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(11)

EP 2 811 498 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

10.12.2014 Bulletin 2014/50(21) Application number: **14160644.2**(22) Date of filing: **19.03.2014**

(51) Int Cl.:

H01H 3/02 (2006.01)**H01H 19/62 (2006.01)****H01H 1/20 (2006.01)****H01H 1/50 (2006.01)****H01H 3/20 (2006.01)****H01H 3/42 (2006.01)****H01H 9/28 (2006.01)****H01H 19/14 (2006.01)****H01H 25/06 (2006.01)**

(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(30) Priority: **04.06.2013 IT TO20130455**(71) Applicant: **MEMBER'S S.p.A.****37045 Legnago (Verona) (IT)**

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• **Crovetti, Claudio****I-46030 Virgilio (Mantova) (IT)**• **Sartorelli, Doriano****I-46047 Porto Mantovano (Mantova) (IT)**(74) Representative: **Marchitelli, Mauro****Buzzi, Notaro & Antonielli d'Oulx Srl****Via Maria Vittoria 18****10123 Torino (IT)**(54) **A switch, in particular a battery cutout switch for vehicles and the like**

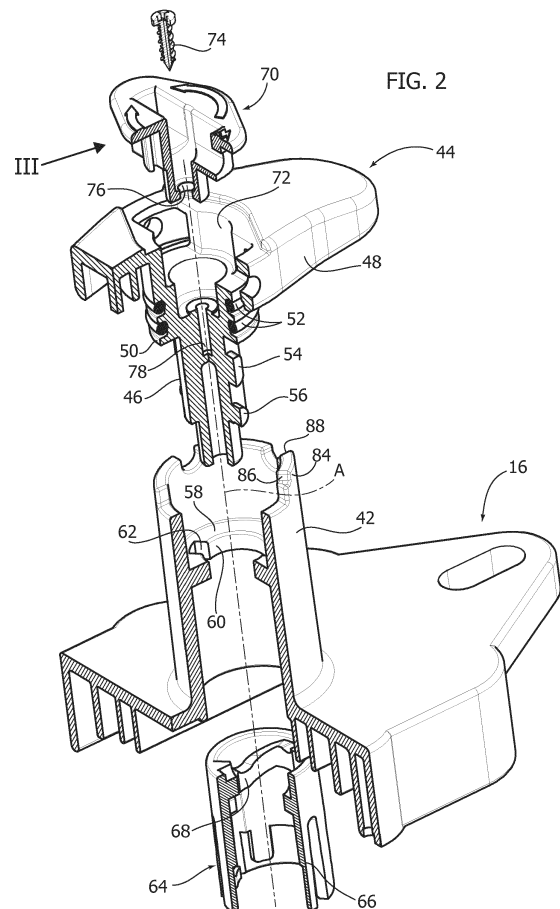
(57) A switch, in particular a battery cutout switch for vehicles and the like, comprising:

- a housing (12) carrying at least one pair of fixed electrical contacts (22),

- a contact-holder body (28) carrying at least one movable electrical contact (32) and movable between an open contacts position and a closed contacts position, and

- a handle (44) rotatable relative to the housing (12) about a longitudinal axis (A) between an insertion/extraction position in which the handle (44) can be removed from the housing (12) with a movement in the direction of said longitudinal axis (A), an open position corresponding to the open contacts position of the contact-holder body (28), and a closed position corresponding to the closed contacts position of said contact-holder body (28), wherein the handle (44) is constrained axially with respect to the housing (12) in any position different from the insertion/extraction position,

- a stop member (70) attachable to the handle (44) in a removable handle position or in a non-removable handle position, wherein when the stop member (70) is attached to the handle (44) in the removable handle position, the handle (44) is rotatable relative to the housing (12) between the insertion/extraction position, the open position and the closed position, and when the stop member (70) is attached to the handle (44) in the non-removable handle position, the stop member (70) limits the angular movement of the handle (44) between the open position and the closed position.

