(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 512 744 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
26.02.2025 Bulletin 2025/09

(21) Application number: **24193280.5**

(22) Date of filing: **07.08.2024**

(51) International Patent Classification (IPC):
B65D 90/08 *(2006.01)* ***E04H 7/18*** *(2006.01)*
E02D 27/38 *(2006.01)* ***E03B 11/00*** *(2006.01)*
E03F 11/00 *(2006.01)* ***E03F 5/02*** *(2006.01)*

(52) Cooperative Patent Classification (CPC):
E04H 7/18; B65D 90/08; E02D 27/38; E03B 11/00; E03F 11/00; E03F 2005/028

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
GE KH MA MD TN

(30) Priority: **25.08.2023 US 202318455963**

(71) Applicant: **Dutchland, Inc.**
Gap, PA 17527 (US)

(72) Inventors:
- **MARTIN, Curshane L.**
East Earl (US)
- **GROFF, Randall S.**
Narvon (US)

(74) Representative: **Ashton, Gareth Mark et al**
Baron Warren Redfern
1000 Great West Road
Brentford TW8 9DW (GB)

(54) **TANK WALL CONNECTION**

(57) A tank wall connection (20) includes a base (100) having a base recess (120) and a wall (200) having an end (210) positioned in the base recess. A grout (400) is filled in the base recess (120) around the end (210) of the wall. A caulk (500) is disposed at a wall joint (410) between the wall and the grout. An epoxy layer (600) is disposed over the caulk and the grout at the wall joint.

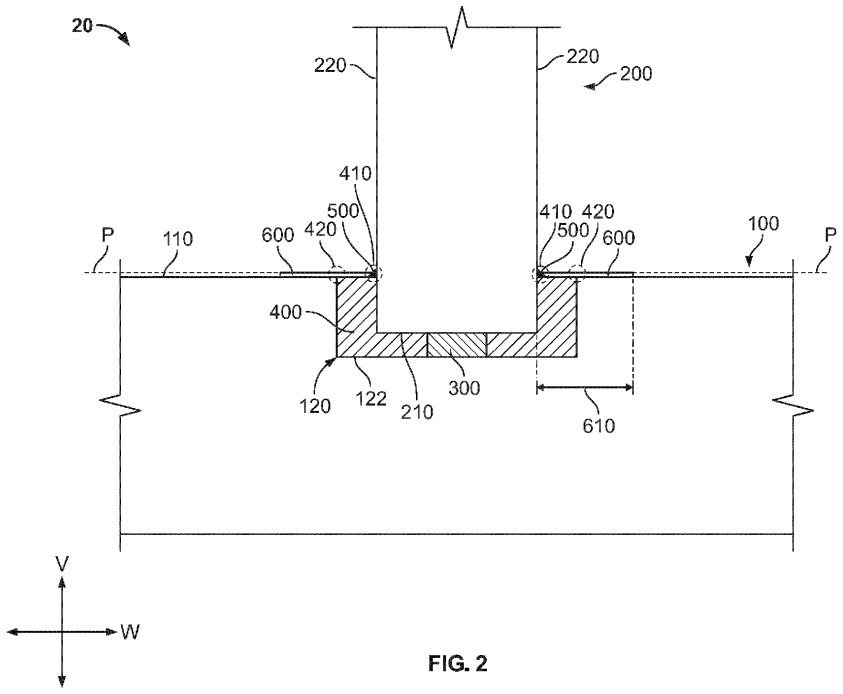

FIG. 2

EP 4 512 744 A1

Description

FIELD OF THE INVENTION

[0001] The present invention relates to a tank wall connection and, more particularly, to a connection between a wall and a base of a retaining tank.

BACKGROUND

[0002] Concrete walls are commonly used to form retention structures, such as a tank used for retaining wastewater. To form the retention structure, the walls are positioned in a concrete base and attached to the base. An epoxy is often used to prevent moisture from entering a joint between the wall and the base and is applied vertically on a side of the wall, over the joint, and horizontally on the base adjacent to the wall.

[0003] When the retention structure is loaded by a retained material, however, the walls deflect, causing cracks in the epoxy. The cracks permit moisture to enter the joint between the wall and the base, decreasing the load capabilities and useful life of the retention structure.

