

(19)



(11)

EP 4 064 308 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

28.09.2022 Bulletin 2022/39

(51) International Patent Classification (IPC):

H01H 13/52 (2006.01)

H01R 13/70 (2006.01)

(21) Application number: **22159052.4**

(52) Cooperative Patent Classification (CPC):

H01H 13/52; H01R 13/70; H01H 2221/03

(22) Date of filing: **28.02.2022**

(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 MK MT NL NO
PL PT RO RS SE SI SK SM TR**

Designated Extension States:

BA ME

Designated Validation States:

KH MA MD TN

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(30) Priority: **24.03.2021 IN 202131012663**

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(54) **PUSH BUTTON SWITCHING ASSEMBLY**

(57) The present invention relates to a push button switching assembly (100) for actuation of tactile switches (104) in an electrical apparatus. The push button switching assembly (100) comprises a base frame (102), a tactile switch (104) mounted within said base frame (102), an actuation member (106), a front cover (108); and a push button (110) extending through said front cover (108). The actuation member (106) is provided with a

lever arm (112) such that upon actuation, said terminal portion (114) transmits the force applied on said push button (110) onto said tactile switch (104). A downward protruding stopper member (116) is provided on said lever arm such that once the tactile switch (104) is pressed said stopper member (116) restricts further movement of said push button (110).

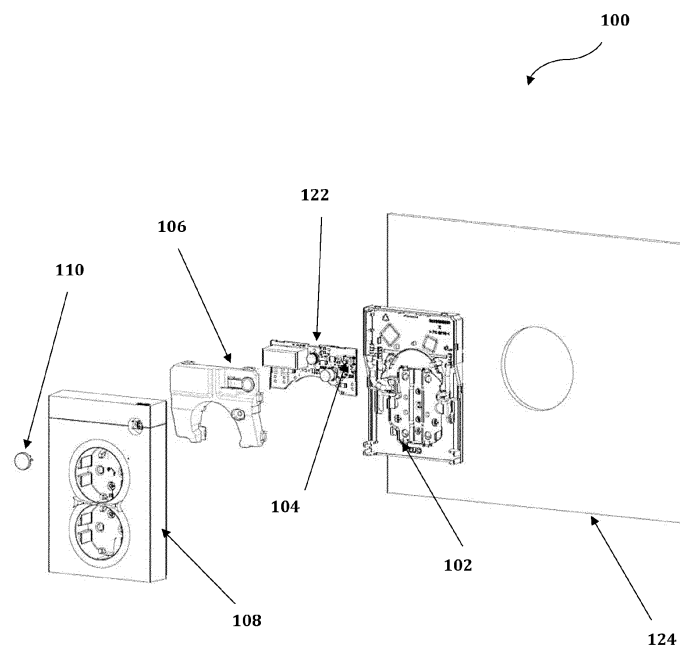
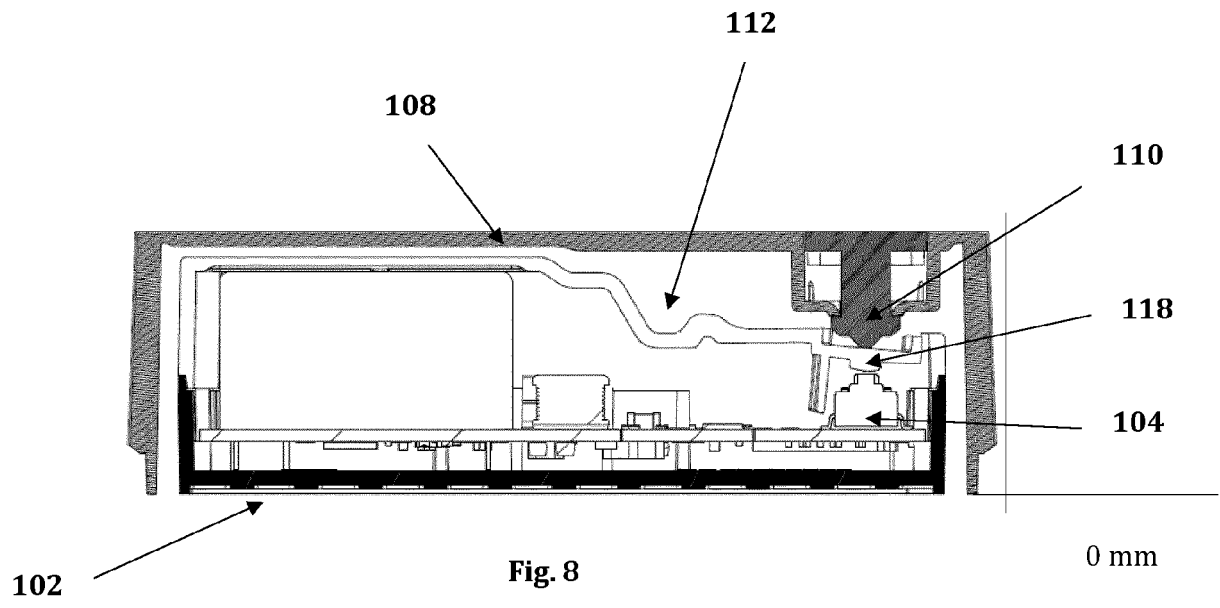


Fig. 2

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Description

Field of invention:

[0001] The present invention generally relates to push button switching assembly for electrical apparatus. More particularly this invention relates to system and method of easy actuation of tactile switches by regulating stroke length of the push button switching assembly. The invention finds its application in the field of the switching and actuation functionality of various electric apparatus mounted in various wall regulations.

Background of the invention:

[0002] In present installation practices, electrical switches are mounted within a cut out of wall. A structural part such as fixing member mounted on the electrical wall box. The switching mechanism of the switch is protected from outside with a front cover. The front cover in general consists of actuation button. The electric push button thus can be actuated by applying force to actuation button such as push button or rocker which compresses tactile switches on the inserts such as printed circuit board (PCB).

[0003] These tactile switches are actuated by applying force to the outer actuation button, which in turns transmits the force to the tactile switch which then actuates the circuit of the PCB to turn on the electrical apparatus. Since certain stroke length of actuation member is used inside the switching assembly, certain types of tactile switches require certain amount of compression force to get actuated, and can easily get damaged if excess force is applied. On the other hand, due of lack of adequate actuation force, the tactile switch may not get actuated at all. In some scenarios, the force applied on outer actuation button transmits to the tactile switch via intermediate members of the switching assembly which causes loss in applied actuation force and results in imperfect switching.

[0004] In the existing method there are switching problems in electrical switches in case of wall regulation by wallpapers used on the installation surface of the wall. More particularly whenever there is one or more wallpapers attached to the wall, a gap is created between the aesthetic cover and the tactile switch. Therefore the actuation force applied on the outer actuation switch does not reach the tactile switch, which results in an improper switching action. Additionally, in the existing mechanism for actuation of tactile switches there is no provision for automatically adjusting the stroke length of the push button switching apparatus with push button flatness with front cover irrespective of wall regulation conditions.