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Description

Field of the invention

[0001] The present invention relates to a switch, in particular of the type intended for use as a battery cutout switch in electrical systems on board vehicles, boats, etc.

Description of the prior art

[0002] Battery cutout switches are usually used for selectively connecting a load, or rather the electrical system on board a vehicle, to a power source, or rather the vehicle battery. Switches of this type generally have a housing carrying two or more fixed electrical contacts and a contact-holder body carrying at least one movable electrical contact cooperating with the fixed contacts and movable between an open contacts position and a closed contacts position.

[0003] Battery cutout switches are usually equipped with a handle rotatable between an open position and a closed position, which cooperates with the contact-holder body to move it from the open contacts position towards the closed contacts position. In certain cases, the handle can be removed to ensure that the switch remains in the open position, for example during maintenance operations. In other cases, the handle is non-removable, and other systems are provided for locking the handle in the open position.

[0004] In the state of the art, battery cutout switches are either with removable handles or with non-removable handles. Manufacturers of battery cutout switches must provide switches with both removable handles and non-removable handles to meet the demands of the market.

Object and summary of the invention

[0005] The present invention aims to provide a battery cutout switch that is easily configurable as a switch with a removable handle or as a switch with a non-removable handle

[0006] According to the present invention, this object is achieved by a switch having the characteristics forming the subject of Claim 1.

[0007] The claims form an integral part of the disclosure provided in relation to the invention.

Brief description of the drawings

[0008] The present invention will now be described in detail with reference to the attached drawings, given purely by way of non-limiting example, wherein:

- Figure 1 is an exploded perspective view of a battery cutout switch according to the present invention,
- Figure 2 is a partially sectioned perspective view of the part indicated by the arrow II in Figure 1,
- Figure 3 is a view from a different angle of the com-

ponent indicated by the arrow III in Figure 2,

- Figures 4, 5 and 6 are perspective views of the part indicated by the arrow IV in Figure 1, illustrating the switch in the removable handle configuration, with the handle in the insertion/extraction position, in the open position and in the closed position, respectively, and
- Figures 7 and 8 are perspective views of the part indicated by the arrow IV in Figure 1, illustrating the switch in the non-removable handle configuration, with the handle in the open position and in the closed position, respectively.

Detailed description of the invention

[0009] With reference to Figure 1, numeral 10 indicates a switch according to the present invention, intended to be used, in particular, as a battery cutout switch for vehicles, boats, etc.

[0010] The switch 10 comprises a housing 12 of plastic material including a base 14 and a cover 16. The cover 16 is attached to the base 14, for example by means of screws 18. Between the cover 16 and the base 14, a gasket 20 may be arranged.

[0011] Within the housing 12, at least one pair of fixed electrical contacts is housed. In the embodiment illustrated in the figures, the switch 10 comprises two pairs of fixed electrical contacts 22. Each fixed contact 22 has the shape of a pin with an enlarged head and a threaded shank. The shanks of the fixed contacts 22 extend through respective holes in the base 14 and are attached to the base 14 by means of respective nuts 24. On the shanks of the fixed contacts 22, respective O-rings 26 can be arranged.

[0012] A contact-holder body 28 is mounted within the housing 12. The contact-holder body 28 is movable relative to the housing 12 along a longitudinal axis A. Between the housing 12 and the contact-holder body 28, a rectilinear guide is provided, for guiding the contact-holder body 28 along the rectilinear direction A. The guide can be formed by ribs projecting from the inner walls of the base 14 and between which the side edges of the contact-holder body 28 are engaged, in a drawer-like manner.

