



(51) International Patent Classification:

H01R 13/24 (2006.01) *H01R 13/11* (2006.01)
H01H 71/08 (2006.01) *H01R 13/18* (2006.01)

(21) International Application Number:

PCT/EP2016/075376

(22) International Filing Date:

21 October 2016 (21.10.2016)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

10 2015 220 704.8
22 October 2015 (22.10.2015) DE

(71) Applicant: **TE CONNECTIVITY GERMANY GMBH**
[DE/DE]; Amperestrasse 12-14, 64625 Bensheim (DE).

(72) Inventors: **TOTH, Gerzson**; Spinnereistr. 19, 68307 Mannheim (DE). **DRESSEL, André**; Habichtsweg 4, 68623 Lampertheim (DE). **GRZYWOK, Wilhelm**; Solalindenstr. 48, 81825 München (DE).

(74) Agent: **KEANE, David**; Murgitroyd & Company, Scotland House, 165-169 Scotland Street, Glasgow Strathclyde G5 8PL (GB).

(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, CZ, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, 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, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, 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,

[Continued on next page]

(54) Title: CONTACT ASSEMBLY FOR A CONTACTOR AND ELECTRICAL ASSEMBLY WITH A CONTACTOR

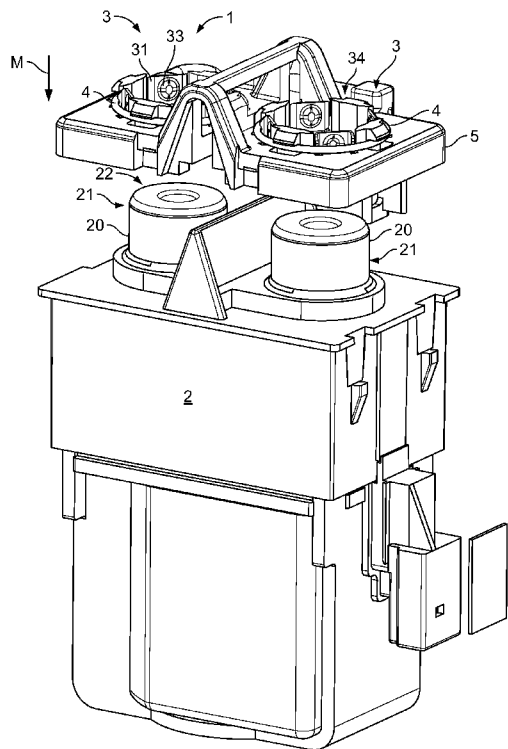


Fig. 11

(57) Abstract: The invention relates to a contact assembly (1) for at least one contact bolt (20) of a contactor (2), comprising a contact element (3) with a base part (30) extending in a plane (B), the base part (30) having an opening (34) for the contact bolt (20) to pass through, and at least one contacting tab (31) that is integrally connected to the base part (30) and located at the edge of the opening (34), the contacting tab (31) being bent out of the plane (B) of the base part (30) and being elastically deflectable parallel to the plane (B), and an electrical assembly (10) with a contactor (2) with two contact bolts (20) and a contact assembly (1), wherein the contact assembly (1) touches the surface shells (21) of the contact bolts (20).

WO 2017/068123 A1

LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, **Published:**
SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, — *with international search report (Art. 21(3))*
GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

Contact assembly for a contactor and electrical assembly with a contactor

The invention relates to a contact assembly for at least one contact bolt of a contactor. The invention further relates to an electrical assembly with a contactor with two contact bolts.

Such contact assemblies are used to tap off the voltage, for example. In previous systems, a contact element is introduced between the contactor and the power consumer. However, this has the disadvantage that a transition resistance occurs twice here, as a result of which the total resistance increases.

The problem of the invention is to provide a solution in which the total resistance is low.

According to the invention, this is solved by a contact assembly for at least one contact bolt of a contactor, comprising a contact element with a base part extending in a plane, the base part having an opening for the contact bolt to pass through, and at least one contacting tab that is integrally connected to the base part and located at the edge of the contact opening, the contacting tab being bent out of the plane of the base part and being elastically deflectable parallel to the plane of the base part.

An electrical assembly according to the invention comprises a contactor with two contact bolts and a contact assembly according to the invention, wherein the contact assembly touches the surface shells of the contact bolts.

In contrast to the prior art, with the solution according to the invention the contact bolt can be contacted at the surface shell. A power consumer can furthermore be connected to the contact bolt at an end face or at another location. However, this connection is also direct, such that a transition resistance only occurs only one single time. The total resistance is lower as a result.

The solution according to the invention can be further improved with the following configurations and developments which are each advantageous.

The contacting tab can extend perpendicular or substantially perpendicular to the opening. A compact configuration is possible as a result.

The contacting tab can protrude perpendicular to the plane of the base part from the base part. As a result, simplicity of manufacture can be achieved.

The contacting tab can have a contact point protruding radially inwards over the rest of the contacting tab, which enables a defined contact. The contact point can be embossed, as a result of which it can be manufactured simply.

In an advantageous configuration, the contacting tab has at least one stiffening tab which extends radially outwards. Deformation of the contacting tab can be minimised as a result. The stiffening tab can be indirectly connected to the base part. For example, it may be connected to the base part only indirectly via the rest of the contacting tab.

- 5 In particular, there can be two stiffening tabs per contacting tab. These can be attached at opposite sides of the contacting tab.

The stiffening tab can extend away from the rest of the contacting tab, in order not to impede the contacting of the contact bolt.

- 10 There can be several contacting tabs. As a result, secure contacting is possible, if the contacting at one contacting tab does not work. For example, the contact assembly can have at least three contacting tabs. The contacting tabs can be distributed at equal angles in order to enable a uniform distribution of force. In the case of three contacting tabs, these can span an equilateral triangle. The at least three contacting tabs can form a contact bolt receptacle.

- 15 If several contacting tabs are provided, these can each have at least one notch-shaped receptacle, wherein the notch-shaped receptacles are situated in a plane. For example, a retaining element or spring element which retains or clamps the contacting tabs can be able to be received in the notch-shaped receptacles. The notch-shaped receptacle can be open radially outwards, in order to enable a simple attachment of a retaining element or a spring element.

- 20 The contact assembly can have an annular overspring for the pressing on of the contacting tab. The overspring can be arranged in the notch-shaped receptacles of the contacting tabs.

The contact element can be cast in a plastic carrier. Said plastic carrier can stabilise the contact element. In addition, handling can be facilitated, because the plastic carrier can be insulating and, as a result, contact with a live element is prevented.

- 25 The contact assembly can have two openings for two contact bolts. As a result, it is possible to tap off the voltage between the two contact bolts.

In order to enable a simple transfer of the voltage, the contact assembly can have a plug contact element, which is integrally connected to the base part, for contacting a plug for a voltage tapping. This plug contact element can be bent away from the base part in order to enable a compact configuration.

The contact assembly can form a plug receptacle. This makes simple contacting possible. The plug receptacle can in particular be formed by a plastic carrier.

The plug receptacle can have a coding so that in each case only one fitting plug can be introduced.

- 5 The contact assembly can have a coding which, in cooperation with the surrounding housing of the relay, can represent a coding which is independent of the relay.

In an electrical assembly, the contact bolts can project above the contact assembly mounted thereon. The contact bolts can protrude out of the contact assembly mounted thereon. This permits a compact configuration. A power consumer can be affixed to the projecting-above or protruding part. For example, a cover surface of the contact bolt can remain free and be used for power contacting.

The contact bolts of the contactor can be cylindrical in order to enable simple contacting. Other configurations are also possible, for instance prismatic, conical or other shapes. A shape of which the cross-section remains unaltered as the height changes, for instance a cylinder, is particularly advantageous here, because a contact assembly can be slid on easily.

Hereinafter, the invention is explained in greater detail by way of example using advantageous configurations with reference to the drawings. The advantageous developments and embodiments depicted here are respectively independent of one another and can be combined with one another as desired, depending on how this is necessary in the application.