[0005] This invention also addresses the problem associated to over-pressing of tactile switches when actuation force of large magnitude is applied. Due to over-pressing of these types on the outer actuation switch, the tactile switches are damaged and any lever arm pressing

the tactile switch also gets damaged, which results into improper switching action. Further, the existing lever arms devised in the push button switches are conventional cantilever flex arm having stress concentration at hinge point. These existing arts have high chance of crack /breakages over thousands of operations thus fails to provide any reliable switching mechanism.

[0006] With a view therefore to overcome the drawbacks associated with conventional systems and apparatus in electrical switching mechanism of tactile switches, the inventors felt the need to develop a novel push button switching assembly. The present invention proposes to provide a solution to the existing difficulties in said field of invention and provides proper actuation of tactile switches at various installation conditions, variation of wall regulation for example.

Summary of the invention:

[0007] The present invention proposes a push button switching assembly for easy installation and proper tactile switch functioning. The electric push button assembly is capable of providing good aesthetic appearance on the electrical outlet assembly without causing any dissatisfaction to the users. Due to the in-built features of the actuation member of the push button switching assembly, present invention is inexpensive, dependable and fully effective in accomplishing its intended purposes.

[0008] Accordingly, a push button switching assembly for actuation of tactile switches in electrical apparatus is provided. The push button switching assembly comprises

a base frame for mounting said push button switching assembly fixed onto a wall;

a tactile switch mounted within said base frame,

an actuation member disposed on said tactile switch for making and breaking electrical connection by actuating said tactile switch,

a front cover; and

a push button extending through said front cover for transmitting actuation force to urge said actuation member to actuate said tactile switch and retracts to original position to maintain flatness with front cover irrespective of wall regulation conditions.

[0009] According to one most preferred embodiment, said actuation member comprises:

- a lever arm having a terminal portion configured to elastically deform in a downward direction towards said tactile switch such that upon actuation said terminal portion transmits the force applied on said

push button onto said tactile switch; and

- a stopper member protruding in a downwards direction such that once the tactile switch is pressed said stopper member restricts further movement of said push button.

[0010] According to one embodiment of the invention said terminal portion of said lever arm is provided with a dip concurrent to said tactile switch.

[0011] According to one embodiment of the invention an elastic restoring member is disposed around said push button providing a push back force which brings said push button to its initial position for next operation.

[0012] According to one preferred embodiment of the invention said elastic restoring member is a coil spring.

[0013] According to one embodiment of the invention said tactile switch is associated with a Printed Circuit Board (PCB).

[0014] According to one embodiment of the invention said lever arm extends in an inclined manner to bring the dip of said lever arm in-line with the tactile switch actuating direction.

[0015] According to one embodiment of the invention wherein said push button is snap fitted with said front cover with poka-yoke locking feature.

[0016] According to one embodiment of the invention said lever arm is configured to provide biasing force to said push button for aligning with said front cover after the push button is released.

[0017] According to one embodiment of the invention the terminal portion of said lever arm is provided with a U-shaped downward projection to receive said push button.

[0018] These and other objects, features and advantages of the present invention will become apparent to those skilled in the art upon reading and understanding the detailed description of the invention set forth below taken in conjunction with the drawings.

Brief description of the drawings:

[0019]

Figure 1 illustrates the cross-sectional view of the invented push button switching assembly in an actuated condition according to one embodiment of the invention.

Figure 2 is the exploded view of the invented push button switching assembly depicting the components of the assembly according to one embodiment of the invention.

Figure 3 is the cross-sectional view of the push button engaged with the front cover illustrating the vertical degree of freedom for the vertical movement of the push button.

Figures 4(a) to 4(c) illustrate the steps of snap fit engagement of the push button with the front cover with poka-yoke locking feature.

Figure 5 depicts a close cross-sectional view of push button engaged with the latching protrusions of the front cover.

Figures 6(a) and 6(b) illustrate two orientation of the push button to engage with the front cover according to one embodiment of the invention.

Figure 7 depicts the perspective view of the push button disengaged from the front cover.

Figure 8 depicts the cross-sectional view of the invented push button switching assembly according to one embodiment of the invention with no gap between the front cover and the base frame.

Figure 9 depicts the cross-sectional view of the invented push button switching assembly in an actuated condition of the tactile switch according to one embodiment of the invention with no gap between the front cover and the base frame.

Figure 10 depicts the cross-sectional view of the invented push button switching assembly according to one embodiment of the invention with the base frame projecting out from the wall surface.

Figure 11 depicts the cross-sectional view of the invented push button switching assembly in an actuated condition of the tactile switch according to one embodiment of the invention with the base frame projecting out from the wall surface.

Figure 12 depicts the cross-sectional view of the invented push button switching assembly according to one embodiment of the invention with the base frame projecting inwards from the wall surface.

Figure 13 depicts the cross-sectional view of the invented push button switching assembly in an actuated condition of the tactile switch according to one embodiment of the invention with the base frame projecting inwards from the wall surface.

Figure 14 depicts the cross-sectional view of the invented push button switching assembly according to one embodiment of the invention with a coil spring disposed around said push button.

Figure 15 depicts the isometric view of the invented push button switching assembly according to one embodiment of the invention.

Detailed description of the drawings:

[0020] In the following, numerous specific details are set forth to provide a thorough description of embodiment. Those skilled in the art will recognize and appreciate that, despite of the detailed nature of the exemplary embodiment provided herein; changes and modifications may be applied to said embodiment without limiting or departing from the generally intended scope.

[0021] Referring to figure 2 of the accompanying drawings, the invented push button switching assembly (100) comprises a base frame (102), a tactile switch (104), an actuation member (106), a front cover (108) and a push button (110) to be assembled together. The assembly is mounted on a wall (124). The wall surface may have wall-papers, or negative wall regulation conditions which are illustrated in figures 8 to 13.

[0022] Figure 1 depicts the cross-sectional push button switching assembly (100) in an assembled configuration. The push button (110) is inserted through a receiving hole of the front cover (108) and gets attached to it with snap-fit locking. In a preferred embodiment of the invention, the rear part of the push button (110) rest on a terminal portion (114) of the lever arm (112) of the actuation member (106). More specifically, the terminal portion (114) is provided with a U-shaped downward projection (128) for receiving said push button (110).

[0023] When the push button (110) is pressed in a downward direction it urges the lever arm (112) of the actuation member (106) to transmit the actuation force to the tactile switch (104). The terminal portion (114) of lever arm (112), without any externally applied force, in general remains in a horizontal level. As seen in figure 1, the remaining portion of the lever arm (112) is configured in an inclined manner with the horizontal level. In a preferred embodiment, as shown in figure 1 for example, plurality of vertical zigzags and/or curvatures are provided along the path of inclination. Due to this inclined design configuration, when external stroke is applied on the push button (110), the force is transmitted to the lever arm (112) and the angle of movement of the flexible lever arm (112) is along the direction of the stroke.

