inspection accesses to the interior of the drainage bodies. Once such drainage bodies are installed in the ground, that is to say are covered with a layer of soil, load elements 30 are provided which may be placed on such breakaway sections 13 that have been broken out. These load distribution elements 30 have a pipe section 31 that may

be cut to size, which may be sealed at its top end by means of a conventional (cast) cover (not illustrated) such that an inspection opening 34 is formed after removal of the cover. At the bottom end of load distribution element 30 support arms 32 are provided, which are used to transmit forces acting on the top end (or on the cover positioned on it) to surface unit 10 over as wide an area as possible.

It should be pointed out at this point that the details described previously, such as, for example, joining devices 41 and 43, should also be present in the embodiment according to Figs. 12 to 14 but are not illustrated for reasons of simplifying the drawing.

It emerges from the above that using surface units 10 presented here and their spacers 20 it is possible to create any number of spaces and channels that are only terminated on their external contours by side walls 15 (see Fig. 5). If one wants to increase the stability of the bodies thus created, then side walls may also be attached inside them.

Fig. 15 shows an assembly of a plurality of surface units according to Fig. 12. Illustrated on the left-hand side of Fig. 15 is a base unit 11, on the right is a top unit 12. If one flips top unit 12 over on to base unit 11 such that plug fastening sections 21 insert into socket fastening sections 22, a drainage body is created which by means of assembly in the manner of a bond is extremely stable per se even without additional bonding of base unit 11 and top unit 12 forming surface units 10.

Figs. 16 to 19 disclose various examples of how the “opposing” fastening devices, that is to say plug fastening devices 21 and socket fastening devices 22, are to be disposed so that on the one hand the surface units can form both base units and also top units and on the other hand assembly can be carried out in the manner of a bond.

In the following, a further embodiment of the invention is described in more detail on the basis of figs. 20 to 23. In these drawings, individual surface units, respectively, drainage bodies are shown which are assembled from individual surface units. From the preceding explanations it follows, however, that such individual elements can be integrated in a manner of a bond with other individual elements to larger drainage

bodies.

The surface units, respectively, drainage bodies according to figs. 20 to 23 differ from the preceding embodiments, first of all, in that the spacers do not have a smooth surface but are provided with corrugations 26, respectively, wave-shaped circumferential surfaces. Thereby, significantly increased stability results in particular against transverse loads and against buckling, respectively, bending.

The side walls have side wall supports 18, which in the assembled state (see figs. 22 and 23), produce a support of the side walls 15 at the spacers. Reference is also made to figs. 8 and 9 which show in principle how such a support functions. Through this construction, a significant increase in the stability of the drainage body and an increase in the resilience is ensured against lateral loads.

Furthermore, it can be seen from figs. 20 to 23 that the surface units 10 and the side walls 15 are constructed as honeycomb structures and thereby offer good water permeability, on the one hand, and a high stability, on the other hand. The surface units 10 and the side walls 15, finally, have breakaway sections 13, already described above, through which pipe connections can be carried out or inspection openings can be created.

List of reference numbers

10	Surface unit
11	Base unit
12	Top unit
13	Breakaway section
15	Side wall
16	Marginal groove
17	Margin
18	Side wall support
20, 20’	Spacer
21	Plug fastening section
22	Socket fastening section
23, 23’	Opening
24	Toothing
25	Notch
26	Stiffening corrugation
30	Load distribution element
31	Pipe section
32	Supporting arm
34	Inspection opening
35	Cover
41	Retaining groove
42	Joining stud
43	Insertion hole
44	Insertion pin
D_E	Installation distance
D_S	Stacking distance

Claims

1. Drainage body, comprising at least two substantially identically shaped surface units (10), that is a base unit (11) and a substantially identically shaped top unit (12), which are combinable with one another in an installation spacing (DE) by way of spacers (20),

characterised in that

the spacers (20, 20') are disposed in such a manner on the surface units (10) that the base units (11) and the top units (12) are layable so as to be overlapping one another in the manner of a masonry bond.

2. Drainage body according to claim 1,

characterised in that

the spacers (20) essentially have, for example, a frusto-conical or frusto-pyramid shape with a circumscribed cross-sectional area which becomes smaller as its distance from the surface units (10) increases.

3. Drainage body according to one of the preceding claims,

characterised in that

the spacers (20) are formed as hollow bodies and are moulded integrally with the surface units (10).

4. Drainage body according to one of the preceding claims,

characterised in that

the surface units (10) are interlockingly stackable in a similarly oriented manner and preferably without offset such that the installation spacing ($_{DE}$) of the surface units (10) is considerably larger than their spacing (D_S) from one another in the stacked condition.

5. Drainage body according to one of the preceding claims, in particular according to claim 2,

characterised in that

the spacers (20) and/or the surface units (10) have plug/socket fastening sections (21/22) distributed in such a way that fastening sections (21, 22), which are each complementary to one another, interlock in the installed condition.

6. Drainage body according to one of the preceding claims, in particular according to claim 5,

characterised in that

fastening sections (21, 22), which are each complementary to one another, are disposed on a surface unit (10) in such a manner that the following rules are applicable:

a) The arrangement of fastening sections (21, 22) each identically formed on one half of the surface unit (10) is laterally reversed in respect of a diagonal of this half of the surface unit (10);

b) The arrangement of the fastening sections (21, 22) is mirrored in respect of a first area bisector of the surface unit (10);

c) In respect of a second area bisector of the surface unit (10), the arrangement of the fastening sections (21, 22) is inverted such that in each case the other fastening section (21, 22) is located in a mirrored position.

7. Drainage body according to one of the preceding claims, in particular according to claim 5 or 6,

characterised in that

the fixing sections (21, 22) have locking devices (24, 25) for mutual interlocking of the spacers (20) and/or for interlocking of the spacers (20) with the surface units (10) in the installed condition.

8. Drainage body according to one of the preceding claims,

characterised in that

the surface units (10) have breakaway sections (13) for the formation of inspection openings (34) and that load distribution elements (30) are provided for placing on the inspection opening (34) and for supporting the cover.

9. Drainage body according to one of the preceding claims,

characterised in that

the spacers (20, 20') have stiffening portions, in particular stiffening corrugations (26) on their circumferential surfaces for stiffening against bending and buckling.

10. Drainage body according to one of the preceding claims,

characterised in that

the side walls (15) are provided and designed such that they are attachable to the base units (11) and to the top units (12) to combine with each other.

11. Drainage body according to one of the preceding claims, in particular according to claim 10,

characterized in that

the side walls (15) have side wall supports (18) which, after joining the side walls (15) to the base units (11) and to the top units (12), are engaged preferably at their ends with the spacers (20, 20') to support the side walls (15).

12. Drainage body according to one of the preceding claims,

characterised in that

the surface units (10) have in particular joining devices (41, 43) on the margins for horizontal and/or vertical joining to other surface units (10) and/or for attaching side walls (15).

13. Drainage body according to one of the preceding claims,

characterised by

cover elements (35) for covering openings in the surface units (10) in the region of the spacers (20).

14. Drainage body, comprising a plurality of substantially identically shaped surface units (10), that is base units (11) and substantially identically shaped top units (12), in particular drainage bodies according to one of the preceding claims, characterised in that

the base units (11) and the top units (12) are joined together so as to be overlapping one another in the manner of a masonry bond.

