

(43) International Publication Date
27 October 2016 (27.10.2016)

(51) International Patent Classification:

H01H 9/04 (2006.01) H02B 1/26 (2006.01)
H01H 71/02 (2006.01)

(21) International Application Number:

PCT/EP2016/058505

(22) International Filing Date:

18 April 2016 (18.04.2016)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

15164288.1 20 April 2015 (20.04.2015) EP

(71) Applicant: GENERAL ELECTRIC TECHNOLOGY
GMBH [CH/CH]; Brown Boveri Strasse 7, CH-5400
Baden (CH).(72) Inventors: KALIN, Daniel; Reiherweg 4, 5036 Oberent-
felden (CH). VON ALLMEN, Peter; Oeltrotten 439, 5054
Kirchleerau (CH).(74) Agent: BREVALEX; 95, rue d'Amsterdam, 75378 Paris
Cedex 8 (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, CZ, DE, 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,
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,
LV, MC, 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).

Declarations under Rule 4.17:

— as to the applicant's entitlement to claim the priority of the
earlier application (Rule 4.17(iii))

Published:

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

(54) Title: ENCLOSURE FOR THE OPERATION MECHANISM OF A CIRCUIT BREAKER

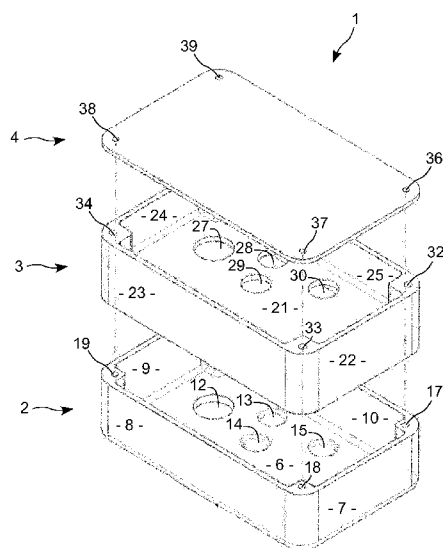


Fig. 1

(57) Abstract: The invention relates to an enclosure (1) for the operating
mechanism of a circuit breaker, this mechanism comprising a main shaft and
secondary shafts, and a spring to actuate the mechanism. According to the in-
vention, this enclosure comprises: –a parallelepiped base (2) having an open
face and comprising a bottom wall (6) opposite to its open face, this bottom
wall (6) having holes (13, 14, 15) to receive bearings carrying the shafts; –a
supporting part (3) comprising a main wall (21) to be mounted at the open
face of the base (2), the main wall (21) comprising holes (27, 28, 29, 30) to
receive bearings carrying the other extremities of the shafts; –a cover (4) to
close the supporting part (3).

**ENCLOSURE FOR THE OPERATION MECHANISM OF A CIRCUIT
BREAKER**

DESCRIPTION

5 TECHNICAL FIELD

The invention relates to the enclosure of an operation mechanism to actuate an indoor or outdoor circuit breaker.

STATE OF PRIOR ART

10 To ensure reliable operation of a circuit breaker operation mechanism over many years, all mechanical parts have to be protected against water, snow, dust and the like. Furthermore, to save to protect operating personnel from injury, the enclosure
15 has to enclose all the moving parts of the mechanism.

This mechanism comprises a main shaft which protrudes out of the enclosure, and which is connected to an actuating member of the circuit breaker.

To avoid an electric arc appearing in the
20 circuit breaker when it is opened, the main shaft has to be rotated quickly and accurately along a predetermined rotational path. More specifically, if the electric contacts are opened at sufficient speed and at the appropriate time, the chances of appearance
25 of an electric arc are almost zero.

For this reason, the operation mechanism comprises an actuating spring cooperating with cams and levers carried by secondary shafts, to actuate the main shaft. When the circuit is to be opened, the actuating
30 spring is released to rotate the cams and levers

carried by the secondary shaft, which in turn to rotate the main shaft at the appropriate speed along the predetermined rotational path.

5 With the operation being conducted in a very short time interval, the mechanical components are moved at high speed, and thus require that the mechanism be powerful.

