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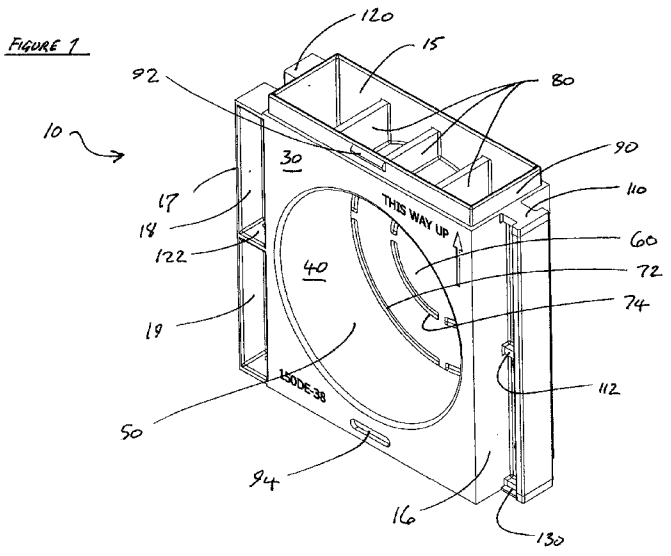

(57) Abstract: A ducting chamber ring (200) or module (10) for making the same, the ring (200) or module (10) being a hollow, injection moulded part, the ring (200) or module (10) defining an inner wall (15), an outer wall 30 and a bore wall (40) extending between said inner and outer walls (15, 30) and surrounding and defining a bore (50).

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Ducting Chamber Ring and Module, a Ducted Chamber, a Mould and a Method of Assembling a Modular Chamber System

The present invention relates to a ducting chamber ring and module, a ducted chamber, a mould and a method of assembling a modular chamber system

Many domestic and civil services such as traffic signalling, street lighting, telecoms, fibre optics, gas, electricity and water supply are routed underground. Such services are connected through complex systems of interconnected ducts and chambers. The ducts, commonly housing pipes or insulated cables, run between the chambers, which allow collection and junctioning of the pipes or cables, or routing to the surface feature which they supply.

For example, in the case of traffic signalling, electric and signalling cables are collected in a chamber, buried underground and located close to both a over-ground control box and signalling device(s).

These chambers were designed and built with consideration to the characteristics of strength under compression, relative water-tightness, low degradation so that minimum maintenance and repair is required (given the inaccessibility of its location once buried). The provision of such underground chambers has developed from the prior practice of building brick walled chambers to assembling purpose built, modular units.

A known solution is rotor-moulded polyethylene modules, joined on their lateral sides to form a ring, the rings then stacked to create the required height of chamber. The lateral joints consist of individual parts which are connected together by a double head and neck part which is hammered into a gap between two parts to retain them.

In practice there are disadvantages arising from this arrangement. The number of parts in the lateral joint provides the opportunity for parts to go missing on site, or for inaccurate assembly, whereby the parts are not hammered in correctly or far enough.

In another known set of modules, vertical assembly of the rings of the known product relies on a 10mm flange protruding upwards from the modules of the lower ring, being received in the modules of the upper ring, to hold the two rings together by friction.

Rings with modules containing holes to receive pipes etc. are known as ducting rings, whilst rings in which all the modules have a continuous flat outer surface are known as riser rings. In a typical configuration there may be, for example, three riser rings on top of a ducting ring to go up to ground level.

Although the advised installation method is to dig a hole that is large enough so that an operator may enter into the hole and build up the chamber from the bottom, commonly a hole is dug which is big enough for the chamber, which is then assembled on the surface and subsequently lowered into the hole. However, given the friction fit of the vertical joining of rings, there are concerns about this practice, as the ring can come apart and fall down with the potential for injury to the user's foot.

A known solution for providing entry and exit points for the ducting, is for holes to be cut in the module walls. However, this creates a zone of weakness, reducing the compressive strength of the module.

It is an object of the present invention to provide an improved ducting chamber ring or module for making the same, having good compressive strength, durability and comprising a minimum number of separate components whilst still offering flexibility such that a variety of chamber sizes may be constructed.

According to the first aspect of the invention there is provided a ducting chamber ring or module for making the same, the ring or module being a hollow, injection moulded

part, the ring or module defining an inner wall, an outer wall and a bore wall extending between said inner and outer walls and surrounding and defining a bore.

The bore wall which lines the bore provides strength to the walls of the ring or module, tying them together and providing a more rigid, strong structure.

The bore wall may be of any suitable shape, but in a preferred embodiment the bore is cylindrical in section. Having a lined cylindrical hole means that there is the strength of an arch over the top and strength from the whole cylinder throughout.

The bore may be spanned by a web, at least part of the web being removable to open the bore. The web may have a line of weakness around the removable part of the web. The line of weakness may be adjacent the bore wall or the line of weakness may be spaced from the bore wall. This arrangement allows the web or part of the web to be cut away easily to provide a line of communication between the inner and outer walls, such that a cable, for example, may be inserted through the module bore.

In a preferred embodiment the web is substantially coplanar with one of said inner and outer walls. This arrangement allows for an easier manufacturing process for the module. Having the web substantially coplanar with either the inner and outer walls simplifies both the tool design and access for cutting the required hole.

In yet another preferred embodiment the wall thickness is substantially uniform. Having the same wall thickness avoids possible complications in the manufacturing process such as unequal cooling of the material.

The ring or module may be made wholly or principally from plastics material, such as polypropylene. Where the ring or module is made principally from plastics material, the plastics material may be combined with a filler, such as talc.

The module or ring may be provided with a step iron. In another preferred embodiment the module or ring is provided with a cable clamp.

In a preferred embodiment the module or ring is reinforced by ribs between said inner and outer walls. At least one of the ribs preferably intersects and is interrupted by the bore. The module or ring is a structural component, and once buried underground it will need to support the static loading of any soil placed thereupon and any transient loading according to the use of the land directly above the site of its burial. The provision of ribs between the walls greatly increases its strength in compression, furthermore, providing ribs intersecting with the bore wall prevents obvious areas of weakness being created.

In a preferred embodiment the bore has constant diameter. The bore diameter may be 64mm or 114mm. The module or ring may comprise a plurality of bores. This arrangement allows supply of ducting of diameters consistent with those used in industry.

In a preferred embodiment a vertical connection arrangement for connection of two or more modules together in a vertical stack is provided, wherein the ring or module includes a snap fit or bump over connection arrangement which may comprise a protrusion at one side and a rebate at the opposite side, the rebate of a first module or ring being sized to cooperate to provide a snap fit or bump over with the protrusion of a second module or ring when the modules or rings are arranged in vertical alignment.

This arrangement allows two, three or four stacked modules of rings to be lifted together. Where the connection is a bump over, it is easily releasable whilst still providing a secure connection.

In a preferred embodiment of a module, an integral lateral connection arrangement comprising a head and neck connector portion is provided in one module and a matched receiving portion to receive a head and neck connector of another module is provided. In another preferred embodiment the connection arrangement includes a stop. This arrangement allows modules to be connected in lateral alignment using the head and neck connection arrangement. By designing an integrated connection arrangement there is no possibility for connecting parts or fasteners to be lost. The provision of a stop ensures that adjacent sections are level when connected together.

According to another aspect of the invention there is provided a mould for injection moulding a hollow part consisting of a ducting chamber ring or module according to any preceding claim, the mould comprising two mould halves, the mould including at least one movable core.

Because the hollow part has an inner wall, an outer wall and a bore wall extending between said inner and outer walls and surrounding and defining a bore, it cannot be injection moulded with a simple mould without movable cores. In fact, it is difficult to mould and a complex mould it required, which includes at least one movable core. Indeed the mould may include two or even three movable cores.

The mould halves may be arranged to move relative to one another to release the moulded part by moving in any desired direction, but in a preferred embodiment the mould halves are arranged to move in a direction substantially parallel to the planes of the inner and outer walls. Preferably, the or one movable core forms the said bore.

According to a further aspect of the present invention a method of assembling a modular chamber system is provided, said method including the steps of:

(a) connecting a combination of ducting chamber modules according to the preceding aspect of the invention and non-ducted chamber modules via integrated head and neck connectors to form a ducting chamber ring or riser ring,

(b) repeating step (a) until the desired number of rings are formed,

(c) connecting said rings in a vertical stack via the integrated protrusion and window or rebate connection arrangement with a snap fit or bump over to form an assembly of rings,

(d) lowering said assembly into an excavated region.

Embodiments of the present invention will now be described by way of example and with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a module of a ducting chamber in a first embodiment;

Figure 2 is another perspective view of the module of Figure 1;

Figure 3 is another perspective view of the module of Figure 1;

Figure 4 is a perspective view of an elongate module of a ducting chamber, in a second embodiment;

Figure 5 is a front elevation of the elongate module of Figure 4;

Figure 6 is a perspective view of a corner module of a ducting chamber in a third embodiment;

Figure 7 is a perspective view of a ducting chamber ring, comprising a plurality of the ducting modules of Fig. 6 and the ducting modules of Figures 4 and 5 joined together;

Figure 8 is a perspective view of a riser ring, comprising a plurality of non-ducting modules joined together;

Figure 9a is a front elevation of the elongate module of Figure 4 with a hole cut out;

Figure 9b is a front elevation of the elongate module of Figure 4 with a 114' hole cut out;

Figure 10 is a perspective view of a ducting chamber ring with a cable fitted through a bore;

Figure 11 is a perspective view of a chamber comprising a plurality of riser rings and a ducting chamber ring; and,

Figure 12 is an exploded perspective view of the mould for moulding the module of Fig 6, two views of the module are also in the Figure.