[0024] As directed in figures 9, 11 and 13 when the push button (110) is actuated, the terminal portion (114) tilt downwards in a resilient manner. In this position the lever arm (112) maintains a push back force on the push button (110) in an upwards direction. Once the external force is removed, the lever arm (112) attains its primary position urging the push button (110) to move upwards for the next actuation operation. Below the U-shaped projection (128) at the terminal portion (114) of the lever arm (112), a dip (118) is provided. The dip (118) matches with the profile of the tactile switch (104). Since the angle of movement of the flexible lever arm (112) is along the direction of the stroke, the dip (118) concurrently falls top of said tactile switch (104). Further, as seen in figure 2, the tactile switch (104) is mounted on a Printed Circuit Board (PCB) (122) or an integral part of the PCB (122).

[0025] The base frame (102) defines a housing in which the tactile switch (104) along with the PCB (122) is mounted in a removable manner. The base frame (102) is provided with plurality of cut-outs for fixing the frame and thereby the entire assembly onto the wall (124) by fixing mechanism such as nailing, gluing etc.

[0026] With reference to figure 14 of the drawings, an elastic restoring member, preferably a coil spring (120) is disposed around said push button (110). The axis of the coil spring coincides with the axis of the push button (110). As the push button (110) travels in a downward direction, the coil spring (120) provides restoring force opposite to the direction of the movement. Thus when the external force is removed, the push button (110) attains its primary position on the he outer surface of the front cover (108) as depicted in figure 15.

[0027] Further, a stopper member (116) is provided at the terminal portion (114) of the lever arm (112). The stopper member (116), in a preferred embodiment is a downward protruding pole member as depicted in the accompanying drawings. The stopper member (116) limits the vertical movement of push button (110). The positioning and protrusion length of the stopper member (116) can be varied according the configuration of the tactile switch (104) and base frame (102). Thus the risk of damaging the tactile switch (104) due to over-pressing is eliminated.

[0028] Referring to figures 3 to 7, of the accompanying drawings, the snap fit attachment of push button (110) within said front cover (108) is illustrated. The insertion slot of the front cover (108) is provided with projection legs (132) extending in a downward direction. The projection legs defines a lip opening for insertion of the rear of said push button (110) to be attached to the front cover (108) by snap-fitting. According to one embodiment, the projection legs (132) can be compressible cantilever snaps.

[0029] As illustrated in figures 4(a)-4(c), with a downwards external force, the push button (110) is inserted to the opening defined by said lips of the projection legs (132). Once the rear end of the push button (110) is inserted and engaged within said lips, said push button (110) cannot be pulled out. Hence along with the push back force from said lever arm (112), a vertical gap (130) is defined (Fig. 3) and eliminates the chances on falling off of the push button (110).

[0030] As seen in figure 7, along with figures 6(a), 6(b), the front end of the push button (110) have circular disc profile with cylindrical body extending downwards. The poka-yoke locking feature (126) is introduced conjunction with the snap-fitting of the push button (110) onto said front cover (108). In figure 6(a) the push button (110) is completely inserted into the insertion slot of the front cover (108) and assembled together. However when push button (110) in rotated 180°, complete insertion and locking of the push button (110) is not possible. This feature in conjunction with the snap-fit lock ensures vertical movement of the push button (110) when external force

is applied.

[0031] Actuation of the tactile switch (104) with the invented push button switching assembly (100), in case of different wall regulations are illustrated through out the figures 8 to 13. Figure 8 depicts a normal intended condition of wall regulation. The base frame (102) is fixed to the level on the wall (124) and the front cover (108) also rests on the level of the wall. There is no gap between the base frame (102) and front cover (108). In this first scenario, the lever arm (112) is constantly under contact with the push button (110) pressing towards upward direction.

[0032] As depicted in figure 9, as external actuating force is applied on the push button (110), the terminal portion (114) of the lever arm (112) is pressed in a vertical direction. Flexible arm makes a stroke onto the tactile switch (104) mounted onto the PCB (122). Once the tactile switch (104) is actuated, the stopper member (116) provided on the lever arm (112) restricts the vertical movement of the push button (110) to avoid any overload/stress onto the tactile switch (104) due to over-stroke.

[0033] Figure 10 depicts a second scenario of wall regulation, where front cover (108) is required to over travel past the base frame (102) to align onto the wall surface. This scenario arises due to base frame (102) over projected out from installation wall (124). Among several installation conditions, this scenario could arise due to irregularities in the wall. Due to this irregularities impact on stroke length and thereby on switch actuation.

[0034] As seen in figure 11, with the inclination and structural feature the lever arm (112) regulates positioning of the push button (110) with push back force and thereby reposition said push button (110) to maintain the stroke actuation. This also enables the push button switching assembly (100) to maintain push button (110) alignment with the front cover (108).

[0035] Figure 12 of the accompanying drawings depicts a third scenario of wall regulation, where front cover (108) is required to remain above the base frame (102) to align onto the wall surface. This scenario arises due to wall paper mounted on the installation wall (124). Among several installation conditions, this scenario could arise due to irregularities in the wall. Due to this irregularities impact on stroke length and thereby on switch actuation. This under travel of front cover (108) which houses the push button (110) disturbs the stroke length and thereby switch actuation.

[0036] As seen in figure 13, with the inclination and structural feature the lever arm (112) regulates positioning of the push button (110) with push back force and thereby reposition said push button (110) to maintain the stroke actuation. This also enables the push button switching assembly (100) to maintain push button (110) alignment with the front cover (108).

[0037] As already mentioned, the foregoing description is illustrative of the invention and not limitative to its scope, because it will be apparent to persons skilled in

the art to devise other alternative embodiments without departing from the broad ambit of the disclosures made herein.

Claims

1. A push button switching assembly (100) for actuation of tactile switches (104) in an electrical apparatus, said push button switching assembly (100) comprising:

- a base frame (102) for mounting said push button switching assembly (100) fixed onto a wall (124);
- a tactile switch (104) mounted within said base frame (102),
- an actuation member (106) disposed on said tactile switch (104) for making and breaking electrical connection by actuating said tactile switch (104),
- a front cover (108); and
- a push button (110) extending through said front cover (108) for transmitting actuation force to urge said actuation member (106) to actuate said tactile switch (104) and retracts to original position to maintain flatness with front cover (108) irrespective of wall regulation conditions,

wherein said actuation member (106) comprises:

- a lever arm (112) having a terminal portion (114) configured to elastically deform in a downward direction towards said tactile switch (104) such that upon actuation, said terminal portion (114) transmits the force applied on said push button (110) onto said tactile switch (104); and
- a stopper member (116) protruding in a downwards direction such that once the tactile switch (104) is pressed said stopper member (116) restricts further movement of said push button (110).

2. The push button switching assembly (100) for actuation of tactile switches (104) in electrical apparatus as claimed in claim 1, wherein said terminal portion (114) of said lever arm (112) is provided with a dip (118) concurrent to said tactile switch (104).