[0013] The contact-holder body 28 carries at least one movable electrical contact. In the illustrated example, the contact-holder body 28 has two through-openings 30 in which two movable electrical contacts 32 are housed, each of which cooperates with a pair of fixed contacts 22. Each movable electrical contact 32 has the shape of an elongated metal plate, with a central portion and two side portions that protrude from opposite sides of the contact-holder body 28. The movable contacts 32 are retained by the contact-holder body 28 by means of respective springs 34, 36. The springs 34 are arranged coaxially within the springs 36 to increase the stiffness of the elastic connection between the movable contacts 32 and the contact-holder body 28. The springs 34, 36

act between the central portion of the respective movable contact 32 and an upper wall of the opening 30, and elastically press the movable electrical contacts 32 against the lower wall of the respective opening 30. The side portions of the movable electrical contacts 32 that protrude from opposite sides of the contact-holder body 28 are facing the heads of a respective pair of fixed contacts 22.

[0014] The contact-holder body 28 is movable along the longitudinal direction A between a closed contacts position, in which the two movable electrical contacts 32 are pressed against the heads of the fixed electrical contacts 22, and an open contacts position, in which the movable electrical contacts 32 are detached from the fixed electrical contacts 22. Elastic means are provided to push the contact-holder body 28 towards the open contacts position. In the illustrated example, these elastic means are formed by a pair of compression coil springs 38 acting between the bottom wall of the base 14 and a pair of side protrusions 40 of the contact-holder body 28.

[0015] With reference to Figures 1 and 2, the cover 16 of the housing 12 has an integral tubular neck 42, coaxial to the longitudinal axis A. A control handle 44 is mounted on the tubular neck 42 in a rotatable manner about the longitudinal axis A. The handle 44 has a shaft 46 inserted within the tubular neck 42 and a handgrip 48 projecting from the upper edge of the tubular neck 42. The handle 44 has a collar 50 provided on the shaft 46 at the base of the handgrip 48. On the collar 50, a pair of O-rings 52 is arranged, which form a seal on the inner surface of the tubular neck 42.

[0016] The shaft 46 of the handle 44 has at least one first control member 54 and at least one second control member 56. The control members 54, 56 are formed by pin-shaped elements projecting in a radial direction from the side wall of the shaft 46. In the illustrated example, two first control members 54 and two second control members 56 are provided. Each control member 54, 56 is offset by 180° with respect to the counterpart control member. The second control members 56 are spaced apart in the direction of the longitudinal axis A with respect to the first control members 54.

[0017] With reference to Figure 2, the tubular neck 42 of the cover 16 has a shoulder 58 projecting radially inward from the side wall of the neck 42. The collar 50 of the handle 44 rests on the upper surface of the shoulder 58. The shoulder 58 has a hole 60 through which the shaft 46 extends with clearance. The hole 60 has two openings 62 through which the engagement members 54, 56 can pass, during the insertion/extraction of the handle 44 in the direction of the longitudinal axis A. The insertion/ extraction of the handle 44 is only possible when the control members 54, 56 are aligned with the openings 62 of the shoulder 58.

[0018] When the handle 44 is inserted into the neck 42, the first control members 54 are located below the shoulder 58. When the first control members 54 are angularly offset with respect to the openings 62 of the shoulder

58, the extraction of the handle 44 is not possible because the first control members 54 interfere with the lower wall of the shoulder 58.

[0019] The handle 44 is rotatable about the axis A relative to the housing 12 between an open position and a closed position. The insertion/extraction position of the handle 44, in which the stop members 54, 56 are aligned with the openings 62 of the shoulder 58, is angularly offset with respect to the work angle of the handle 44 between the open position and the closed position.

[0020] Considering the open position as a reference position of the handle 44, and considering the angles of rotation in the clockwise direction as positive, and the angles of rotation of the handle in a counterclockwise direction as negative, the insertion/extraction position of the handle 44 is rotated by -40° with respect to the open position. The closed position is rotated by +90° with respect to the open position.

[0021] Therefore, when the handle 44 rotates between the open position and the closed position, and vice versa, the first engagement members 54 are angularly offset with respect to the openings 62 of the shoulder 58, and prevent the extraction of the handle 44. In normal operation, the handle 44 is therefore free to rotate about the longitudinal axis A, with respect to the housing 12, between the open position and the closed position, but is constrained at the housing 12 in the direction of the longitudinal axis A.