SUMMARY

[0004] A tank wall connection includes a base having a base recess and a wall having an end positioned in the base recess. A grout is filled in the base recess around the end of the wall. A caulk is disposed at a wall joint between the wall and the grout. An epoxy layer is disposed over the caulk and the grout at the wall joint.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] The invention will now be described by way of example with reference to the accompanying figures, of which:

Figure 1 is a perspective view of a retaining tank;
Figure 2 is a sectional side view of a tank wall connection; and
Figure 3 is a flowchart of a process of connecting a wall and a base in a retaining tank.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0006] Exemplary embodiments of the present invention will be described hereinafter in detail with reference to the attached drawings, wherein like reference numerals refer to like elements. The present invention may, however, be embodied in many different forms and should not be construed as being limited to the embodiments set forth herein; rather, these embodiments are provided so that the present disclosure will convey the concept of the disclosure to those skilled in the art.

[0007] Throughout the drawings, only one of a plurality of identical elements may be labeled in a figure for clarity of the drawings, but the detailed description of the element herein applies equally to each of the identically appearing elements in the figure. Throughout the specification, directional descriptors are used such as "vertical direction" and "width direction". These descriptors are merely for clarity of the description and for differentiation of the various directions. These directional descriptors do not imply or require any particular orientation of the disclosed elements.

[0008] A retaining tank 10 according to an exemplary embodiment is shown in Figure 1. The retaining tank 10 includes a plurality of walls 200 disposed in a base 100. The walls 200 are each connected to the base 100 by a tank wall connection 20 shown in Figure 2 and described in greater detail below. The retaining tank 10 defines a retention area 12 or a plurality of retention areas 12 between the walls 200 and the base 100. A material to be retained by the retaining tank 10, such as wastewater, is disposed in the retention areas 12.

[0009] The retaining tank 10 shown in Figure 1 is merely an example illustrating a possible application of the tank wall connection 20 shown in Figure 2 and described herein. In other embodiments, the tank wall connection 20 described in greater detail below could be used in a retaining tank 10 having another overall shape or structure and to retain any of a number of different materials commonly retained by retention tanks in the retention areas 12. In some embodiments, the tank wall connection 20 can be used to form a retaining structure that does not define enclosed retention areas 12, but rather has at least one open side, or is an alignment of walls 200 along a single direction. The tank wall connection 20 described in detail below can apply in any embodiment or application in which a wall 200 is connected to a base 100 as described with reference to Figure 2 herein.

[0010] As shown in Figure 2, the tank wall connection 20 includes a base 100 and a wall 200 connected to the base 100. The base 100 and the wall 200 are each formed separately of a concrete material. The concrete material of the base 100 and the wall 200 can be formed of any mixture of cement, water, and aggregate known to those with ordinary skill in the art and used in retention structure applications. The base 100 and the wall 200 may have any reinforcement structure within the concrete material that is commonly used in retention structure applications.

[0011] The base 100, as shown in Figure 2, has a top surface 110 and a base recess 120 extending into the top surface 110 in a vertical direction V.

[0012] The wall 200, as shown in Figure 2, has an approximately rectangular cross section with an end 210 and a pair of side surfaces 220 extending from the end 210 along the vertical direction V. The side surfaces 220 are positioned opposite one another in a width direction W perpendicular to the vertical direction V. In the shown embodiment, the side surfaces 220 each extend in the vertical direction V perpendicularly with respect to a surface of the wall 200 at the end 210. In other embodiments, at least one of the side surfaces 220 can extend at

an angle with respect to the vertical direction V.

[0013] A process 700 of creating the tank wall connection 20 to connect the wall 200 and the base 100 will now be described in greater detail with reference to Figures 2 and 3.

[0014] In a step 710 shown in Figure 3, the base 100 is provided with the base recess 120 as described above.

[0015] In a step 720 shown in Figure 3, a shim 300 is positioned in the base recess 120. As shown in Figure 2, the shim 300 is positioned on a bottom surface 122 of the base recess 120. In an embodiment, the shim 300 is formed of a plastic material. In other embodiments, the shim 300 may be formed of any type of material that is sufficiently durable for the application.