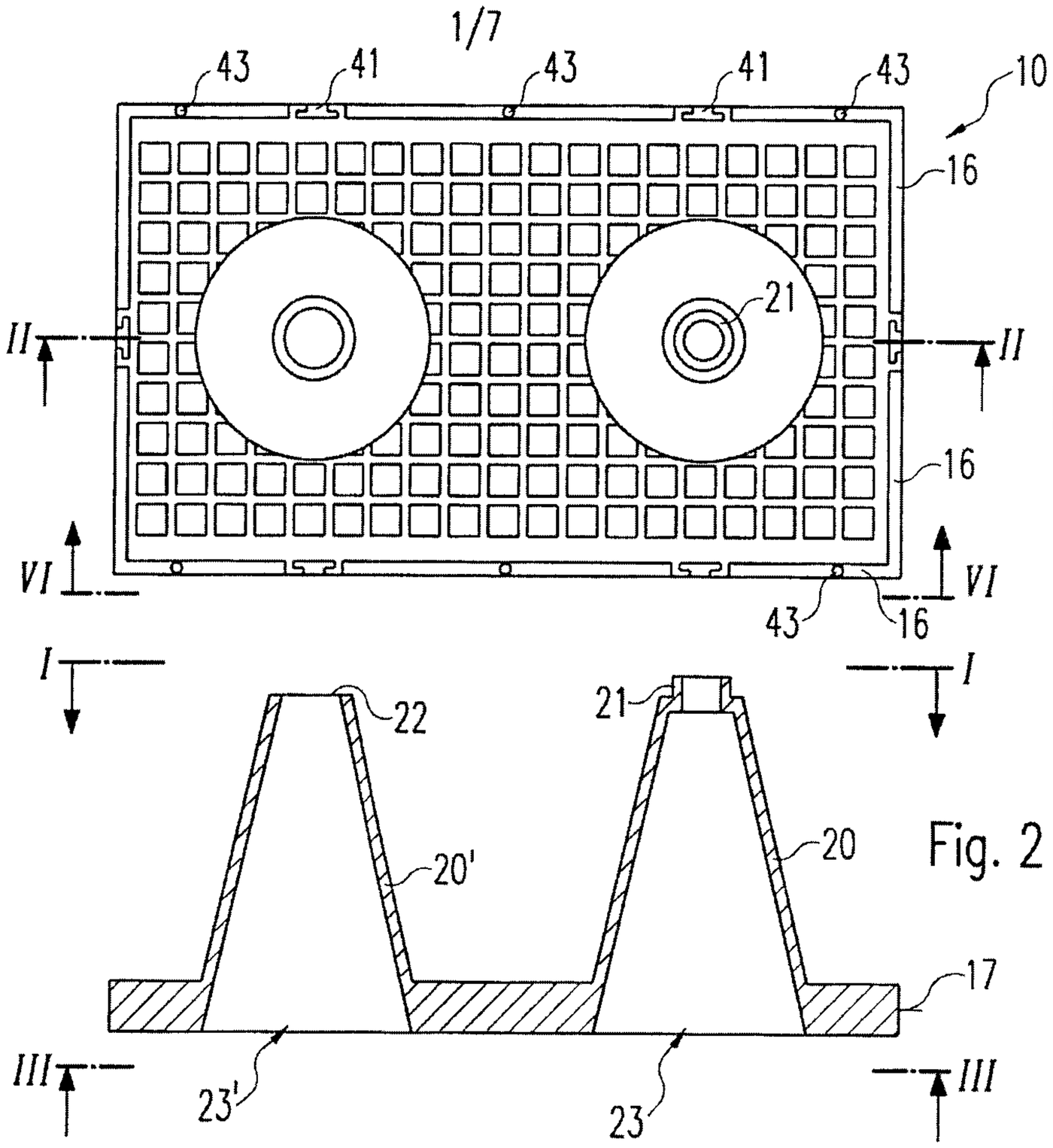


Fig. 1

Fig. 2

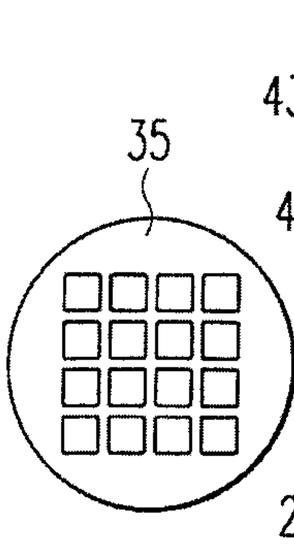


Fig. 4

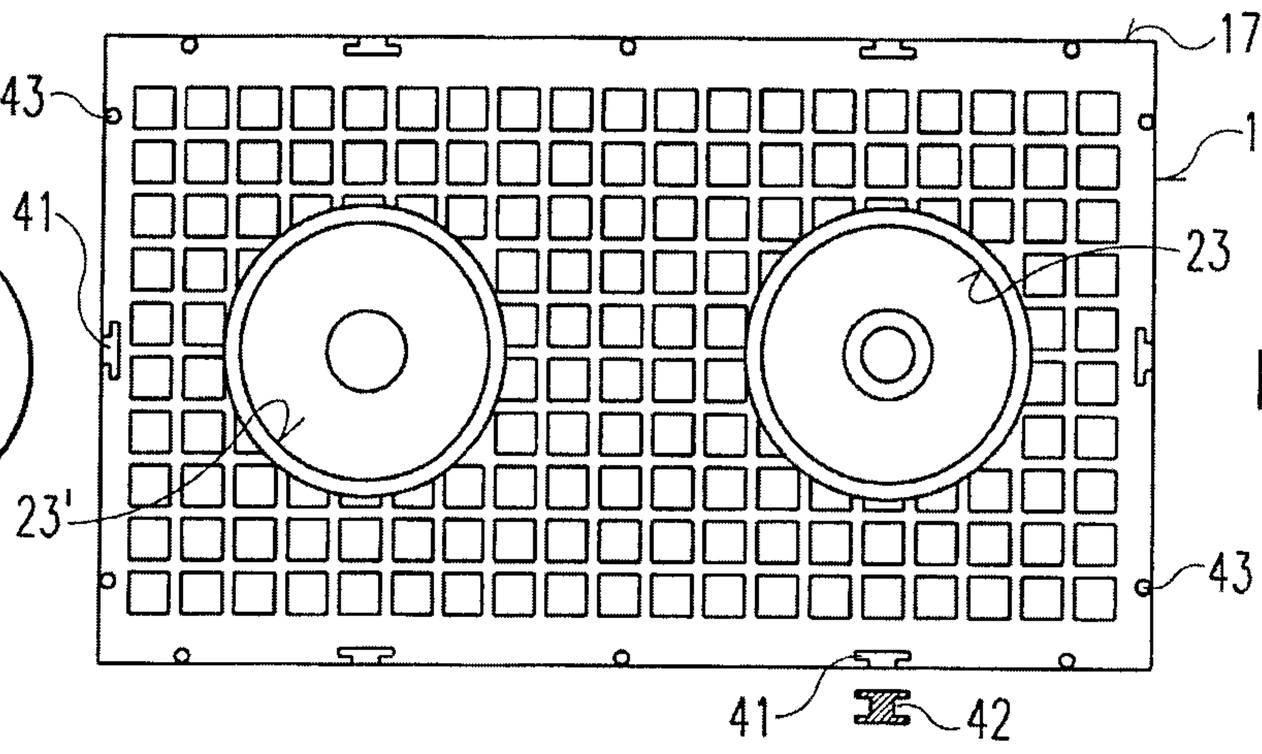


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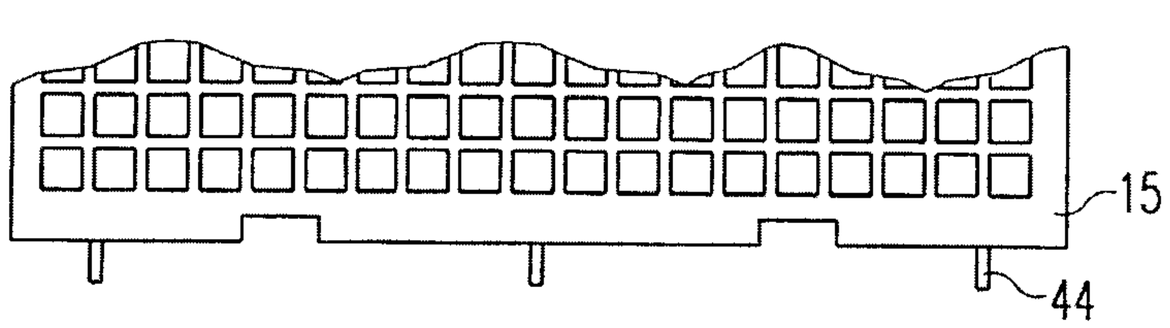


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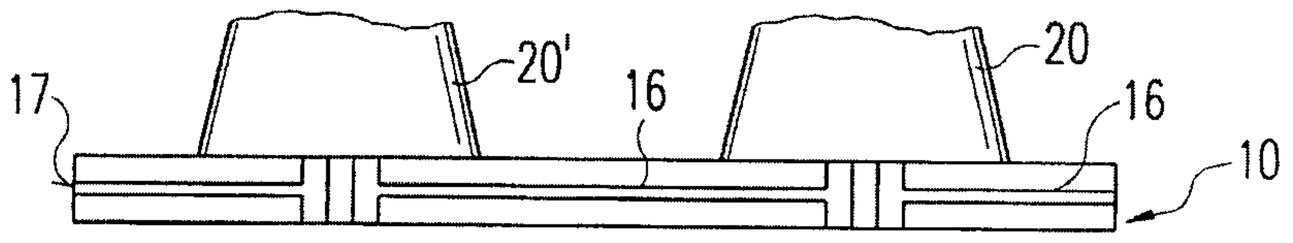