3. The push button switching assembly (100) for actuation of tactile switches (104) in electrical apparatus as claimed in claim 1, wherein an elastic restoring member (120) is disposed around said push button (110) providing a push back force which brings said push button (110) to its initial position for next operation.

4. The push button switching assembly (100) for actu-

ation of tactile switches (104) in electrical apparatus as claimed in claim 3, wherein said elastic restoring member is a coil spring (120).

5. The push button switching assembly (100) for actuation of tactile switches (104) in electrical apparatus as claimed in any of claims 1 to 4, wherein said tactile switch (104) is associated with a Printed Circuit Board (PCB) (122).
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6. The push button switching assembly (100) for actuation of tactile switches (104) in electrical apparatus as claimed in any of claims 1 to 5, wherein said lever arm (112) extends in an inclined manner to bring the dip (118) of said lever arm (112) in-line with the tactile switch actuating direction.
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7. The push button switching assembly (100) for actuation of tactile switches (104) in electrical apparatus as claimed in any of claims 1 to 6, wherein said push button (110) is snap fitted with said front cover (108) with a poka-yoke locking feature (126).
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8. The push button switching assembly (100) for actuation of tactile switches (104) in electrical apparatus as claimed in any of claims 1 to 7, wherein said lever arm (112) is configured to provide a biasing force to said push button (110) for aligning with said front cover (108) after the push button (110) is released.
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9. The push button switching assembly (100) for actuation of tactile switches (104) in electrical apparatus as claimed in any of claims 1 to 8, wherein the terminal portion (114) of said lever arm (112) is provided with a U-shaped downward projection (128) to receive said push button (110).
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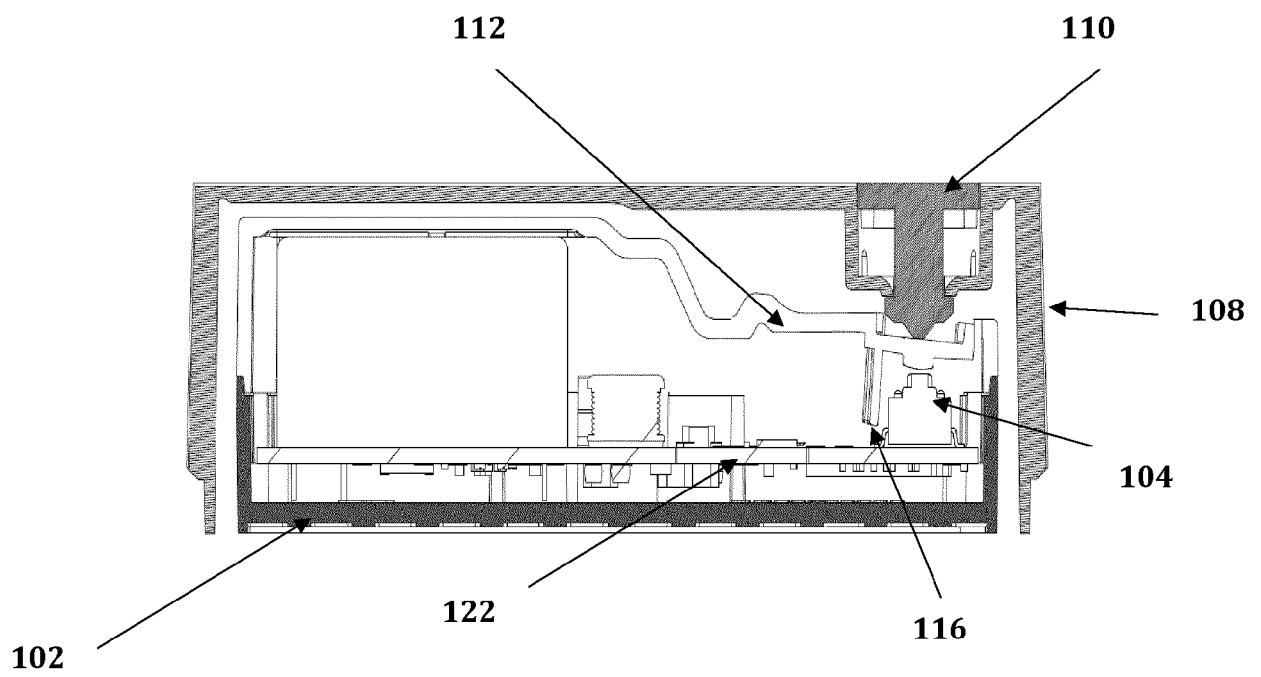