[0016] In a step 730 shown in Figure 3, the end 210 of the wall 200 is positioned in the base recess 120. As shown in the embodiment of Figure 2, the end 210 of the wall 200 is positioned on the shim 300, and the shim 300 is positioned between the end 210 of the wall 200 and the base 100.

[0017] A grout 400 is then filled in the base recess 120 in a step 740 shown in Figure 3. In an embodiment, the grout 400 is formed of a cement material and, in a further embodiment, is formed of a non-shrink cement material. The grout 400, as shown in Figure 2, is filled in the base recess 120 around the end 210 of the wall 200 and covering the shim 300. The grout 400 is then cured.

[0018] The grout 400, in a cured state shown in Figure 2, is aligned with the top surface 110 of the base 100. The grout 400 forms a wall joint 410 between the wall 200 and the grout 400 at the side surfaces 220 of the wall 200 and forms a base joint 420 between the base 100 and the grout 400 at the top surface 110 of the base 100.

[0019] In a step 750 shown in Figure 3, a caulk 500 is applied at the wall joints 410 between the grout 400 and the side surfaces 220 of the wall 200. In an embodiment, the grout 400 filled in the step 740 is cured before the caulk 500 is applied in the step 750.

[0020] The caulk 500, as shown in Figure 2, is positioned just to cover the seam between the grout 400 and the wall 200 at the wall joints 410; a small portion of the bead of caulk 500 is positioned on each of the side surfaces 220 of the wall 200 and on the grout 400 adjacent to the side surface 220. The caulk 500 is an elastomeric joint sealant that can resiliently deform and remain intact when the wall 200 moves with respect to the grout 400. In an embodiment, the caulk 500 is a polyurethane-based joint sealant, and may be Sikaflex®-1A.

[0021] In a step 760 shown in Figure 3, an epoxy layer 600 is disposed over the caulk 500 and over the grout 400. In an embodiment, the caulk 500 applied in the step 750 is cured before the epoxy layer 600 is applied in the step 760.

[0022] The epoxy layer 600, as shown in Figure 2, is positioned over the caulk 500 and the grout 400 at the wall joints 410 and extends over the grout 400 and over the top surface 110 of the base 100. The epoxy layer 600 covers the wall joints 410 and covers the base joints 420 between the base 100 and the grout 400. The epoxy layer 600 extends in a single plane P that is parallel to the top surface 110 of the base 100; the epoxy layer 600 does not extend in the vertical direction V and is not applied or otherwise disposed on the side surfaces 220 of the wall 200. The epoxy layer 600 extends in the width direction W to a length 610 from the wall 200 that is sufficient to be positioned on and cover a portion of the top surface 110 of the base 100.

[0023] The epoxy layer 600 is a two-part epoxy coating. In an embodiment, the epoxy layer 600 is Sikaguard®-62. In other embodiments, the epoxy layer 600 may be any kind of epoxy usable in the concrete retention applications described herein.

[0024] The tank wall connection 20 of the present invention prevents moisture from entering the wall joints 410 and the base joints 420. The caulk 500 is positioned directly in the wall joints 410 and is an elastomeric material that elastically deforms and remains intact even when the wall 200 deflects under a load. The caulk 500 is further protected by the epoxy layer 600, which also covers the base joints 420. The epoxy layer 600 is not positioned on the wall 200 and, even when the wall 200 deflects, the epoxy layer 600 is not deformed and is less susceptible to cracking than in the prior art. The tank wall connection 20 thus provides a more effective moisture barrier that increases the useful life of the retaining tank 10 or other retention structure formed by the walls 200 and base 100 connected by the tank wall connection 20.

Claims

1. A tank wall connection (20), comprising:

   a base (100) having a base recess (120);
   a wall (200) having an end (210) positioned in the base recess (120);
   a grout (400) filled in the base recess (120) around the end (210) of the wall;
   a caulk (500) disposed at a wall joint (410) between the wall (200) and the grout (400); and
   an epoxy layer (600) disposed over the caulk (500) and the grout (400) at the wall joint (410).

2. The tank wall connection (20) of claim 1, wherein the base (100) has a top surface (110) and the base recess (120) extends into the top surface.

3. The tank wall connection (20) of claim 2, wherein the epoxy layer (600) extends over the top surface (110) of the base.

4. The tank wall connection (20) of claim 2 or 3, wherein the grout (400) is aligned with the top surface (110) of the base.