The module 10 of a ducting chamber of the first embodiment (see Figures 1, 2 and 3) comprises an inner wall 15, an outer wall 30 substantially parallel to the inner wall 15, two end walls 16 and 17 and a bore wall 40 extending between said inner and outer walls 30 substantially perpendicular thereto and surrounding and defining a cylindrical bore 50 through the module 10. The bore 50 is located centrally in the module 10. The terms "inner" and "outer" apply to the ducting chamber module 10 in use as assembled to comprise a ducting chamber ring (see Figure 7). The module 10 has a length of 150mm, as measured between a first end wall 16 and a second end wall 17,

whilst the diameter of the bore is 110mm. The module is injection moulded in a plastics material comprising 20% talc filled polypropylene (PP).

A web 60 extends across the bore 50 and is coplanar with the inner wall 15. The web 60 includes two lines of weakness 72, 74, a first line of weakness 72 adjacent the bore wall 40 and a second line of weakness 74 spaced from the bore wall 40 and concentric with the first line of weakness 72. .

These lines of weakness 72, 74 are more clearly shown in Figure 5, which is a front view of an elongate module 12 of a second, similar embodiment, also shown in Figure 4.

Referring back to Figure 1, the module 10 is reinforced by a plurality of upright, parallel ribs 80 between said inner and outer walls 15, 30. Some of the ribs 80 intersect and are interrupted by the bore wall 40.

In the module 10, all wall thicknesses are 4mm.

The module 10 features a lateral connection arrangement and a vertical connection arrangement.

The lateral connection arrangement comprises a head and neck connector portion 110 (male) located on end wall 16 of the module 10 and a head and neck receiving portion 120 (female) located in end wall 17, on the other side of the module 10.

The end wall 16 is a flat surface, from which the head and neck connector portion 110 extends orthogonally. The head and neck connector portion 110 includes a reinforcing flange 112 at the mid-point of the vertical extent of the head and neck connector portion 110.

The end wall 17 features not only a recessed head and neck receiving portion 120 but also additional recesses 18 and 19, on both inner and outer sides 15, 30 of the module 10, the recesses 18 and 19 providing an anchoring point for additional features, (not

shown). The recesses 18 and 19 are separated by a reinforcing flange 122 at the mid-point of the vertical extent of the head and neck receiving portion 120.

Two modules 10 may therefore be laterally connected by sliding the head and neck receiving portion 120 of a first module 10 down onto a head and neck connector portion 110 of a second module 10. A stop 130 at the base of the head and neck connector portion 110 prevents over travel of the head and neck receiving portion 120 of the first module 10 and ensures vertical alignment of the modules 10. Lateral connection of modules is shown in Fig. 7.

The vertical connection arrangement comprises an flange 90 tracing the periphery of the inside upper edge of module 10 offset inwardly from the inner and outer walls 30 on the upper end of the module 10 and a recessed flange 85 tracing the periphery of the lower edge of the module 10 (see figure 3), the offset flange 90 and the recessed flange 85 being sized such that the flange 90 of a first module 10 may slidably engage with the recess 75 defined by the recessed flange 85 of a second module 10 when stacked vertically. Furthermore the offset flange 90 features a protrusion 92, and the recessed flange 85 features a rebate in the form of a window 94, such that when two modules 10 are stacked vertically the protrusion 92 of the second module 10 provides a bump over connection which releasably engages with the window 94 of the first module 10.

Figures 4 and 5 show a module 12 in a second embodiment. The second embodiment is similar to the first and only the differences from the first embodiment will be described. Equivalent features to that of the first embodiment are given the same reference numerals. The length of the module 12 is double that of the first, at 300mm, and this time the module 12 features two bores 52, 54 centrally located vertically and laterally spaced apart, each bore being defined by a bore wall 40.

Yet another module 14 is shown in Figure 6, according to a third embodiment of the present invention. This third embodiment is similar to the first and second embodiments and only the differences from the first embodiment will be described. Again, equivalent features to that of the first embodiment are given the same reference

numerals. This module 14 is a corner piece. It features an L-shaped inner wall having first and second arms 15a, 15b and an L-shaped outer wall having first and second arms 32, 34. Both the inner and outer walls have a curved portion, providing a smooth transition 37 between the first and second arms 15a, 15b of the inner wall and another smooth transition 36 between the first and second arms 32, 34 of the outer wall.

A first bore 56 is defined by a first bore wall 42 running between the first arm 15a of the inner wall and the first arm 32 of the outer wall. Similarly a second bore 58 is defined by a second bore wall 44 running between the second arm 15b of the inner wall and the second arm 34 of the outer wall.

A combination of modules joined together forms a ducted ring 200 (see Figure 7). Four corner piece modules 14 of the third embodiment are joined to four modules 12, which are the elongate modules 12 of the second embodiment, via the lateral connection arrangement described previously.

A combination of non-ducted modules 70 joined together forms a riser ring 300 (see Figure 8). The non-ducted modules 70 are the same as the modules 20, 14 of the second and third embodiments but without the bores 56, 58, 52, 54 and bore walls 40, 42, 44.

Figures 9a and 9b show the elongate module 12 of the second embodiment with a hole cut in the web. In figure 9a the hole has been cut along a line of weakness 74 concentric with and spaced from the cylindrical bore wall 50. In Figure 9b the hole has been cut along a circular line of weakness 72 adjacent the bore wall 50.

Figure 10 shows the ducted ring 200 of Figure 7, and features a cable 210 and a pipe 220. The pipe 220 is positioned in line with the bore 50, extending orthogonally away from the outer wall 15 of an elongate module 12. The elongate module 12 has a hole cut in one of the webs 60 (in the manner of Figs. 9a and 9b) such that the bore 50 provides a communication path for the cable 210 which is routed from outside the ducted ring 200, inside pipe 220. After passing through the bore 50, the cable 210 is gathered along the inside walls of modules 12, 14 of the ducted ring 200.

A ducting chamber 400 (see figure 11) comprises a ducting chamber ring 200 with three riser rings 300 stacked vertically on top of one another. The protrusions 92 of the individual modules 12, 14 have engaged with the rebates 94 of the modules 70 located directly above to form a secure fit.

Therefore it can be seen that the provision of a cylindrical bore wall 40, allows provision of a communication path for a cable 210 or the like (by cutting a hole in the web 60), without threatening the strength and integrity of the modules 10, 12 and 14. Furthermore the provision of ribs 80 which interface with the bore wall 40 enhances the structural integrity of the modules 10, 12 and 14 without compromising the bore 50 itself.

Furthermore the provision of the lateral connection arrangement featuring an integral head and neck connector portion 110 and an integral head and neck receiver portion 120 requires no fastening means beyond the provision of the modules themselves.

It can also be seen that the provision of a vertical connection arrangement comprising a bump over from a protrusion 92 engaging with a window 94, a secure connection results when stacking modules or rings.

Figure 12 shows the mould 200 for moulding the ducting chamber module of Figure 6. The mould 200 moulds two of the modules at once. The mould 200 comprises two mould halves 202, 204. The smaller mould half 202 includes four pillars 206 extending orthogonally from a major surface 208 of the mould half 202 which defines a cavity 210. The pillars 206 are arranged one at each corner and are received in use in corresponding bores 212 in the larger mould half 204.

The larger mould half 204 carries six movable cores mounted by raised boxes 214 to 224 each mounting a pair of axially movable pins 226 to 236. Each pair of pins 226 to 236 is arranged at and moves in a different, sub 45 degree angle to the direction of movement of the mould halves 202, 204 as defined by the axes of the pillars 206 and

bores 212. The directions of movement of the pins 226 to 236 are shown by bold arrows. The major surface 238 of the larger mould half 204 is rectangular.

The box 214 nearest one short edge of the major surface 238 is elongate in a direction parallel to the short edge and mounts two pins 226 side by side in the direction of elongation of the box 214. The axes of the pins 226 are parallel to one another and the axes of the pins 226 are at an angle of about 15 degrees to the direction of movement of the mould halves 202, 204, leaning out towards the adjacent short edge of the major surface 238.

The next box 216 is inboard of the first box 214 being the other side of the first box 214 from the short edge. The pins 228 on the second box 216 lean in the opposite direction from the pins 226 of the first box 214 and at about the same angle of 15 degrees to the direction of movement of the mould halves 202, 204.

The first and second boxes 214, 216 lie in the same quadrant of the major surface 238. The third box 220 is still closer to the same short edge as the first and second boxes 214, 216 than the other short edge, but lies in the adjacent quadrant. The third box 220 is rectangular, but is elongate in a direction perpendicular to the first and second boxes 214, 216. The third box 220 just overlaps the notional centre line of the major surface 238 parallel with the short edges. The pins 232 of the third box 220 are at an angle of about 15 degrees to the direction of movement of the mould halves 202, 204 and lean towards the adjacent long edge of the major surface 238.

The first, second and third boxes 214, 216, 220 are associated with moulding one module. The fourth, fifth and sixth boxes 218, 222, 224 are arranged in the same positions on the other side of the surface, as if rotated about a centre of symmetry at the centre of the major surface 238, so as to mould a second module.

The mould halves 202, 204 are arranged to move relative to one another to mould and release the moulded part by moving in a direction substantially parallel to the planes of the inner and outer walls 15, 32, 34 of the moulded part.

The pins 226 to 236 carry the movable cores which form the features which are not in the line of draw of mould movement of the mould halves. Thus one core, as seen in Fig 12, forms the bore 50. Other cores form the recesses 18, 19.

The modules herein described have had lengths of either 150mm or 300mm, but it is reasonable to expect anyone skilled in the art to appreciate that many different dimensions could be applied to the principle without diverging from the invention as presented and offering even further improved versatility and flexibility to the user. Likewise various wall-thicknesses could be envisaged and the material choice is not restricted only to polypropylene or talc.