As a result, the general structure of this type of mechanism, which can be seen for example in
10 figures 1 to 5 of patent document US7227091 is heavy. It comprises two or more supporting plates, to which are secured ball bearings carrying the main shaft and the secondary shafts, and other mechanical components.

Since this mechanism has to be protected
15 from rain, snow and the like, it is installed into a sealed cabinet, which is made of metal sheets which are arranged together and sealed.

The aim of the invention is to provide a solution to reduce the cost of such a system in order
20 to render it more competitive.

PRESENTATION OF THE INVENTION

The invention relates to an enclosure for the operating mechanism of a circuit breaker, this
25 mechanism comprising a main shaft and secondary shafts carrying elements such as levers cams and gears, and an actuating spring, characterized in that this enclosure comprises:

- a base having a generally parallelepiped
30 shape with an open face, this base comprising a bottom wall opposite to its open face, this bottom wall having

blind holes to receive bearings carrying first extremities of the secondary shafts and a through hole receiving the main shaft to allow it protrude out of this base ;

- 5 - a supporting part comprising a main wall to be mounted at the open face of the base, the main wall comprising through holes to receive bearings carrying the other extremities of the shafts ;
- a cover to close the supporting part.

10 With this solution, the enclosure is both a chassis part which supports all the mechanical parts of the mechanism and which also protects this operation mechanism against external dust water and the like.

 The invention also relates to an enclosure
15 as defined above, wherein the supporting part is a flat piece.

 The invention also relates to an enclosure as defined above, wherein the supporting part has a generally parallelepiped shape having an open face, its
20 main wall being opposite to its open face to receive additional elements, such as position indicators, interlockings, electrical auxiliary switches, and wherein the cover closes the open face of the supporting part.

25 The invention also relates to an enclosure as defined above, wherein the base comprises an opening to which an external case is secured to receive the spring which actuates the mechanism.

 The invention also relates to an enclosure
30 as defined above, wherein the base comprises at its corners threaded holes perpendicular to its bottom wall

to receive screws for securing the supporting part and the cover to the base.

BRIEF DESCRIPTION OF THE DRAWINGS

5 Figure 1 is an exploded view of the enclosure according to a first embodiment of the invention;

 Figure 2 is an exploded view of the enclosure according to a second embodiment of the
10 invention;

 Figure 3 is an exploded view of the enclosure according to a third embodiment of the invention.

15 DETAILED PRESENTATION OF PARTICULAR EMBODIMENTS

 The basic idea of the invention is an element having a parallelepiped shape closed on all its sides except the top which is covered by an additional part. All the mechanical and electrical parts are
20 mounted inside this element before it is closed by a sealed cover. The element with its cover is both an enclosure and a strong frame for carrying all the operation mechanism.

 As seen in figure 1, the enclosure 1
25 according to the invention comprises a base 2 having a parallelepiped shape, a supporting part 3 also having a parallelepiped shape, and a cover 4.

 The base 2 comprises a rectangular bottom wall 6, and four side walls 7, 8, 9, 10, each side wall
30 being perpendicular to the bottom wall 6 and extending

from one of the borders of the rectangular bottom wall 6.

The bottom wall 6 comprises at its inner face a through hole 12 intended to receive a ball bearing to carry the main shaft of the operation mechanism. It further comprises three blind holes 13, 14, 15 intended to receive ball bearings to carry three secondary shafts which carry the levers, cams and gears of the mechanism. The operation mechanism with its bearings and shafts is not shown on the figures.

Each corner of this base 2, i.e. each junction of two contiguous side walls comprises a threaded hole located in the thickness of the junction of the walls and extending perpendicular to the bottom wall 2. Three of these four threaded holes are visible in figure 1 and marked as 17, 18, 19.

The supporting part 3 is similar to the base 2. It has a generally parallelepiped shape open on one face : it comprises a rectangular bottom wall 21, four side walls 22, 23, 24, 25 perpendicular to the bottom wall 21 and each extending a corresponding border of the rectangular bottom wall 21.

