



(51) International Patent Classification:

H05B 3/06 (2006.01) *F24H 1/12* (2022.01)
H05B 3/48 (2006.01) *F24H 9/1818* (2022.01)
F24H 1/00 (2022.01) *B60H 1/22* (2006.01)

(21) International Application Number:

PCT/EP2024/052911

(22) International Filing Date:

06 February 2024 (06.02.2024)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

23158327.9 23 February 2023 (23.02.2023) EP

(71) Applicant: VALEO SYSTEMES THERMIQUES

[FR/FR]; 8 rue Louis Lormand La Verrière, 78320 Le Mesnil-Saint-Denis (FR).

(72) Inventors: KOZICKA, Jan; C/o VALEO AUTOKLI-

MATIZACE K.S., Sazecská 247/2, 108 00 Prague (CZ).
LEON VALENZUELA, David; C/o VALEO AUTOKLI-
MATIZACE K.S., Sazecská 247/2, 108 00 Prague (CZ).

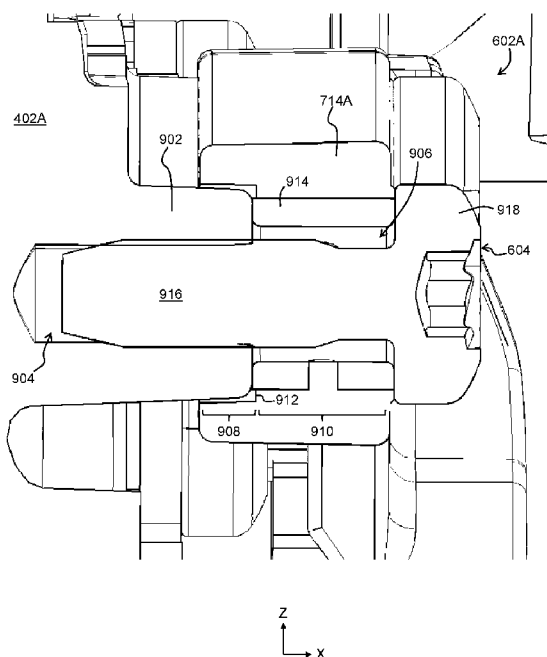
(74) Agent: VALEO SYSTEMES THERMIQUES; 8 rue Louis Lormand La Verrière, 78320 Le Mesnil-Saint-Denis (FR).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CV, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, MG, MK, MN, MU, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, CV, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SC, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, ME, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

(54) Title: HEATING DEVICE

Figure 9



(57) Abstract: The heating device comprises: - a heating chamber; - a resistor located inside the heating chamber for heating a coolant, the resistor comprising a terminal passing through a wall (402A) of the heating chamber, the wall (402A) being provided with a positioning pin (902) projecting outside the heating chamber; - a printed circuit board; - a lead frame connected to the printed circuit board and to the terminal of the resistor; - an overmolding (714A) around the lead frame, the overmolding (714A) having a trough-hole (906) in which the positioning pin (902) is inserted; - a sleeve (914) inserted into the through-hole (906) next to the positioning pin (902); and - a fixing element (604) comprising a rod (916) and a head (918), the rod (916) being inserted into successively the sleeve (914) and a hole (904) of the positioning pin (902), so that the sleeve (914) is clamped between the positioning pin (902) and the head (918).

Published:

— *with international search report (Art. 21(3))*

Description

TITLE OF THE INVENTION : HEATING DEVICE

Technical field

5 [0001] The invention relates to a heating device for heating a coolant. The heating device is in particular intended for a vehicle, such as an automotive vehicle, for example for a heating air of a passenger compartment of the vehicle. The vehicle may be an electric or hybrid vehicle. The vehicle may be autonomous.

Background Art

10 [0002] The air of the passenger compartment is generally heated by using a heat exchanger to transfer heat between a flow of air and a coolant, for example a liquid. For hybrid or electric vehicles, the coolant is heated by a heating device in which an electric current is circulated in at least one resistor placed in contact with the coolant, so that a temperature of the resistor increases, thereby heating the coolant.

[0003] In this context, it is known to use a heating device comprising:

15 - a heating chamber provided with a coolant inlet for letting coolant enter and a coolant outlet for letting the coolant exit;

 - a resistor located inside the heating chamber for heating the coolant, the resistor comprising a terminal passing through a wall of the heating chamber; and

20 - a printed circuit board located outside the heating chamber for controlling the resistor.

[0004] The terminal needs to be connected to the printed circuit board, so that the resistor can be controlled by electronics present on the printed circuit board. The connection must be positioned precisely, in order to arrive at the correct location on

25 the printed circuit board. However, due to space constraints, it is often not possible to use positioning pins.

[0005] It may thus be desirable to provide an object which makes it possible to overcome at least some of the aforementioned problems and constraints.

Summary of the invention

30 [0006] It is therefore proposed a heating device comprising:

- a heating chamber provided with a coolant inlet for letting coolant enter and a coolant outlet for letting the coolant exit;
- a resistor located inside the heating chamber for heating the coolant, the resistor comprising a terminal passing through a wall of the heating chamber; and
- a printed circuit board located outside the heating chamber for controlling the resistor.

characterized in that the wall is provided with a positioning pin projecting outside the heating chamber and having a hole, and characterized in that it further comprises

- a connection module comprising:
 - a lead frame comprising a connection pin connected to the printed circuit board and a connector connected to the terminal of the resistor,
 - an overmolding around the lead frame, the overmolding having a trough-hole in which the positioning pin is inserted, and
 - a sleeve inserted into the through-hole next to the positioning pin; and
- a fixing element comprising a rod and a head, the rod being inserted into successively the sleeve and the hole of the positioning pin, so that the sleeve is clamped between the positioning pin and the head.

[0007] Thanks to the invention, the positioning and fixing functions are carried out by the same elements, namely the pierced positioning pin of the wall and the receiving through-hole of the overmolding of the connection module, which saves space.

[0008] The invention may also include one or more of the following optional features, in any technically possible combination.

[0009] Optionally, the wall is a removable cover covering an opening through which the resistor can be inserted into the heating chamber.

[0010] Also optionally, the fixing element is a screw or a rivet or a bolt.

[0011] Also optionally, the sleeve is made of steel.

[0012] Also optionally, inside the through-hole of the overmolding, the positioning pin extends at less than 0.2 mm from the overmolding in at least one direction transverse to a longitudinal direction of the positioning pin.

[0013] Also optionally, one amongst the positioning pin and the through-hole of the overmolding, has a truncated cone shape, while the other has a cylindrical shape.

[0014] Also optionally, the heating device further comprises a housing comprising the heating chamber and delimiting an inner space, in which the heating chamber
5 extends.

[0015] Also optionally, the printed circuit board extends in the inner space.

[0016] It is also proposed a vehicle comprising a heating device according to the invention, in particular in an installation of the vehicle, for heating air of a passenger compartment of the vehicle.

10 [0017] It is also proposed a method for connecting, in a heating device, a terminal of a resistor located in a heating chamber provided with a coolant inlet for letting coolant enter and a coolant outlet for letting the coolant exit, the terminal passing through a wall of the heating chamber, to a printed circuit board located outside the heating chamber for controlling the resistor, characterized in that the wall is provided with a
15 positioning pin projecting outside the heating chamber and having a hole, and in that the method comprises:

- fixing a connection module to the wall by inserting a positioning pin of the wall projecting outside the heating chamber into a through-hole provided in an overmolding around a lead frame of the connection module, while
20 connecting the terminal to a connector of the lead frame;
- inserting a rod of a fixing element into successively a sleeve located inside the through-hole and a hole of the positioning pin, so that the sleeve is clamped between the positioning pin and a head of the fixing element located at an end of the rod; and
- 25 - fixing the printed circuit board to the heating chamber, while connecting a pin of the lead frame to the printed circuit board.

