

**BOX-SHAPED DEVICE FOR HOLDING WATER, SUCH AS A RAINWATER
BOX, AND
METHOD FOR USING THE SAME**

The invention relates to a box-shaped device for holding water, such as a rainwater box, comprising at least four partially open side walls and a panel extending between the side walls and having a rectangular shape, the width of which is half the length, which side walls and which panel enclose an interior space in which water can be held, the panel being provided on the inside with columns which extend substantially parallel to the side walls.

Such a box-shaped device designed as a rainwater box is known from European patent application 1,416,099. This known rainwater box uses a large number of supporting columns which serve to transfer loads to the ground below. The rainwater box provides an interior space in which water can be stored; such rainwater boxes which are stacked on top of and next to one another in the ground thus make up a reservoir with a considerable storage capacity.

In addition, a rainwater box is known which has passageways through which for example mobile inspection apparatus, such as cameras, can be driven. This means that said apparatus can be moved through the reservoir along a passageway which is substantially horizontal. The drawback thereof is that, as the reservoir is underground, access thereto is limited. This is due to the fact that, although passageways are formed in the horizontal direction in the rainwater boxes which are stacked next to and on top of one another, it is not possible to form passageways in other directions, in the vertical direction in particular. This means that it is not possible to gain access, for example from ground level, to the interior of a series of rainwater boxes stacked on top of and next to one another. Access always has to be gained from a side, which means that a manhole or the like has to be provided next to a series of stacked rainwater boxes.

It is therefore an object of the invention to provide a rainwater box which offers an improved inspection facility. Said object is achieved by the fact that the panel is provided with a free passage which is situated in the centre of one of the two square panel halves of the panel which are determined by the rectangular shape and by the fact

that the free passage ends in the interior space enclosed by the side walls and the panel.

The rainwater box according to the invention can be accessed, for example, by inspection apparatus, in the vertical direction. This means that a reservoir that comprised of such rainwater boxes can be accessed from above, which is usually easier than from the side in the case of underground reservoirs. In addition, it is of course also possible to provide two opposite side walls with passages, in such a manner that an inspection apparatus can also be displaced inside the reservoir in the horizontal direction.

Introducing an apparatus, such as an inspection apparatus, into a rainwater box is not possible in the case of the rainwater boxes disclosed in the abovementioned European patent application 1,416,099. The variants illustrated in the latter either have a panel which does not have a free central passage or have a panel with a central column which, however, does not end in the interior space, but extends through the latter in closed form.

Preferably, each square panel half of the panel has a central free passage. The fact that the panel of a rainwater box comprises two squares means that, independent of the way in which the rainwater boxes are stacked, there is always a through passage. This is the case both with rainwater boxes which are stacked in an overlapping manner in the longitudinal direction and with boxes which are stacked on top of one another at an angle of 90 degrees.

A further advantage of the specific shape, in which the length is twice as large as the width, is the stability of the stack. The rainwater boxes can be placed in a brickwork pattern, which is advantageous for the cohesion of the reservoir.

As has already been mentioned, the inside of the panel is provided with columns which extend substantially parallel to the side walls. With a view to an efficient, stable construction, the columns are preferably arranged in a regular pattern around the passages. The passage is therefore situated outside the area of the panel defined by the columns. This means that the passage is situated outside those parts of the panel to

which the columns are connected. In addition, the panel may be provided with studs on the outside. Preferably, said studs are each in line with a column. If the columns are hollow at their end which is turned away from a stud, and the diameter of a cavity of a column of a rainwater box is adapted accordingly, the studs of the one rainwater box can be accommodated inside the cavity of the columns of another rainwater box when the rainwater boxes are stacked on top of one another.

The passage is in open communication with the interior space or forms part thereof. This means that the passage is situated outside the periphery of each column. The passage has to provide sufficient room for, for example, an inspection apparatus. This is made possible by the fact that the passage is surrounded by columns in such a manner that the distance between in each case the columns of a pair of columns which surround the duct is relatively large, and the distance between the columns of other pairs of columns is relatively small, since no inspection apparatus has to be passed between said other pairs of columns.

Furthermore, each panel half of the panel may comprise nine identical square units which adjoin one another; in this case, the associated passage may be situated in the central one of said units. With such a design, the four units which are situated on the corners of a panel half may be provided with at least four columns which are situated at the corner points of said units. In addition, each unit may be provided with a fifth column which is positioned in the centre between the four columns.