The bottom wall comprises four through holes 27, 28, 29, 30 corresponding to the holes of the bottom wall 6 of the base 2. This four through holes receive corresponding ball bearings to carry the other extremities of the main shaft and of the secondary shafts.

Each corner of the supporting part, i.e. each junction of two contiguous side walls comprises a

through hole perpendicular to the bottom wall. Three of these through holes are visible in the figures and marked as 32, 33, 34.

5 As seen in the figures, the cover 4 is a rectangular flat piece such as a metal sheet, which comprises four through holes at its corners, these through holes being marked as 36, 37, 38, 39.

When the case is mounted, the bottom of the supporting part 3 is located against the top edges of the side walls of the base 2, and the cover 4 is
10 located against the top edges of the supporting part 3. Four screws firmly secure these three part to each other. Each screw is inserted in a through hole of the cover and in a corresponding through hole of the
15 supporting part, and is screwed in a corresponding threaded hole of the base.

A gasket or a sealing compound can advantageously be provided between the base 2 and the supporting part 3, and also between the cover 4 and the
20 supporting part 3, to ensure appropriate sealing of these parts.

As mentioned above, the base part comprises all the main mechanical parts of the operation
25 mechanism: the main shaft and the secondary shafts with their corresponding levers, cams and gears. All these shafts are carried at each extremity by a corresponding bearing mounted in the holes 12-15 of the bottom wall 6 of the base 2 and in the holes 27-30 of the bottom or
30 main wall 21 of the supporting part 3. The actuating

spring of the operation mechanism is also mounted into the base 2.

The supporting part 3 comprises additional elements of the mechanism such as position indicators, interlockings, electrical auxiliary switches, and the like. Since the holes of the bottom wall 21 of the supporting part are through holes, the extremities of the shafts can protrude partly in the supporting part 3 to be connected to or to cooperate with the additional elements mounted into this supporting part 3.

As for the actuating spring of the operation mechanism, it can be mounted into the base with the other mechanical components if its dimensions are not too large. But if the dimensions of this spring are too large, and especially if the spring is too long, this spring can be mounted in an additional case according to the second embodiment of the invention shown in figure 2.

In this second embodiment, the enclosure comprises a case 41 having the general shape of a cylinder with an oblong base, which is closed at one extremity and open at its other extremity. The open extremity comprises a flange 42 integral with the cylinder, this flange being perpendicular and surrounding this extremity, and enabling this case 41 to be secured to the side wall 8 of the base, by means of bolts or the like.

The base 2' of this second embodiment is similar to the base 2 of the first embodiment, except that its side wall 8 comprises a corresponding oblong

through hole marked as 43, and surrounded by corresponding through holes to receive fixation bolts. Accordingly, the spring can be installed into the cylindrical case 41 which protrudes out of the base 2',
5 and which is secured to it by the fixation bolts traversing the flange 43 and the wall 8. One extremity of the spring protrudes inside the base 2', allowing this spring to be released to allow its free end to actuate the moving parts of the operation mechanism, in
10 order to move the main shaft at appropriate speed.

As seen in figure 2, the general structure in this second embodiment of the invention is similar to the one of the first embodiment: the base of the supporting part 3 is applied against the edges of the
15 side walls of the base 2', and the cover 4 is located and secured onto the open face of the supporting part 3 to close it.

The base 2', the supporting part 3 and the cover 4 are secured to each other by screws, in the
20 same way as in the first embodiment. The main parts of the operating mechanism are mounted into the base 2', and the additional parts or auxiliary parts of this mechanism are mounted into the supporting member, and connected to the corresponding shafts.

25 In a third embodiment of the invention which corresponds to figure 3, the supporting part 3', is reduced to just a flat piece which forms a bottom wall 21.

As visible from figure 3, this rectangular
30 bottom wall is similar to the bottom wall of the supporting part of the first and second embodiments of

the invention. It comprises four through holes 27-30 to receive the bearings carrying the extremities of the shafts, and it also comprises through holes 32-34 at each corner, to be traversed by the screws used to
5 secure the cover 4 and the supporting part 21 to the base 2.