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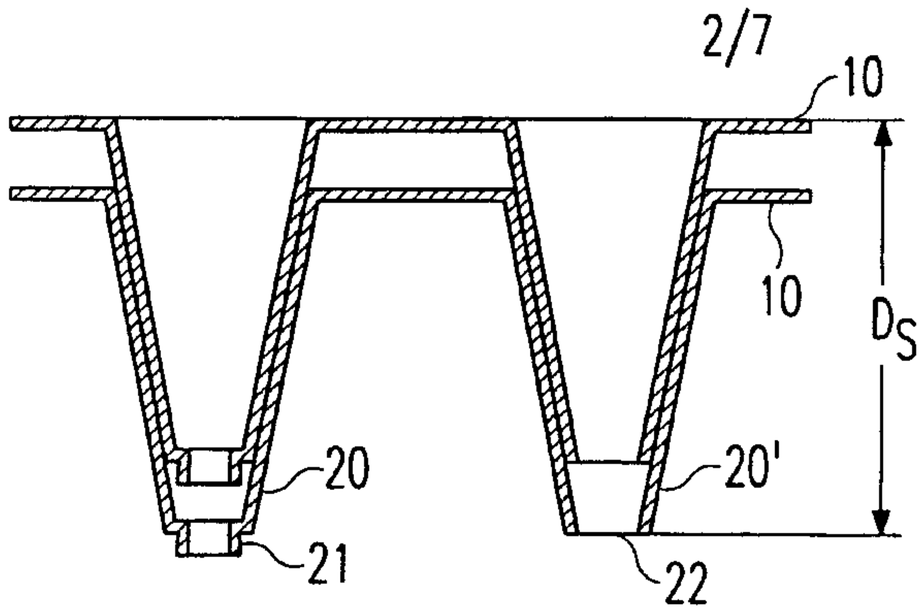


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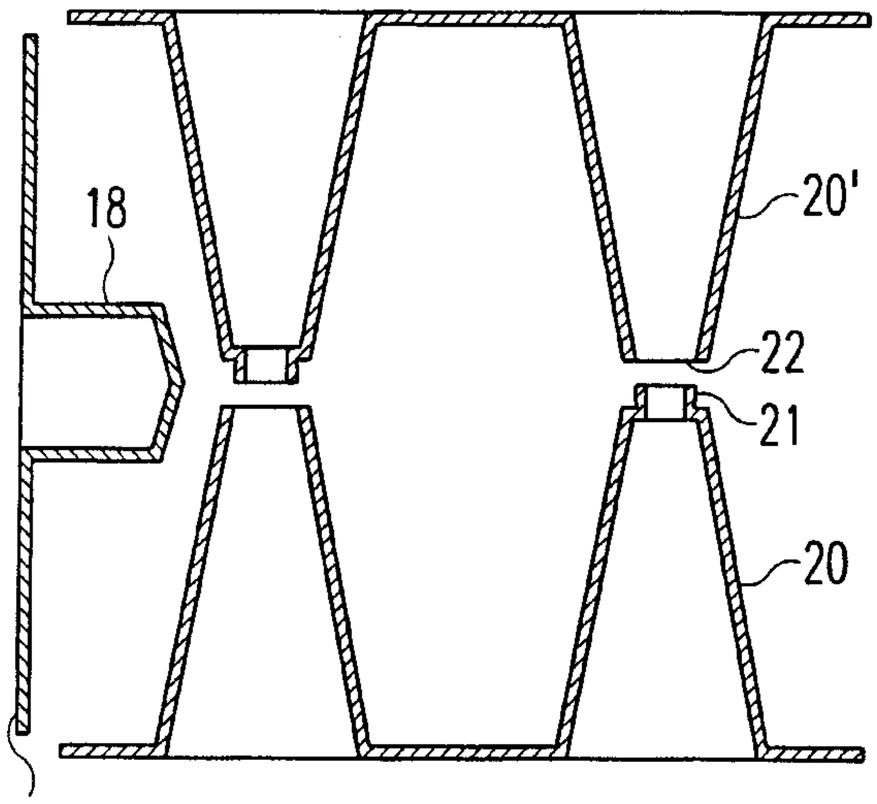


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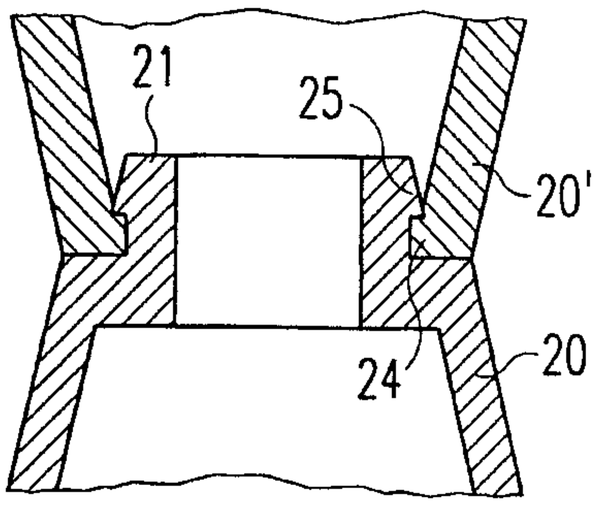