Fig. 1

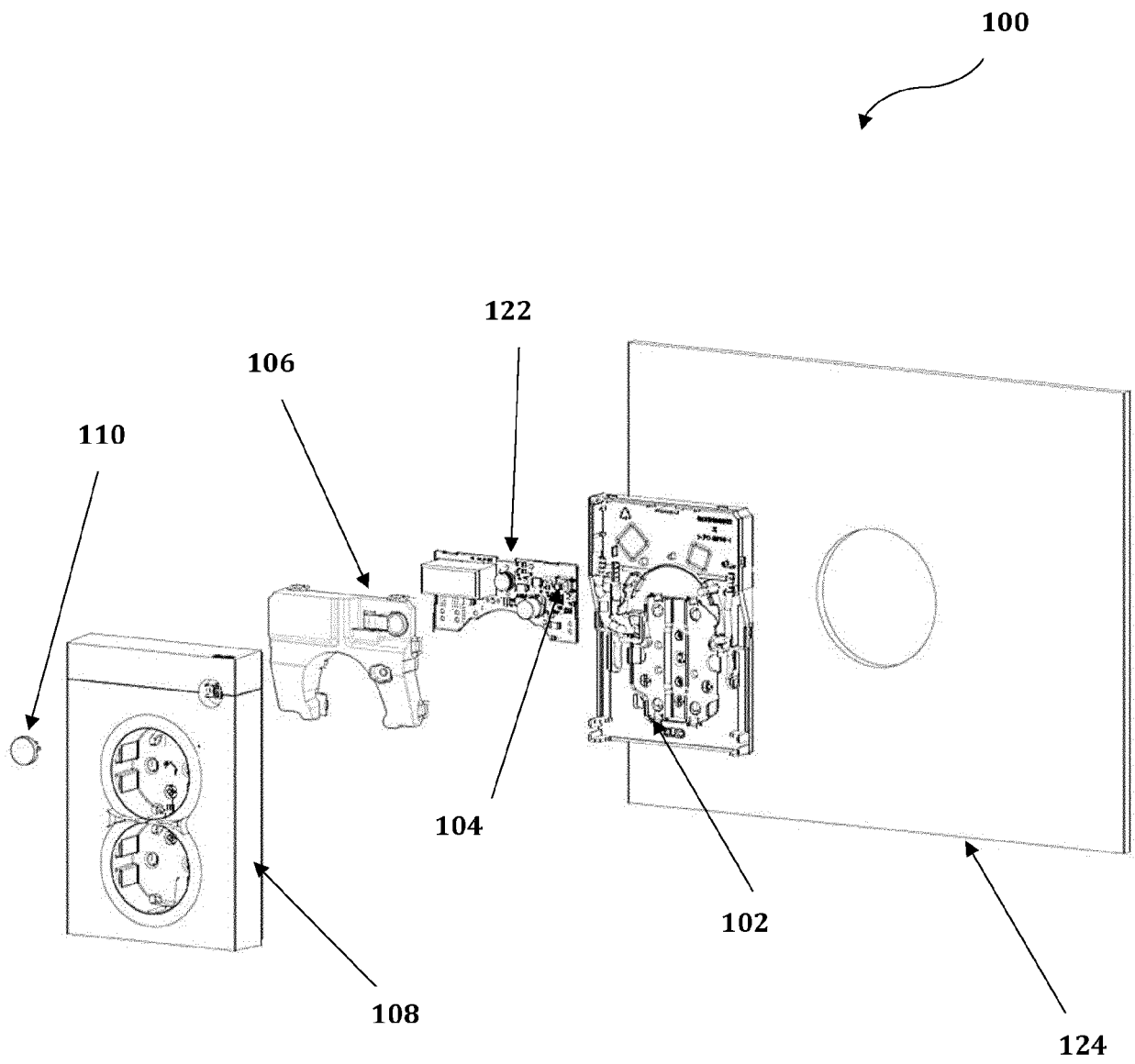


Fig. 2

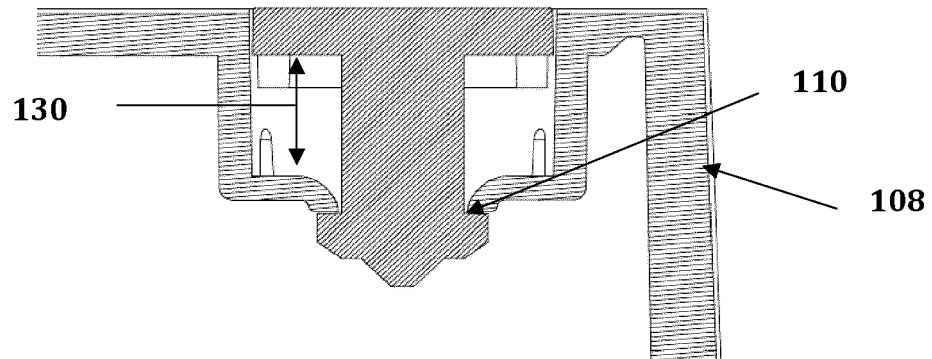
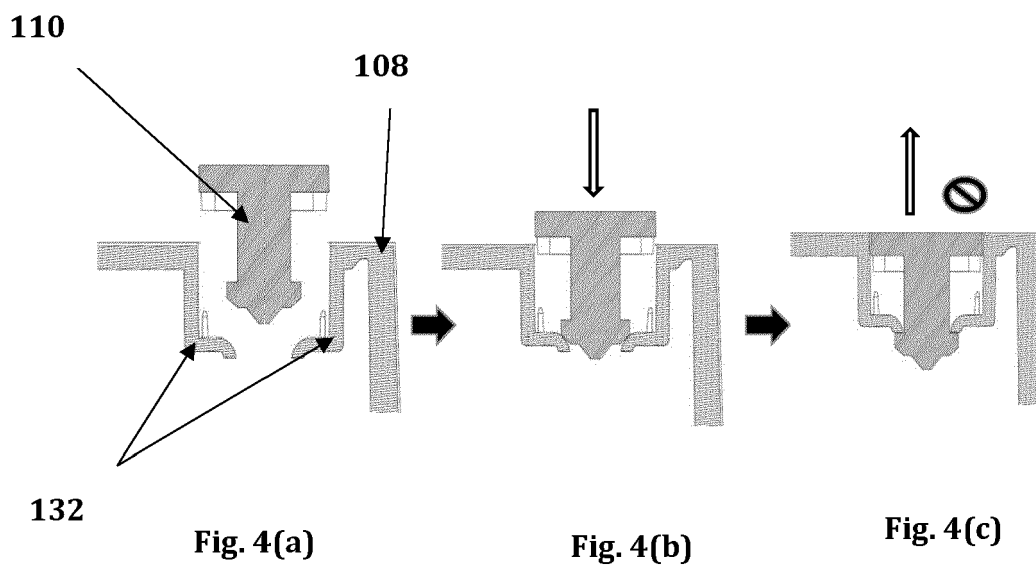