[0022] With reference to Figure 2, the switch 10 comprises a cam 64 fixed with respect to the contact-holder body 28. The cam 64 can be a separate component fixed to the contact-holder body 28, or can be integrally formed within the contact-holder body 28. The cam 64 comprises an outer tubular wall 66 within which the shaft portion 46 of the handle 44 carrying the control members 54, 56 extends. The cam 64 has at least one inclined ramp 68 projecting radially inward from the side wall 66. Preferably, the cam 64 has two inclined ramps 68 cooperating with respective control members 54, 56. The first and second control members 54, 56 are arranged, respectively, above and below the respective inclined ramp 68. The rotation of the handle 44 between the open position and the closed position controls the movement of the contact-holder body 28, from the open contacts position to the closed contacts position, by means of the control members 54 and the inclined ramps 68 of the cam 64. When the handle 44 rotates from the closed position to the open position, the springs 38 push the contact-holder body 28 toward the open contacts position. The second control members 56 act by dragging the contact-holder body 28 into the open contacts position in the case wherein the movable electrical contacts 32 remain stuck to the fixed electrical contacts due to incrustations, microwelding or the like. The handle 44 is held in a stable position in the open position, and the closed position, thanks to the engagement of the first control members 54 in respective notches formed in the lower ends and upper ends of the respective inclined ramps 68.

[0023] With reference to Figure 2, the switch 10 includes a stop member 70, which has the purpose of limiting the angular stroke of the handle 44 about the axis A. The stop member 70 can be fixed to the handle 44 in a first position (removable handle position) or in a second position (non-removable handle position). When the stop member 70 is fixed to the handle 44 in the removable handle position, the handle 44 is free to rotate about the axis A by an angle between -40° and $+90^\circ$ relative to the reference position (open position). When the stop member 70 is fixed to the handle 44 in the non-removable handle position, the handle 44 can rotate about the axis A by an angle between 0 and 90° relative to the reference position.

[0024] The stop member 70 is inserted in a seat 72 formed on the upper part of the handle 44. The stop member 70 is fixed to the handle 44 by means of a screw 74 which extends through a hole 76 of the stop member 70, and is screwed into a hole 78 formed in the shaft 46 of the handle 44. The two positions of the stop member 70, relative to the handle 44, are rotated by 180° relative to one another about the axis A.

[0025] With reference to Figure 3, the stop member 70 has a first abutment element 80 and a second abutment element 82. The abutment elements 80, 82 are asymmetric to each other.

[0026] With reference to Figure 2, the neck 42 of the cover 16 has a fixed abutment element 84, which cooperates with the abutment elements 80, 82 of the stop member 70. The fixed abutment element 84 is formed by an integral projection of the upper edge of the neck 42. The fixed abutment element 84 has a first and a second abutment surface 86, 88.

[0027] Both in the removable handle configuration and in the non-removable handle configuration, the stop member 70 and the fixed abutment element 84 define two stroke-end positions of the handle 44 relative to the housing 12. In the removable handle position of the stop member 70, the two stroke-end positions are angularly spaced between each other by 130° . In the non-removable handle position of the stop member 70, the stroke-end positions are angularly spaced between each other by 90° .

[0028] Figures 4, 5 and 6 show the configuration in which the stop member 70 is fixed to the handle 44 in the removable handle position.

[0029] With reference to Figure 4, the first stroke-end position corresponds to the position of insertion/extraction of the handle 44. In this position, the first abutment element 80 of the stop member 70 is in abutment with the first abutment surface 86 of the fixed abutment element 84. In this position, the control members 54, 56 of the handle 44 are aligned with the openings 62 of the collar 58 and the handle 44 can be inserted or withdrawn in the direction of the longitudinal axis A.