20 In the drawings:

Fig. 1 shows a schematic perspective view of a contact assembly according to the invention on a contactor;

Fig. 2 shows a schematic perspective view of the contact assembly from Fig. 1 without the contactor;

25 Fig. 3 shows a schematic perspective view of a first manufacturing step of a contact assembly according to the invention;

Fig. 4 shows a schematic perspective view of a second manufacturing step of a contact assembly according to the invention;

- Fig. 5 shows a schematic perspective view of a third manufacturing step of a contact assembly according to the invention;
- Fig. 6 shows a schematic perspective view of a fourth manufacturing step of a contact assembly according to the invention;
- 5 Fig. 7 shows a schematic perspective view of a fifth manufacturing step of a contact assembly according to the invention;
- Fig. 8 shows a schematic perspective view of a sixth manufacturing step of a contact assembly according to the invention;
- Fig. 9 shows a schematic perspective view of a seventh manufacturing step of a contact assembly according to the invention;
- 10 Fig. 10 shows a schematic perspective view of the contact assembly from Fig. 9 from another viewing direction;
- Fig. 11 shows a schematic perspective view of the attachment of the contact assembly from Figures 9 and 10 on a contactor;
- 15 Fig. 12 shows a schematic perspective view of the contact assembly from Figures 9 and 10 mounted on the contactor;
- Fig. 13 shows a schematic longitudinal section through the contact assembly together with the contactor; and
- Fig. 14 shows a further schematic perspective view of a detail of the contact assembly.
- 20 Fig. 1 depicts a contact assembly 1 according to the invention affixed to a contactor 2. Together, the two of them form an electrical assembly 10. Two contact bolts 20 of the contactor 2, which are configured cylindrically here, are used to attach power consumers which are switched with the contactor 2.
- The contact assembly 1 comprises a plastic carrier 5 and two contact elements 3 embedded
25 therein for contacting the contact bolts 20 at their surface shells 21. Two oversprings 4 press the contacting tabs 31 against the surface shells 21. The contact bolts 20 protrude out of the contact assembly 1 mounted thereon.

Fig. 2 depicts the contact assembly 1 without the contactor 2. Several contacting tabs 31 in each case surround an opening 34 through which a contact bolt 20 of the contactor 2 can be plugged. Contact points 33, which enable defined contacting, project radially inwards, i.e. into the opening 34. The contact points 33 are embossed. The contacting tabs 31 can be elastically
5 deflected in a deflection direction A which extends parallel to the plane B of the base part 30.

The contact assembly 1 further forms a plug receptacle 8 which is used to attach a plug with which the voltage can be transferred.

Figures 3 to 9 depict the manufacture of the contact assembly 1. The different intermediate products are labelled with the letters A to G here. Thus, Fig. 3, for instance, depicts the first step
10 of the manufacturing process, wherein the reference symbol 3A denotes the first product in the manufacture of the contact element 3.

Fig. 3 shows a stamped-out metal sheet element. It was stamped or cut out of a uniform metal sheet and forms a coherent structure. The individual elements such as the contacting tabs 31 or the plug contact element 7 can already be recognised in a half-finished state.

15 In a second step, the contact points 33 are embossed, as can be recognised in Fig. 4. At the same time, the plug contact elements 7 are bent down. They now stick out perpendicular from the plane B of the base part 30, such that, in the mounted state, they extend parallel to a side wall of the contactor, and a compact configuration is possible as a result.

In a further step, stiffening tabs 35 are bent away at the contacting tabs 31. These stiffening
20 tabs 35 serve to stabilise the contacting tabs 31. The stiffening tabs 35 and thus the contacting tabs 31 have notch-shaped receptacles 36, which later serve to receive the annular oversprings 4.

In a further step, the contacting tabs 31 are bent out of the plane B of the base part 30, such
25 that they stick out, approximately perpendicularly, from the plane B of the base part 30. In each case, four contacting tabs 31, which are distributed at equal angles, now form an opening 34 for the contact bolt 20. The contacting tabs 31 are situated at the edge of the opening 34. The notch-shaped receptacles 36 for the oversprings 4 are situated in a plane E which is parallel to the plane B of the base part 30.

The embossed, formed and still connected contact elements 3 are cast in a plastic body 5. This
30 stabilises the contact elements 3 and the entire contact assembly 1. As a result, in a further step, the bars connecting the two contact elements 3 can be detached (see Fig. 8). The two contact elements 3 are now electrically insulated from one another.

The annular oversprings 4 are attached in the next step (Fig. 9). In order to be able to better retain the annular oversprings 4, retaining elements 50 which at least partially grip around the oversprings 4 are formed on the plastic body.

Fig. 10 depicts the finished contact assembly 1 from Fig. 9 from another viewing direction. In this case, the view is from below onto the contact assembly 1 and it is, for example, possible to recognise the plug receptacle 8 with the plug contact elements 7 arranged therein. One plug contact element 7 is integrally connected to a contact element 3 in each case, such that a voltage carried between the contact bolts 20 of the contactor 2 can be tapped off between the two plug contact elements 7. In this case, a coding 40 permits plugging together only with a fitting mating plug.

As depicted in Fig. 11, this contact assembly 1 is now applied along a mounting direction M onto the contactor 2. In this case, the contact bolts 20 are guided through the contact openings 34 and are contacted by the contact elements 3 at their surface shells 21.

A cover surface 22 remains free in the mounted state. The contact assembly 1 is located between the cover surfaces 22 and a body 27 of the contactor 2. The contact bolts 20 project above the contact assembly 1. This permits a compact construction.

Fig. 13 is a longitudinal section through the combination of the contact assembly 1 and the contactor 2 in the mounted state. There is a direct contact between the contacting tabs 31 and the contact bolt 21. Likewise, there can occur at a cover surface 22 or in a recess 21 a direct connection to a power consumer, in which only one single transition resistance occurs. Such a current circuit consequently has a lower total resistance than an assembly in which a voltage tapping takes place by introducing an additional element between the contact bolts 21 and a contact element 3 and thus an indirect connection takes place between the contact bolts 21 and the power consumer.

The contacting tabs 31 can be elastically deflected parallel to a plane B of the base part 30. The spring forces which arise press the contacting tabs 34 against the surface shells 21 of the contact bolt 20.

A detail view can be seen in Fig. 14. A plug receptacle 8 has a coding 40, which in each case only enables the connection of a fitting plug.

Reference Signs

	1	contact assembly
	1 A, B, C, D, E, F, G	contact assembly during manufacture
	2	contactor
5	3	contact element
	3 A, B, C, D, E, F, G	contact element during manufacture
	4	overspring
	5	plastic carrier
	7	plug contact element
10	8	plug receptacle
	10	electrical assembly
	20	contact bolts
	21	surface shell
	22	cover surface
15	23	recess
	27	body
	30	base part
	31	contacting tab
	33	contact point
20	34	opening
	35	stiffening tab
	36	notch-shaped receptacle
	40	coding
	50	retaining element
25	A	deflection
	B	plane of the contact element
	E	plane of the notch-shaped receptacles
	M	mounting direction

Claims

1. The contact assembly (1) for at least one contact bolt (20) of a contactor (2), comprising a contact element (3) with a base part (30) extending in a plane (B), the base part (30) having an opening (34) for the contact bolt (20) to pass through, and at least one contacting tab (31) that is integrally connected to the base part (30) and located at the edge of the opening (34), the contacting tab (31) being bent out of the plane (B) of the base part (30) and being elastically deflectable parallel to the plane (B).
5
2. The contact assembly according to Claim 1, wherein the contacting tab (31) has a contact point (33) protruding radially inwards over the rest of the contacting tab (31).
- 10 3. The contact assembly (1) according to Claim 1 or 2, wherein the contacting tab (31) has at least one stiffening tab (35) which extends radially outwards.
4. The contact assembly (1) according to any one of claims 1 to 3, wherein several contacting tabs (31) are provided, which each have at least one notch-shaped receptacle (36), wherein the notch-shaped receptacles (6) are situated in a plane (E).
- 15 5. The contact assembly (1) according to any one of claims 1 to 4, wherein the contact assembly (1) has at least three contacting tabs (31).
6. The contact assembly (1) according to any one of claims 1 to 5, wherein the contact assembly (1) has an annular overspring (4) for the pressing on of the contacting tab (31).
7. The contact assembly (1) according to any one of claims 1 to 6, wherein the contact element (3) is cast in a plastic carrier (5).
20
8. The contact assembly (1) according to any one of claims 1 to 7, wherein the contact assembly (1) has two openings (34) for two contact bolts (20).
9. The contact assembly (1) according to any one of claims 1 to 8, wherein the contact assembly (1) has a plug contact element (7), which is integrally connected to the base part (30), for contacting a plug for a voltage tapping.
25
10. The contact assembly (1) according to any one of claims 1 to 9, wherein the contact assembly (1) forms a plug receptacle (8).

11. An electrical assembly (10) with a contactor (2) with two contact bolts (20) and a contact assembly (1) according to any one of claims 1 to 10, wherein the contact assembly (1) touches the surface shells (21) of the contact bolts (20).
12. The electrical assembly (10) according to Claim 11, wherein the contact bolts (20) project
5 above the contact assembly (1) mounted thereon.
13. The electrical assembly (10) according to Claim 12, comprising a power consumer, wherein the power consumer is arranged at the part of the contact bolts (20) projecting above the contact assembly (1).