For the purpose of further increasing the stability of the rainwater box, the latter may be provided with ribs on the inside of the panel. Preferably, said ribs extend between the columns and intersect with or touch the latter. Furthermore, the panel halves may be defined by a dividing line, such as a nominal line of weakening.

As has already been mentioned above, the panel halves have central passages in order to allow access in the vertical direction. In addition, in each case two opposite side walls may be provided with passages, in such a manner that access can also be ensured in the horizontal direction. In particular, the two side walls which are opposite one another in the longitudinal direction of the panel may each have a passage which is

positioned centrally with respect to the transverse direction of said side walls. In addition, the two side walls which are opposite one another in the transverse direction of the panel and which each comprise two side wall halves, each of which adjoins a square panel half of the panel, may have a passage which is positioned centrally with respect to the longitudinal direction of said side wall halves.

In general, it can be stated that with all of the abovementioned embodiments, each square panel half of the panel is of point-symmetrical design. This also applies to all columns which are positioned on such a panel half, as well as to the openings which are provided in the side walls and side wall halves adjoining the panel half.

The invention also relates to a method for using the device according to the invention. Said method comprises the following steps:

- placing the device below ground in such a manner that the panel is directed substantially horizontally,
- moving an apparatus, such as an inspection apparatus, through the passage provided in the panel in order to carry out work in the interior space of the device.

As has already been explained above, a device or a collection of devices which have been stacked on top of or next to one another can be accessed from above by an apparatus. The passage which is provided in the panel of each device provides room for such an apparatus, for example for an inspection apparatus or a cleaning apparatus. Due to the shape of the panel, when the devices are stacked on top of one another, the passages thereof and the adjoining ducts are aligned with one another, in such a manner that the apparatus can pass from the top to the bottom through the devices stacked on top of one another in order to carry out work. The latter may comprise an inspection by means of, for example, a TV camera, a cleaning operation by means of a spraying device and the like.

In the text above, reference has been made to passages which are suitable for introducing an inspection apparatus into the rainwater box. However, it will be clear that the respective passages can also be used in order to pass other apparatus through, such as cleaning apparatus.

The free passage in the panel halves and/or the side walls has a surface which, as has been mentioned above, has to be suitable for allowing an apparatus, such as an inspection apparatus, a cleaning apparatus and the like, to pass through. The shape of the free passage is therefore preferably a round shape, such as a circular shape.

It is important that the dimensions of the passage in a specific direction are approximately equal to the dimensions in a direction perpendicular thereto, in such a manner that the narrow, elongate openings are excluded. Narrow, elongate openings are understood to be openings whose length dimension is, for example, five or ten times larger than their width dimension. The free passage may be defined inside an edge which may, if desired, be breakable. In this case, the free passage may acquire a larger free surface as a result of the removal of the breakable edge.

The invention will now be explained in more detail below with reference to an exemplary embodiment illustrated in the figures, in which:

Fig. 1 shows a perspective view of the top side of a box-shaped device according to the invention which is designed as a rainwater box;

Fig. 2 shows a perspective view of the bottom side;

Fig. 3 shows a top view;

Fig. 4 shows a view of a long side;

Fig. 5 shows a view of a short side;

Fig. 6 shows a cross section through two rainwater boxes which have been stacked on top of one another.

The rainwater box according to the invention illustrated in Figs. 1 and 2 comprises two long side walls 1, two short side walls 2 and a bottom panel 3. The length of the bottom panel is twice as large as its width, resulting in two square panel halves 4, 5. Said panel halves define the dividing line 6, which also continues in the dividing lines 7 in the long walls 1.

Each square panel half 4, 5 has nine square units 8, 9 and 10. Each of the square units 8 is situated on a corner of a panel half 4, 5, the square units 9 are situated in between, while the square unit 10 is positioned in the centre and comprises an inspection passage

11. Said inspection passage 11 is provided with breakable edges 28, which make it possible, in a known manner, to increase the diameter of the inspection passage 11, if desired.

Each of the square units 8 which are situated on a corner of a panel half 4, 5 is provided with five columns 12, 13. The columns 12 are each on a corner of the unit, column 13 is situated in between, in the centre. Thus, each panel half 4, 5 has twenty columns, which offer strong support for a rainwater box which is situated above or below.

Studs 14, 15 are provided on the other side of the panel 3 which are aligned with said columns 12, 13. The diameter of these studs 14, 15 is chosen such that they fit in the cavities 16 of the columns 12, 13, as is illustrated in Fig. 6.