Fig. 3



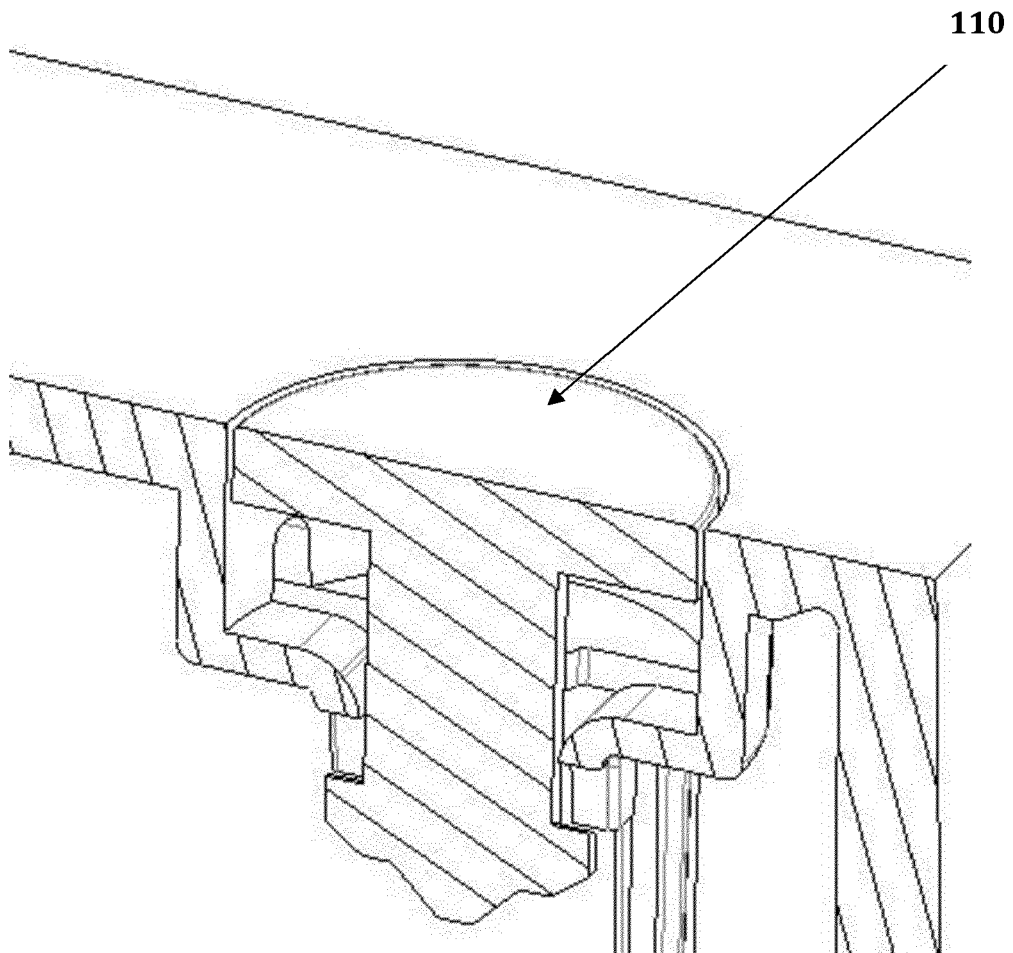


Fig. 5

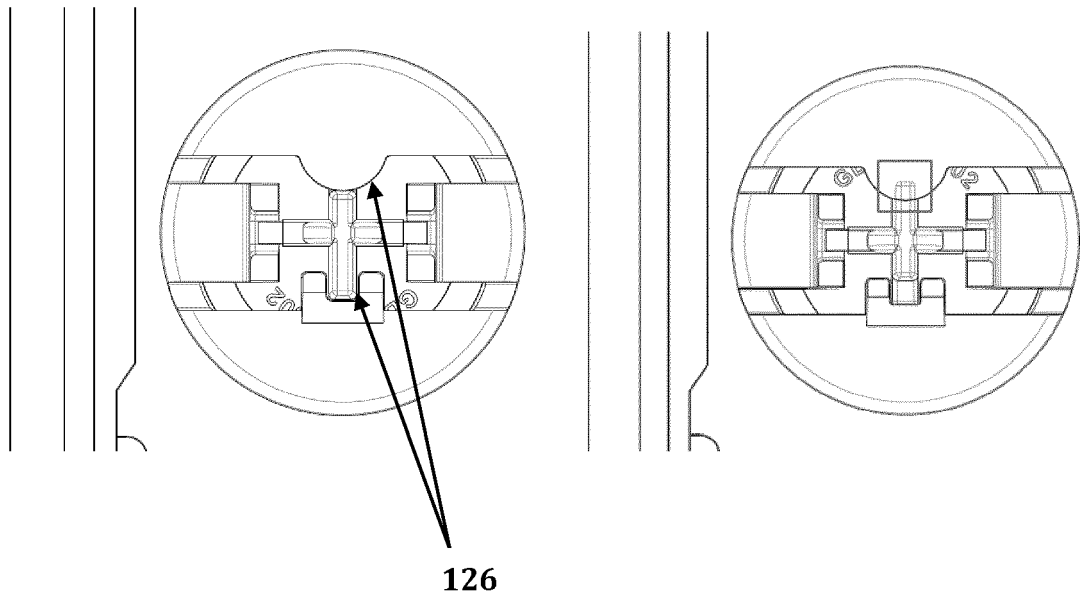


Fig. 6(a)

Fig. 6(b)