Fig. 10

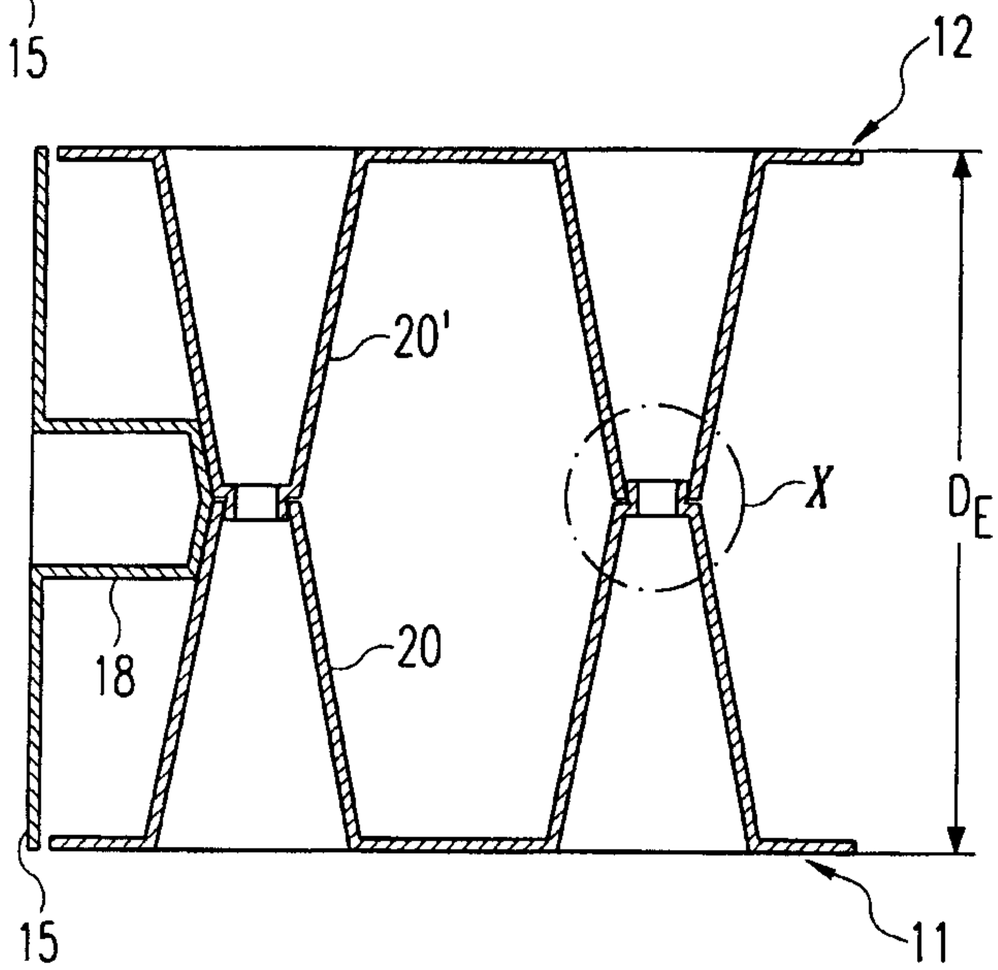


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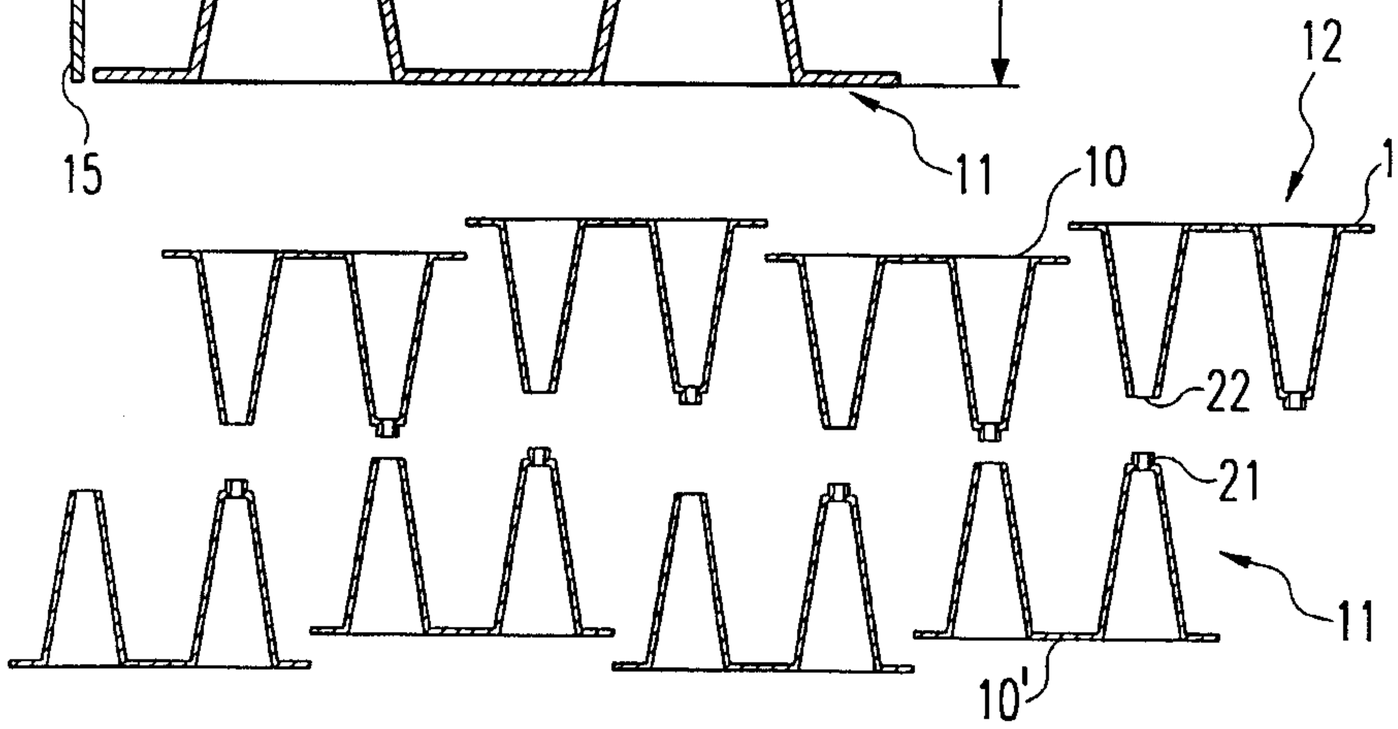