Brief description of the drawings

[0018] The invention will be better understood using the following description, given solely by way of example and made with reference to the accompanying drawings in
30 which:

- figure 1 is a three dimensional view of a heating device according to the invention,

- figure 2 is a three dimensional view of the heating device, with a top cover removed in order to reveal a printed circuit board,
- figure 3 is a three dimensional view of the heating device, with the printed circuit board removed in order to reveal a heating chamber,
- 5 - figure 4 is a three dimensional cross-sectional view of the heating device, showing resistors in the heating chamber,
- figure 5 is a three dimensional view of the heating device, with front covers removed in order to reveal terminals of the resistors passing through the heating chamber,
- 10 - figure 6 is a three dimensional view of part of the heating device, showing connection modules for connecting the terminals of the resistors to the printed circuit board,
- figure 7 is a three dimensional view of one of the connection modules, with an overmolding shown transparent,
- 15 - figure 8 is a three dimensional view of the other of the connection modules, with an overmolding shown transparent,
- figure 9 is a cross sectional view of a fixing mechanism for fixing the connection module to the front cover, and
- figure 10 is a block diagram illustrating steps of a method for connecting
20 the terminals of the resistors to the printed circuit board.

Description of embodiments of the invention

[0019] Referring to **figures 1 to 9**, an example of a heating device 100 according to the invention, will now be described.

[0020] In the following description, elements of the heating device 100 will be
25 described with respect to an arbitrary orthogonal set of axis X, Y, Z.

[0021] Referring to **figure 1**, the heating device 100 comprises a housing 102 with a main body 104 and an upper cover 106 and a front cover 108.

[0022] Referring to **figure 2**, the heating device 100 further comprises a printed circuit board 202 extending into an inner space 204 defined by the housing 102.

30 [0023] Referring to **figure 3**, the heating device 100 further comprises a heating chamber 302 extending in the inner space 204 of the housing 102 and fixed to the

housing 102, for example to its main body 104. For example, the heating chamber 302 comprises two compartments 304A, 304B.

[0024] Referring to **figure 4**, the heating chamber 302 comprises for example front covers 402A, 402B for respectively closing openings 403A, 403B of the
5 compartments 304A, 304B, and a connection 404 for letting coolant pass between the compartments 304A, 304B.

[0025] The heating chamber 302 is further provided with a coolant inlet 406 for letting coolant enter and a coolant outlet 408 for letting the coolant exit. For example, the coolant inlet 406 is provided in the compartment 304A, while the coolant outlet is
10 provided in the compartment 304B. With this configuration, the coolant enters by the coolant inlet 406 in the compartment 304A, pass to the compartment 304B through the connection 404 and exits the compartment 304B by the coolant outlet 408.

[0026] The heating device 100 further comprises at least one resistor 410A, 410B located inside the heating chamber 302 for heating the coolant. For example, one
15 resistor 410A, 410B is provided in each compartment 304A, 304B. For example, the opening 403A, 403B are sized in order to allow passage of the resistors 410A, 410B, respectively.

[0027] Referring to **figure 5**, each resistor 410A, 410B comprises two terminals 502A, 504A, 502B, 504B for receiving electrical power. At least one of the two
20 terminals 502A, 504A, 502B, 504B passes through a wall of the heating chamber 302. For example, both terminals 502, 504 pass through the cover 402A, 402B of the compartment 304A, 304B in which lies the resistor 410A, 410B.

[0028] Referring to **figure 6**, the heating device 100 comprises, for each resistor 410A, 410B, a connection module 602A, 602B for connecting at least one of the two
25 terminals 502A, 504A, 502B, 504B of the resistor 410A, 410B to the printed circuit board 202. Each connection module 602A, 602B is fixed to the housing, for example to the associated cover 402A, 402B, by at least one fixing element such as a screw 604.

[0029] Referring to **figure 7**, the connection module 602A comprises, for each of the
30 two terminals 502A, 504A, a lead frame 702A, 704A. Each lead frame 702A, 704A comprises one connection pin 706A, 708A connected to the printed circuit board 202, for example passing through a respective hole provided in the printed circuit board 202. Each lead frame 702A, 704A further comprises a connector 710A, 712A

connected to the terminal 502A, 504A. For example each connector 710A, 712A comprises a clamp for clamping the associated terminal 502A, 504A. The connection module 602A further comprises an overmolding 714A around the lead frames 702A, 704A.

- 5 [0030] Similarly, Referring to **figure 8**, the connection module 602B comprises, for each of the two terminals 502B, 504B, a lead frame 802B, 804B. Each lead frame 802B, 804B comprises one connection pin 806B, 808B connected to the printed circuit board 202, for example passing through a respective hole provided in the printed circuit board 202. Each lead frame 802B, 804B further comprises a connector
10 810B, 812B connected to the terminal 502B, 504B. For example each connector 810B, 812B comprises a clamp for clamping the associated terminal 502B, 504B. The connection module 602B further comprises an overmolding 814B around the lead frames 802B, 804B.

- [0031] Referring to **figure 9**, fixing of the cover 402A by means of the fixating
15 element 604 will now be described in greater detail. Fixing of cover 402B by means of the fixating elements 604 is similar.

- [0032] The cover 402A is provided with a positioning pin 902 projecting outside the heating chamber 302 and having a hole 904. More precisely, the positioning pin 902 extends along a longitudinal direction, which is the X direction in the illustrated
20 example.

- [0033] The overmolding 714A has a positioning trough-hole 906 in which the positioning pin 902 is inserted. For example, the positioning trough-hole 906 comprises a first section 908 and a second section 910 connected to each other by an inner shoulder 912, so that the first section 908 has a diameter greater than a
25 diameter of the second section 910. The positioning pin 902 may then be inserted into the first section 908, the inner shoulder 912 forming a stop for the positioning pin 902.

- [0034] Inside the through-hole 906 of the overmolding 714A, the positioning pin 902 extends preferably at less than 0.2 mm from the overmolding 714A, 814B in at least
30 one direction transverse to a longitudinal direction Z of the positioning pin 902, preferably in all transverse directions. In the illustrated example, the transverse directions are in the plane defined by directions Y and Z.

[0035] Also preferably, one amongst the positioning pin 902 and the through-hole 906 of the overmolding 714A, has a truncated cone shape, while the other has a cylindrical shape. In the illustrated example, the positioning pin 902 has the truncated cone shape, and the first section 908 of the through-hole 906 of the overmolding has a cylindrical shape. This helps guide the insertion of the positioning pin 902 inside the through-hole 906.

[0036] The connection module 602A further comprises a sleeve 914 inserted, for example pressed-in, into the positioning through-hole 906 next to the positioning pin 902. For example, the sleeve 914 is inserted into the second section 912. For example, the sleeve 914 is made of steel, in order to be more rigid than the overmolding 714A.

[0037] The fixing element, i.e. the screw 604 in the described example, comprises a rod 916 and a head 918 fixed to a end of the rod 916. The rod 916 is successively inserted into the sleeve 914 and the hole 904 of the positioning pin 902, so that the sleeve 914 is clamped between the positioning pin 902 and the head 918.

[0038] Referring to **figure 10**, a method 1000 for connecting the terminals to the circuit board will now be described.

[0039] At a step 1002, the housing 102 with the heating chamber 302 is obtained, with the covers 402A, 402B and the printed circuit board 202 separated.