Furthermore, the bore wall may be other shapes, such as oval, hexagonal or triangular and is not restricted only to a cylinder. The rebate and protrusion do not have to be in the proportions shown, for example they may be shorter or longer. Finally, the stop may be positioned at locations other than at the base of the head and neck connector portion, for example, it may equally be located at the top of the head and neck connector portion or at the top or base of the head and neck receiving portion.

Claims

1. A ducting chamber ring or module for making the same, the ring or module being a hollow, injection moulded part, the ring or module defining an inner wall, an outer wall and a bore wall extending between said inner and outer walls and surrounding and defining a bore.

2. A ducting chamber ring or module according to claim 1 wherein the bore is cylindrical in section.

3. A ducting chamber ring or module of claim 1 or claim 2 wherein the bore is spanned by a web, at least part of the web being removable to open the bore.

4. A ducting chamber ring or module of claim 3 wherein the web has a line of weakness around the removable part of the web.

5. A ducting chamber ring or module of claim 4, wherein the web has a line of weakness adjacent the bore wall.

6. A ducting chamber ring or module of claim 4 or claim 5, wherein the web has a line of weakness spaced from the bore wall.

7. The ducting chamber ring or module according to any of claims 3 to 6 wherein the web is substantially coplanar with one of said inner and outer walls.

8. The ducting chamber ring or module according to claim 5 wherein the web is coplanar with the inner wall.

9. The ducting chamber ring or module according to any preceding claim wherein the wall thickness is substantially uniform.

10. A ducting chamber ring or module according to any preceding claim, wherein the hollow part is reinforced by ribs between said inner and outer walls.

11. A ducting chamber ring or module according to claim 10 wherein at least one of the ribs intersects and is interrupted by the bore.

12. A ducting chamber ring or module according to any preceding claim wherein the bore has constant diameter.

13. A ducting chamber ring or module according to any preceding claim wherein the bore diameter is 64mm or 114mm.

14. A ducting chamber ring or module according to any preceding claim comprising a plurality of bores.

15. A ducting chamber ring or module according to any preceding claim including a step iron.

16. A ducting chamber ring or module according to any preceding claim including a cable bearing bracket.

17. A ducting chamber ring or module according to any preceding claim, wherein the ring or module includes a snap fit or bump over connection arrangement comprising a protrusion at one side and a rebate at the other side, the rebate of a first module or ring being sized to cooperate to provide a snap fit or bump over with the protrusion of a second module or ring when the modules or rings are arranged in vertical alignment.

18. A ducting chamber ring or module according to any preceding claim, wherein the ring or module is made wholly or principally from plastics material.

19. A ducting chamber ring or module according to any preceding claim, wherein the ring or module is made wholly or principally from polypropylene.

20. A ducting chamber ring or module according to any preceding claim, wherein the ring or module is made from plastics material and talc.

21. A ducting chamber module according to any preceding claim including an integral connection arrangement comprising a head and neck connector portion.

22. A ducting chamber module according to any preceding claim including an integral connection arrangement comprising a head and neck receiving portion to receive a head and neck connector.

23. A ducting chamber module according to claim 22 when dependent upon 21, wherein the modules can be connected in lateral alignment using the head and neck connection arrangement

24. A ducting chamber module according to claim 22 or claim 23 wherein the connection arrangement includes a stop to ensure adjacent sections are level when connected together.

25. A ducting chamber module according to any of claims 21 to 24, wherein the integral connection arrangement is an interference fit.

26. A ducting chamber ring comprising a plurality of ducting chamber modules as claims in any of claims 21 to 25 connected in a ring.

27. A ducted chamber comprising at least one ducting chamber ring as claimed in any of claims 1 to 20 or 26 and at least one riser ring.

28. A mould for injection moulding a hollow part consisting of a ducting chamber ring or module according to any preceding claim, the mould comprising two mould halves, mould including at least one movable core.

29. A mould as claimed in claim 28, wherein the mould halves are arranged to move relative to one another to release the moulded part by moving in a direction substantially parallel to the planes of the inner and outer walls.

30. A mould as claimed in claim 29, wherein the or one movable core forms the said bore.

31. A mould as claimed in claim 28, 29 or 30, wherein the mould includes at least two movable cores.

32. A mould as claimed in claim 31, wherein the mould includes at least three movable cores.

33. A method of assembling a modular chamber system, said method including the steps of:

a) connecting a combination of ducting chamber modules as claimed in any preceding claim and non-ducted chamber modules via integrated head and neck connectors to form a ducting chamber ring or riser ring,

b) repeating step (a) until the desired number of rings are formed,

c) connecting said rings in a vertical stack via the integrated protrusion and rebate connection arrangement with a snap fit to form an assembly of rings,

d) lowering said assembly into an excavated region.

34. A modular chamber system substantially as described herein with reference to the accompanying drawings.

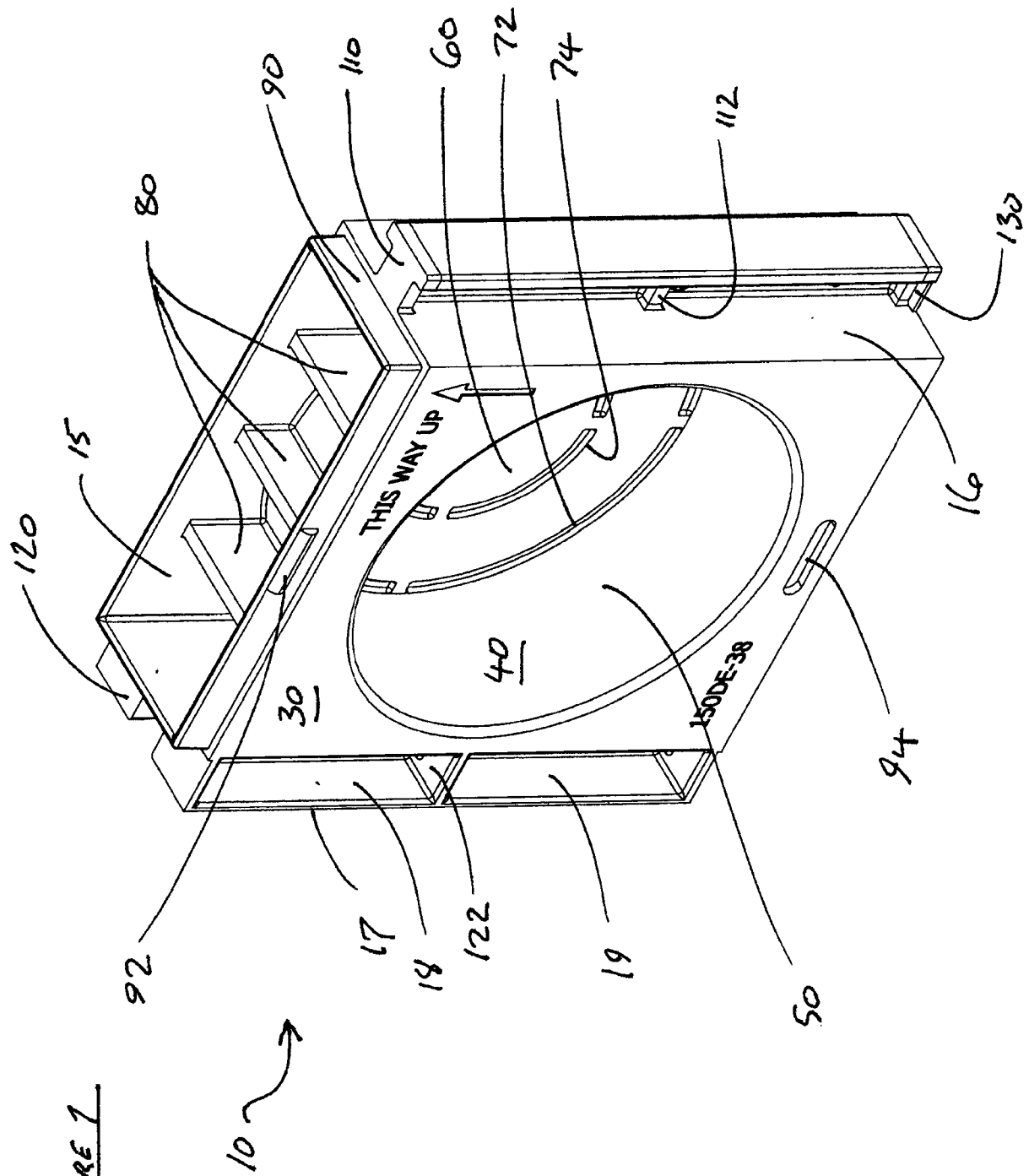
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FIGURE 1