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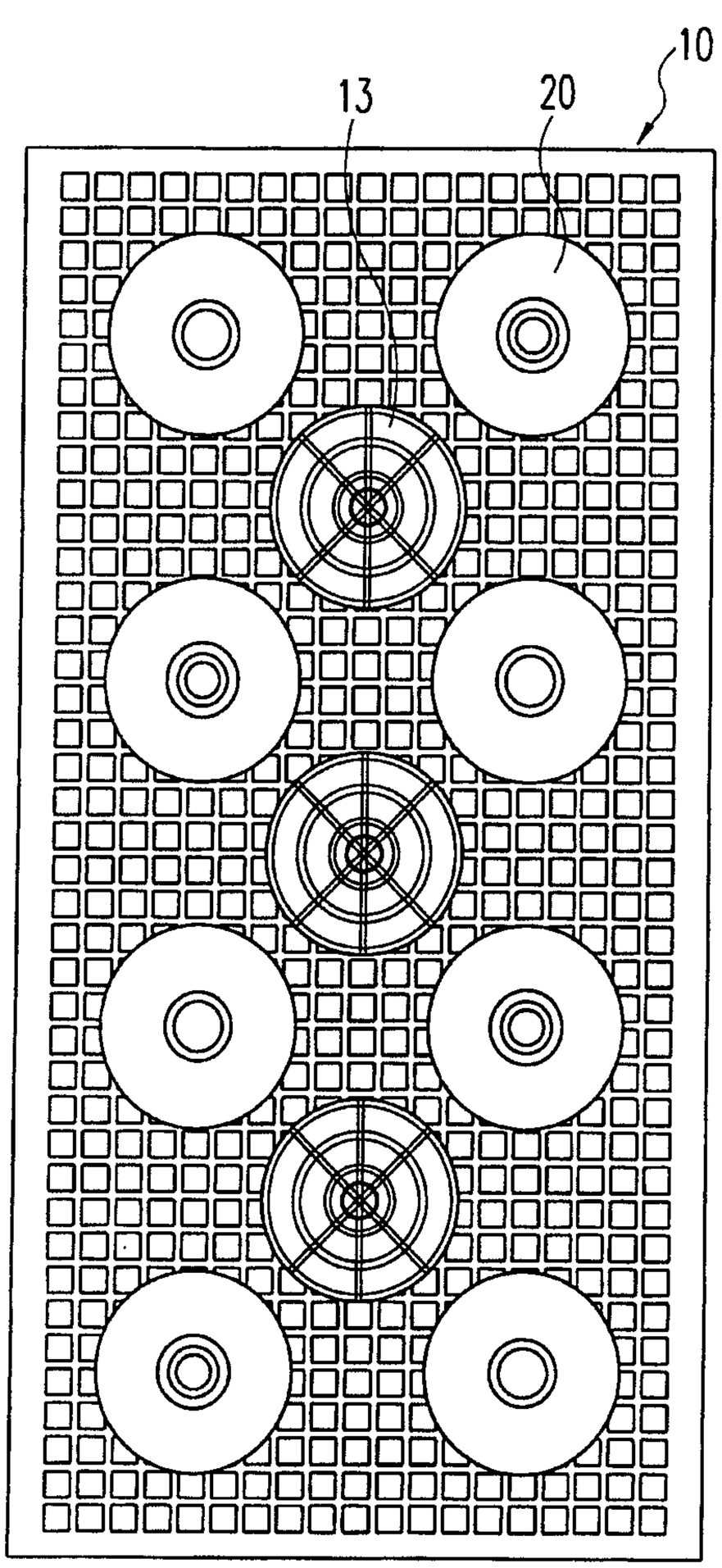


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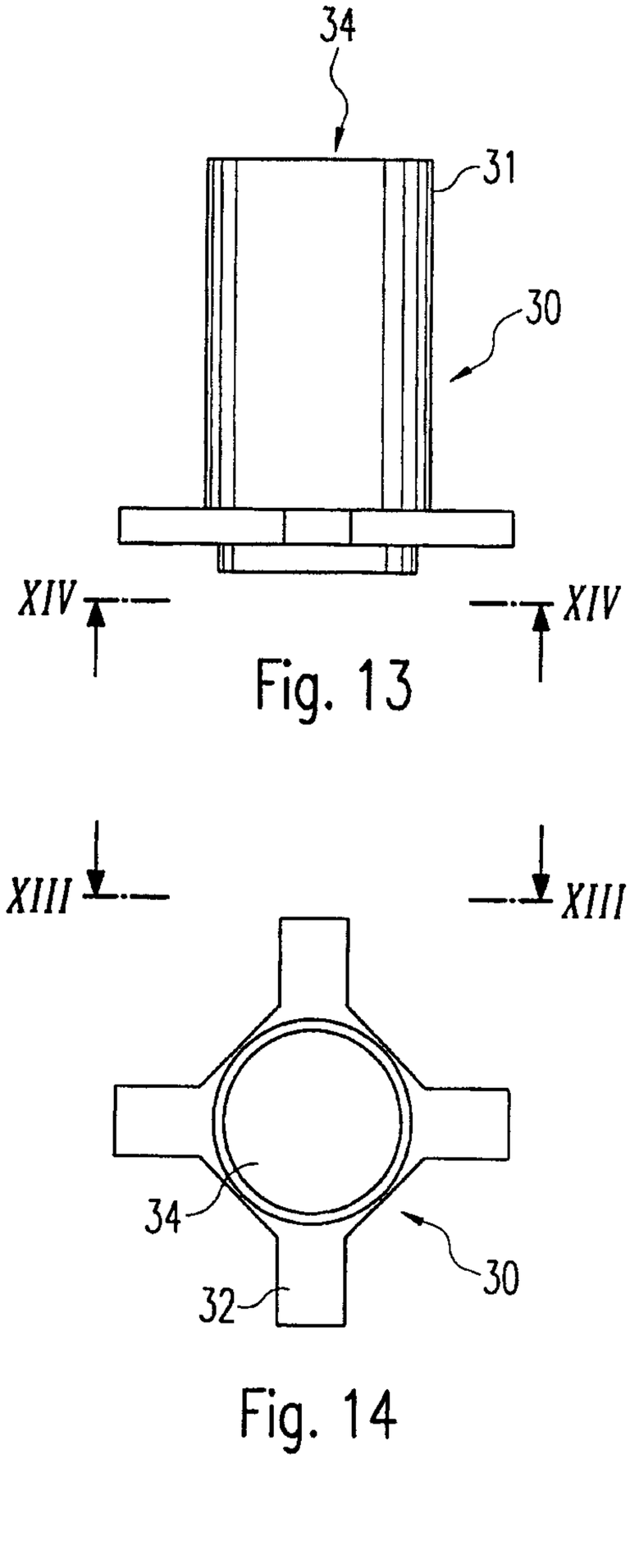