[0040] At a step 1004, each resistor 410A, 410B is inserted into its respective compartment 304A, 304B through the respective opening 403A, 403B.

[0041] At a step 1006, each cover 402A, 402B is fixed to the heating chamber 302 to close the associated opening 403A, 403B, while letting the terminals 502A, 504A, 502B, 504B pass through the cover 402A, 402B.

[0042] At a step 1008, each connection module 602A, 602B is temporarily fixed to the associated cover 402A, 402B by inserting the positioning pin 902 of the cover 402A, 402B into the through hole 906, into its first section 908 in the described example, of the connection module 602A, 602B. At the same time, the terminals 502A, 504A, 502B, 504B are respectively clamped by the connectors 502A, 504A, 502B, 504B.

[0043] At a step 1010, the fixing elements, i.e. the screws 604, are installed so as to fix the connection modules 602A, 602B to the covers 402A, 402B, respectively.

[0044] At a step 1012, the printed circuit board 202 is fixed to the housing 102, for example by screwing, for example to the heating chamber 302, while connecting the pins 706A, 708B, 806B, 808B of the connection module 602A, 602B to the printed circuit board 202.

- 5 [0045] As a conclusion, it will be noted that the invention is not limited to the embodiments described above. It will indeed appear to those skilled in the art that various modifications can be made to the embodiments described above, in the light of the teaching which has just been disclosed to them.

- 10 [0046] In the detailed presentation of the invention which is made previously, the terms used must not be interpreted as limiting the invention to the embodiments set out in the present description, but must be interpreted to include therein all the equivalents within the reach of those skilled in the art by applying their general knowledge to the implementation of the teaching which has just been disclosed to them.

Claims

[1] Heating device (100) comprising:

- a heating chamber (302) provided with a coolant inlet (406) for letting coolant enter and a coolant outlet (408) for letting the coolant exit;
 - 5 - a resistor (410A, 410B) located inside the heating chamber (302) for heating the coolant, the resistor (410A, 410B) comprising a terminal (502A, 504A, 502B, 504B) passing through a wall (402A, 402B) of the heating chamber (302); and
 - a printed circuit board (202) located outside the heating chamber (302) for
10 controlling the resistor (410A, 410B);
- characterized in that the wall (402A, 402B) is provided with a positioning pin (902) projecting outside the heating chamber (302) and having a hole (904), and characterized in that it further comprises:
- a connection module (602A, 602B) comprising:
15 • a lead frame (702A, 704A, 802B, 804B) comprising a connection pin (706A, 708A, 806A, 808A) connected to the printed circuit board (202) and a connector (710A, 712A, 810B, 812B) connected to the terminal (502A, 504A, 502B, 504B) of the resistor (410A, 410B),
 • an overmolding (714A, 814B) around the lead frame (702A, 704A,
20 802B, 804B), the overmolding (714A, 814B) having a trough-hole (906) in which the positioning pin (902) is inserted, and
 • a sleeve (914) inserted into the through-hole (906) next to the positioning pin (902); and
 - a fixing element (604) comprising a rod (916) and a head (918), the rod
25 (916) being inserted into successively the sleeve (914) and the hole (904) of the positioning pin (902), so that the sleeve (914) is clamped between the positioning pin (902) and the head (918).

[2] Heating device (100) according to claim 1, wherein the wall (402A, 402B) is a removable cover covering an opening (403A, 403B) through which the resistor (410A, 410B) can be inserted into the heating chamber (302).
30

[3] Heating device (100) according to claim 1 or 2, wherein the fixing element (604) is a screw or a rivet or a bolt.

- [4] Heating device (100) according to any of claims 1 to 3, wherein the sleeve (914) is made of steel.
- [5] Heating device (100) according to any of claims 1 to 4, wherein, inside the through-hole (906) of the overmolding (714A, 814B), the positioning pin (902) extends at less than 0.2 mm from the overmolding (714A, 814B) in at least one direction (X, Y) transverse to a longitudinal direction (Z) of the positioning pin (902).
- [6] Heating device (100) according to any of claims 1 to 5, wherein one amongst the positioning pin (902) and the through-hole (906) of the overmolding (714A, 814B), has a truncated cone shape, while the other has a cylindrical shape.
- [7] Heating device (100) according to any of claims 1 to 6, further comprising a housing (102) comprising the heating chamber (302) and delimiting an inner space (204), in which the heating chamber (302) extends.
- [8] Heating device (100) according to claim 7, wherein the printed circuit board (202) extends in the inner space (204).
- [9] Vehicle comprising a heating device (100) according to any of claims 1 to 8, in particular in an installation of the vehicle, for heating air of a passenger compartment of the vehicle.
- [10] Method (1000) for connecting, in a heating device (100), a terminal (502A, 504A, 502B, 504B) of a resistor (410A, 410B) located in a heating chamber (302) provided with a coolant inlet (406) for letting coolant enter and a coolant outlet (408) for letting the coolant exit, the terminal (502A, 504A, 502B, 504B) passing through a wall (402A, 402B) of the heating chamber (302), to a printed circuit board (202) located outside the heating chamber (302) for controlling the resistor (410A, 410B), characterized in that the wall (402A, 402B) is provided with a positioning pin (902) projecting outside the heating chamber (302) and having a hole (904), and in that the method comprises:
- fixing (1008) a connection module (602A, 602B) to the wall (402A, 402B) by inserting a positioning pin (902) of the wall (402A, 402B) projecting outside the heating chamber (302) into a through-hole (906) provided in an overmolding (714A, 814B) around a lead frame (702A, 704A, 802B, 804B) of the connection module, while connecting the terminal (502A, 504A,

502B, 504B) to a connector (502A, 504A, 502B, 504B) of the lead frame (702A, 704A, 802B, 804B);

- 5 - inserting (1010) a rod (916) of a fixing element (604) into successively a sleeve (914) located inside the through-hole (906) and a hole (904) of the positioning pin (902), so that the sleeve (914) is clamped between the positioning pin (902) and a head (918) of the fixing element (604) located at an end of the rod (916); and
- 10 - fixing (1012) the printed circuit board (202) to the heating chamber (302), while connecting a pin (706A, 708B, 806B, 808B) of the lead frame (702A, 704A, 802B, 804B) to the printed circuit board (202).