As is illustrated in Fig. 5, the short side walls also have an inspection passage 17 which define an inspection duct extending between the latter. As illustrated in Fig. 4, the long side walls also have inspection passages 18, 19 which define an inspection duct extending between the latter. The passages 11 and 17-19 are suitable for passing mobile apparatus through, for example an inspection camera.

The inside of the panel 3 is provided with ribs 20 extending in the longitudinal direction, ribs 21 extending in the transverse direction and oblique ribs 22, 23 extending at an angle of 45 degrees, as is illustrated in Fig. 3. All said ribs 20-23 extend between the respective columns 12, 13, and intersect with these.

The outside of the long walls 1 and the short walls 2 are also provided with ribs 24 and 25, respectively, which are in line with the transverse ribs 21 and the longitudinal ribs 20. By means of all these ribs 20-25, the stability of the rainwater box can be significantly improved. An edge strip 26 runs around the square units 8-10.

As can be seen in the view from Fig. 3, the passage 11 is delimited by pairs of columns which are in this case diametrically opposite one another. The distance between in each case two of these columns forming a pair is greater than the distance between two columns of other pairs which do not delimit a passage.

List of reference numerals

1. Long side wall
2. Short side wall
3. Panel
4. Panel half
5. Panel half
6. Dividing line panel
7. Dividing line long side wall
8. Square unit
9. Square unit
10. Square unit
11. Passage panel
12. Column
13. Column
14. Stud
15. Stud
16. Cavity column
17. Passage short side wall
18. Passage long side wall
19. Passage long side wall
20. Rib in longitudinal direction of panel
21. Rib in transverse direction of panel
22. Oblique rib panel
23. Oblique rib panel
24. Rib side wall
25. Rib side wall
26. Edge strip
27. Interior space
28. Breakable edge passage

Claims

1. Box-shaped device for holding water, such as a rainwater box, comprising at least four partially open side walls (1, 2), a panel (3) extending between the side walls (1, 2) and having a rectangular shape, the width of which is half the length, which side walls (1, 2) and which panel (3) enclose an interior space (27) in which water can be held, the panel (3) being provided on the inside with columns (12, 13) which extend substantially parallel to the side walls (1, 2), characterized in that the panel (3) is provided with a free passage (11) which is situated in the centre of one of the two square panel halves (4, 5) of the panel (3) which are determined by the rectangular shape, and in that the free passage (11) ends in the interior space (27) enclosed by the side walls (1, 2) and the panel (3).
2. Device according to Claim 1, in which each square panel half (4, 5) of the panel (3) is provided with a central passage (11).
3. Device according to Claim 1 or 2, in which the passage (11) is situated outside the area of the panel (3) defined by the columns (12, 13).
4. Device according to one of the preceding claims, in which the columns (12, 13) are arranged in a regular pattern around in each case a passage (11).
5. Device according to one of the preceding claims, in which the panel (3) is provided with studs (14, 15) on the outside.
6. Device according to Claim 5, in which the studs (14, 15) are each in line with a column (12, 13).
7. Device according to Claim 6, in which the columns (12, 13) are hollow (16) at their end which is turned away from a stud (14, 15), and the diameter of a cavity (16) of a column (12, 13) of a device is adapted in such a manner to a stud (14, 15) of another device that said cavity (16) and stud (14, 15) mate.