Fig. 13

Fig. 14

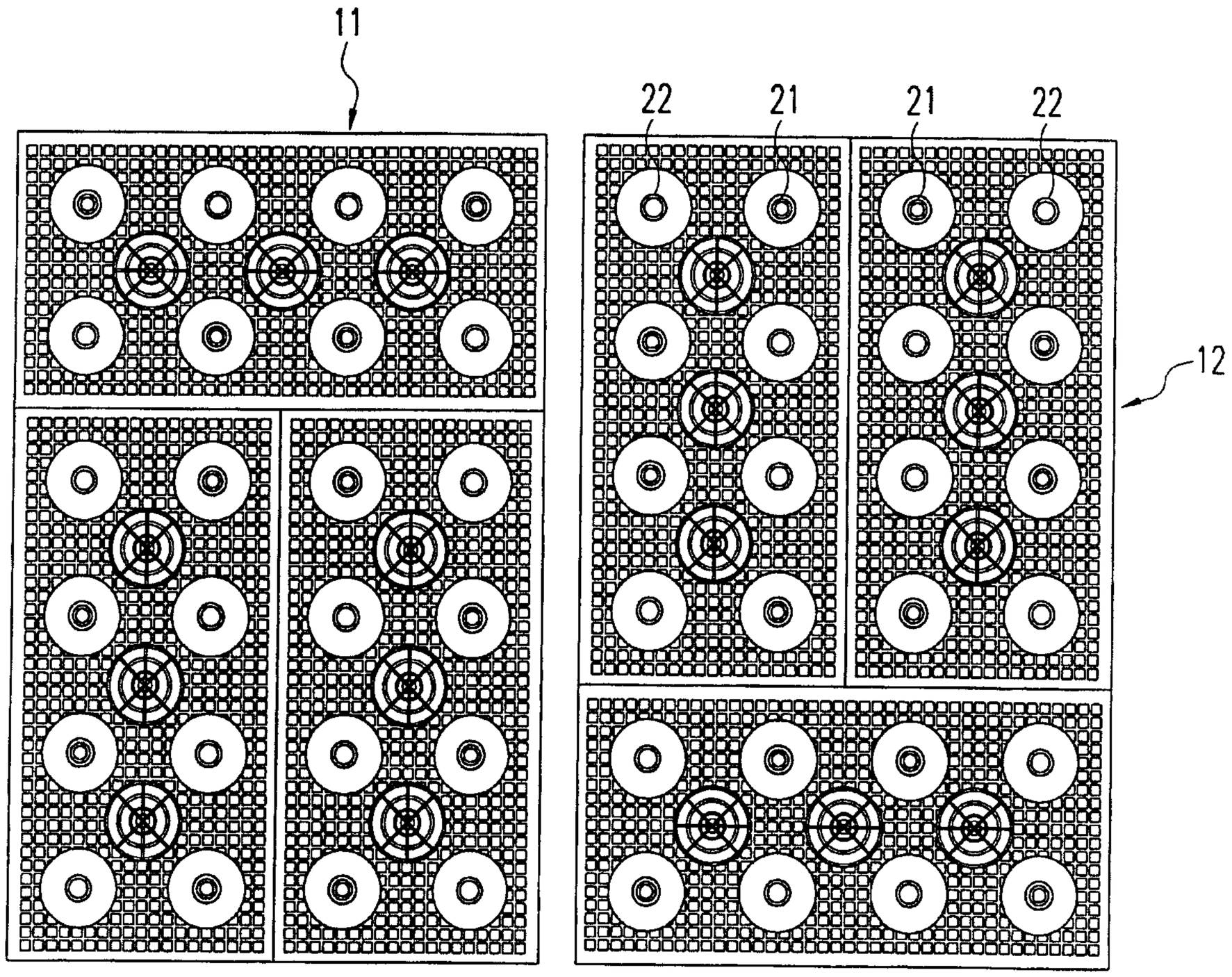


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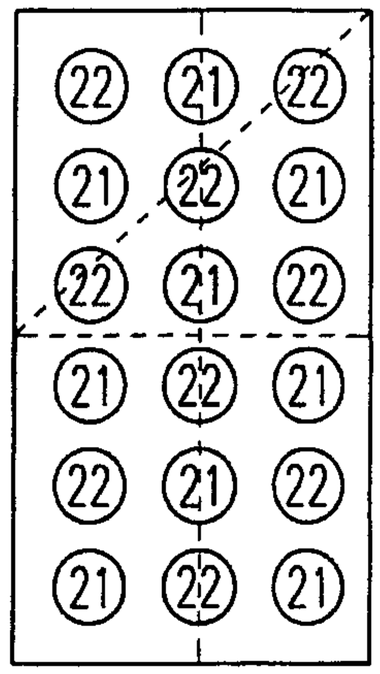


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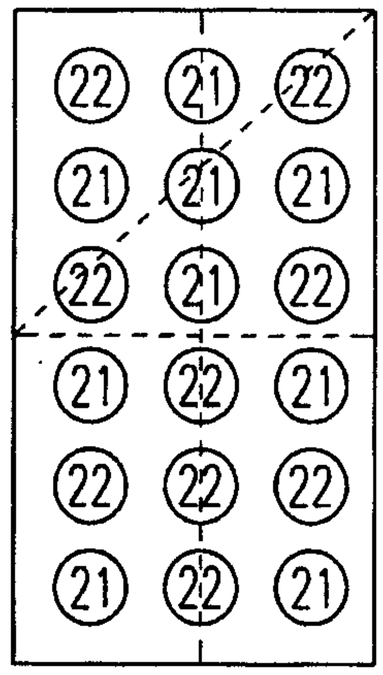


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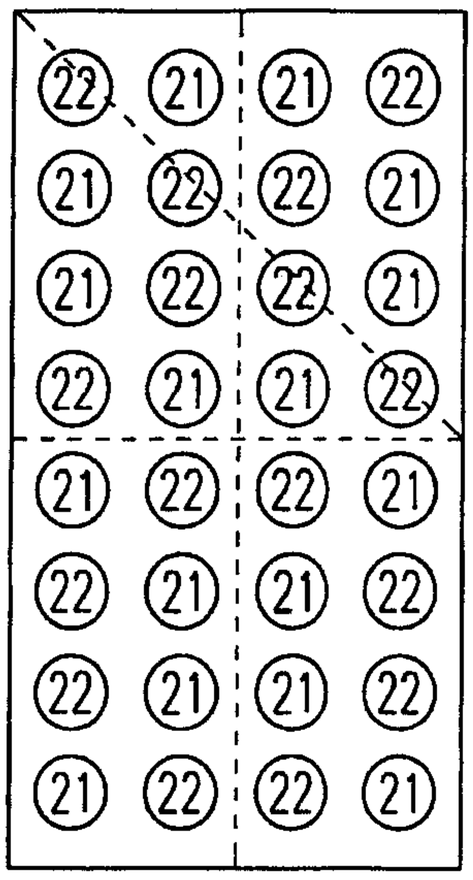