5. The tank wall connection (20) of any preceding

claim, wherein the epoxy layer (600) is disposed over the base (100) and optionally over a base joint (420) between the base (100) and the grout (400).

6. The tank wall connection (20) of any preceding claim, wherein the epoxy layer (600) is not disposed on the wall (200).

7. The tank wall connection (20) of any preceding claim, further comprising a shim (300) positioned in the base recess (120), wherein the shim (300) is optionally formed of a plastic material.

8. The tank wall (20) connection of claim 7, wherein the shim (300) is positioned between the end of the wall (200) and the base (100).

9. The tank wall connection (20) of claim 7 or 8, wherein the shim (300) is covered by the grout (400).

10. The tank wall connection (20) of any preceding claim, wherein the base (100) and the wall (200) are each formed of a concrete material.

11. The tank wall connection (20) of any preceding claim, wherein the epoxy layer (600) extends in a single plane (P).

12. A process (700) of connecting a wall (200) and a base (100) in a retaining tank, comprising:

providing (710) the base (100) with a base recess (120);
positioning (730) an end (210) of the wall in the base recess (120);
filling (740) the base recess (120) with a grout (400) around the end (210) of the wall;
applying (750) a caulk (500) at a wall joint (410) between the wall and the grout; and
applying (760) an epoxy layer (600) over the caulk (500) and the grout (400) at the wall joint.

13. The process (700) of claim 12, wherein the grout (400) is cured before the caulk (500) is applied.

14. The process (700) of claim 12 or 13, wherein the caulk (500) is cured before the epoxy layer (600) is applied.

15. The process (700) of claim 12, 13 or 14, further comprising positioning (720) a shim (300) in the base recess (120) before positioning the end (210) of the wall in the base recess.

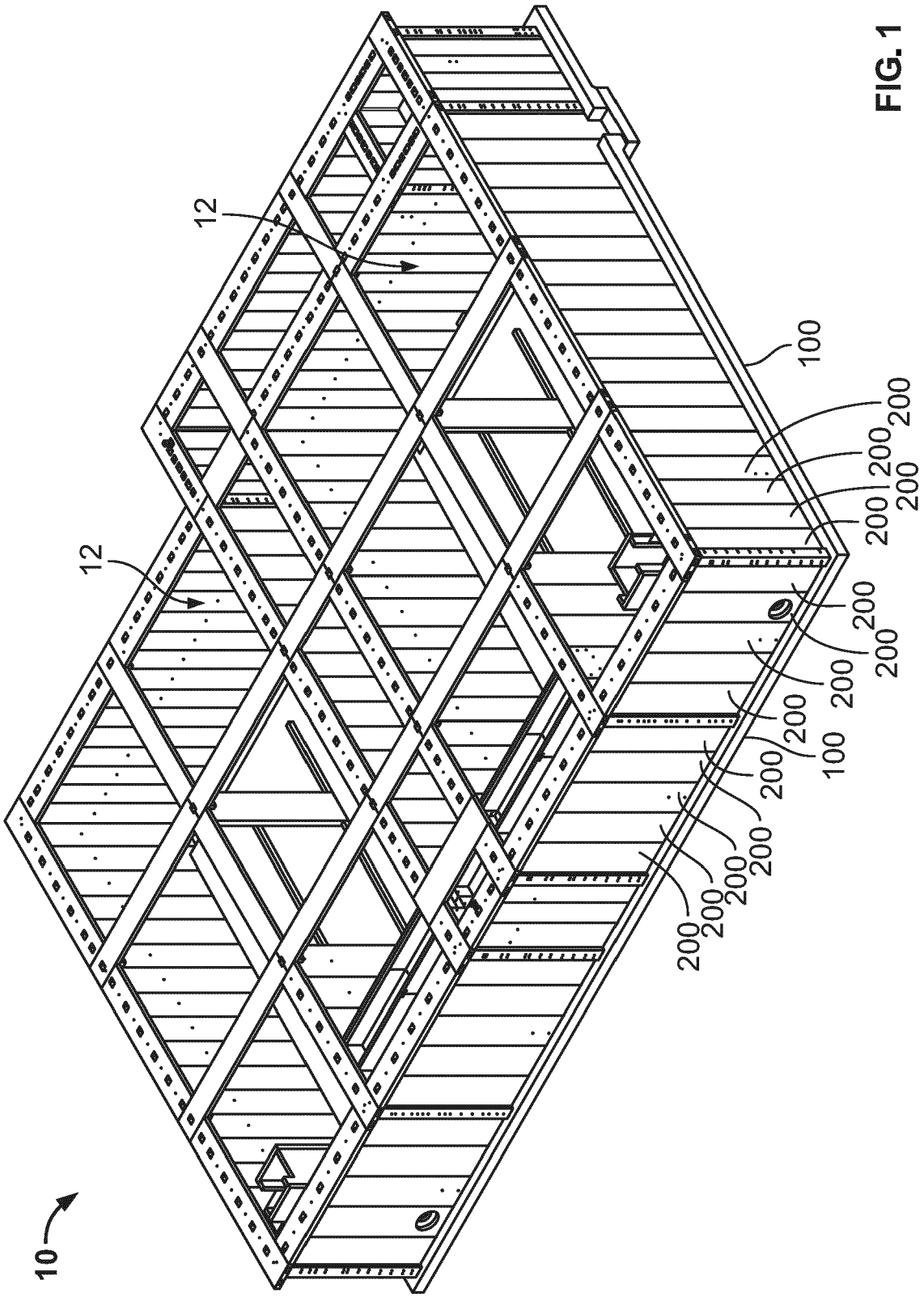
12
12
100
200
200
200
200
200
200
200
200
100
200
200
200
200
200
200
10