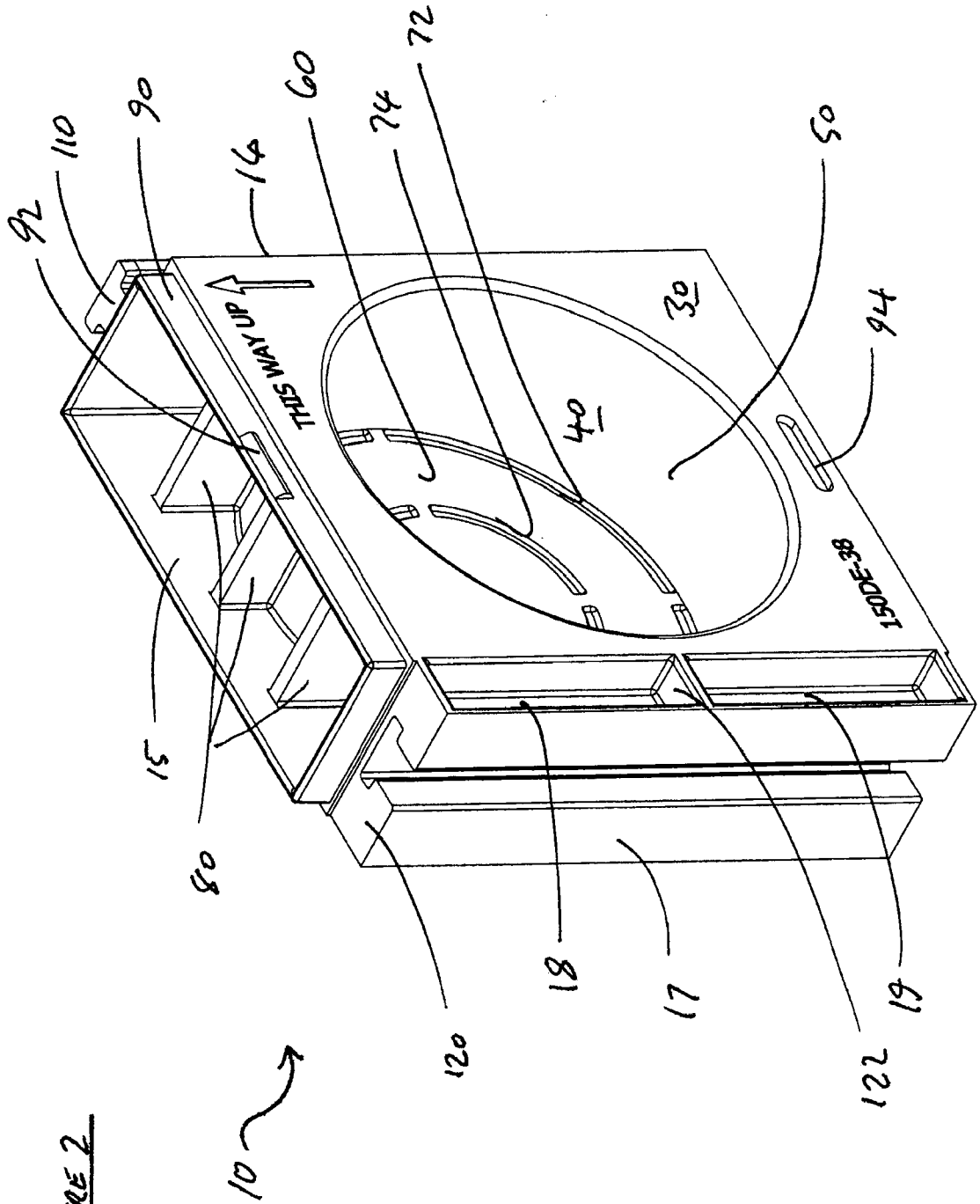
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FIGURE 2