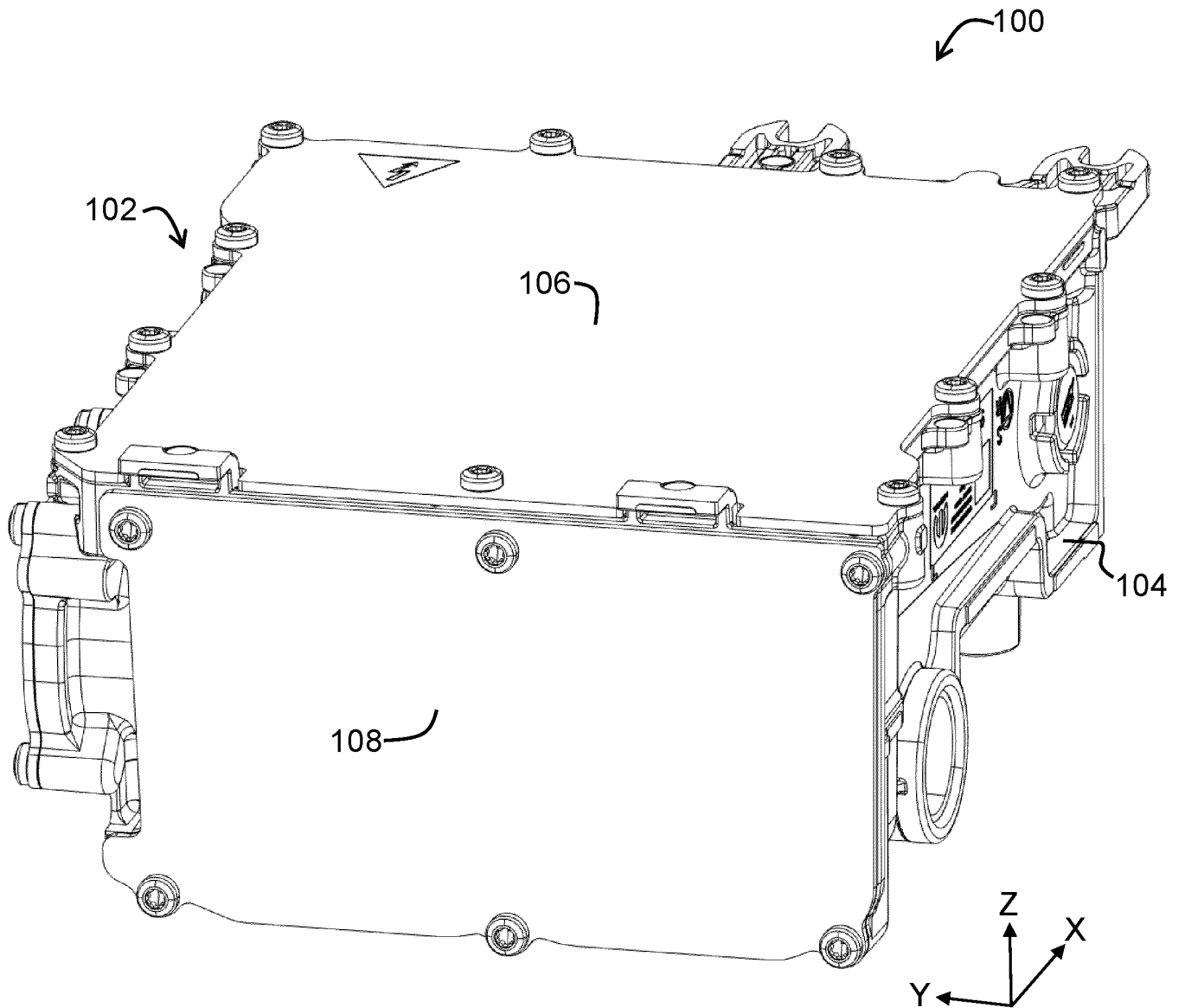
Figure 1

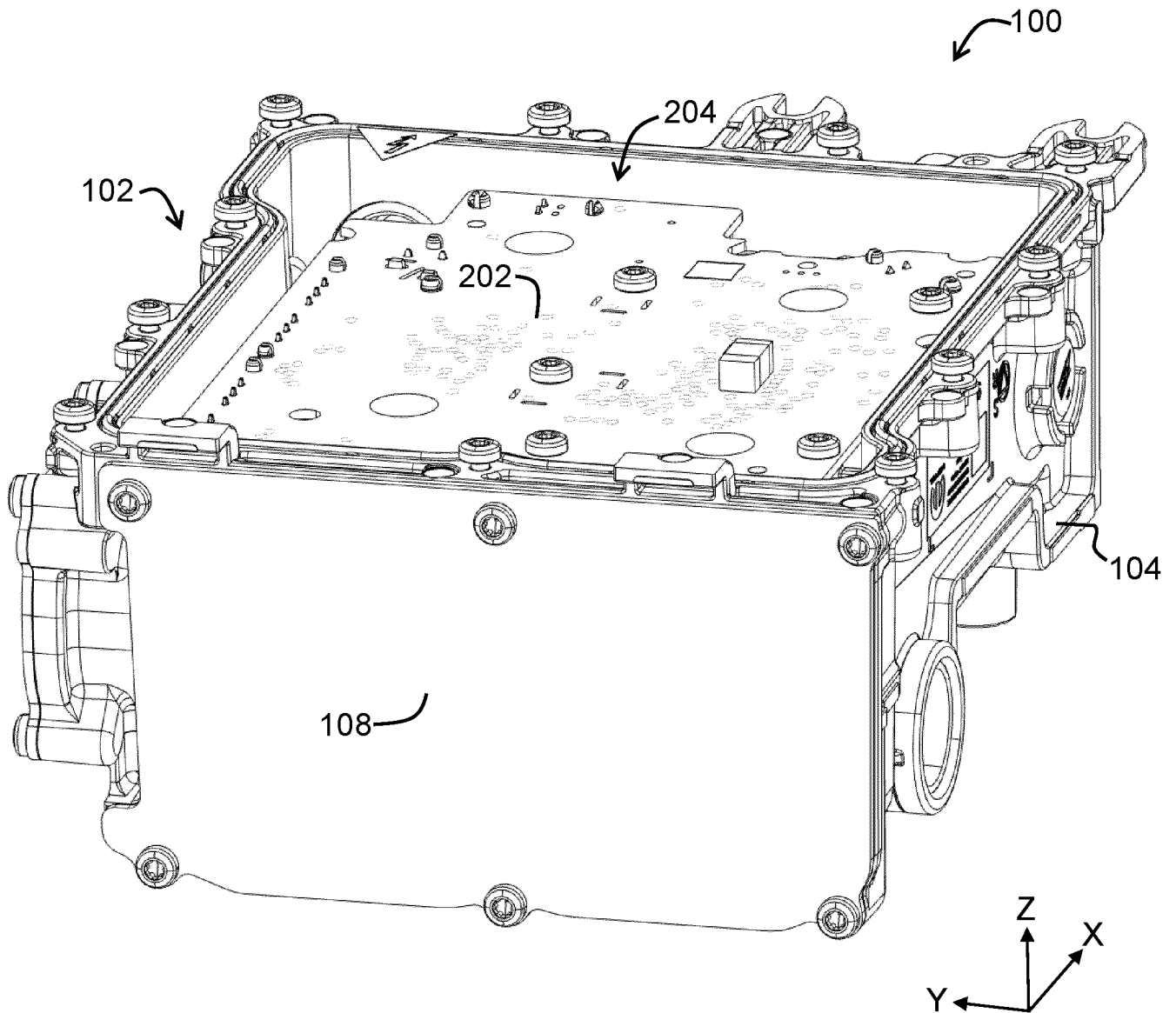
Figure 2

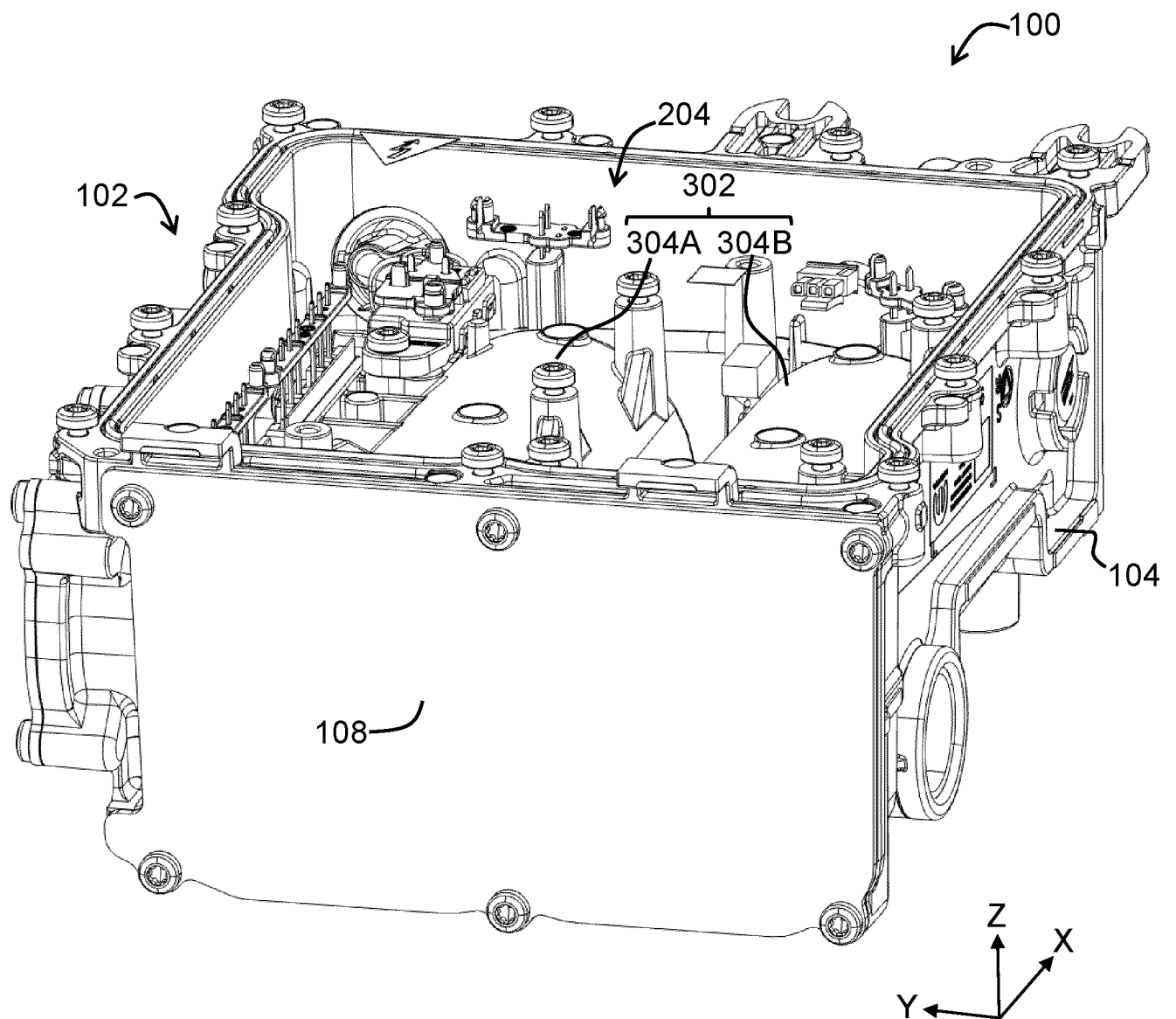
Figure 3

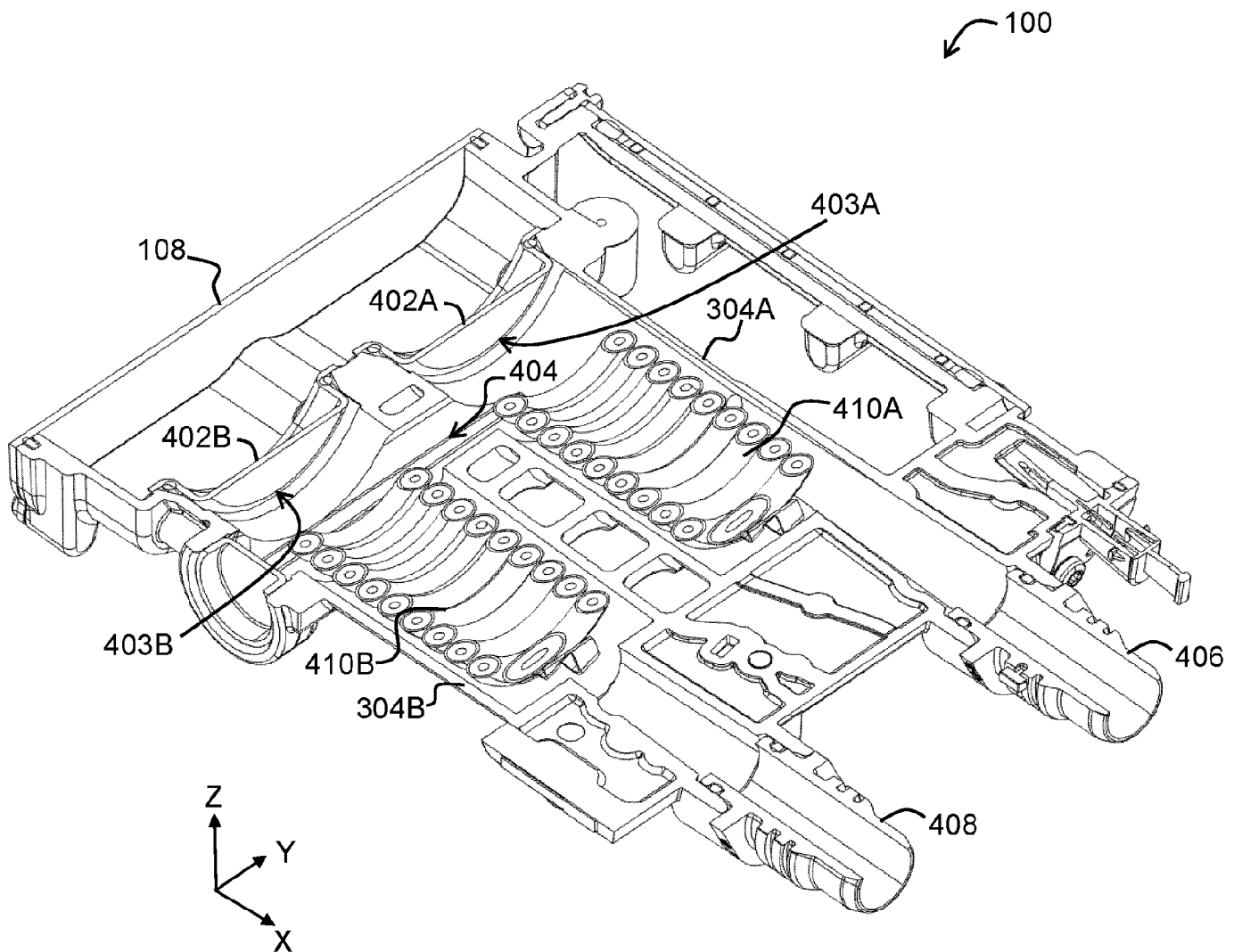
Figure 4

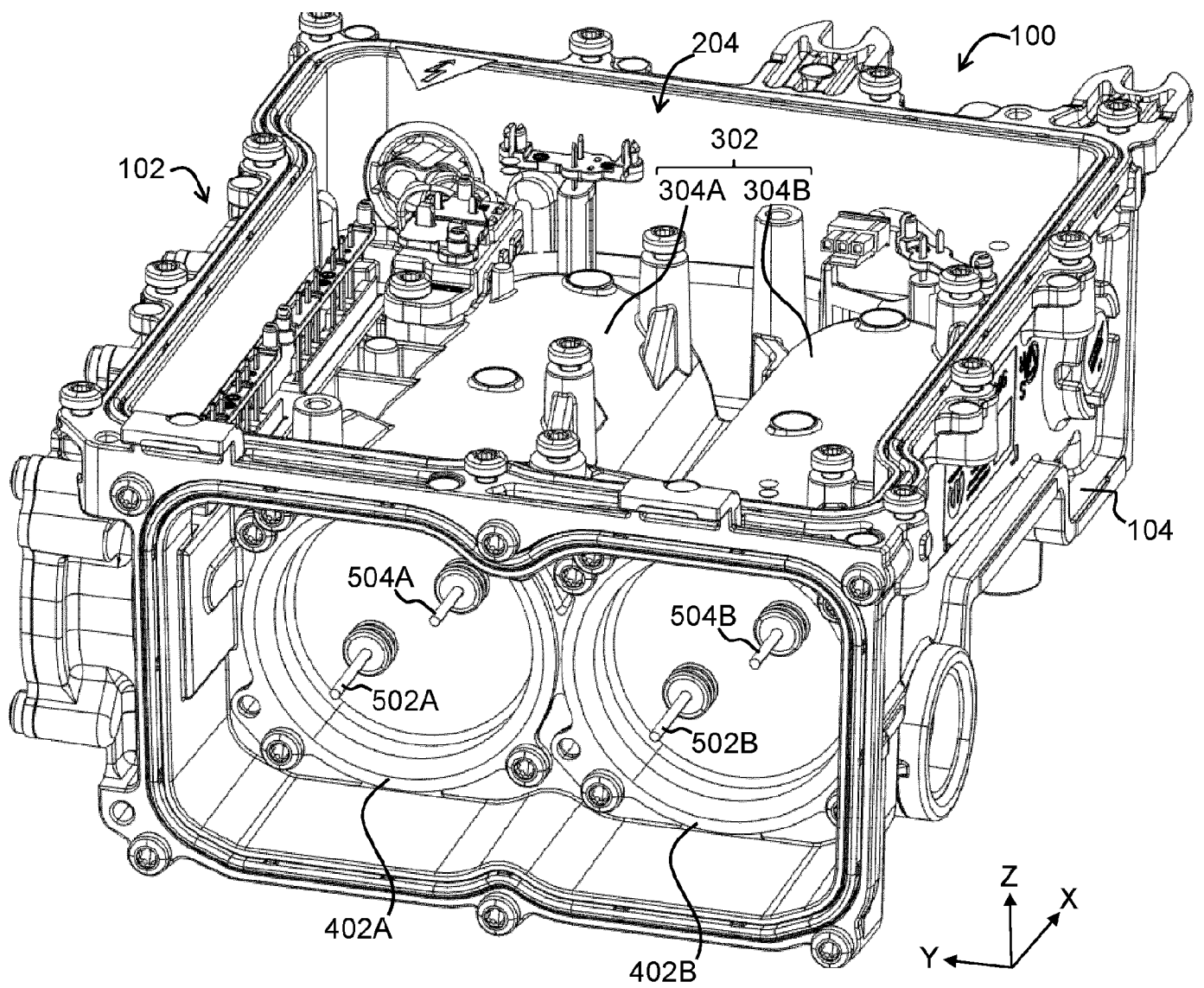
Figure 5

Figure 6

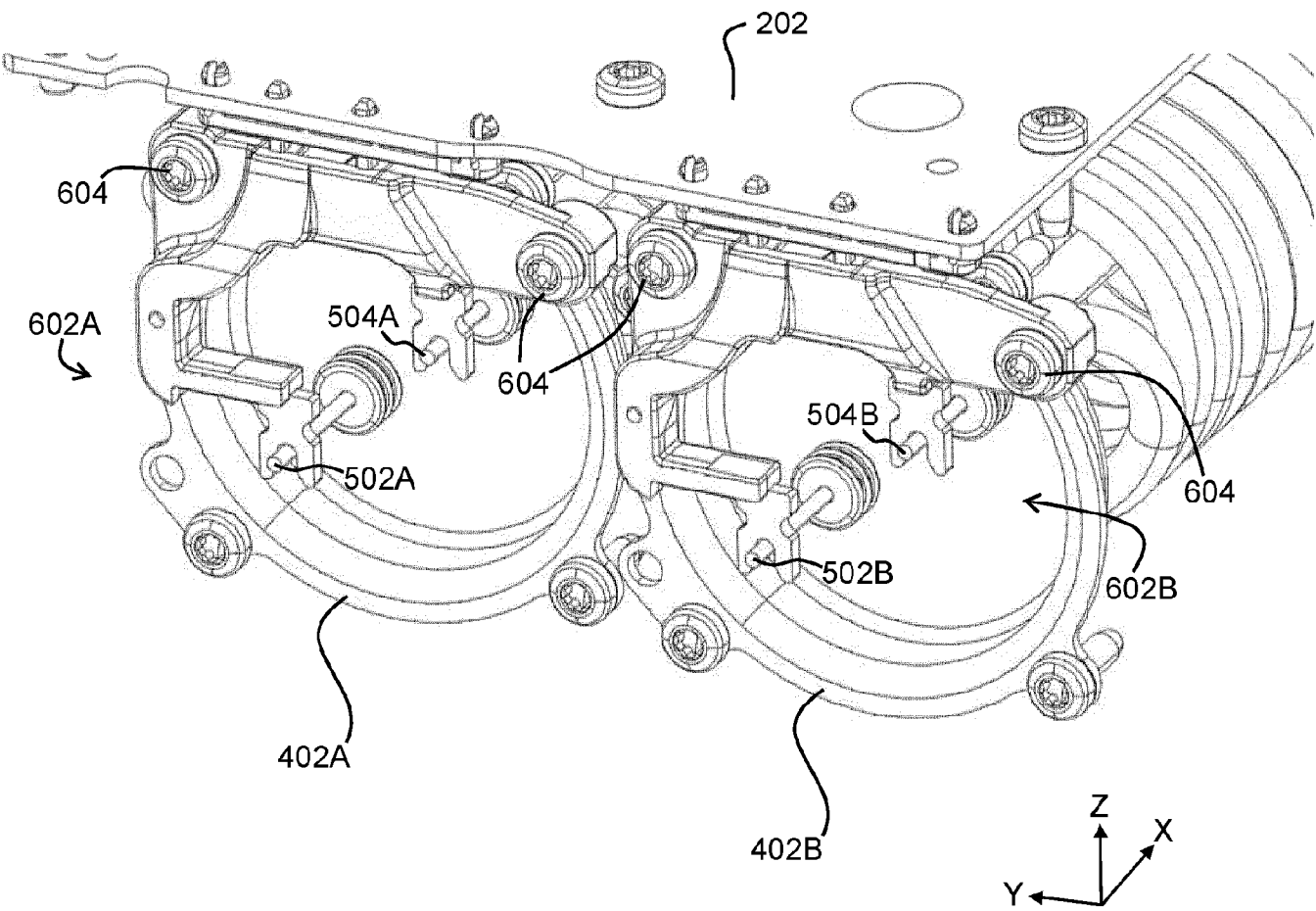


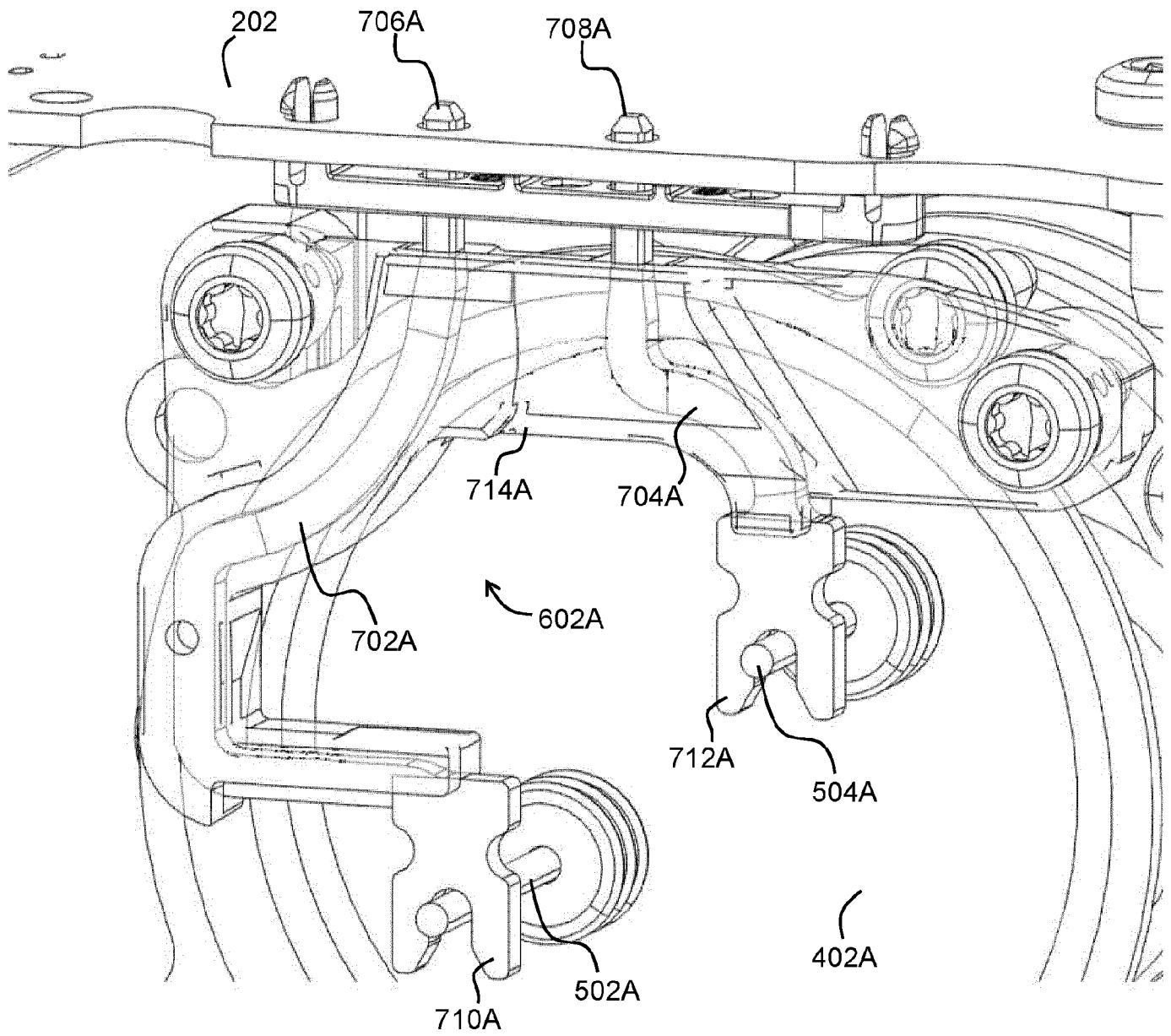
Figure 7

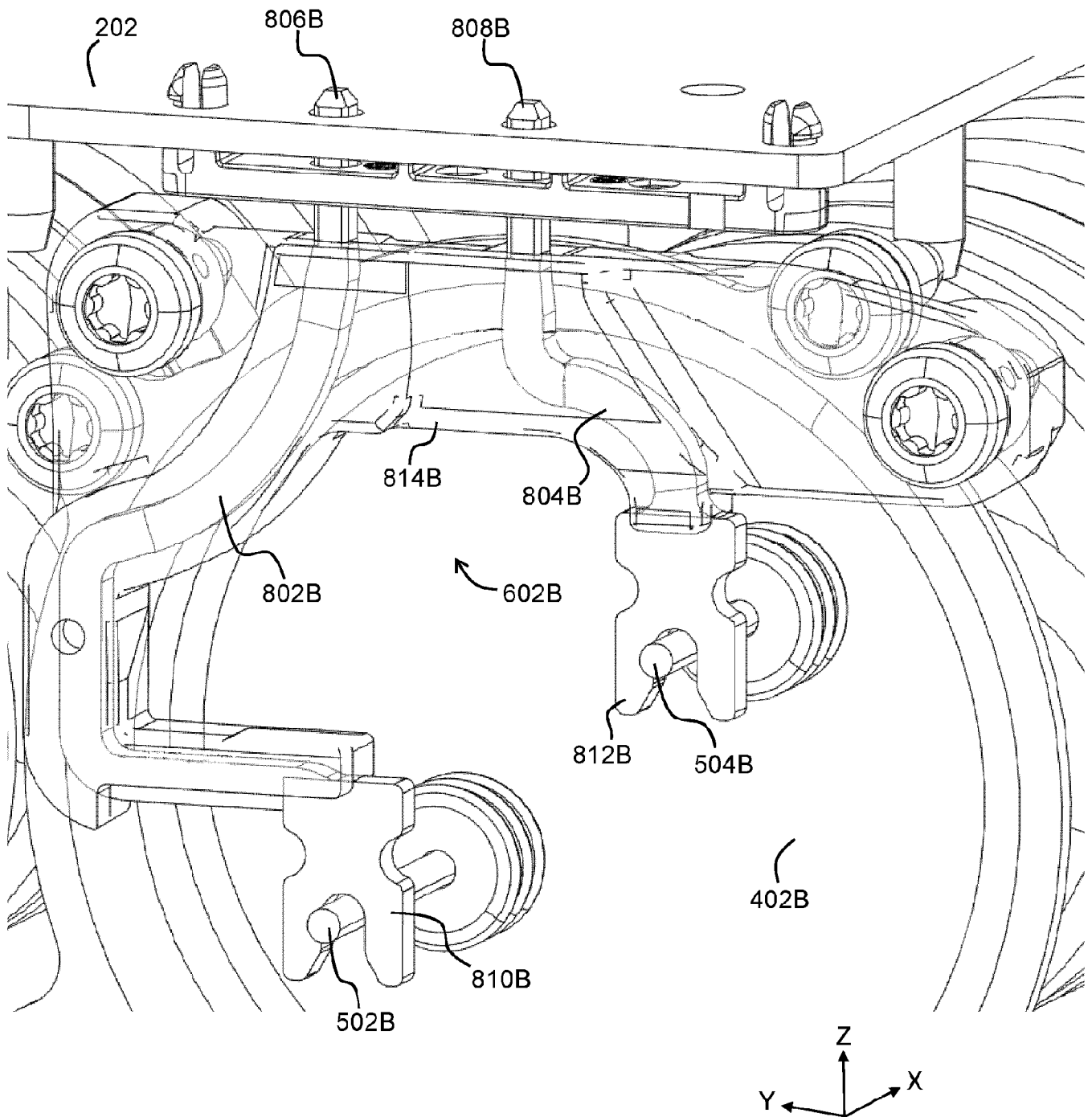
Figure 8

Figure 9

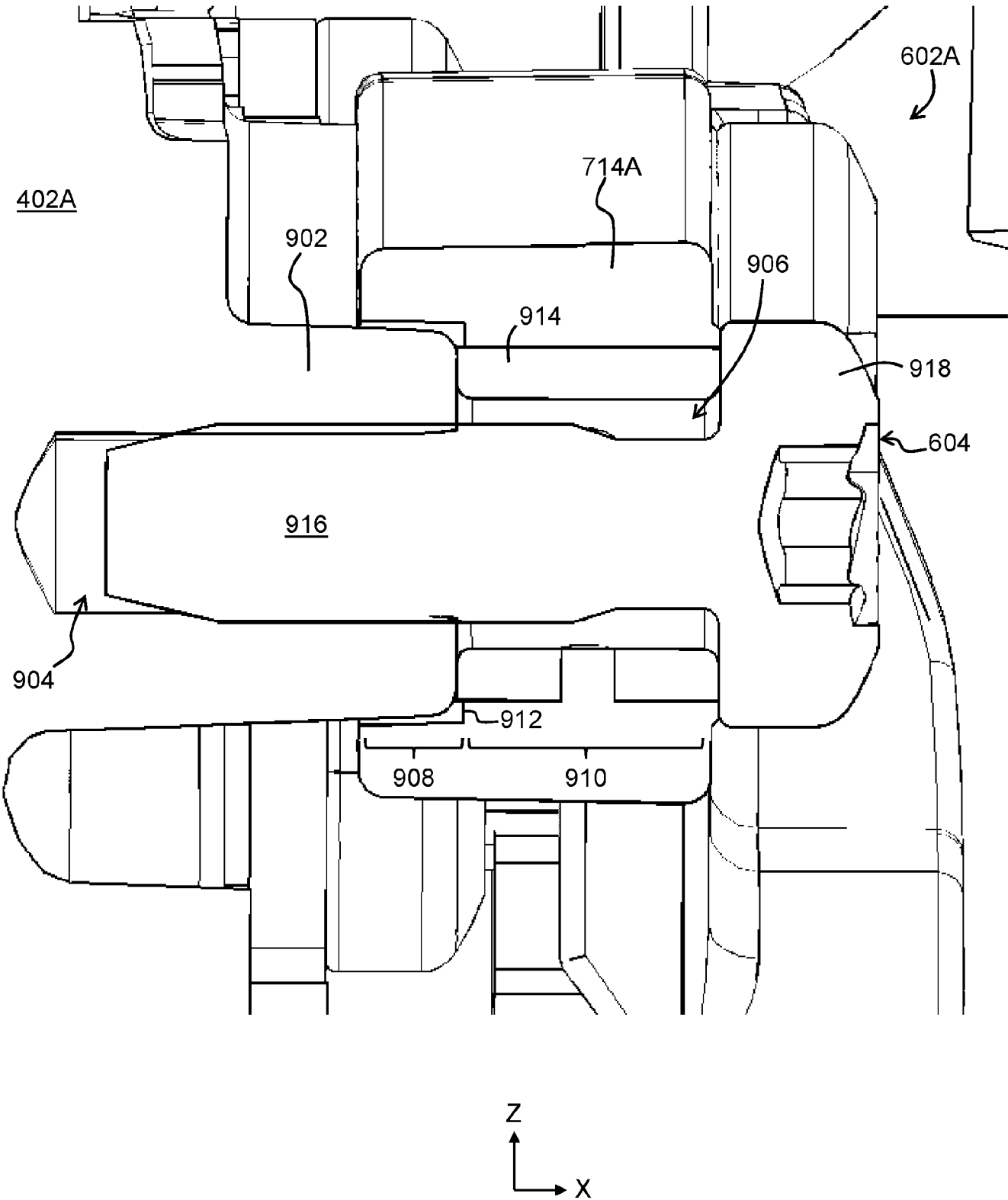
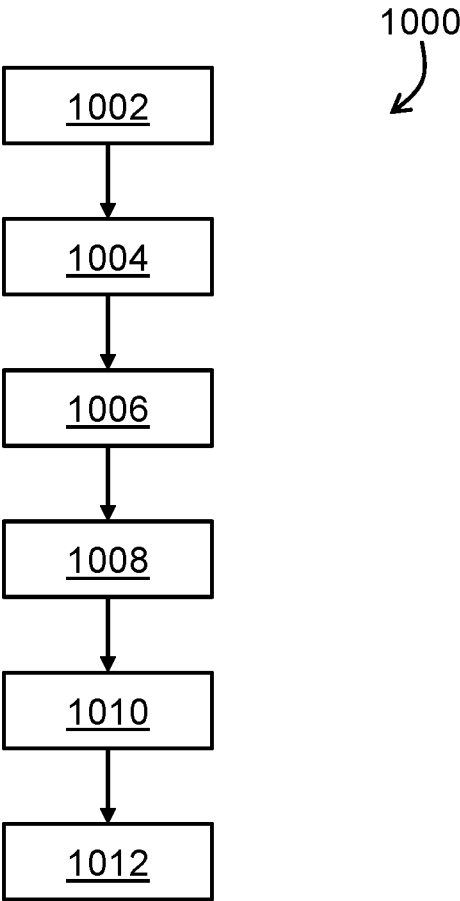


Figure 10



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2024/052911

A. CLASSIFICATION OF SUBJECT MATTER		
INV.	H05B3/06	H05B3/48