FIG. 1

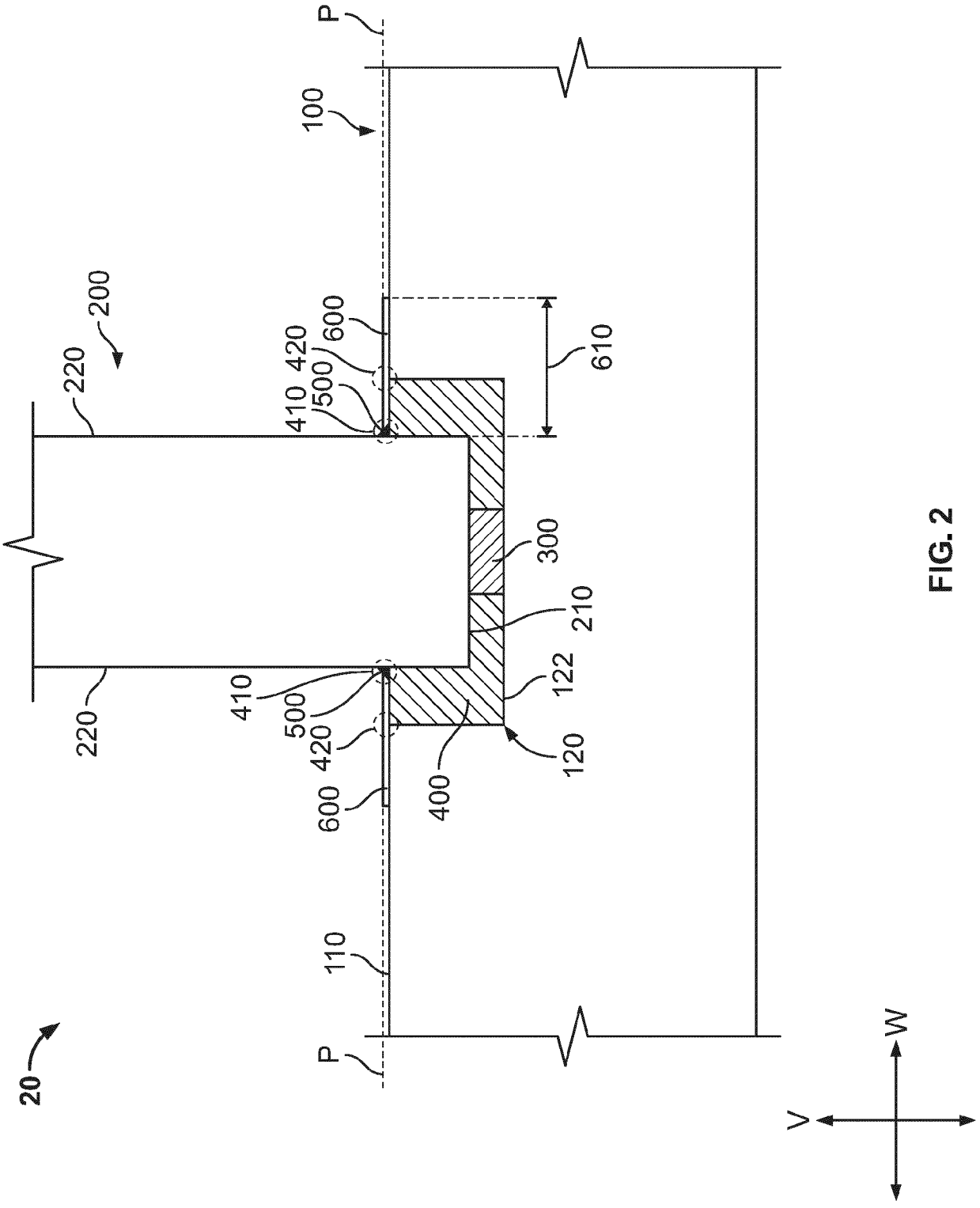

FIG. 2

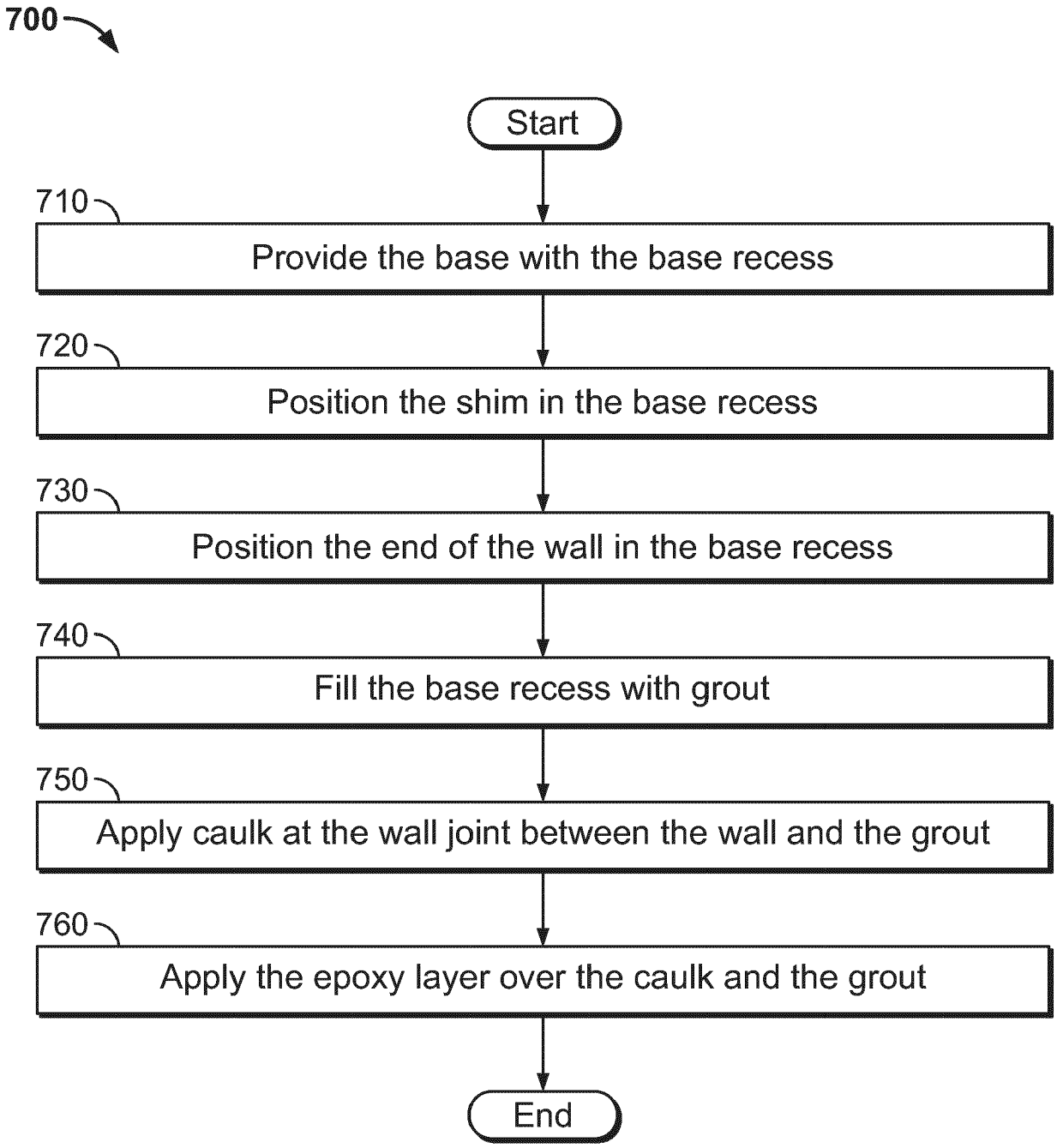
700
Start
710
Provide the base with the base recess
720
Position the shim in the base recess
730
Position the end of the wall in the base recess
740
Fill the base recess with grout
750
Apply caulk at the wall joint between the wall and the grout
760
Apply the epoxy layer over the caulk and the grout
End