Figure 5 shows the handle in the open position. In this position, there is no contact between the stop

member 70 and the fixed abutment element 84.

Figure 6 shows the handle 44 in the closed position. In this position, the second abutment element 82 of the stop member 70 is in contact with the second abutment surface 88 of the fixed abutment element 84. In this position, the stop member 70 prevents a further rotation of the handle 44 in the clockwise direction.

Figures 7 and 8 show the configuration in which the stop member 70 is fixed to the handle 44 in the non-removable handle position.

Figure 7 shows the handle 44 in the open position. In this position, the second abutment element 82 of the stop member 70 is in contact with the first abutment surface 86 of the fixed abutment element 84. In this condition, the stop member 70 prevents a further rotation of the handle 44 in a counterclockwise direction and prevents the handle 44 reaching the insertion/extraction position. Therefore, the handle 44 can only rotate between the open position and the closed position and cannot be removed.

Figure 8 shows the handle 44 in the closed position. In this condition, the first abutment element 80 of the stop member 70 is in contact with the second abutment surface 88 of the fixed abutment element 84, and prevents a further rotation of the handle 44 in the clockwise direction.

[0030] To change the position of the stop member 70, it is sufficient to unscrew the screw 74, remove the stop member 70 from its seat 72, reinsert the stop member 70 in the seat 72 in a position rotated by 180° relative to the previous one, and retighten the stop member 70 to the handle 44 by means of the screw 74.

[0031] With reference to Figure 1, the switch 10 can be fitted with a cap 90 which can be applied to the upper end of the neck 42 after the extraction of the handle, to prevent the entrance of dust, water, dirt, or the like, to the inside of the housing 12. The cap 90 can be connected to a flexible strip 92 provided at the opposite end with a ring 94 fitted on the neck 42. The flexible strip 92 can be equipped with a circular projection on which the cap 90 engages in the position where it is not used, so as to avoid contaminants collecting inside the cap 90.

[0032] Of course, without prejudice to the principle of the invention, the details of construction and the embodiments may vary widely with respect to those described and illustrated without departing from the scope of the invention as defined by the claims that follow.