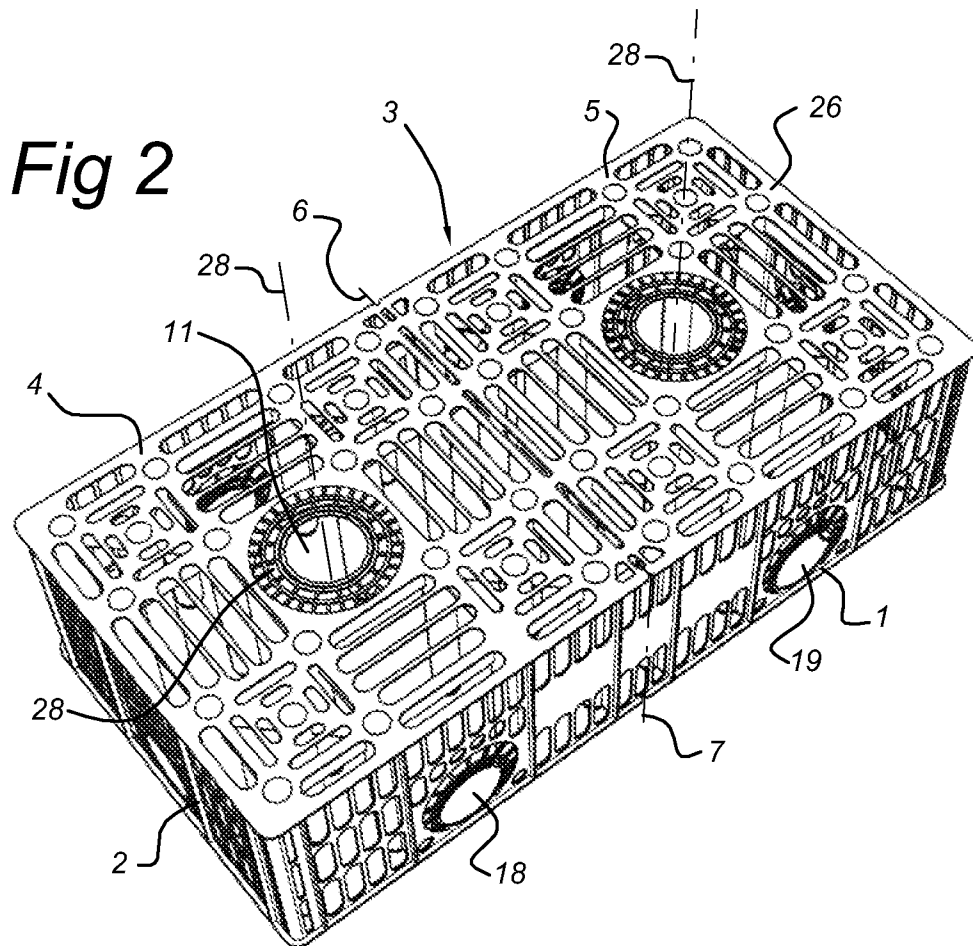
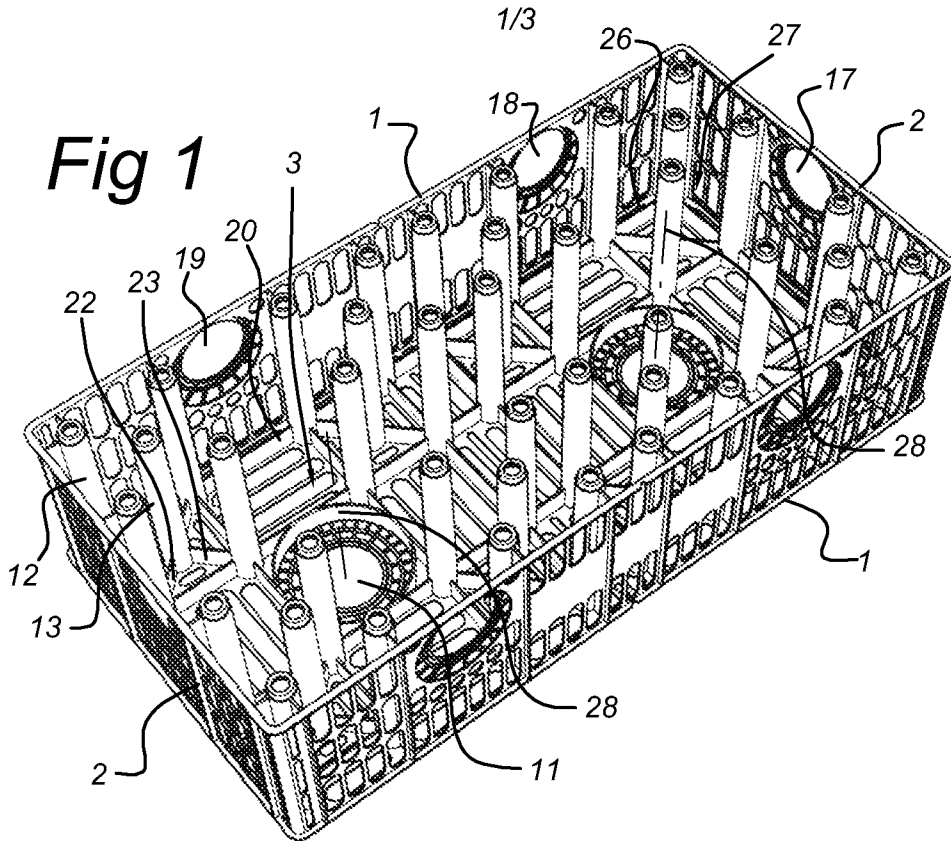
- 7a. Device according to one of the preceding claims, in which the passage (11) is in open communication with the interior space (27) and/or forms part of the interior space (27).
- 7b. Device according to Claim 7a when dependent on one of Claims 3-7, in which the passage (11) is situated outside the periphery of each column (12, 13).
- 7c. Device according to Claim 7a or 7b, in which the passage (11) is surrounded by columns (12, 13) in such a manner that the distance between in each case the columns of a pair of columns which surround the passage (11) is relatively large and the distance between the columns of other pairs of columns is relatively small.
8. Device according to one of the preceding claims, in which each panel half (4, 5) of the panel (3) comprises nine identical square units (8-10) which adjoin one another, and each passage (11) is situated in the central unit (10) which forms the centre unit of said square units.
9. Device according to Claim 8 when dependent on one of Claims 3-7, in which the four corner units (8) which are situated on the corners of the central unit (10) are provided with at least four columns (12) which are situated on the corner points of said corner units (8).
10. Device according to Claim 9, in which each corner unit (8) is provided with a fifth column (13) which is positioned in the centre between the four columns (12).
11. Device according to one of Claims 8-10, in which the nine adjoining units (8-10), comprising the central unit (10), the corner units (8) and the intermediate units (9), which intermediate units (9) are in each case situated between two corner units (8), of a panel half are surrounded by an edge strip (26).
12. Device according to one of Claims 8-11, in which ribs (20-23) are provided on