The enclosure according to this third embodiment of the invention is adapted to a situation where the operation mechanism is more simple, i.e.
10 comprises a smaller amount of components, allowing the whole operation system to fit entirely within the base element 2.

In these three embodiments of the invention discussed above, the base 2 and the supporting element
15 3 are made of casted aluminum in order to be strong enough to firmly support the mechanical components of the operation mechanism.

Except those of the main-shaft, all bearing bores are executed as blind holes to ensure that no
20 sealing is necessary. The main shaft which protrudes out of the base 2 to be connected to the operating member of the circuit breaker is either sealed by a rotary shaft seal or by the circuit breaker housing.

The cover can be fixed by screws, as
25 explained above, but it can also be provided with hinges to allow easy access to the electric equipment as well as the manual operated parts. If necessary, windows in the cover can be provided to allow the position indicators to remain visible even when the
30 cover is closed.

CLAIMS

1. Enclosure (1) for the operating mechanism of a circuit breaker, this mechanism comprising a main shaft and secondary shafts carrying
5 elements such as levers cams and gears, and an actuating spring, characterized in that this enclosure comprises :

- a base (2 ; 2') having a generally parallelepiped shape with an open face, this base (2 ;
10 2') comprising a bottom wall (6) opposite to its open face, this bottom wall (6) having blind holes (13, 14, 15) to receive bearings carrying first extremities of the secondary shafts and a through hole (12) receiving the main shaft so as to allow it protrude out of this
15 base (2 ; 2') ;

- a supporting part (3 ; 3') comprising a main wall (21) to be mounted to the open face of the base (2 ; 2'), the main wall (21) comprising through
holes (27, 28, 29, 30) to receive bearings carrying the
20 other extremities of the shafts ;

- a cover (4) to close the supporting part (3 ; 3').

2. Enclosure according to claim 1, wherein
25 the supporting part (3') is a flat piece.

3. Enclosure according to claim 1 or 2, wherein the supporting part (3) has a generally parallelepiped shape having an open face, its main wall
30 (21) being opposite to its open face to receive additional elements, such as position indicators,

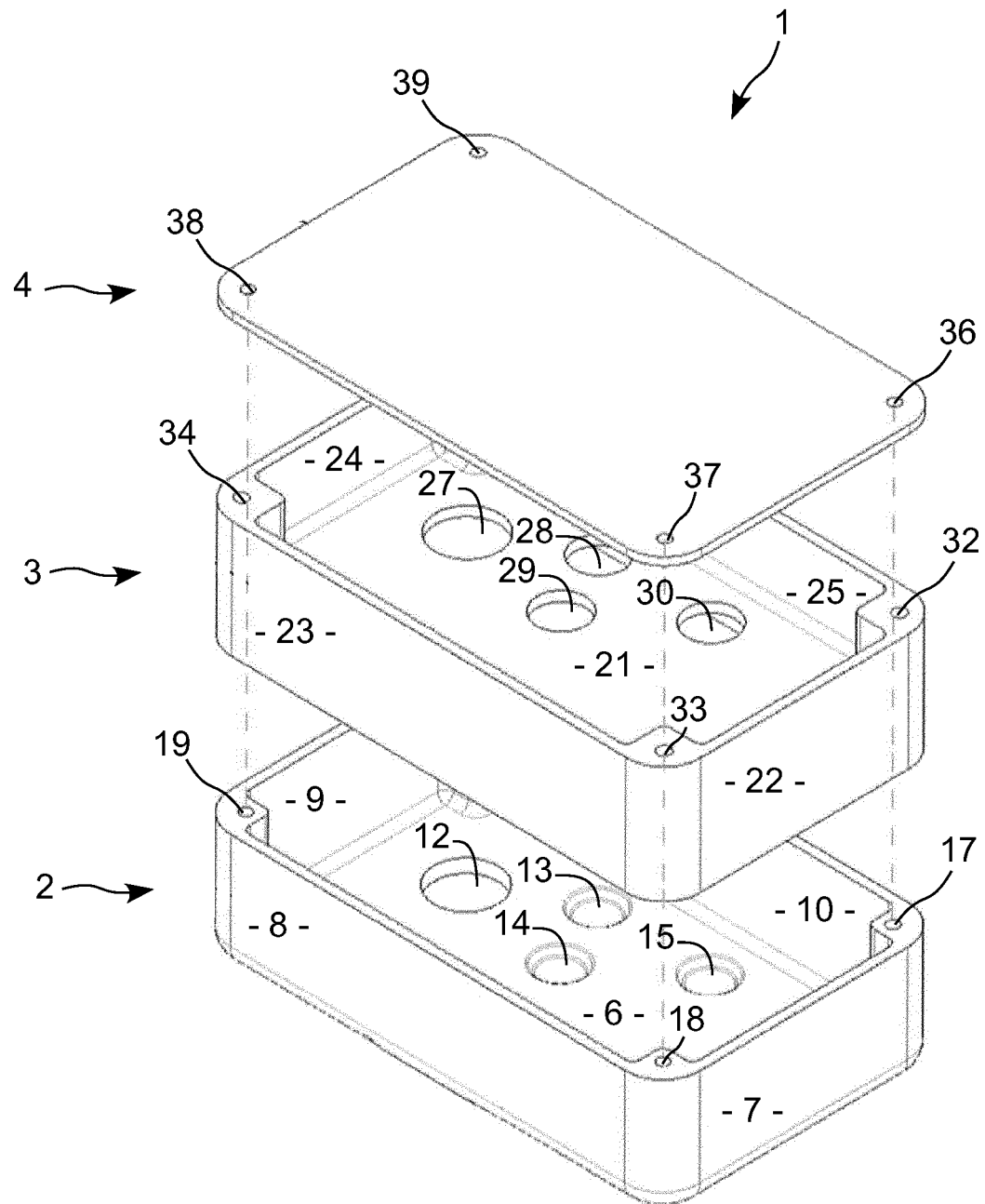
interlockings, electrical auxiliary switches, and wherein the cover closes the open face of the supporting part.