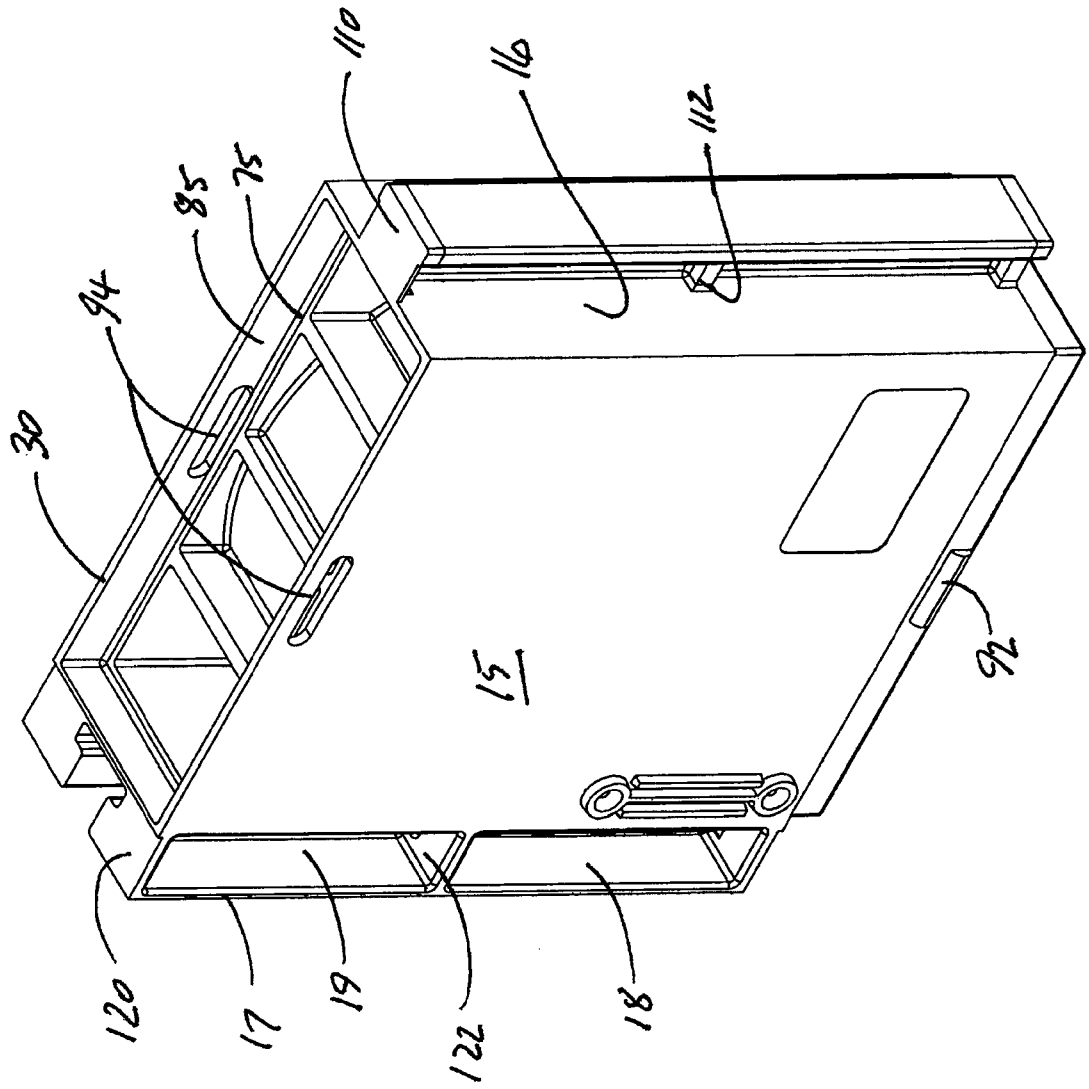

Figure 3

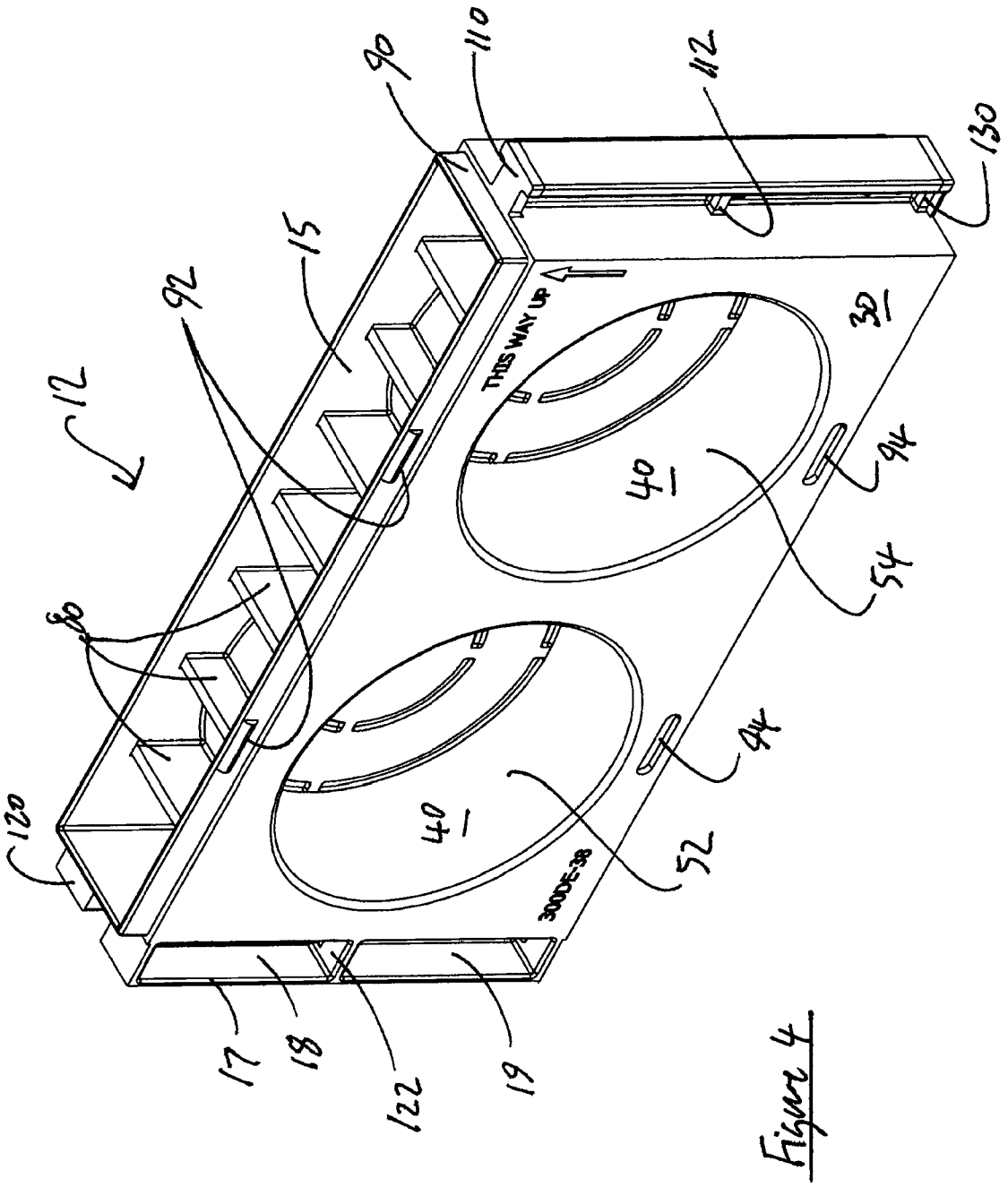
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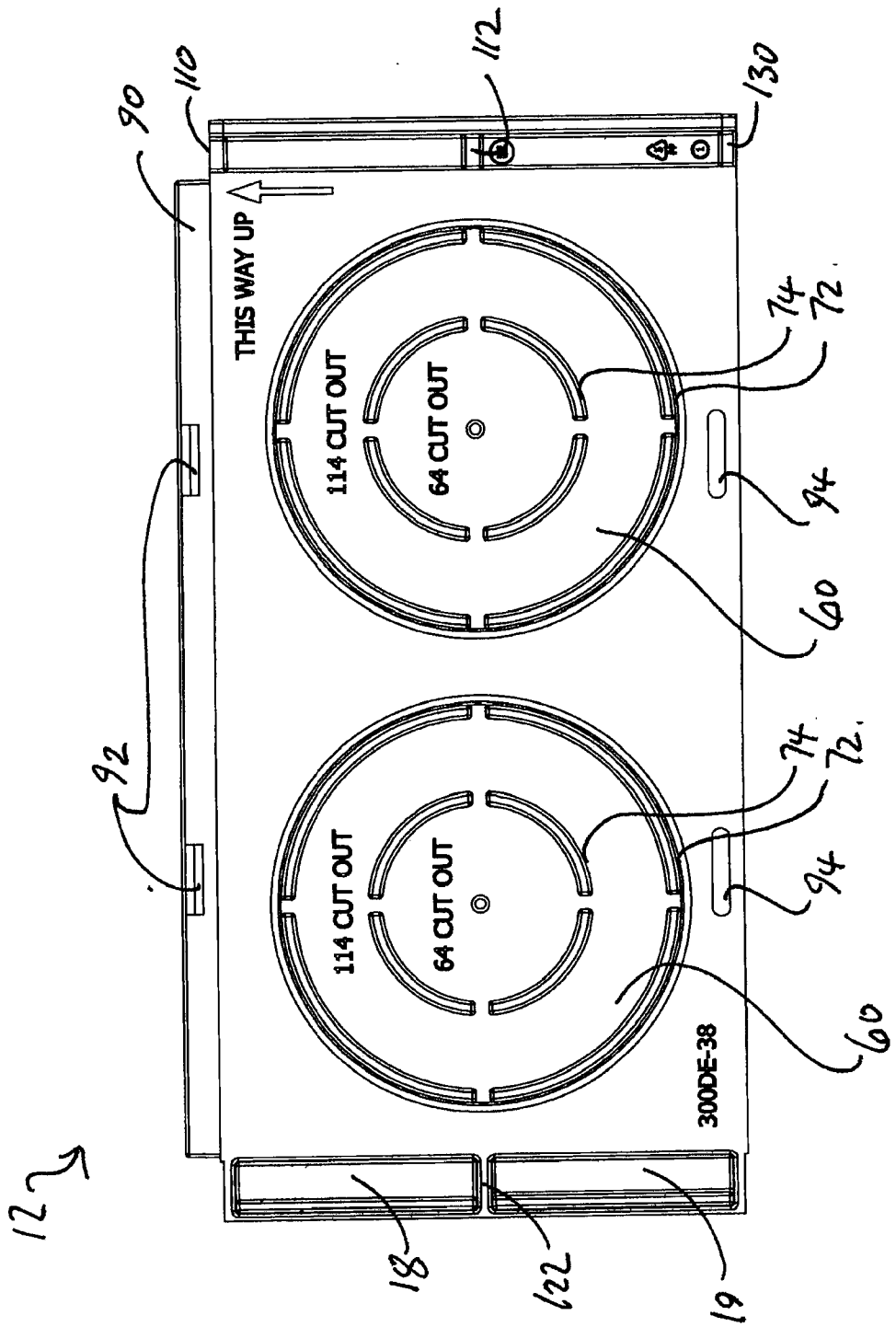
Figure 4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94
60