Claims

1. A switch, in particular a battery cutout switch for vehicles and the like, comprising:

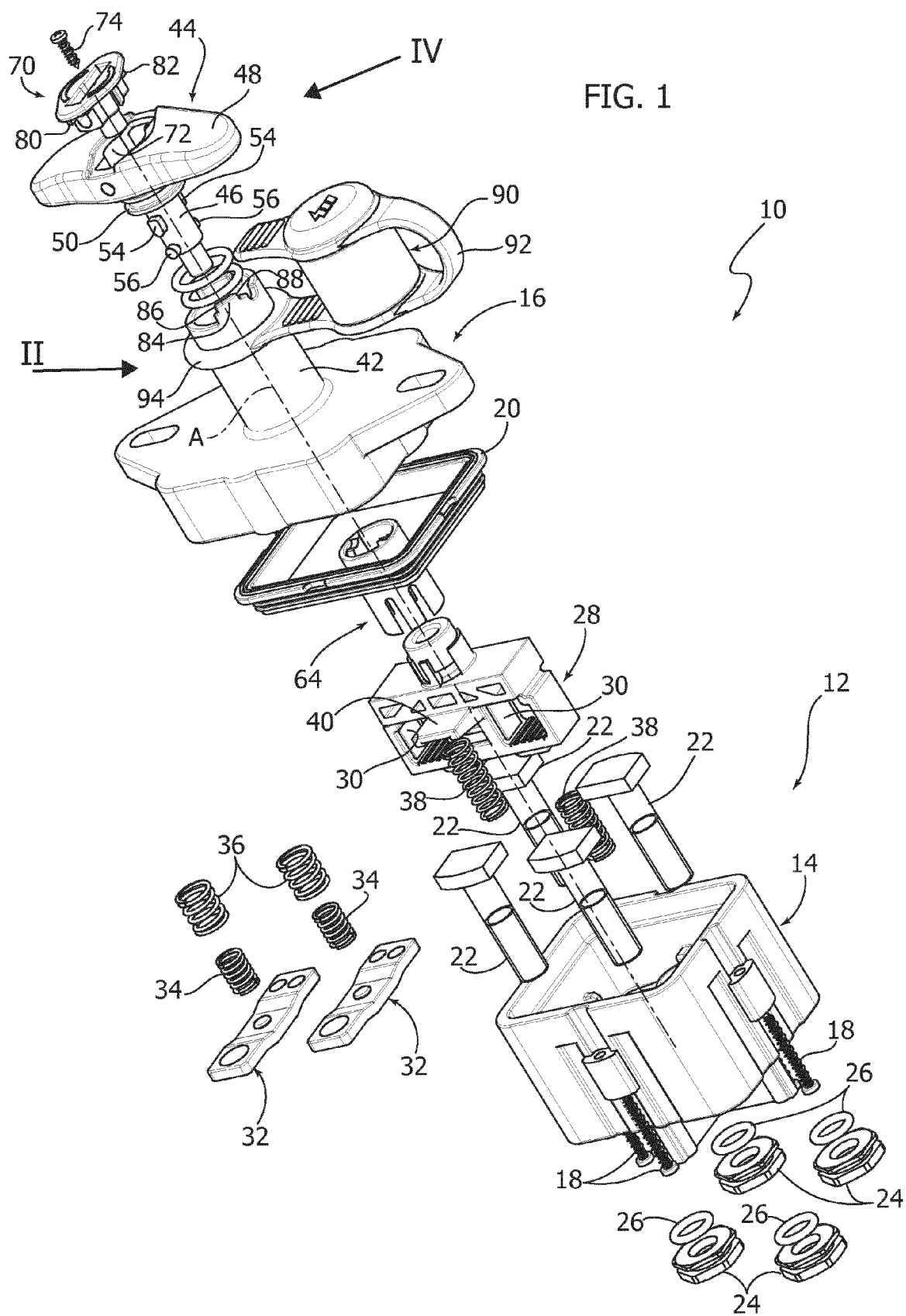
- a housing (12) carrying at least one pair of fixed electrical contacts (22),

- a contact-holder body (28) carrying at least one movable electrical contact (32) and movable between an open contacts position and a closed contacts position, and

- a handle (44) rotatable relative to the housing (12) about a longitudinal axis (A) between an insertion/extraction position in which the handle (44) can be removed from the housing (12) with a movement in the direction of said longitudinal axis (A), an open position corresponding to the open contacts position of the contact-holder body (28), and a closed position corresponding to the closed contacts position of said contact-holder body (28), wherein the handle (44) is constrained axially with respect to the housing (12) in any position different from the insertion/extraction position,

characterized in that it comprises a stop member (70) attachable to the handle (44) in a removable handle position or in a non-removable handle position, the stop member (70) having a first and a second abutment element (80, 82), which cooperate with abutment surfaces (86, 88) of a fixed abutment element (84) to form the stroke-end of the angular movement of the handle (44), wherein when the stop member (70) is attached to the handle (44) in the removable handle position, the handle (44) is rotatable relative to the housing (12) between the insertion/extraction position, the open position and the closed position, and when the stop member (70) is attached to the handle (44) in the non-removable handle position, the stop member (70) limits the angular movement of the handle (44) between the open position and the closed position.

2. A switch according to claim 1, **characterized in that** said stop member (70) is inserted in a seat (72) formed on an upper part of the handle (44).
3. A switch according to claim 1, **characterized in that** said fixed abutment element (84) is formed by a protrusion that extends from an upper edge of a tubular neck (42) of said housing (12).
4. A switch according to claim 3, **characterized in that** said tubular neck (42) has an internal shoulder (58) equipped with openings (62), which allow the passage of protruding control members (54, 56) of said handle (44) into said insertion/extraction position.