5 4. Enclosure according to claim 1 or 2, wherein the base (2') comprises an opening (43) to which an external case (41) is secured to receive the spring which actuates the mechanism.

10 5. Enclosure according to any of the previous claims, wherein the base (2 ; 2') comprises at its corners threaded holes perpendicular to its bottom wall (6) to receive screws for securing the supporting part (3 ; 3') and the cover (4) to the base (2 ; 2').

15

1/3

FIG. 1

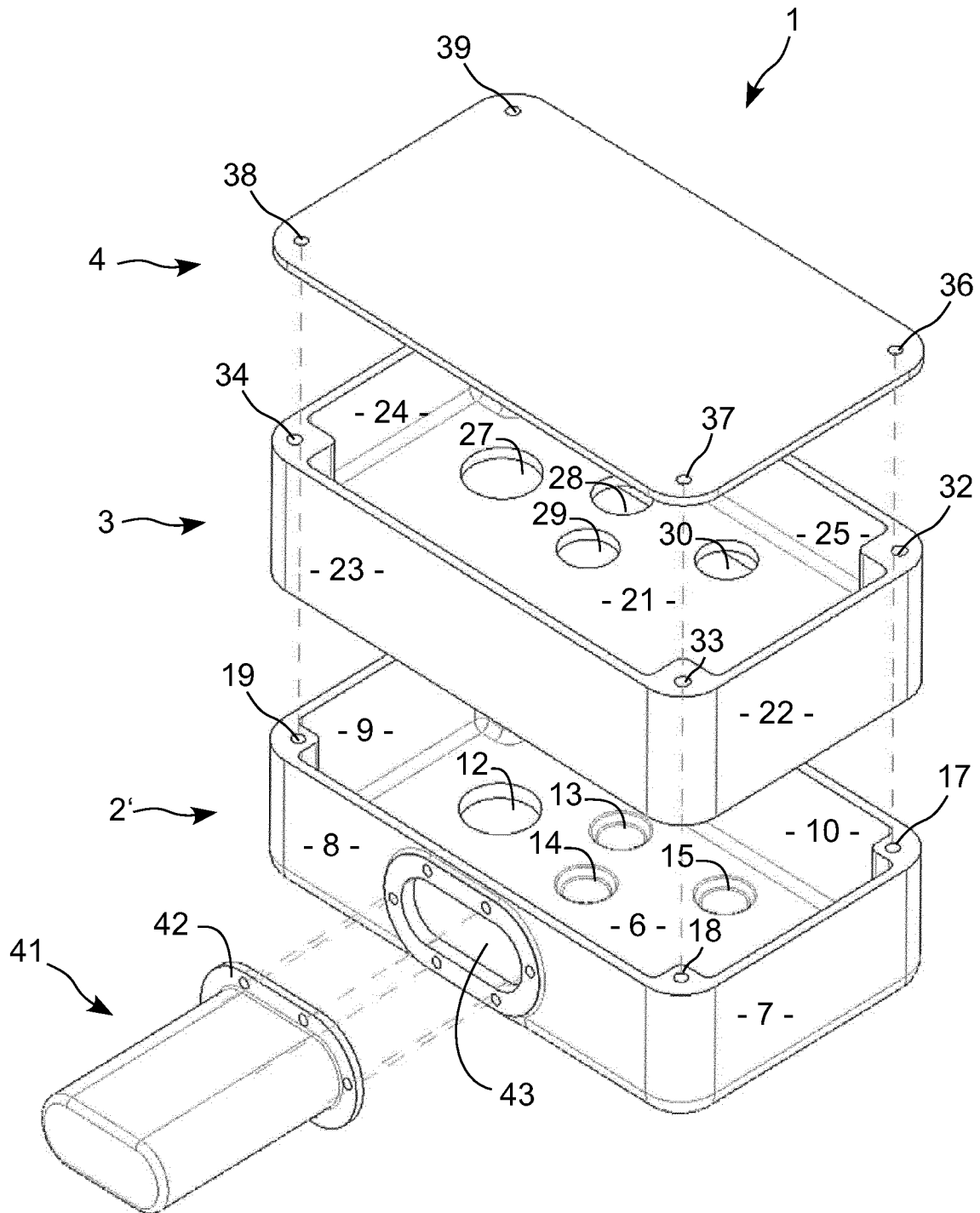


FIG. 2

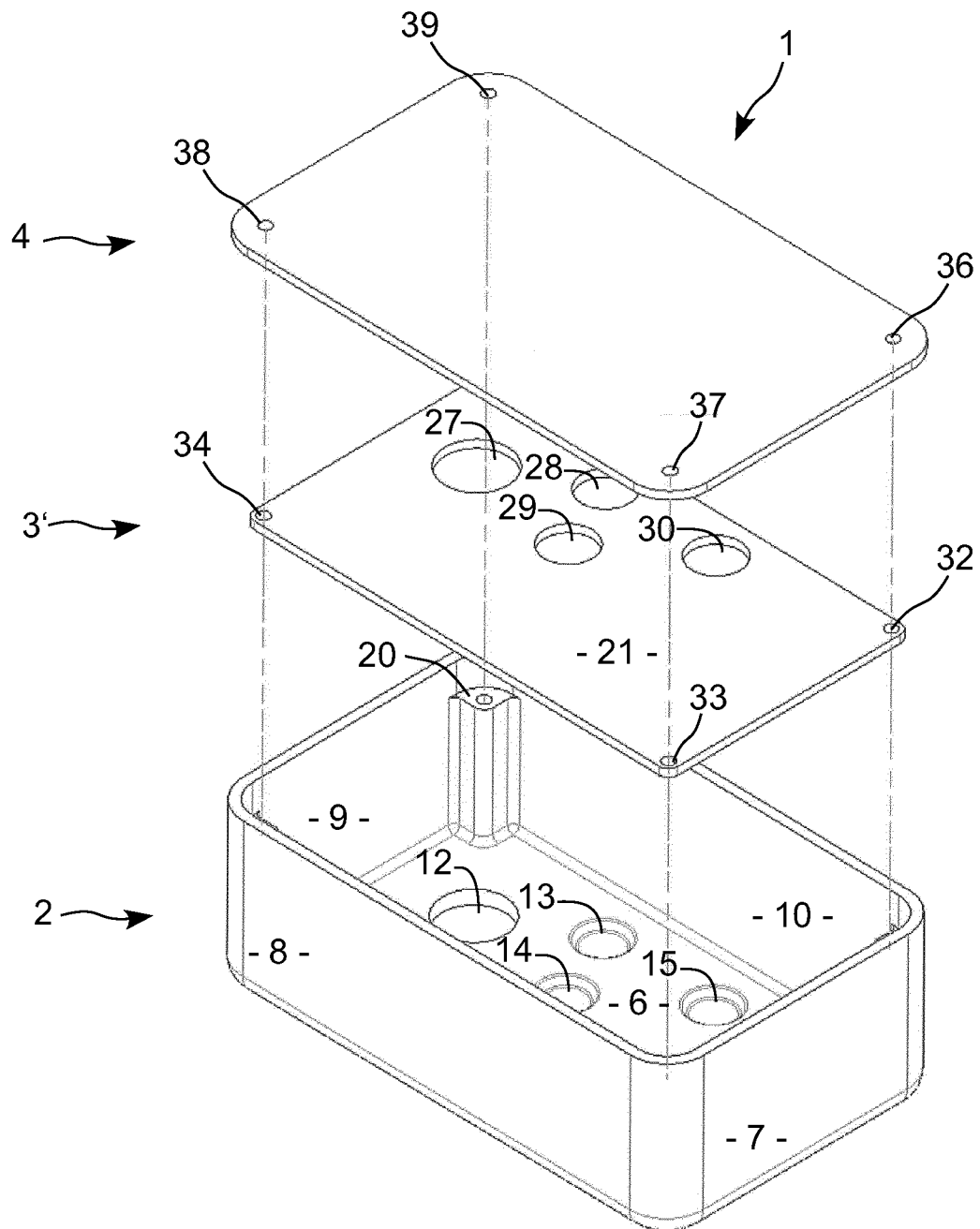


FIG. 3

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2016/058505

A. CLASSIFICATION OF SUBJECT MATTER INV. H01H9/04 H01H71/02 H02B1/26 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) H01H H02B		