FIG. 3

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 24 19 3280

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	US 2016/251868 A1 (CLOSE STEVEN R [US]) 1 September 2016 (2016-09-01) * paragraph [0031]; figures 2-4,8 *	1-15	INV. B65D90/08 E04H7/18 E02D27/38
Y	FR 2 979 577 A1 (RIVAPLAN AG [CH]) 8 March 2013 (2013-03-08) * page 14, lines 3-5; figures 3,4 *	1-15	E03B11/00 E03F11/00 E03F5/02
Y	DE 20 41 142 A1 (BRAAS & CO GMBH) 24 February 1972 (1972-02-24) * figure 2 *	1-15	
A	CN 207 988 637 U (ZHONGJIAN ZHENGDA TECH CO LTD ET AL.) 19 October 2018 (2018-10-19) * figures 1,3 *	7-9,15	
A	DE 10 2008 018270 A1 (BERGMANN MARTIN [DE]; LAETZSCH GMBH KUNSTSTOFFVERARB [DE] ET AL.) 22 October 2009 (2009-10-22) * paragraphs [0067], [0069], [0070], [0075]; figures 5a,5d *	1-15	TECHNICAL FIELDS SEARCHED (IPC)
A	WO 2023/089058 A1 (CPC AG [CH]) 25 May 2023 (2023-05-25) * figures 11d,11f *	1-15	E03B E03F E02D B65D E04H
A	CN 111 287 555 B (SINOHYDRO BUREAU 8 CO LTD) 23 July 2021 (2021-07-23) * figure 8 *	1,12	E04B E04C
A	EP 1 224 134 B1 (UTEK UMWELTSCHUTZTECHNOLOGIEN [DE]) 19 November 2003 (2003-11-19) * paragraphs [0023], [0024]; figures 2-7 *	1	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	10 January 2025	Isailovski, Marko

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 24 19 3280

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

10-01-2025

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2016251868 A1	01-09-2016	NONE	
FR 2979577 A1	08-03-2013	AT 13346 U1	15-11-2013
		CH 705458 A2	15-03-2013
		FR 2979577 A1	08-03-2013
DE 2041142 A1	24-02-1972	NONE	
CN 207988637 U	19-10-2018	NONE	
DE 102008018270 A1	22-10-2009	NONE	
WO 2023089058 A1	25-05-2023	AU 2022389038 A1	06-06-2024
		CA 3237759 A1	25-05-2023
		CN 118369482 A	19-07-2024
		EP 4433665 A1	25-09-2024
		JP 2024541140 A	07-11-2024
		WO 2023088555 A1	25-05-2023
		WO 2023089058 A1	25-05-2023
CN 111287555 B	23-07-2021	NONE	
EP 1224134 B1	19-11-2003	AT E254572 T1	15-12-2003
		AU 1385301 A	30-04-2001
		CA 2387587 A1	26-04-2001
		CZ 20021349 A3	18-06-2003
		DE 19950466 A1	10-05-2001
		EP 1224134 A1	24-07-2002
		PL 354252 A1	29-12-2003
		WO 0128893 A1	26-04-2001

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82