Figure 5

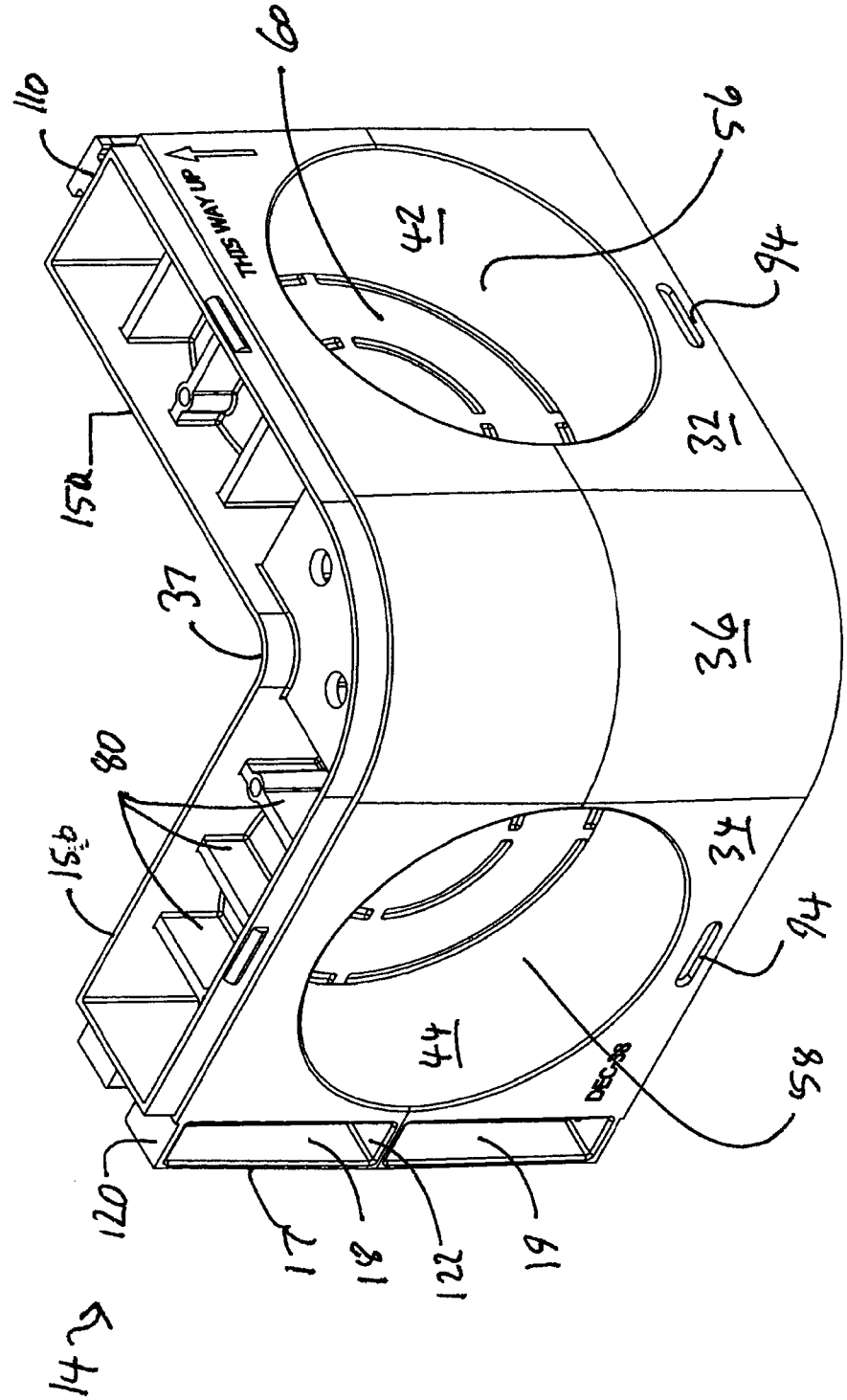

110
60
56
42
94
32
15a
37
36
80
15b
34
94
44
58
DECK
120
17
18
122
19
14
THIS WAY UP

Figure 6

Figure 7

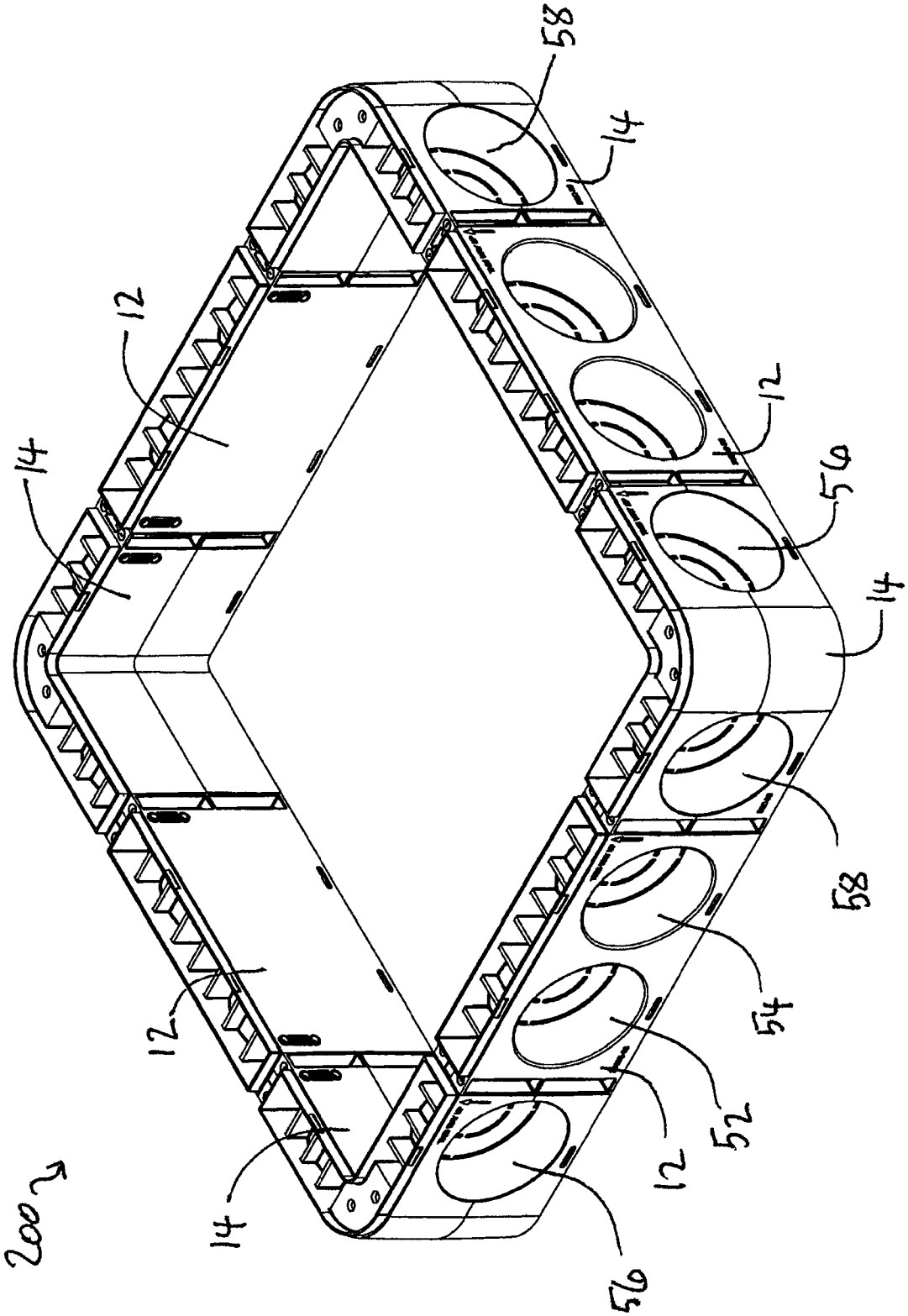


Figure 8

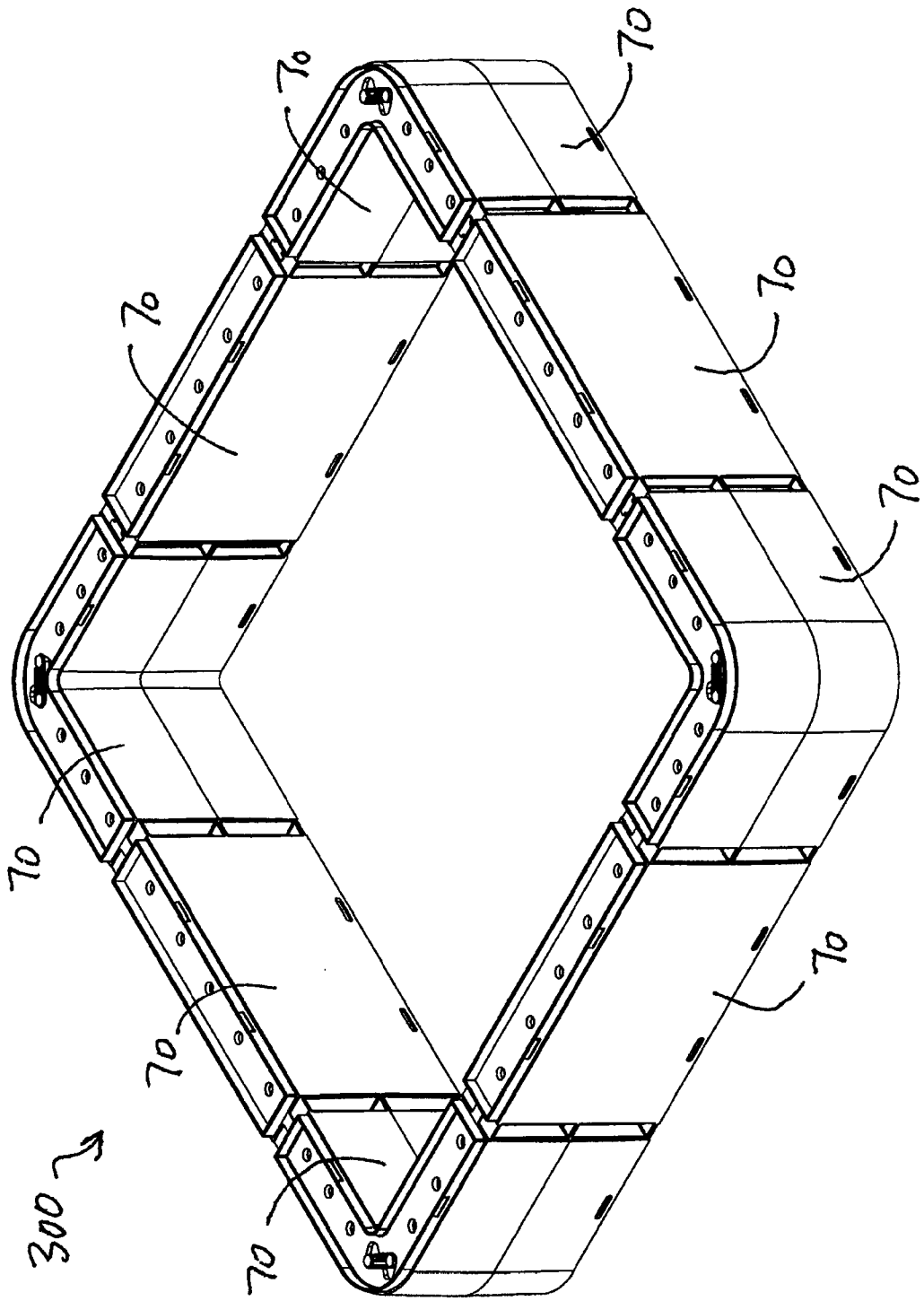


Figure 9a

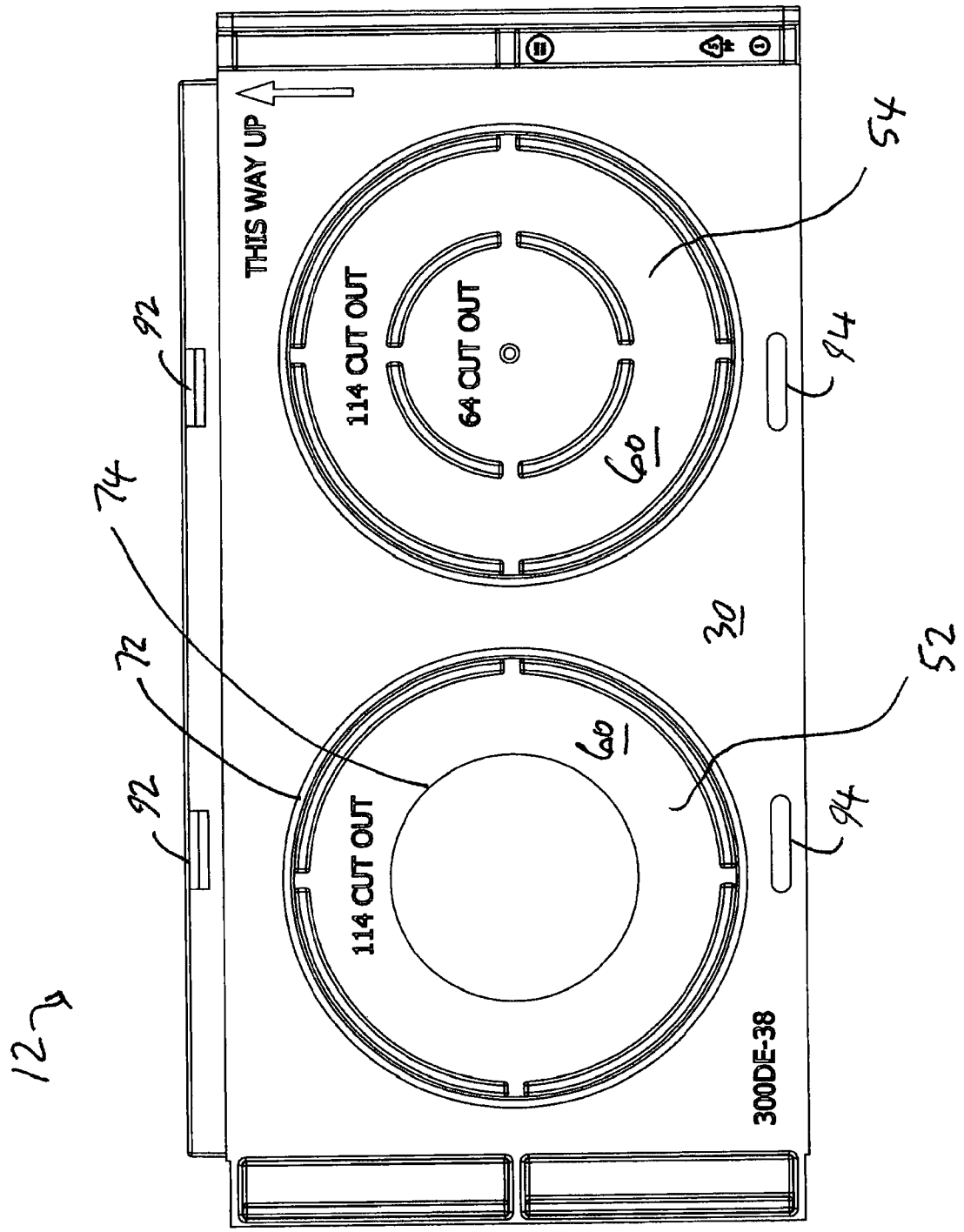