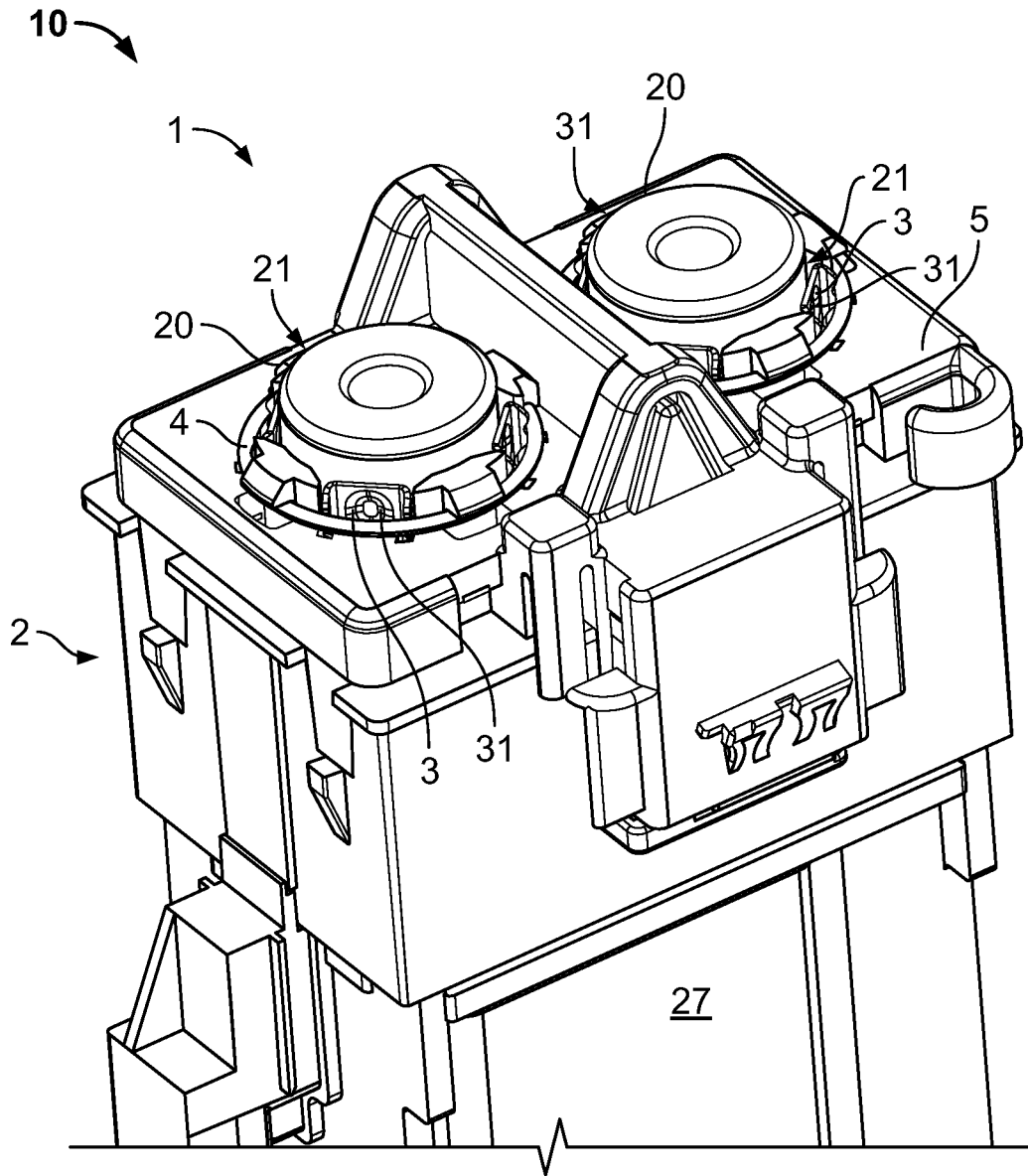


Fig. 1

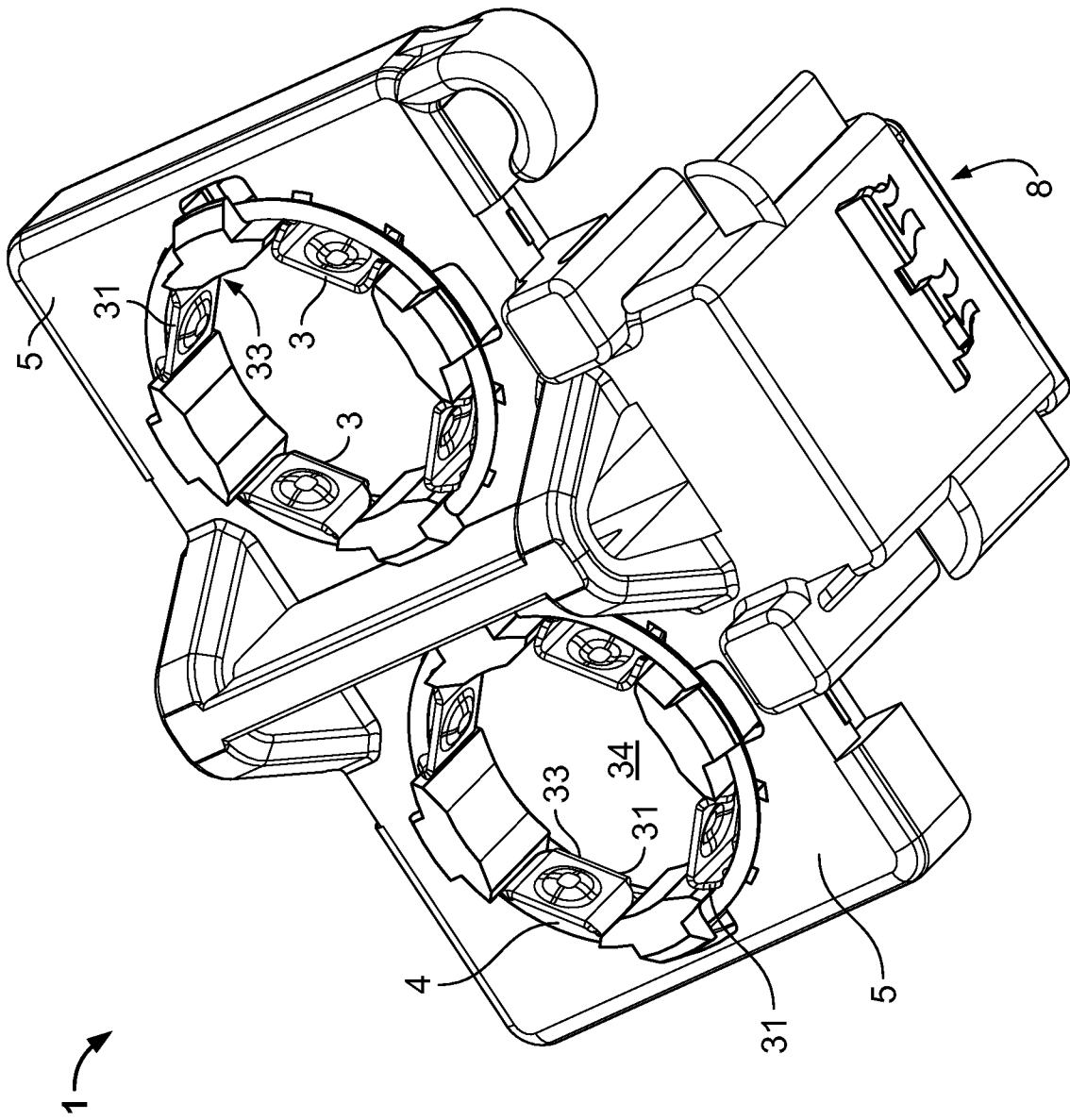


Fig. 2

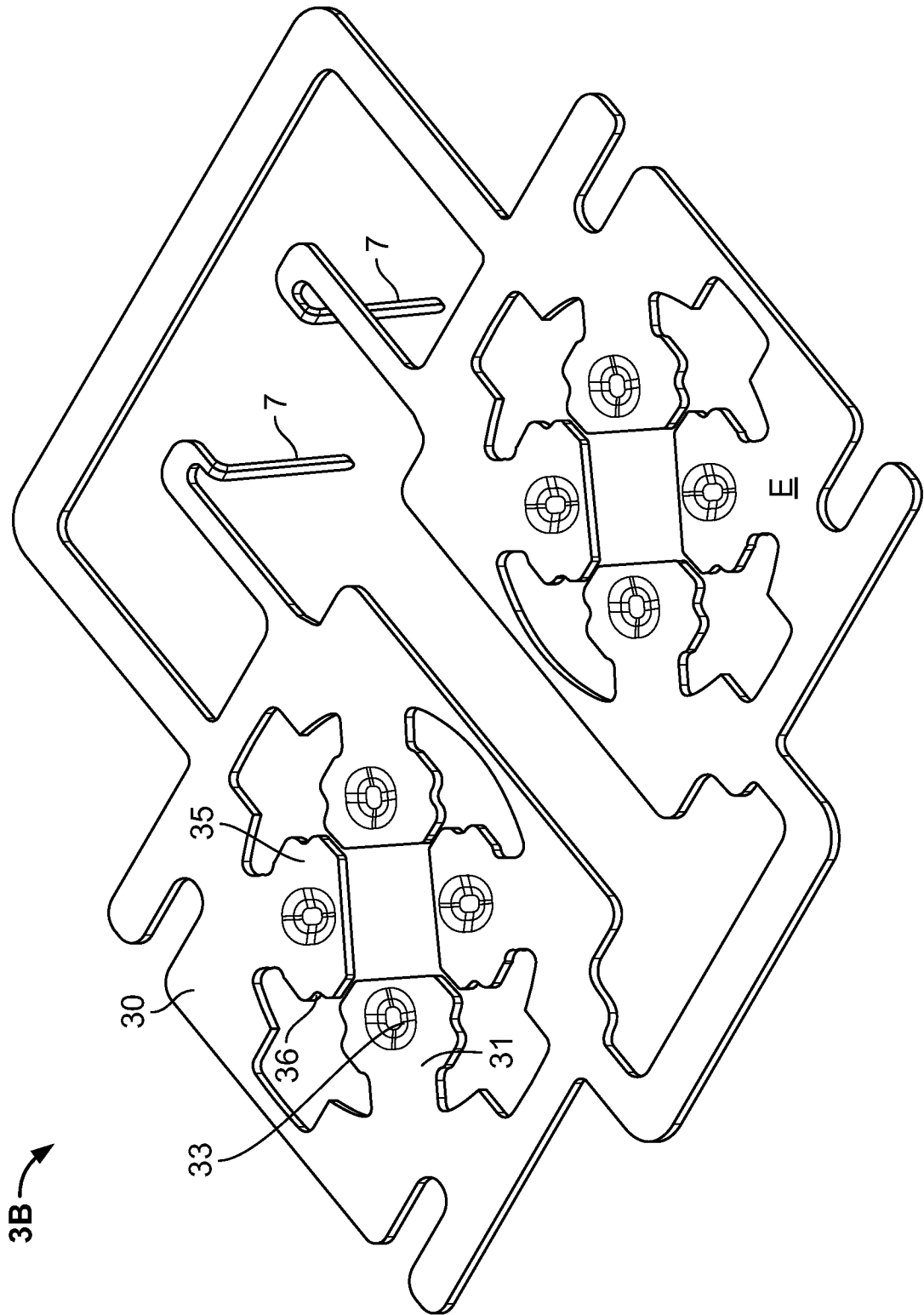


Fig. 4

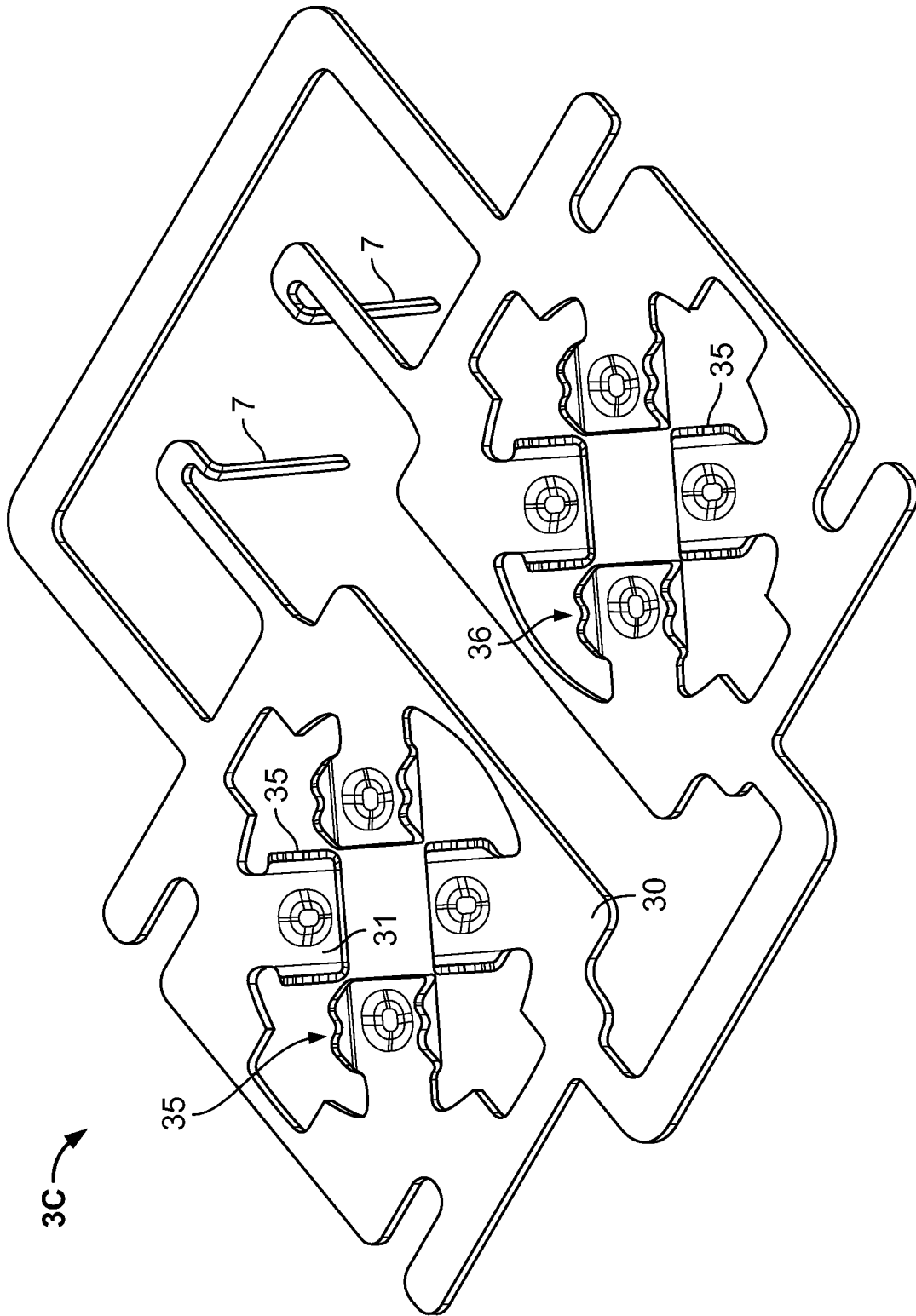


Fig. 5

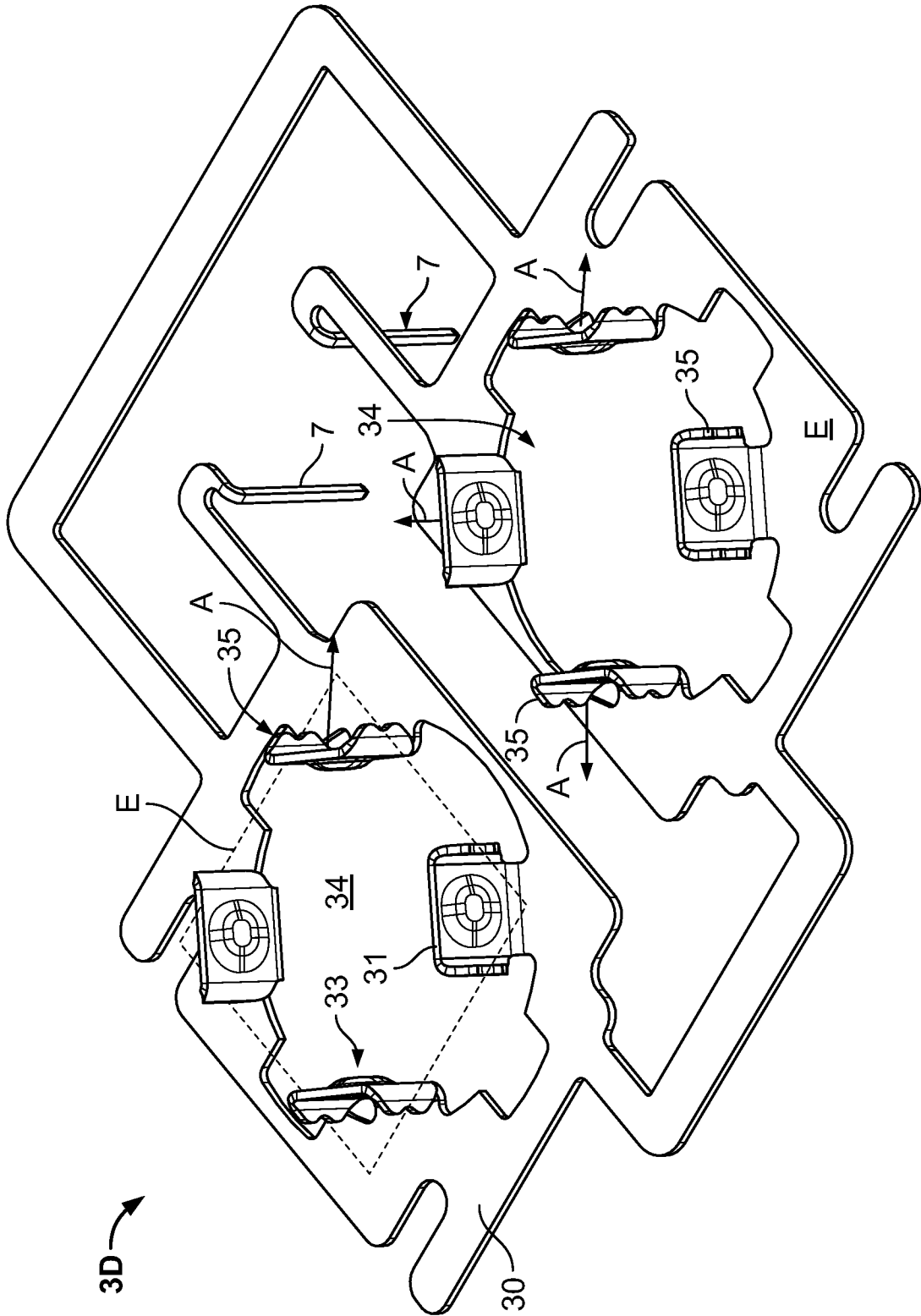


Fig. 6

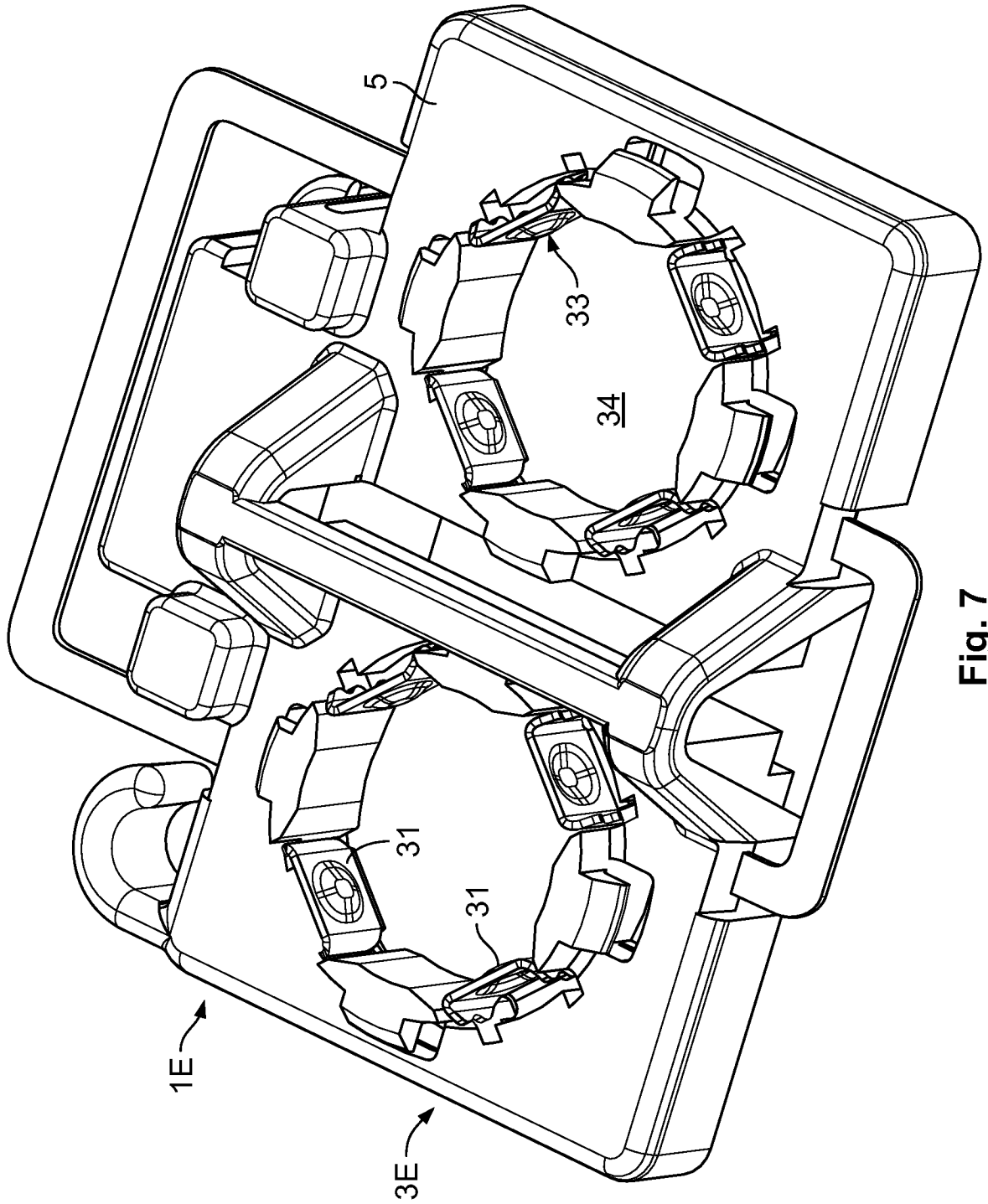


Fig. 7

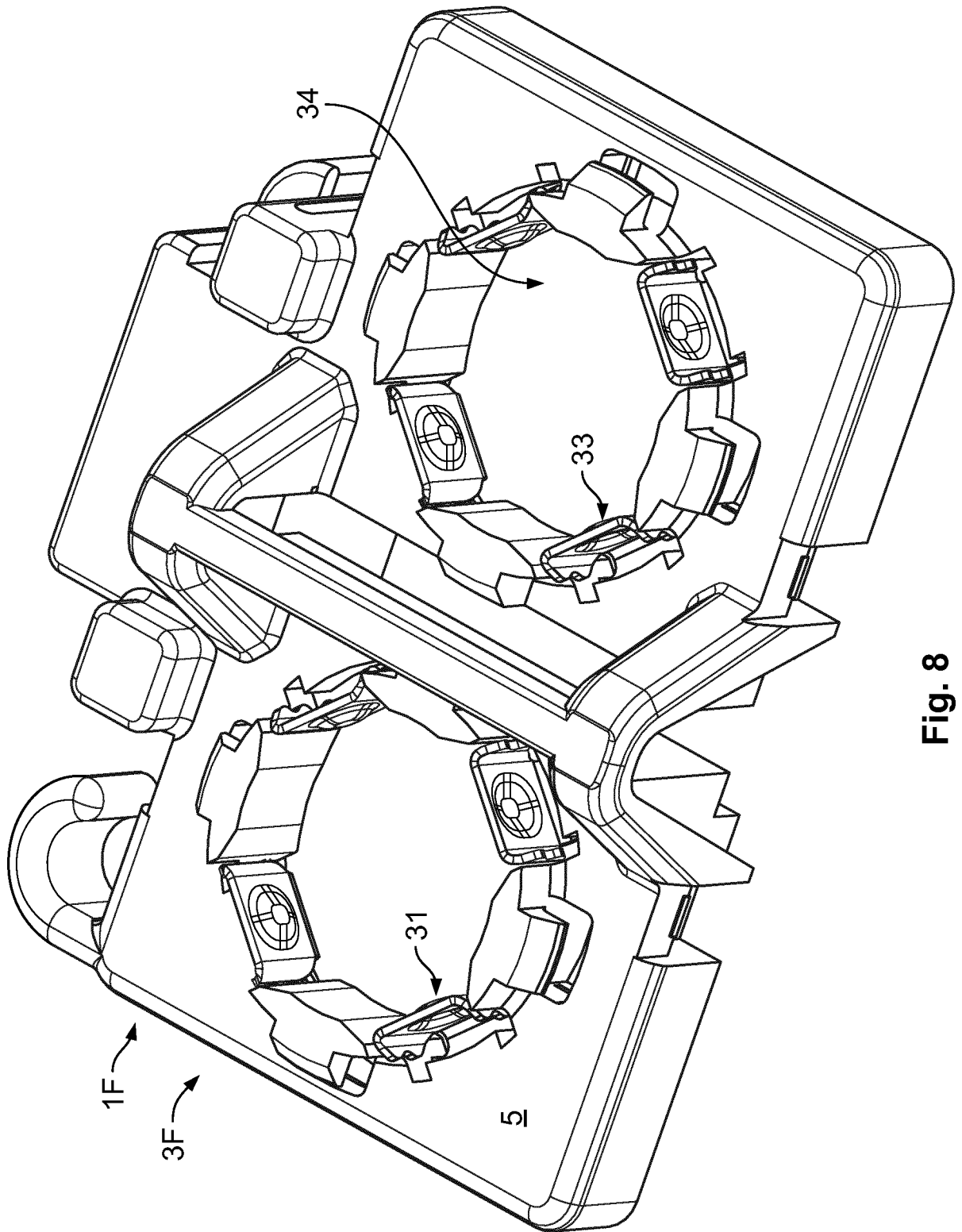


Fig. 8