Fig. 18

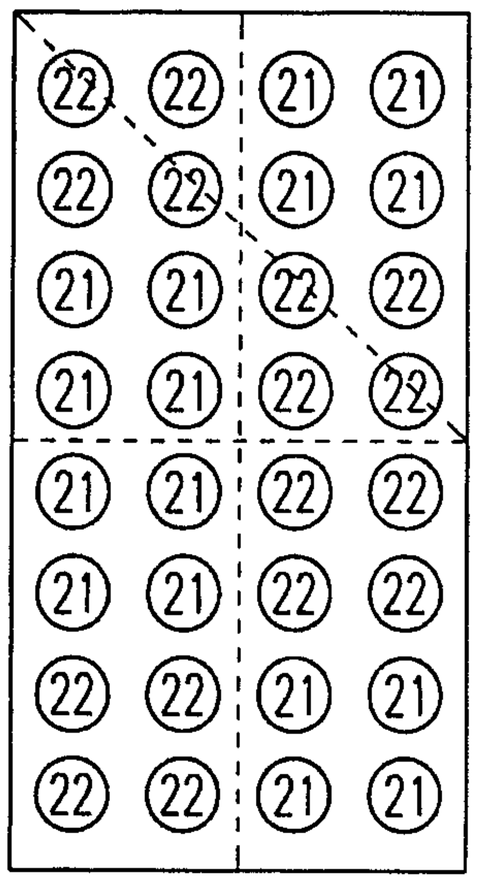


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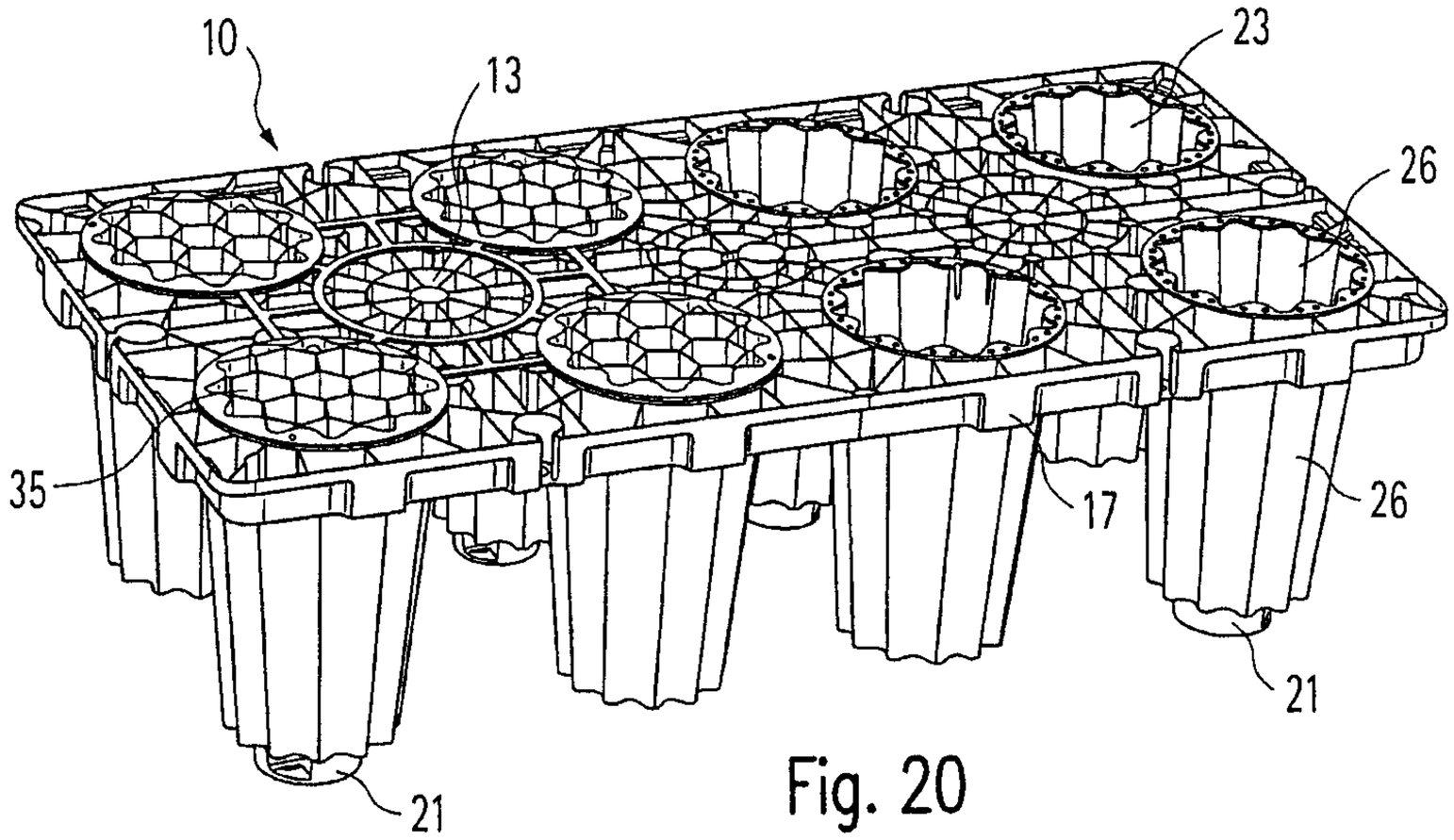