the inside of the panel (3).

13. Device according to Claim 12, in which the ribs (20-23) extend between the columns (12, 13) and intersect with or touch the latter.
14. Device according to Claim 13, in which the ribs (20) extend in the longitudinal direction of the panel (3).
15. Device according to Claim 13 or 14, in which the ribs (21) extend in the transverse direction of the panel (3).
16. Device according to Claim 13, 14 or 15, in which the ribs (22, 23) extend at an angle of 45 degrees.
17. Device according to one of the preceding claims, in which the outer sides of the side walls (1, 2) are provided with raised ribs (25).
18. Device according to Claim 17 when dependent on Claim 14 or 15, in which the raised ribs (25) are in line with the ribs (20, 21) of the panel (3) which extend in the longitudinal direction and/or in the transverse direction.
19. Device according to one of the preceding claims, in which the panel halves (4, 5) are defined by a dividing line (6), such as a nominal line of weakening.
20. Device according to one of the preceding claims, in which two opposite side walls (1, 2) are provided with passages (17-19).
21. Device according to Claim 20, in which the two side walls (2) which are opposite one another in the longitudinal direction of the panel (3) each have a passage (17) which is positioned centrally with respect to the transverse direction of said side walls.
22. Device according to Claim 20 or 21, in which the two side walls (1) which are

opposite one another in the transverse direction of the panel (3) each comprise two side wall halves, each of which side wall halves adjoins a square panel half of the panel (3), and two opposite side wall halves each have a passage (18, 19) which is positioned centrally with respect to the longitudinal direction of said side wall halves.

23. Device according to one of the preceding claims, in which each square panel half of the panel (3) is of point-symmetrical design.
24. Method for use of the device according to one of the preceding claims, comprising the steps of:
 - placing the device below ground in such a manner that the panel (3) is directed substantially horizontally,
 - moving an apparatus, such as an inspection apparatus, through the passage (11) provided in the panel (3) in order to carry out work in the interior space of the device.
26. Method according to Claim 24 or 25, comprising the step of inspecting the interior space of the device by means of an inspection apparatus, such as a TV camera.
27. Method according to one of the Claims 24-26, comprising the step of cleaning the interior space of the device by means of a cleaning device, such as a spraying device.