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.
A	US 7 227 091 B2 (GACOND MARIUS [CH] ET AL) 5 June 2007 (2007-06-05) cited in the application column 8, lines 7-10 column 12, lines 46-51 figures 1,4,5 -----	1-5
A	GB 1 481 129 A (DIEHL) 27 July 1977 (1977-07-27) page 2, lines 60-63,84-90 figure 1 -----	1
A	US 3 713 345 A (SANDS T) 30 January 1973 (1973-01-30) column 2, lines 25-26 column 3, lines 33-35 figures 1-2B -----	1
-/-		
☒ 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	Date of mailing of the international search report	
20 June 2016	07/07/2016	
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 Ledoux, Serge	

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2016/058505

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 750 948 A (AMONETT DANIEL KEITH [US] ET AL) 12 May 1998 (1998-05-12) columns 5-8 figures 1b, 2-4b,6,19,20 -----	1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2016/058505

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 7227091	B2	05-06-2007	AT 392703 T 15-05-2008
		CN 1776852 A 24-05-2006	
		DE 602005006077 T2 18-06-2009	
		EP 1659601 A1 24-05-2006	
		FR 2878070 A1 19-05-2006	
		KR 20060055413 A 23-05-2006	
		US 2006105880 A1 18-05-2006	
GB 1481129	A	27-07-1977	DE 2410098 A1 04-09-1975
			FR 2262823 A1 26-09-1975
			GB 1481129 A 27-07-1977
US 3713345	A	30-01-1973	CA 963293 A 25-02-1975
			DE 2250221 A1 10-05-1973
			GB 1361706 A 30-07-1974
			US 3713345 A 30-01-1973
US 5750948	A	12-05-1998	CA 2207314 A1 28-11-1997
			CN 1170218 A 14-01-1998
			US 5750948 A 12-05-1998
			US 5910649 A 08-06-1999