	B60H1/22	
ADD.	F24H1/00	F24H1/12
		F24H9/1818
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)		
H05B F24H B60H		
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.
A	EP 2 280 232 A2 (BALBOA WATER GROUP INC [US]) 2 February 2011 (2011-02-02) abstract paragraphs [0020] - [0031] figures 1-11 -----	1-10
A	EP 3 843 502 A1 (EBERSPAECHER CATEM GMBH & CO [DE]) 30 June 2021 (2021-06-30) abstract figures 1-5 paragraphs [0017] - [0024] -----	1-10
A	EP 3 334 245 A1 (EBERSPAECHER CATEM GMBH & CO [DE]) 13 June 2018 (2018-06-13) abstract figures 5,15 paragraphs [0026], [0045] - [0049] ----- -/-	1-10
☒ Further documents are listed in the continuation of Box C. ☒ 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		"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
"E" earlier application or patent but published on or after the international filing date		"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
"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)		"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
"O" document referring to an oral disclosure, use, exhibition or other means		"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed		
Date of the actual completion of the international search		Date of mailing of the international search report
16 April 2024		29/04/2024
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer de la Tassa Laforgue

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2024/052911

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 93 06 773 U1 (GERING MANFRED [DE]; GERING GERTA [DE]) 21 April 1994 (1994-04-21) figures 1-3 page 8, line 1 - page p, line 21 -----	1-10

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2024/052911

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2280232 A2	02-02-2011	EP 2280232 A2	02-02-2011
		US 2011019983 A1	27-01-2011
EP 3843502 A1	30-06-2021	CN 113056040 A	29-06-2021
		DE 102019220591 A1	01-07-2021
		EP 3843502 A1	30-06-2021
		EP 3958651 A1	23-02-2022
		US 2021199306 A1	01-07-2021
EP 3334245 A1	13-06-2018	CN 108151290 A	12-06-2018
		CN 108151294 A	12-06-2018
		CN 108156673 A	12-06-2018
		CN 108156674 A	12-06-2018
		CN 108156677 A	12-06-2018
		DE 102016224296 A1	07-06-2018
		EP 3334242 A1	13-06-2018
		EP 3334243 A1	13-06-2018
		EP 3334244 A1	13-06-2018
		EP 3334245 A1	13-06-2018
		EP 3334246 A1	13-06-2018
		EP 3592105 A1	08-01-2020
		US 2018156493 A1	07-06-2018
		US 2018156494 A1	07-06-2018
		US 2018160476 A1	07-06-2018
		US 2018160478 A1	07-06-2018
		US 2018160480 A1	07-06-2018
DE 9306773 U1	21-04-1994	NONE	