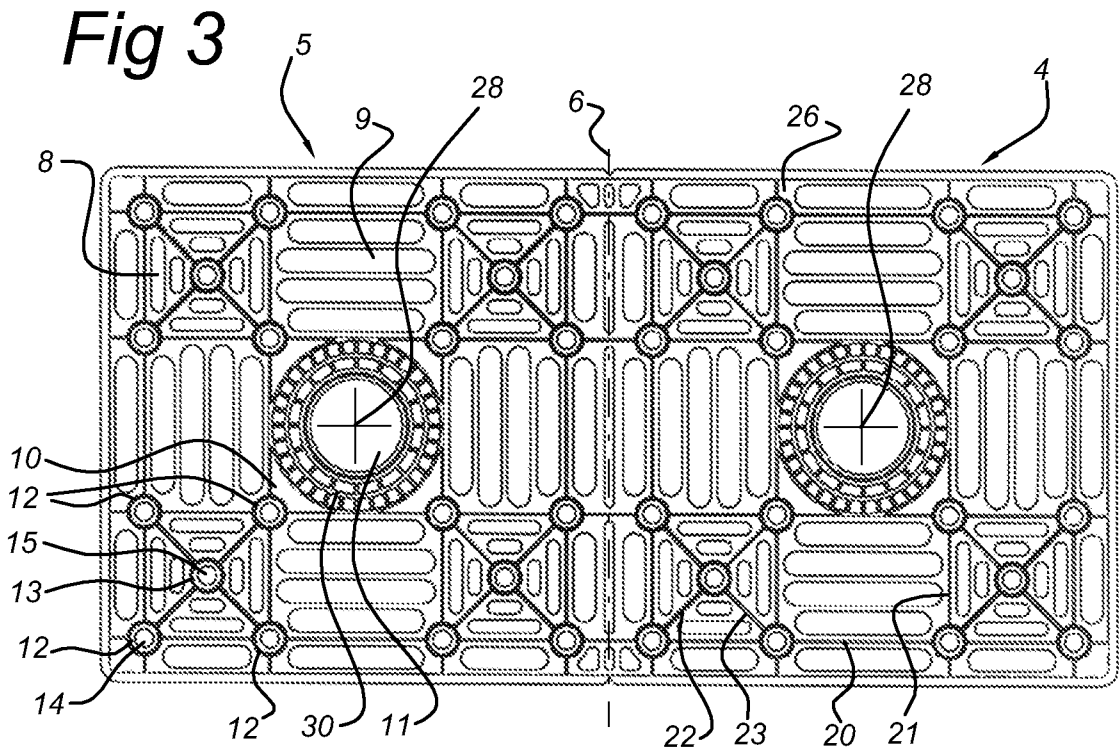


Fig 4

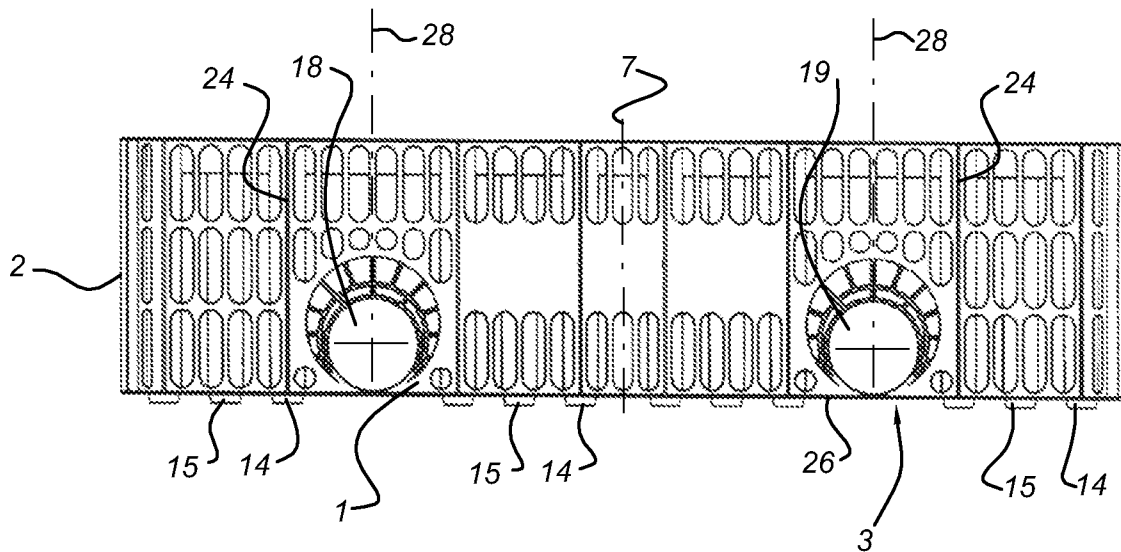


Fig 5

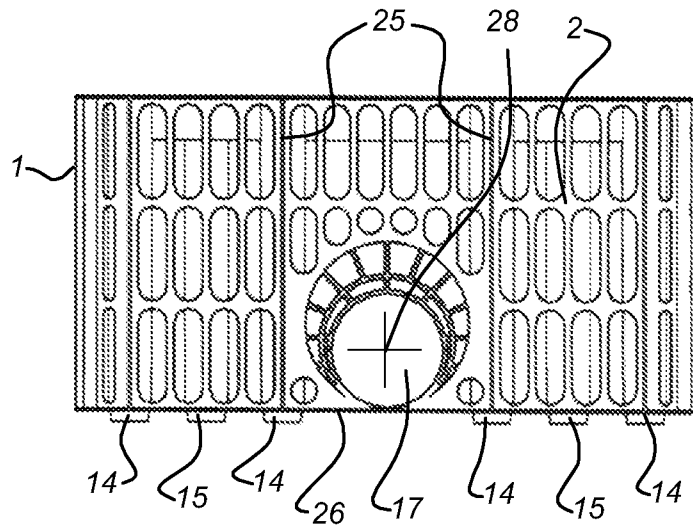
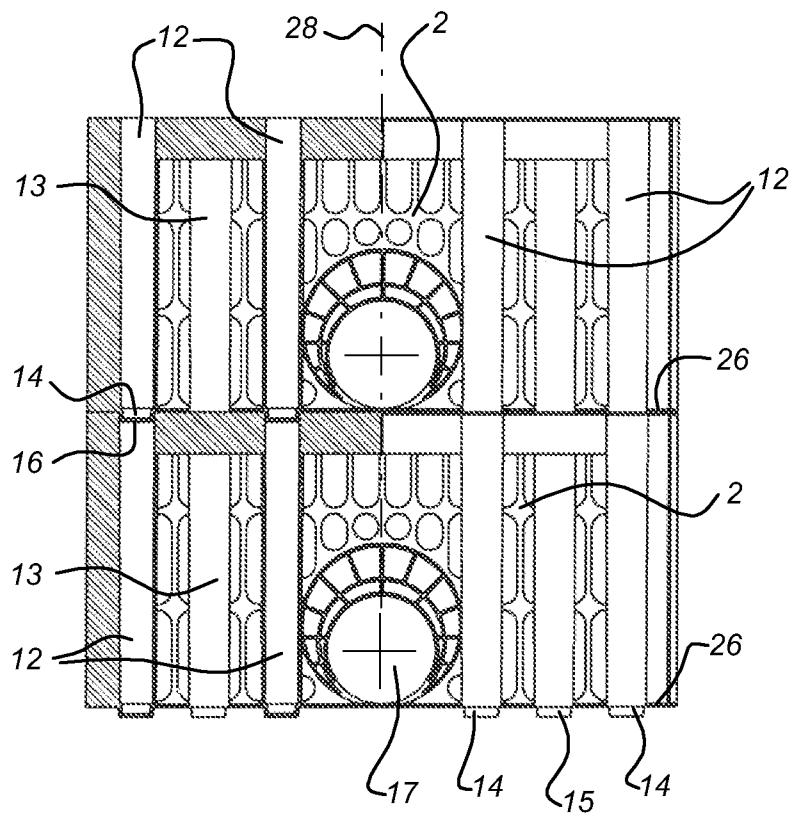


Fig 6



INTERNATIONAL SEARCH REPORT

International application No
PCT/NL2008/050282

A. CLASSIFICATION OF SUBJECT MATTER
INV. E03F1/00 E03F5/10

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
E03F E03B E02B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|-----------|--|-----------------------|
| X | EP 1 416 099 A (POLYPIPE CIVILS LTD [GB]) 6 May 2004 (2004-05-06) cited in the application column 4, line 30 - column 9, line 16; figures 1-16 | 1-26 |
| X | EP 1 743 984 A (SOGEMAP INJECTION [FR]) 17 January 2007 (2007-01-17) paragraph [0029] - paragraph [0059]; claim 12; figures | 1-29 |
| A | DE 10 2005 056131 A1 (HEITKER GMBH [DE]) 27 July 2006 (2006-07-27) paragraph [0036] - paragraph [0044]; figures 1-9 | 1,27-29 |

Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents:

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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/NL2008/050282

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|--|------------------|-------------------------|--------------------------|
| EP 1416099 | A | 06-05-2004 | NONE |
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| DE 102005056131 | A1 | 27-07-2006 | NONE |