Fig. 20

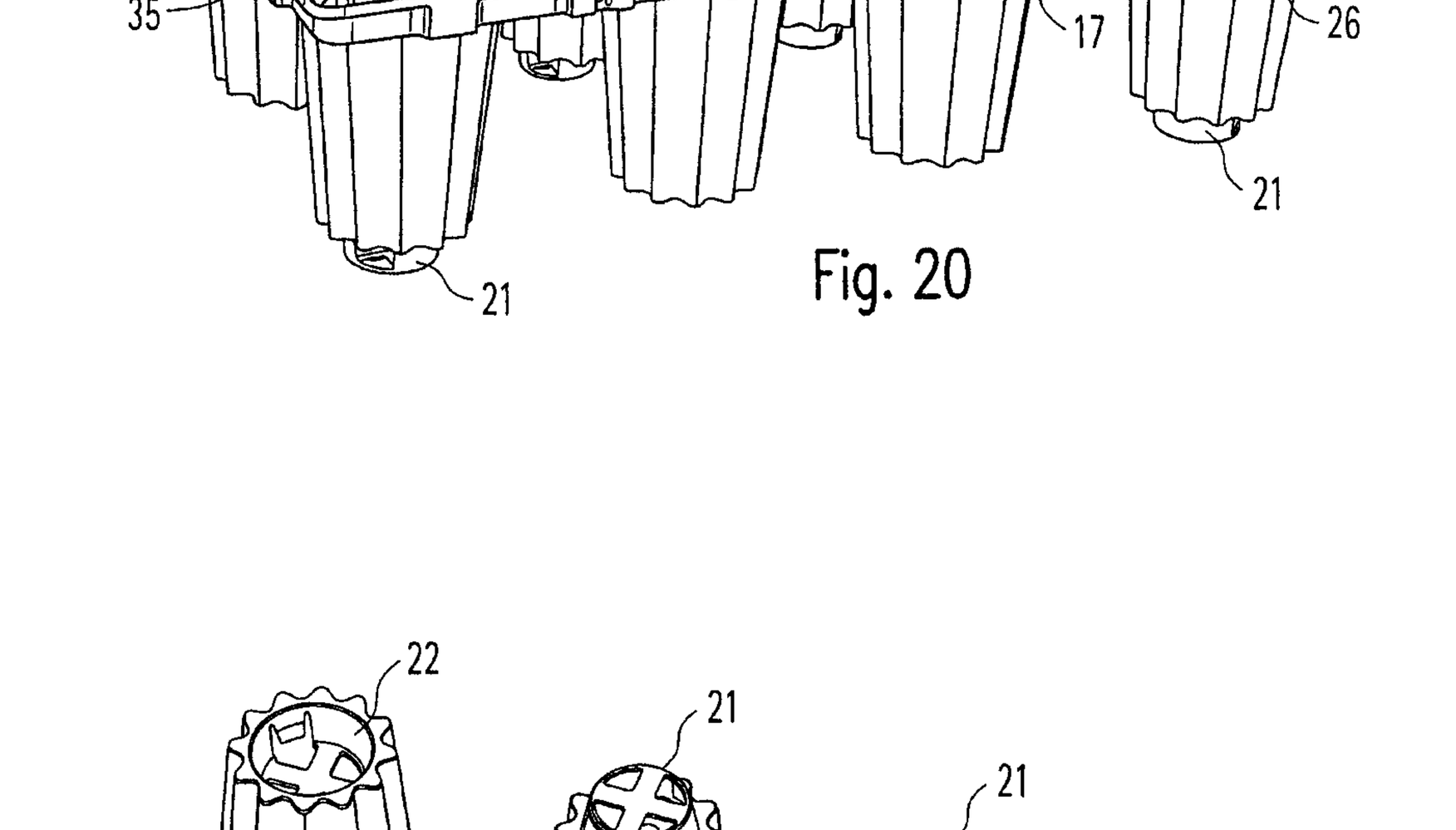


Fig. 21

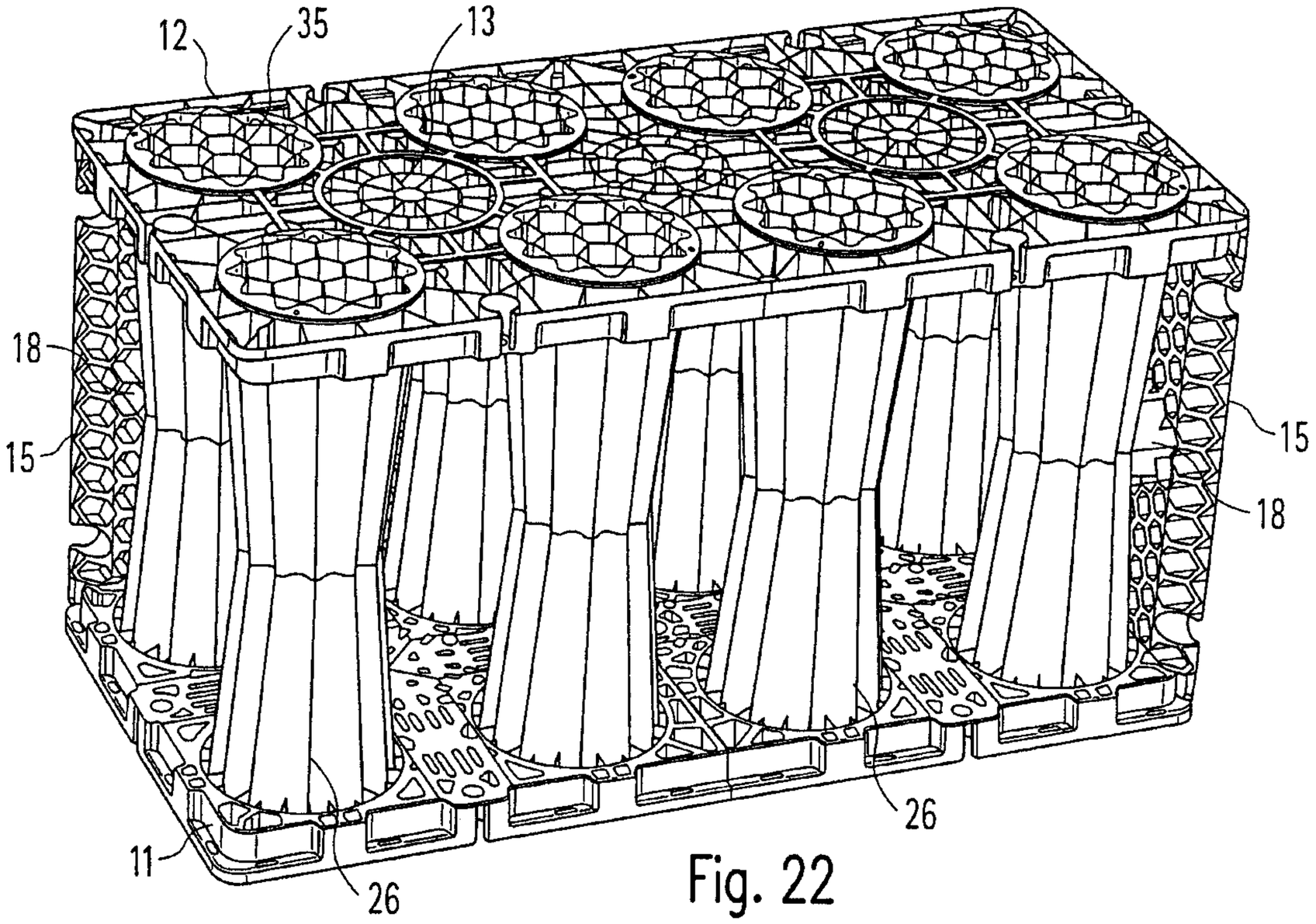


Fig. 22

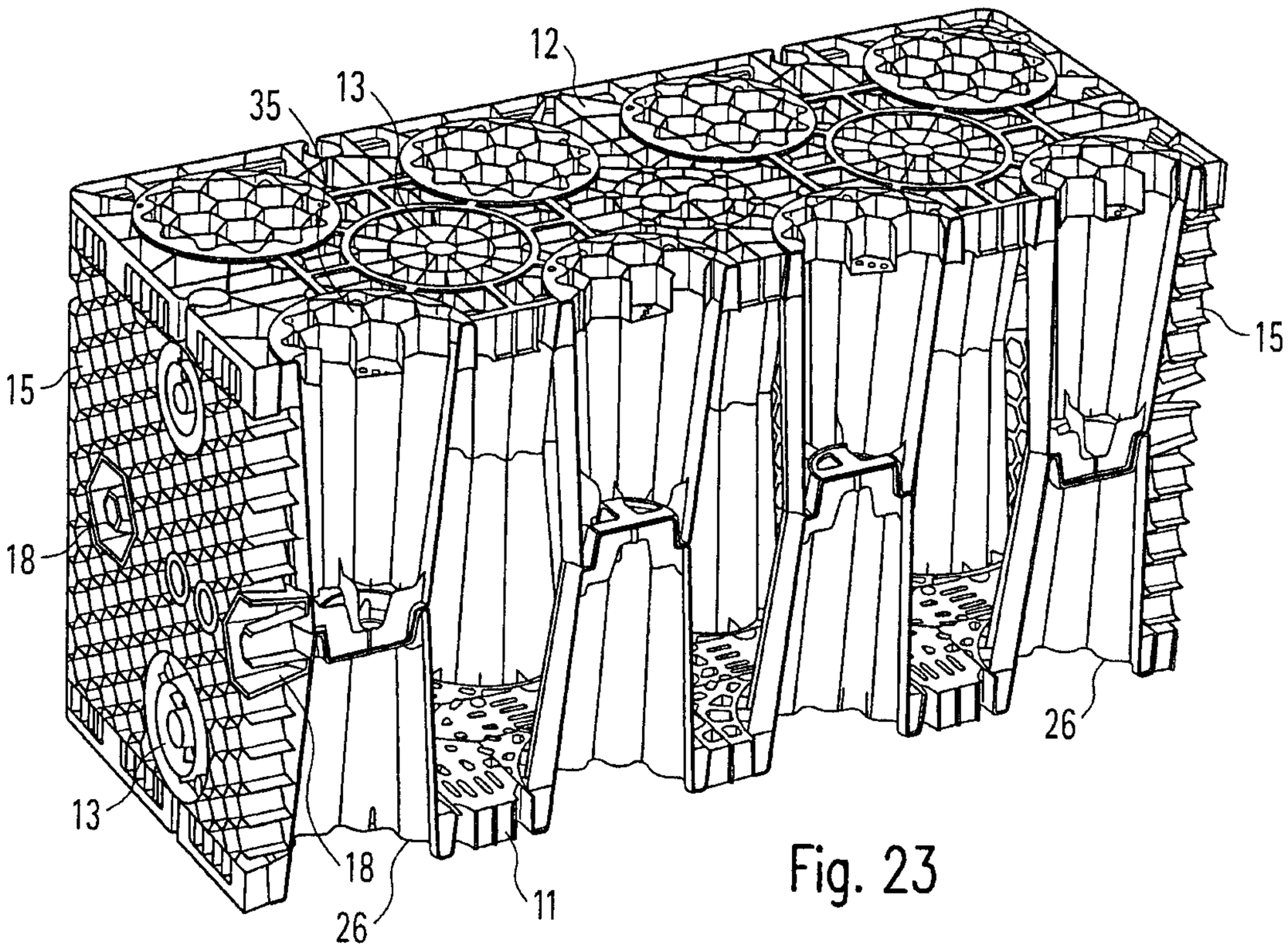


Fig. 23