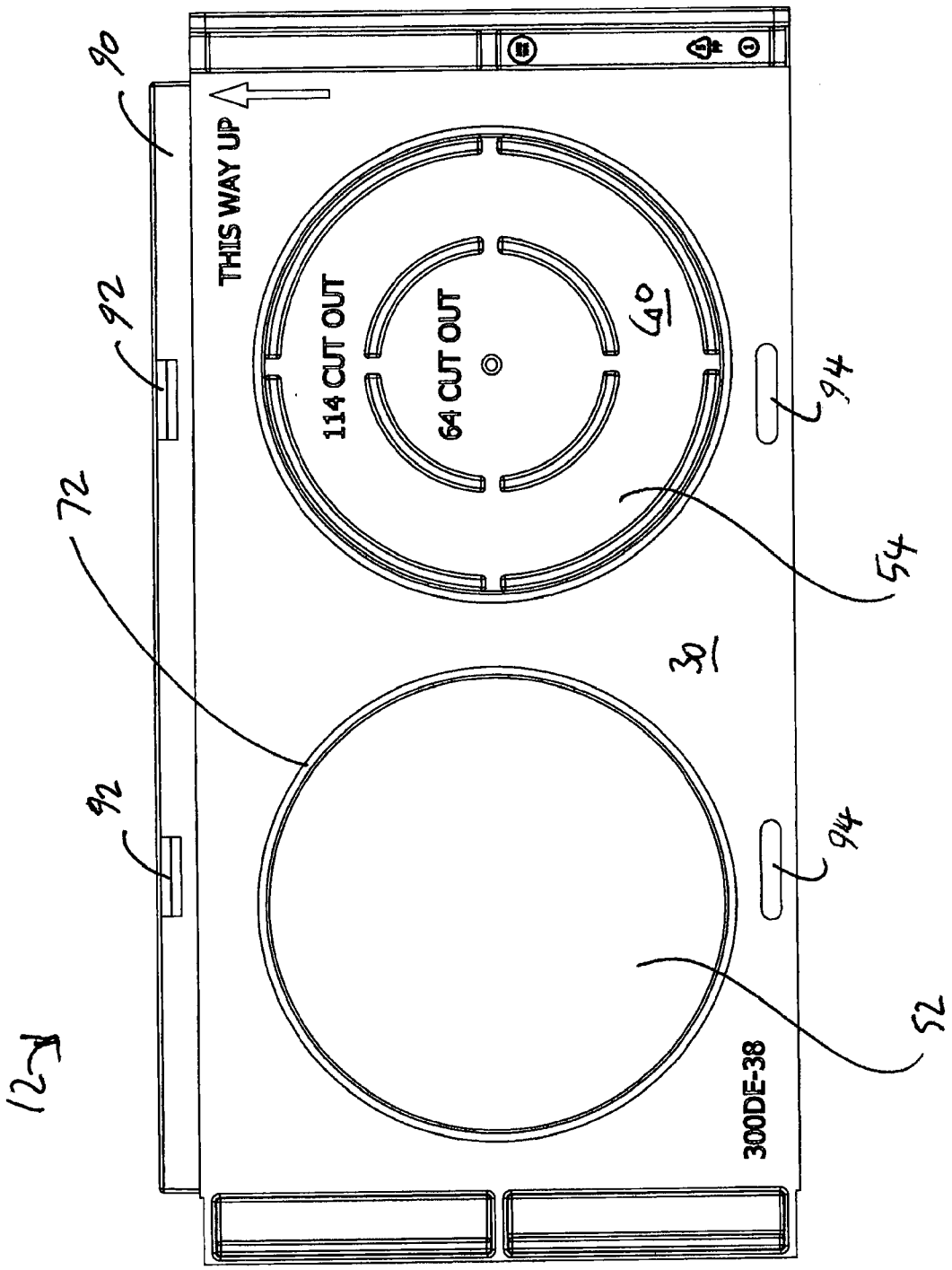

THIS WAY UP
114 CUT OUT
64 CUT OUT
114 CUT OUT
300DE-38
54
52
92
92
94
94
74
72
60
60
30
12

Figure 9b


90
92
72
92
127
THIS WAY UP
114 CUT OUT
64 CUT OUT
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94
54
30
94
52
300DE-38