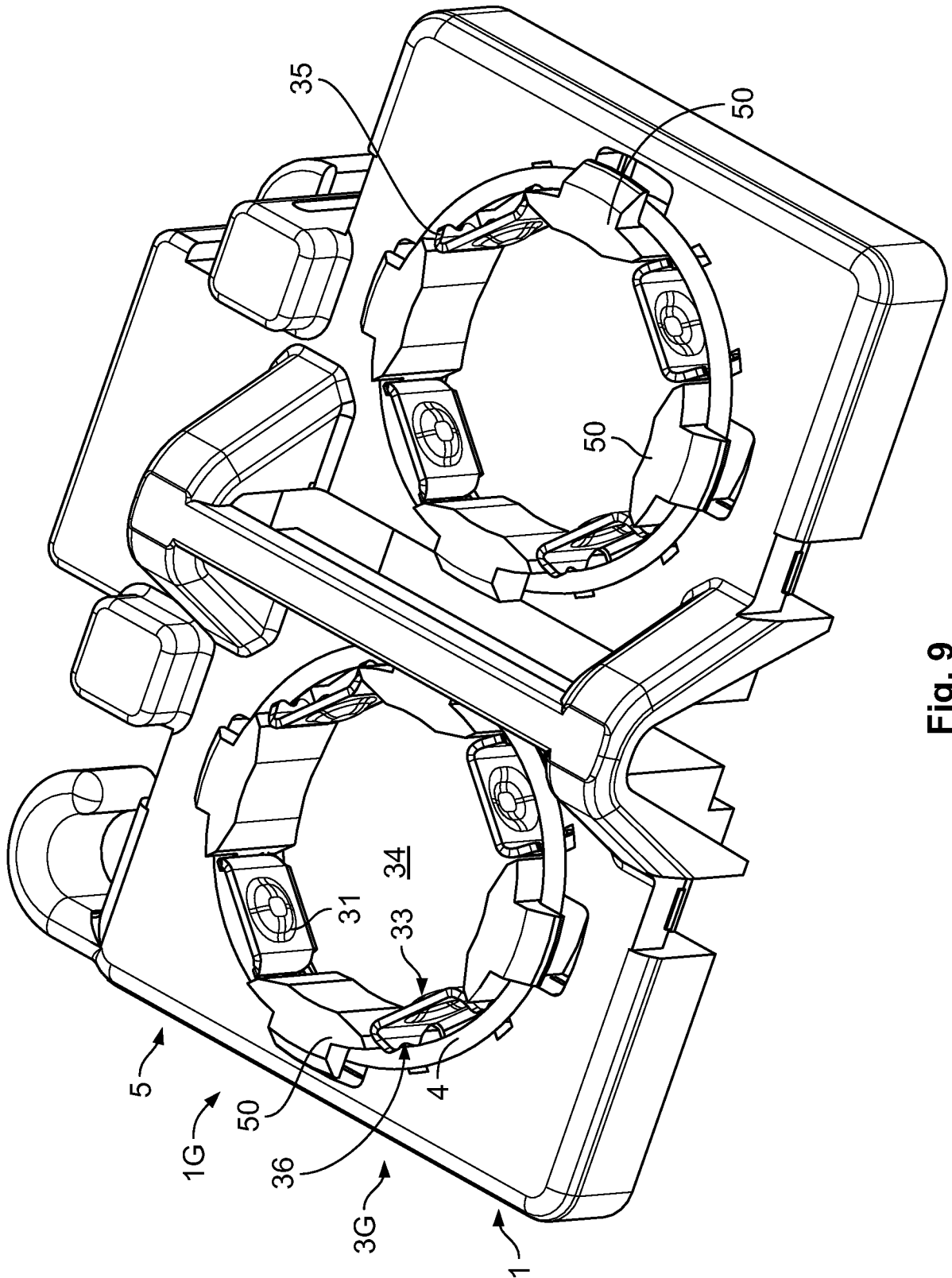


Fig. 9

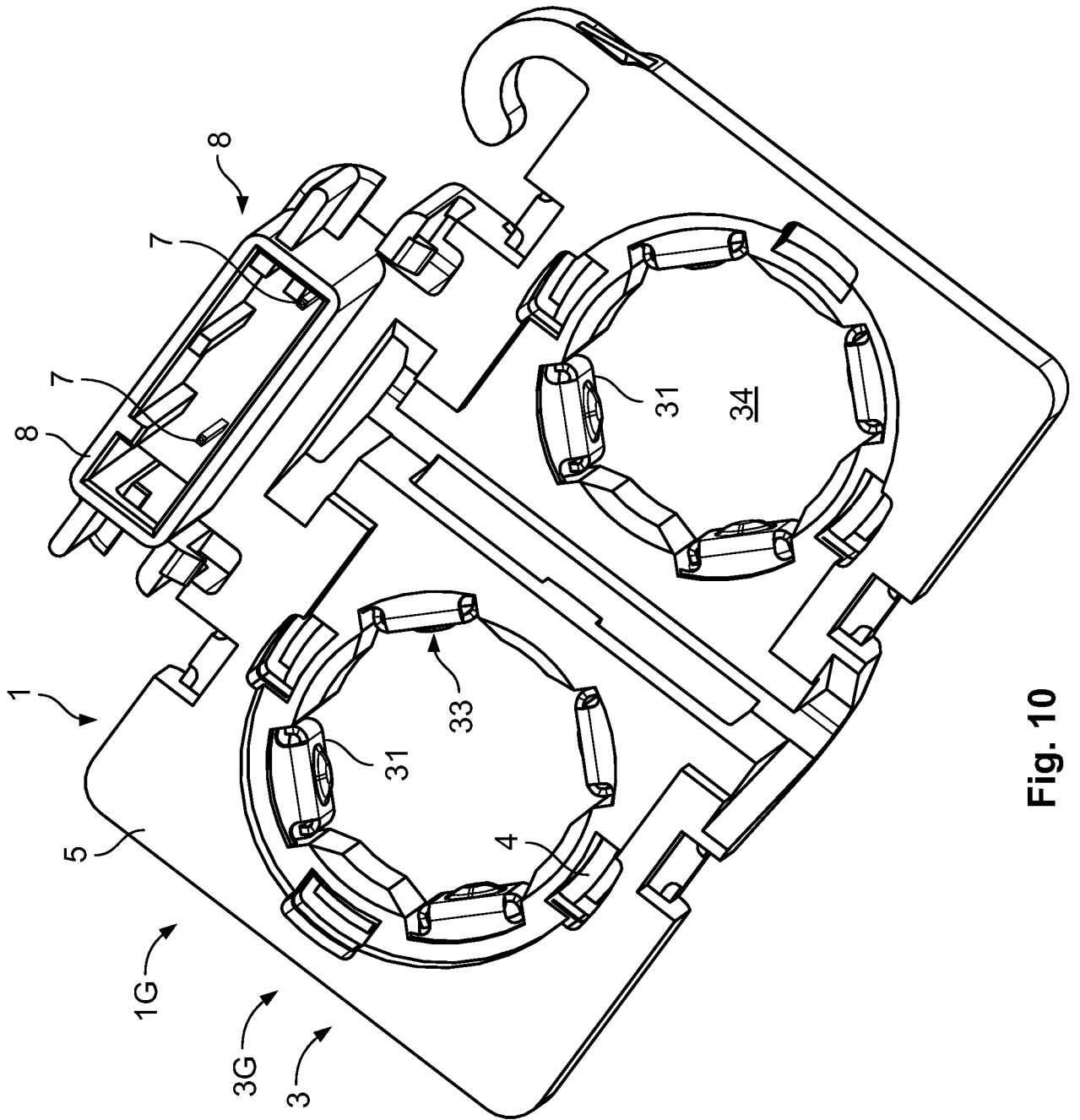


Fig. 10

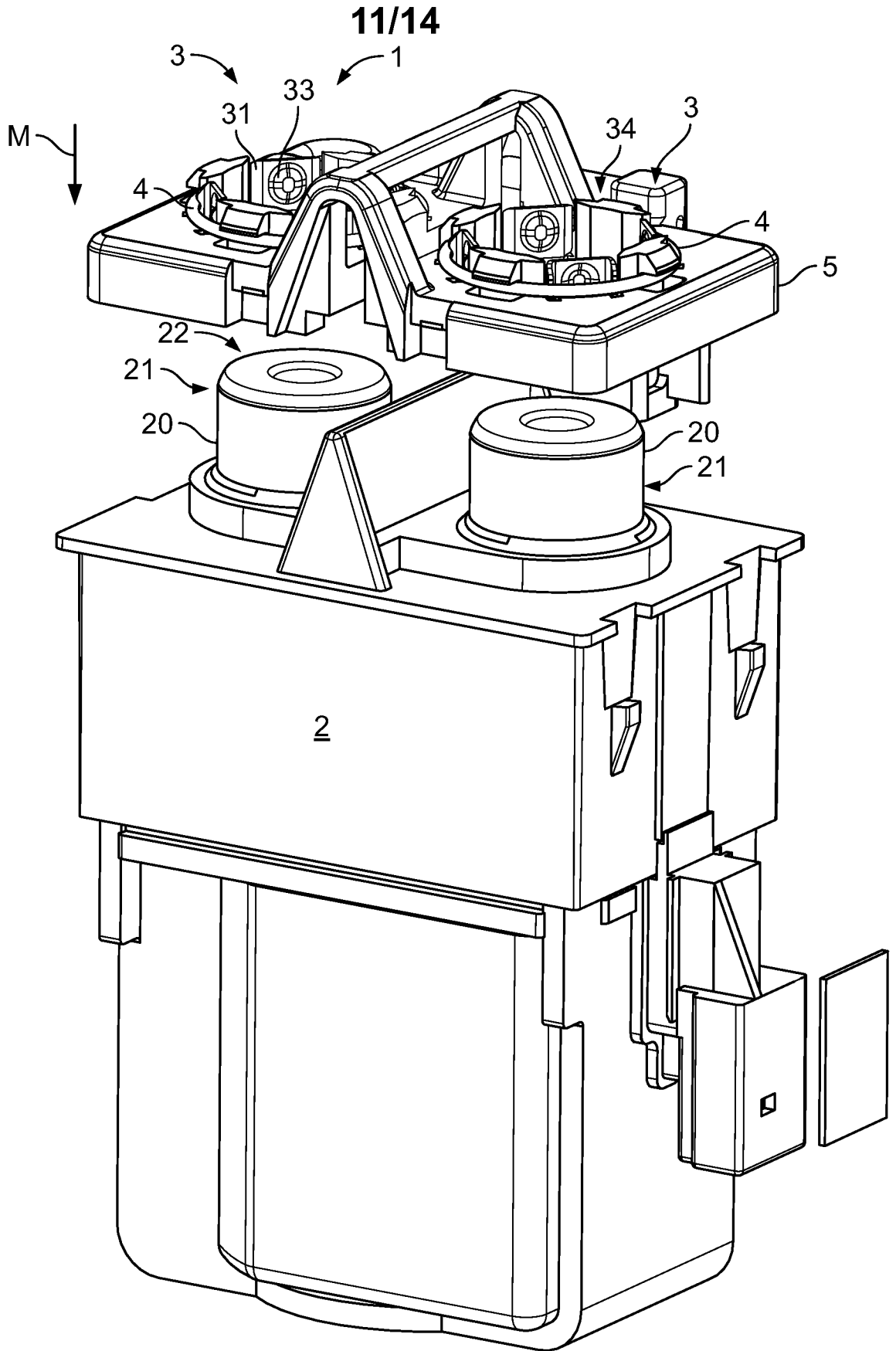


Fig. 11

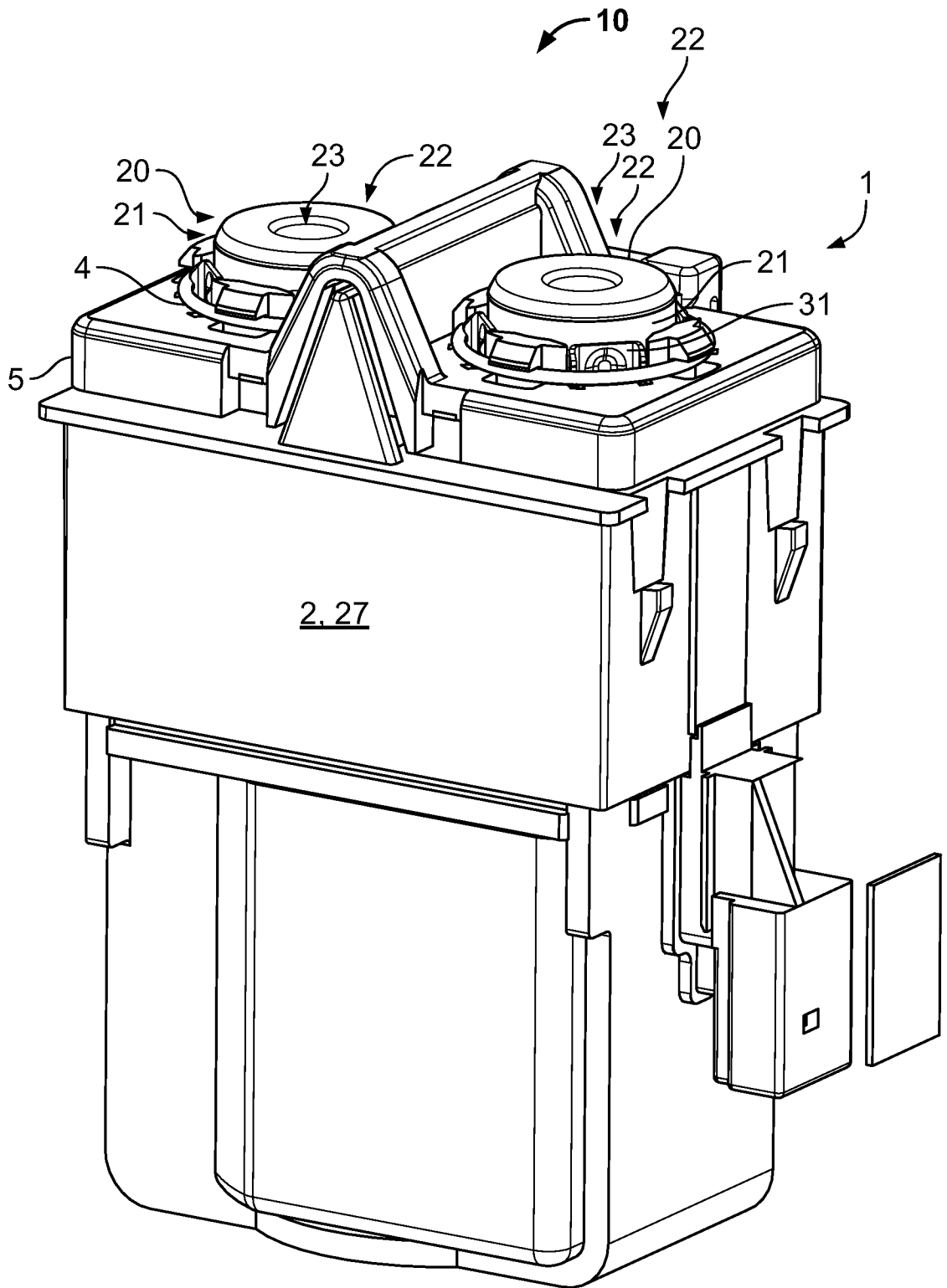


Fig. 12

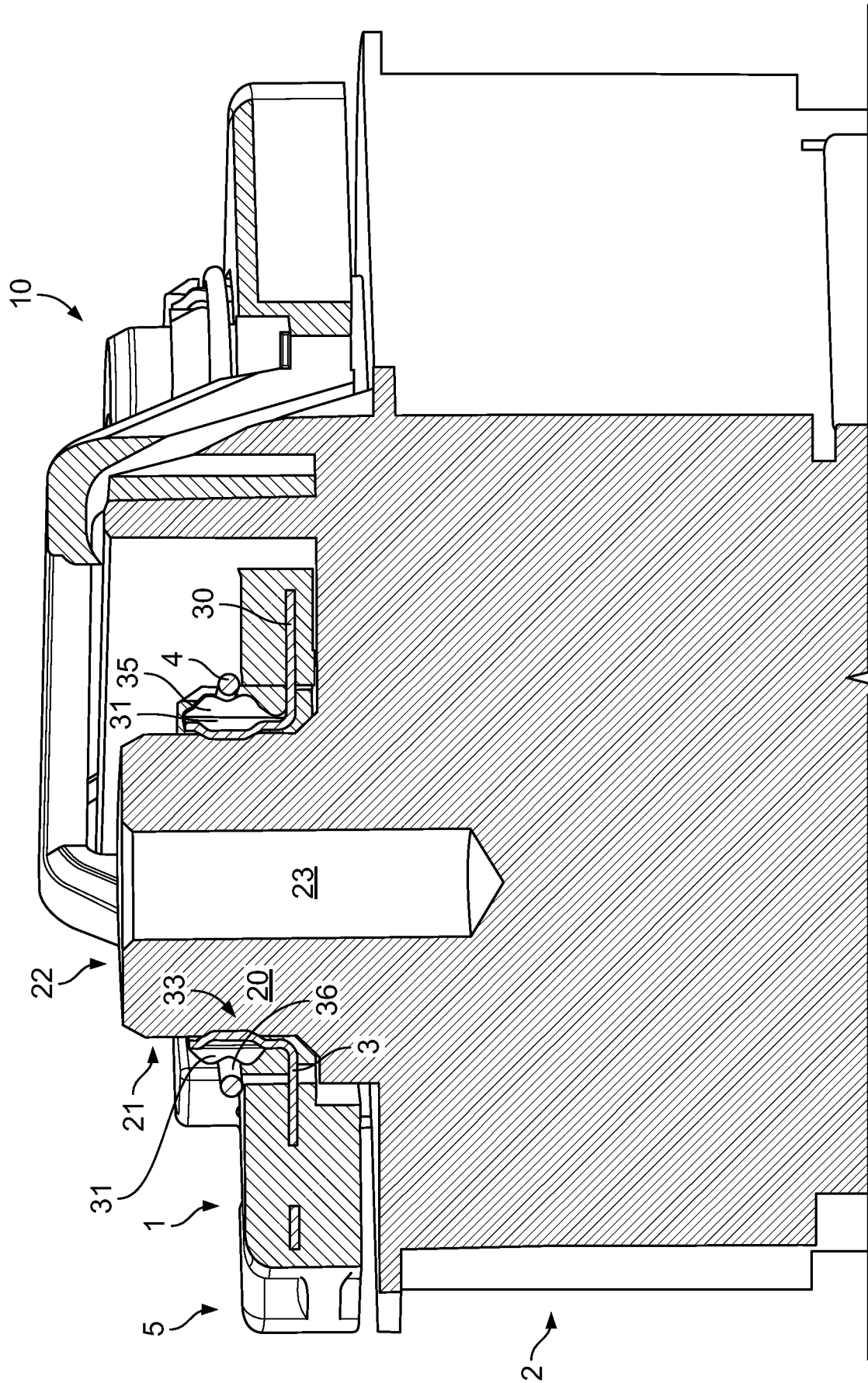


Fig. 13

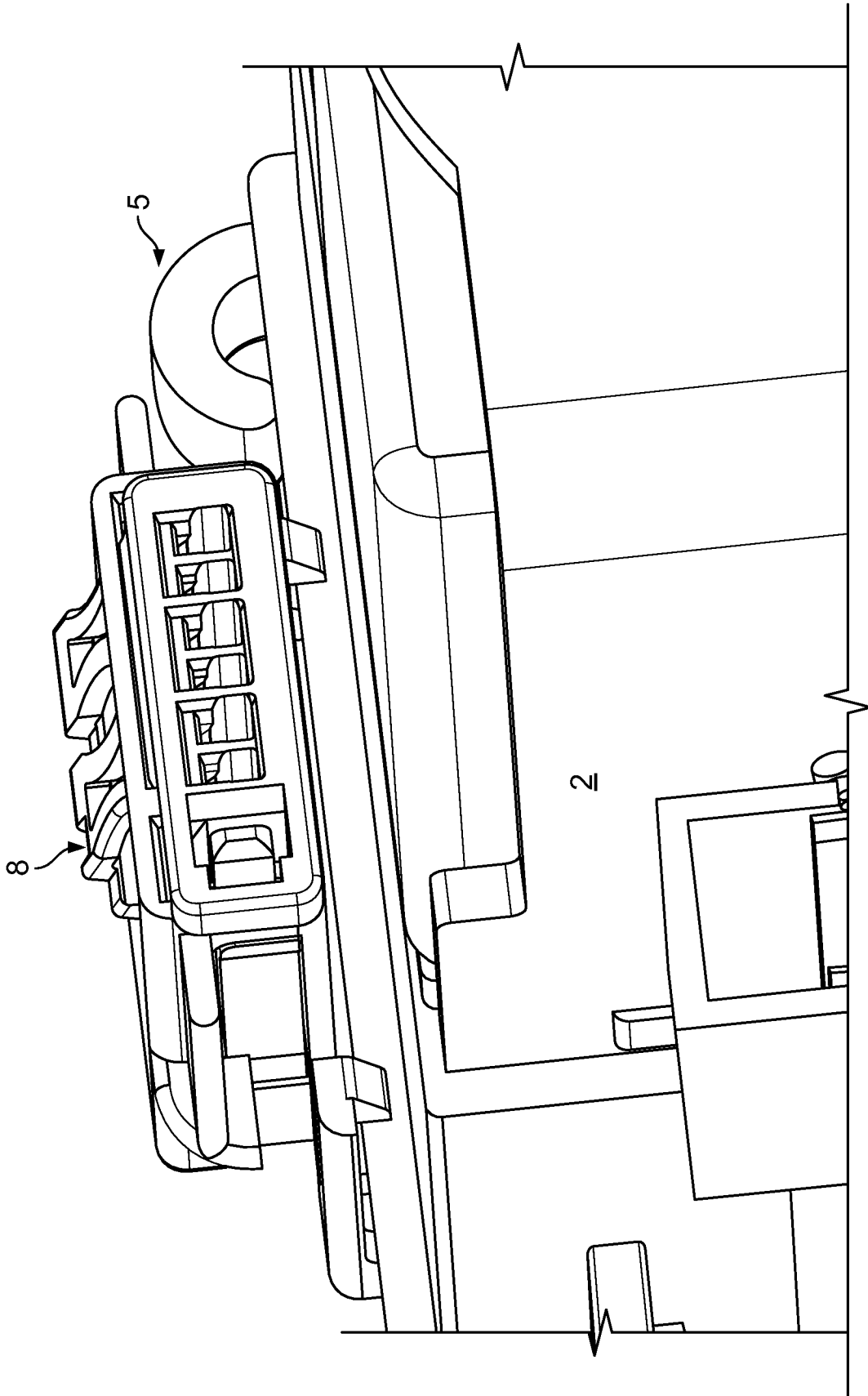


Fig. 14

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2016/075376