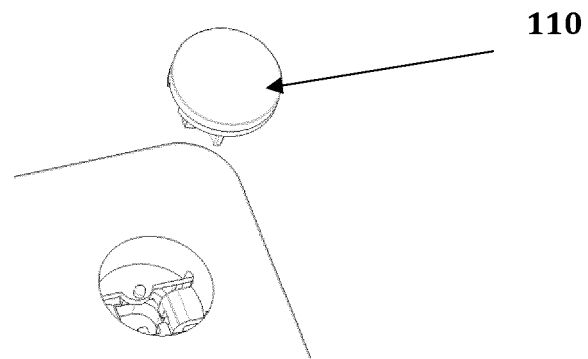
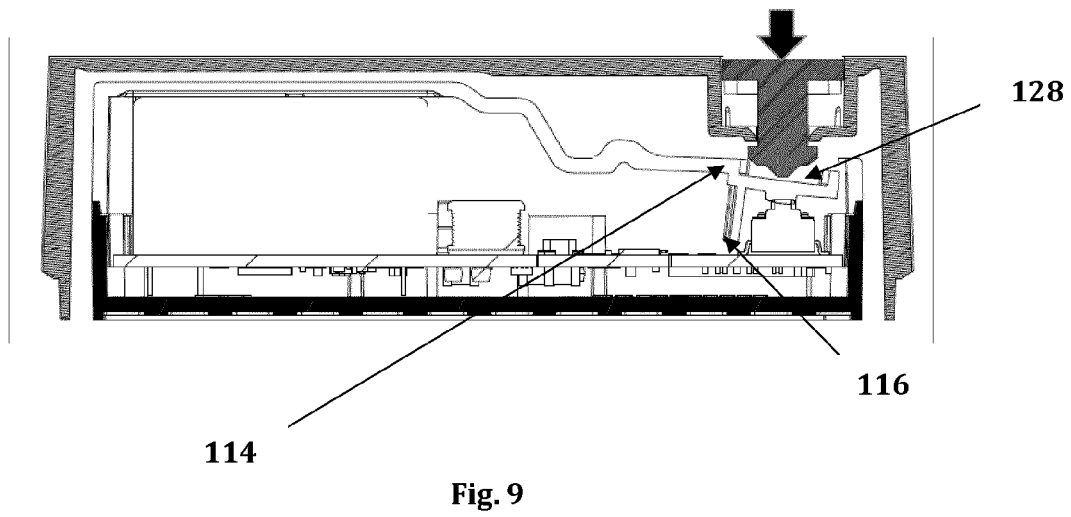
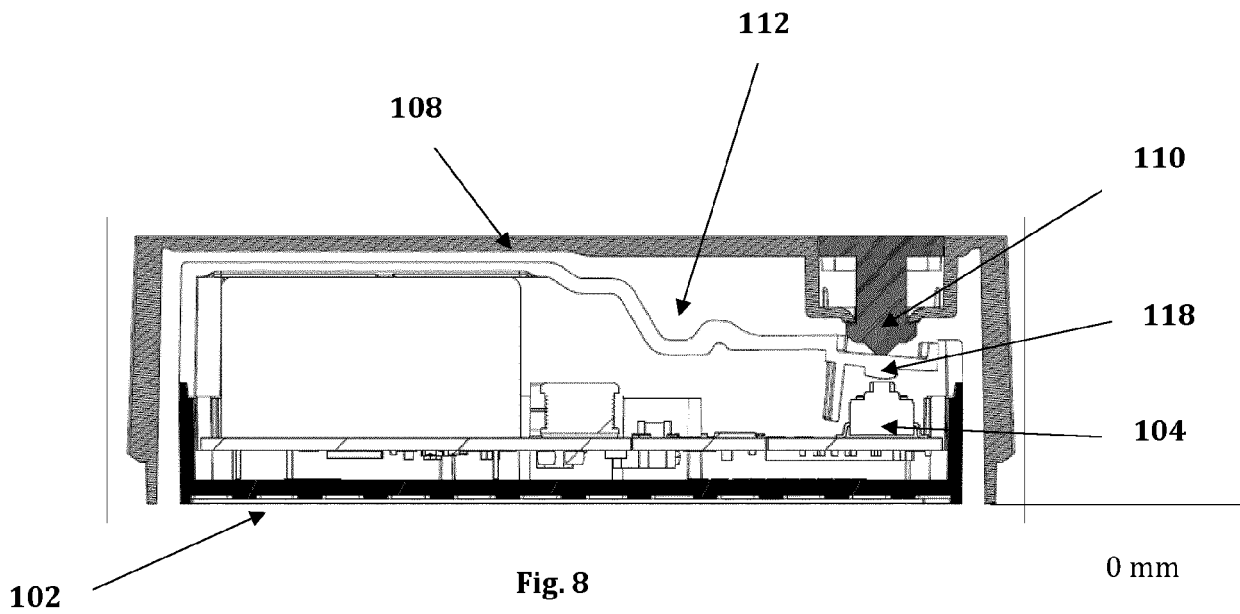
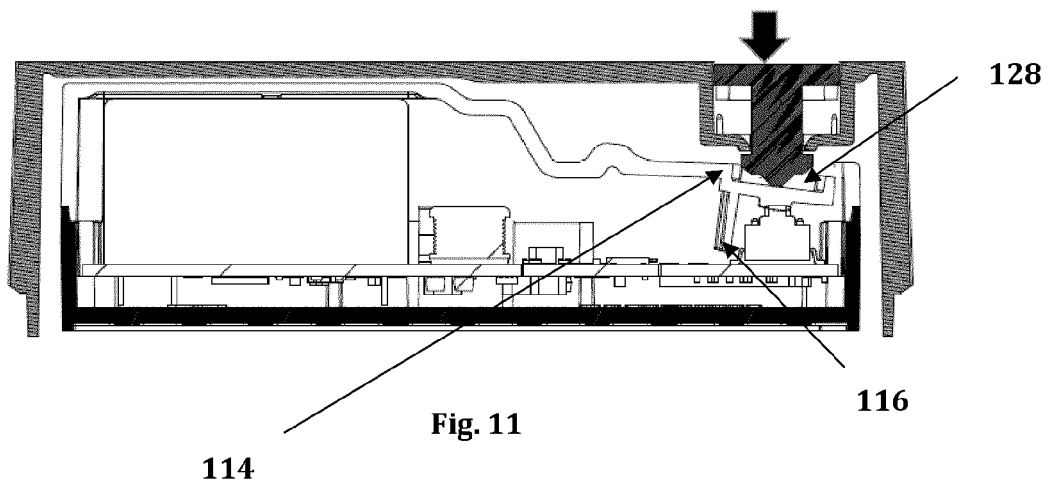
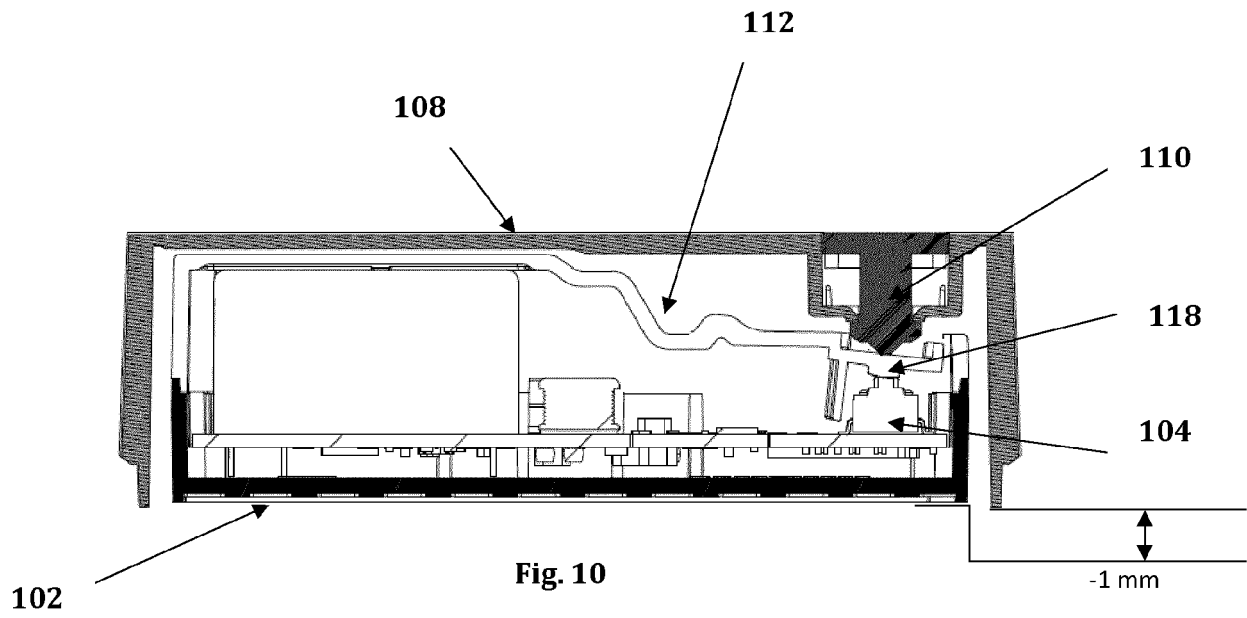
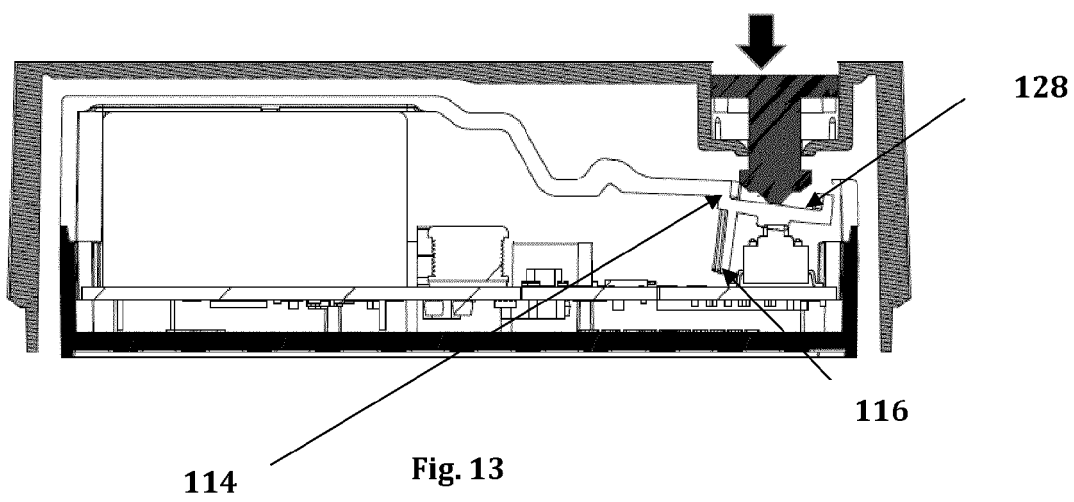
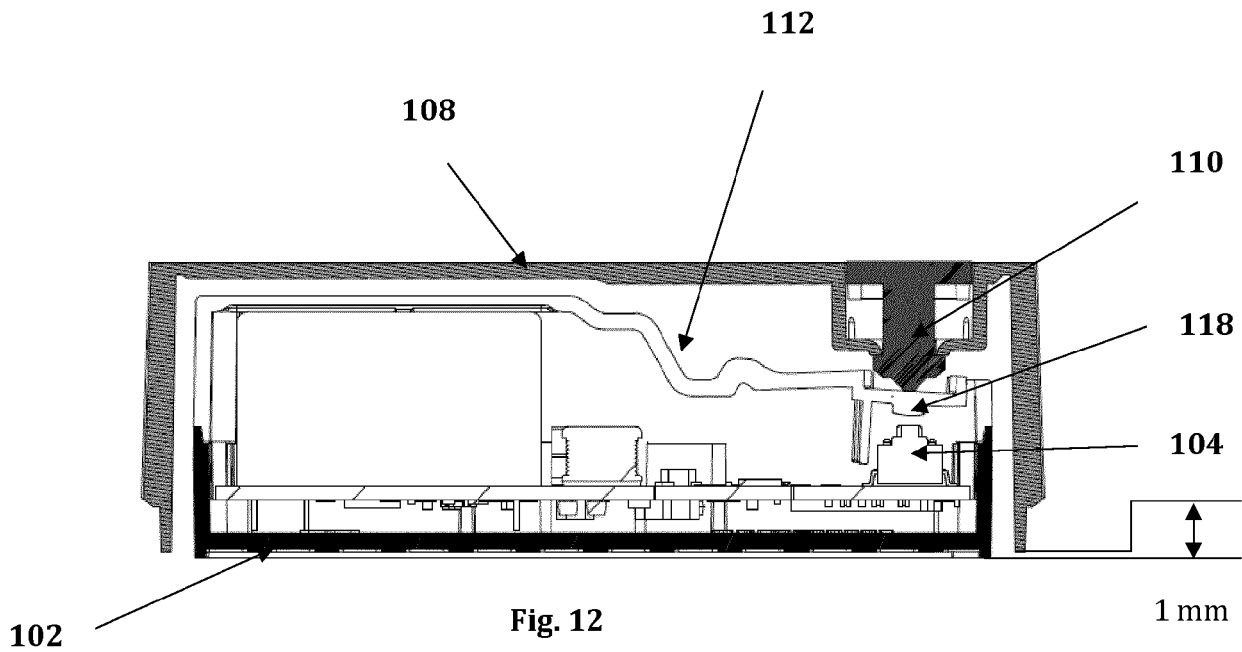
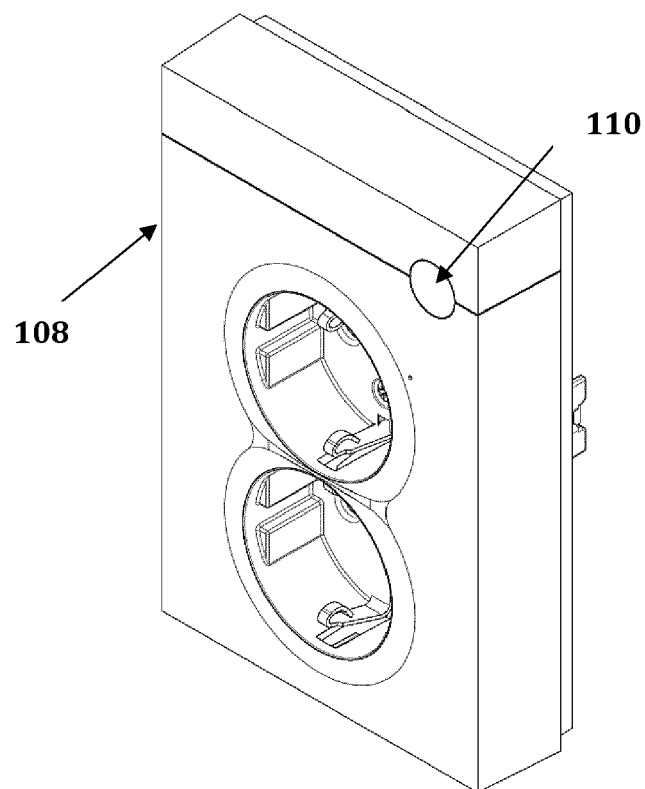
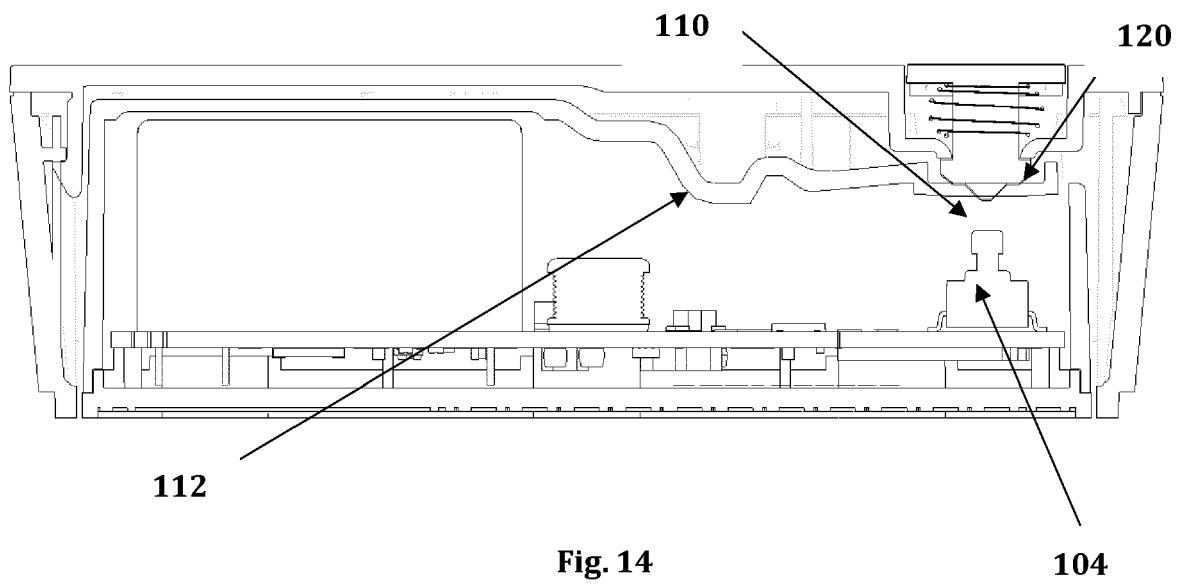


Fig. 7











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Application Number

EP 22 15 9052

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A	US 2017/207037 A1 (TANAKA TAKAKI [JP]) 20 July 2017 (2017-07-20) * paragraphs [0022] - [0081] * * figures 1-11 * -----	1-9	TECHNICAL FIELDS SEARCHED (IPC) H01H H01R

The present search report has been drawn up for all claims

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Place of search

Munich

Date of completion of the search

18 August 2022

Examiner

Ledoux, Serge

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

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