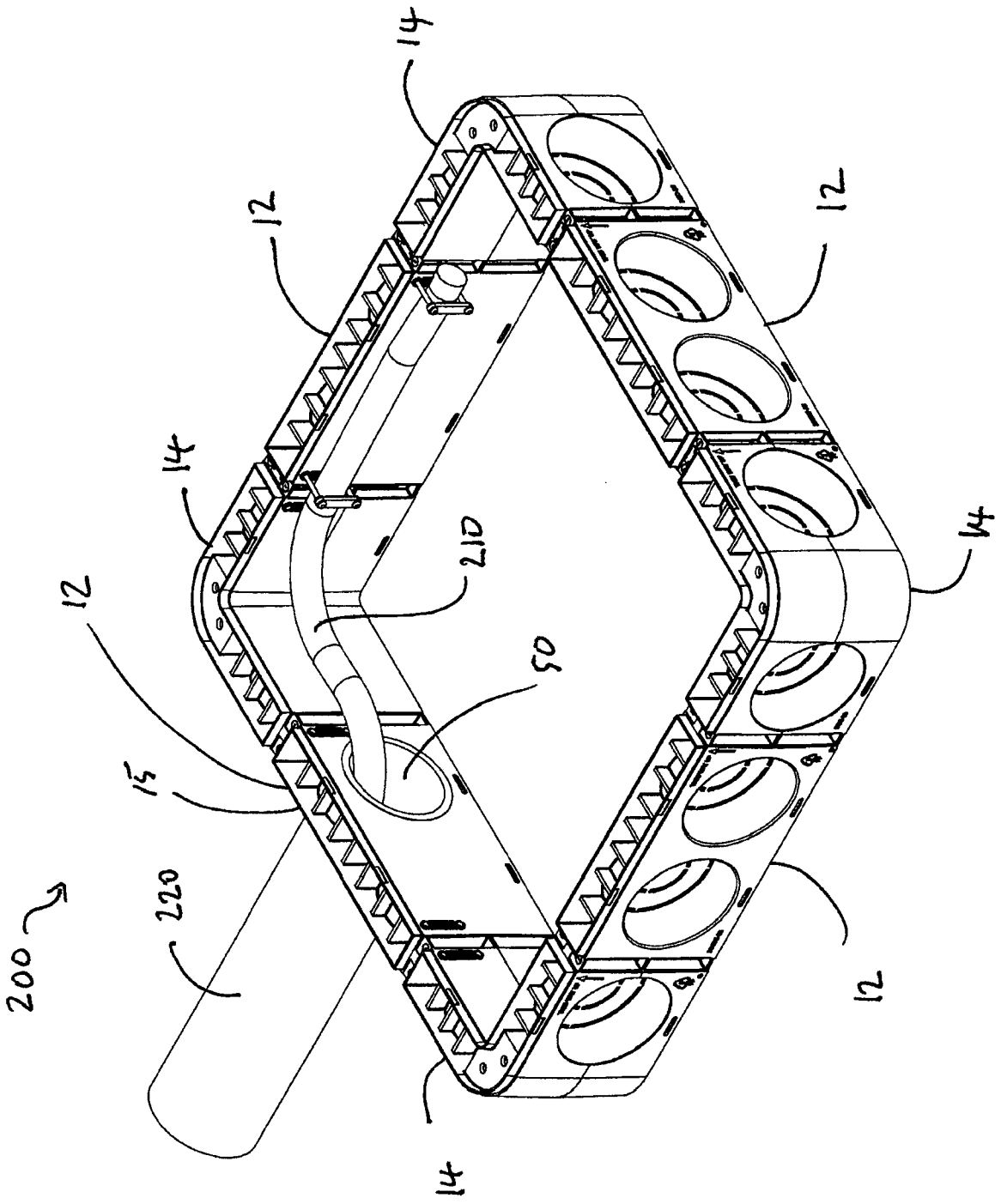
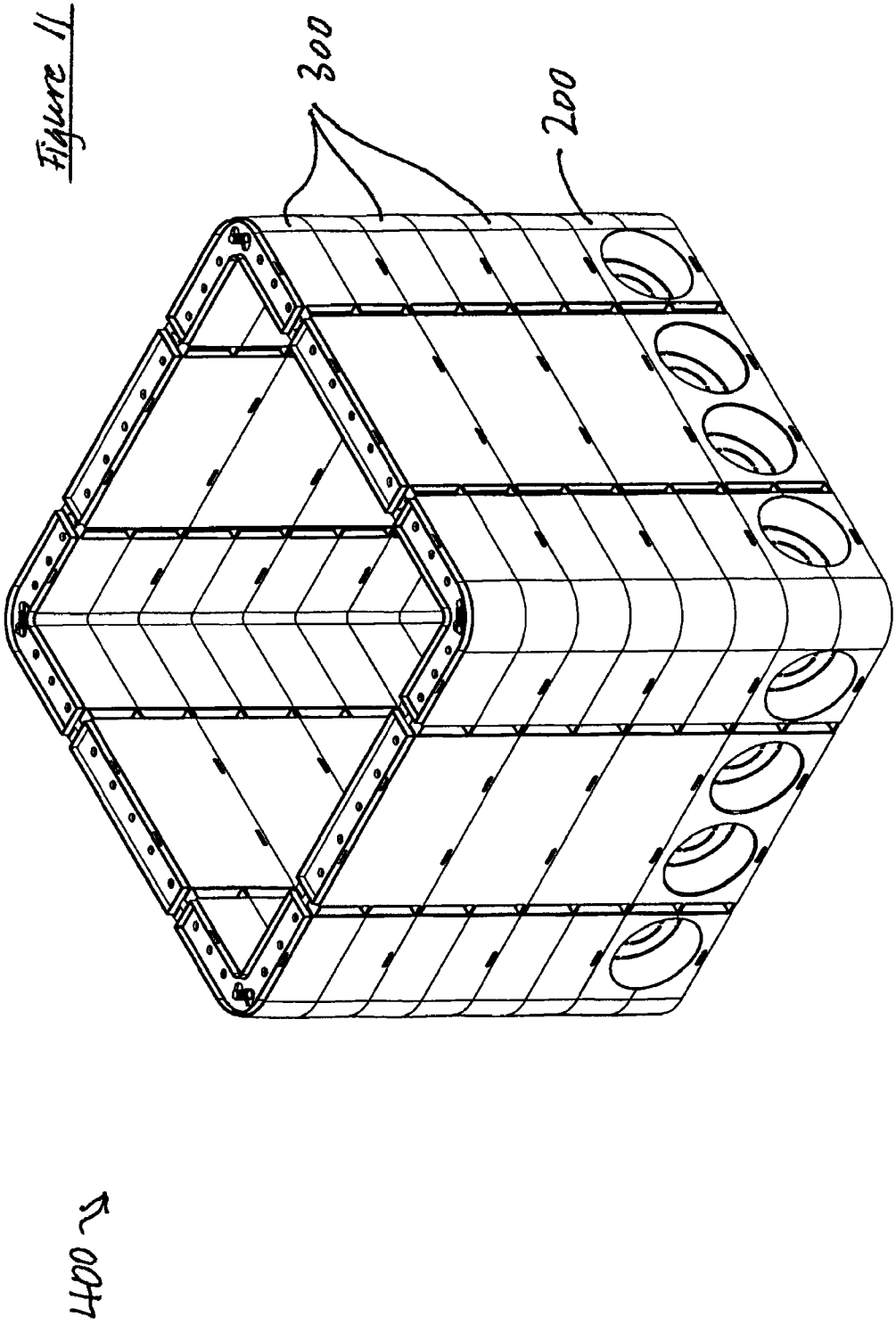
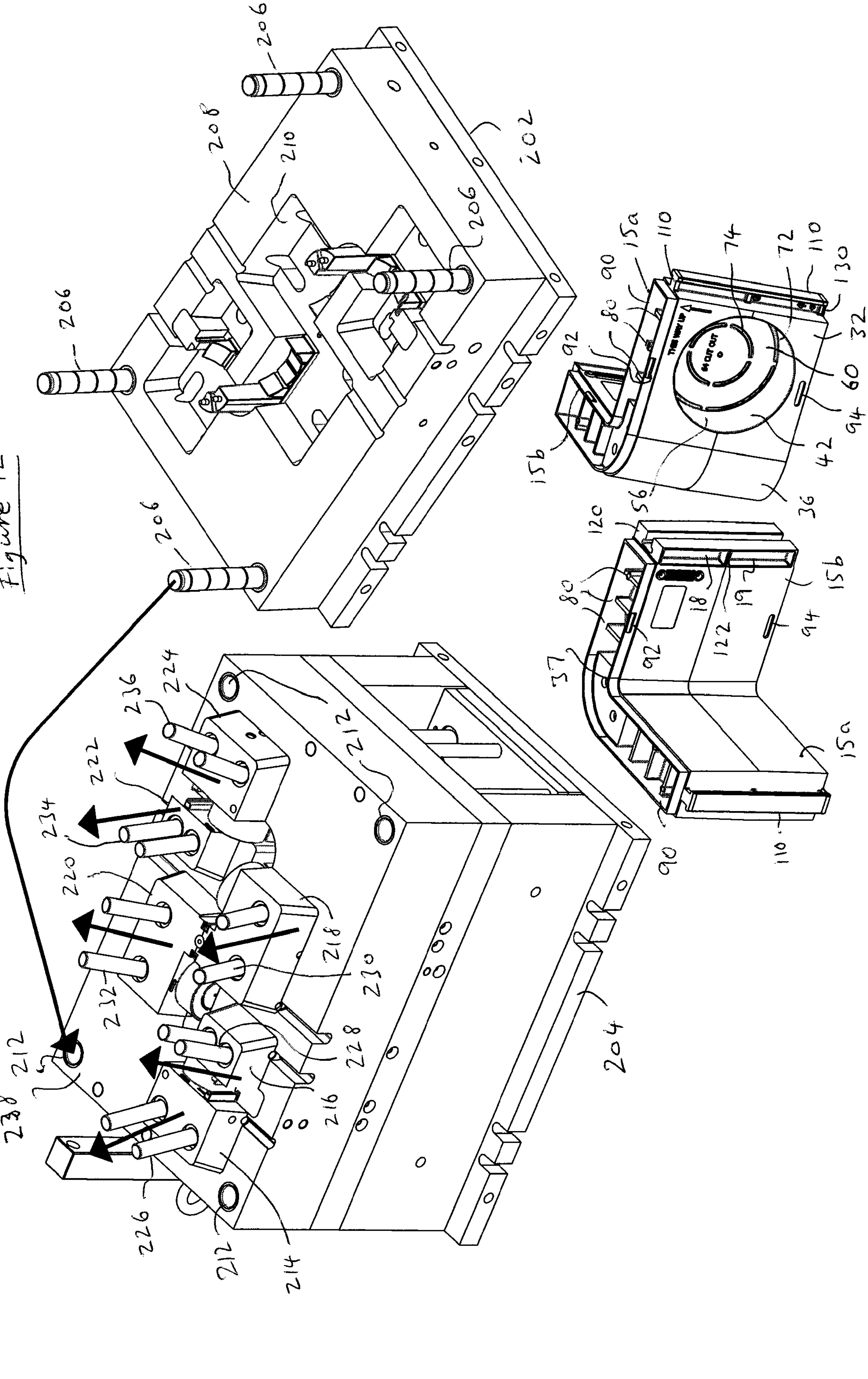


Figure 10

Figure 11




202
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226
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230
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234
236
238
15a
15b
18
19
32
36
37
42
56
60
72
74
80
90
92
94
110
120
122
130
THIS WAY UP

Figure 12

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	**FOR FURTHER ACTION**	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
P339030PCT/B		
International application No.	International filing date *(day/month/year)*	(Earliest) Priority Date *(day/month/year)*
PCT/EP2013/060995	29 May 2013 (29-05-2013)	30 May 2012 (30-05-2012)
Applicant		
PETER SAVAGE LIMITED		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 4 sheets.

[X] It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**
   a. With regard to the **language,** the international search was carried out on the basis of:
      [X] the international application in the language in which it was filed
      [ ] a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))
   b. [ ] This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6*bis*(a)).
   c. [ ] With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. [ ] **Certain claims were found unsearchable** (See Box No. II)

3. [ ] **Unity of invention is lacking** (see Box No III)

4. With regard to the **title,**
   [X] the text is approved as submitted by the applicant
   [ ] the text has been established by this Authority to read as follows:

5. With regard to the **abstract,**
   [X] the text is approved as submitted by the applicant
   [ ] the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority

6. With regard to the **drawings,**
   a. the figure of the **drawings** to be published with the abstract is Figure No. 1
      [ ] as suggested by the applicant
      [X] as selected by this Authority, because the applicant failed to suggest a figure
      [ ] as selected by this Authority, because this figure better characterizes the invention
   b. [ ] none of the figures is to be published with the abstract

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2013/060995

A. CLASSIFICATION OF SUBJECT MATTER
INV. H02G9/10 F16L41/03
ADD.

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)
H02G F16L

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 practicable, 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 0 151 905 A2 (RICCINI S R L SOCIETA A RESPON [IT]) 21 August 1985 (1985-08-21)	1-8
A	abstract page 2, line 8 - page 3, line 4 line 18 - page 3, line 29 page 5, line 10 - line 24 claim 1 figure 1	9-34

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
5 November 2013	15/11/2013

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Schaeffler, C

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Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2013/060995

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 643 606 A1 (BEINER GUENTER [DE]; VAN EIJNDHOVEN ALEX [NL]) 5 April 2006 (2006-04-05)	1,2
A	abstract paragraph [0005] paragraph [0007] paragraph [0011] paragraph [0020] - paragraph [0021] claims 1-8 figure 4	3-34

X	WO 98/02617 A1 (DIAZ BERANGO GORKA [ES]) 22 January 1998 (1998-01-22)	1,2,26, 27
A	abstract figures 1,16	3-25, 28-34

X	GB 2 404 409 A (ECCLES [GB]) 2 February 2005 (2005-02-02)	1-7
A	abstract page 4, line 8 page 5, line 18 - line 23 page 6, line 6 - line 14 page 12, line 6 - line 24 page 15, line 6 - line 28 claims 1-3,19-23 figures 1,4	8-34

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2013/060995

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0151905 A2	21-08-1985	NONE	
EP 1643606 A1	05-04-2006	NONE	
WO 9802617 A1	22-01-1998	AU 3444797 A	09-02-1998
		EP 0863263 A1	09-09-1998
		WO 9802617 A1	22-01-1998
GB 2404409 A	02-02-2005	NONE	