A. CLASSIFICATION OF SUBJECT MATTER
 INV. H01R13/24 H01H71/08 H01R13/11
 ADD. H01R13/18

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)
 H01R H01H

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, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2007/136569 A2 (ANTAYA TECHNOLOGIES CORP [US]; MACHADO MANUEL H [US]; SULLIVAN SIMON []) 29 November 2007 (2007-11-29) figures 1-30	1-3,5-8, 10-13
X	EP 2 079 133 A1 (LEGRAND FRANCE [FR]; LEGRAND SNC [FR]) 15 July 2009 (2009-07-15) figures 1-7	1,5
X	US 4 056 299 A (PAIGE WALTER GRIFFIN) 1 November 1977 (1977-11-01) figures 1-6	1,5,7,8
X	US 6 033 245 A (YAMKOVY PAUL G [US]) 7 March 2000 (2000-03-07) figures 1-9	1,4,9

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
- "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 3 January 2017	Date of mailing of the international search report 11/01/2017
--	---

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 Ferreira, João
--	---

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2016/075376

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2007136569	A2	29-11-2007	CA 2686809 A1
			EP 2059951 A2
			EP 2819178 A2
			ES 2517591 T3
			HK 1131698 A1
			PT 2059951 E
			US 2007287322 A1
			US 2010112842 A1
			WO 2007136569 A2

EP 2079133	A1	15-07-2009	CN 101483288 A
			EP 2079133 A1
			FR 2926167 A1
			RU 2008151969 A

US 4056299	A	01-11-1977	NONE

US 6033245	A	07-03-2000	NONE