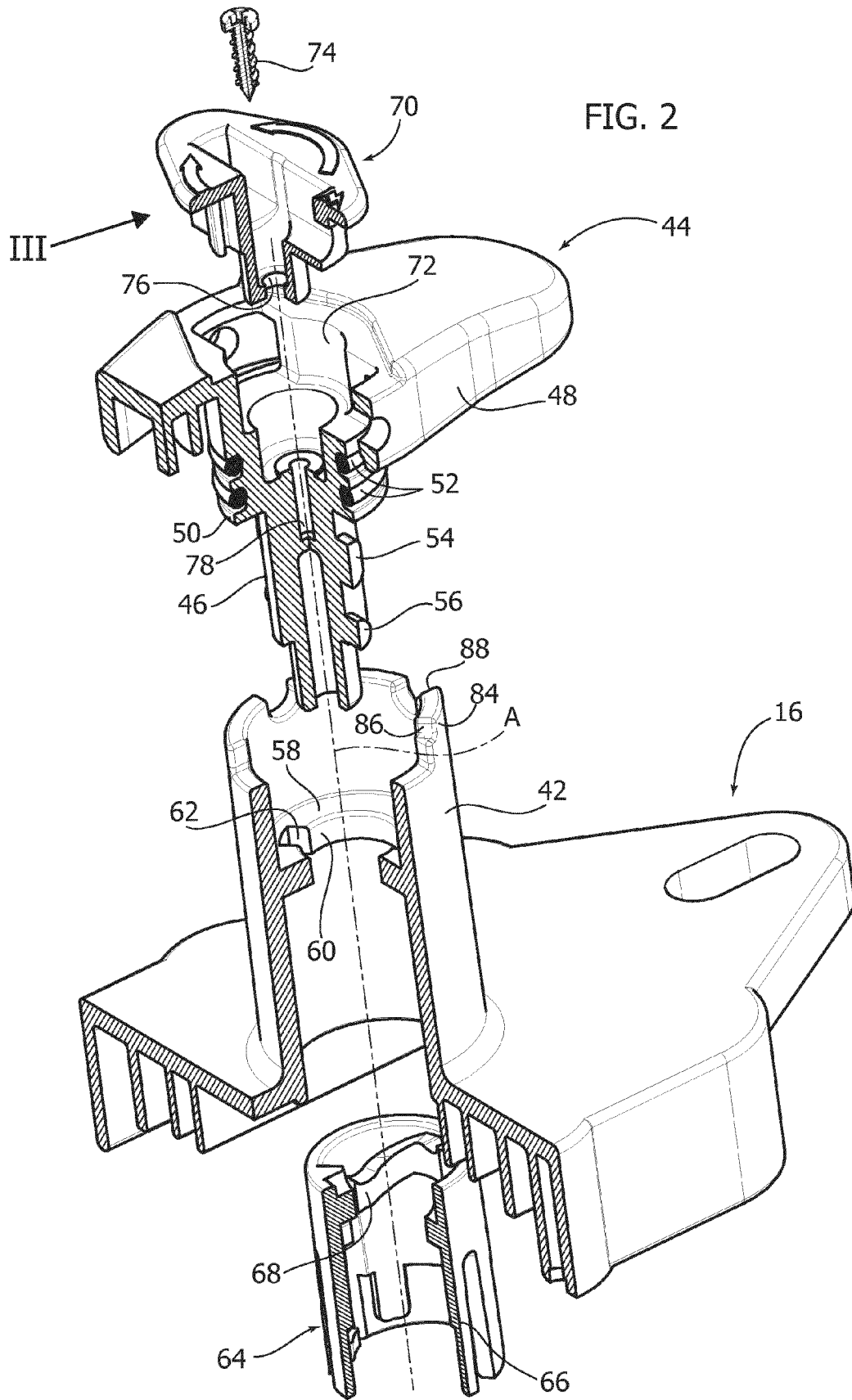


FIG. 3

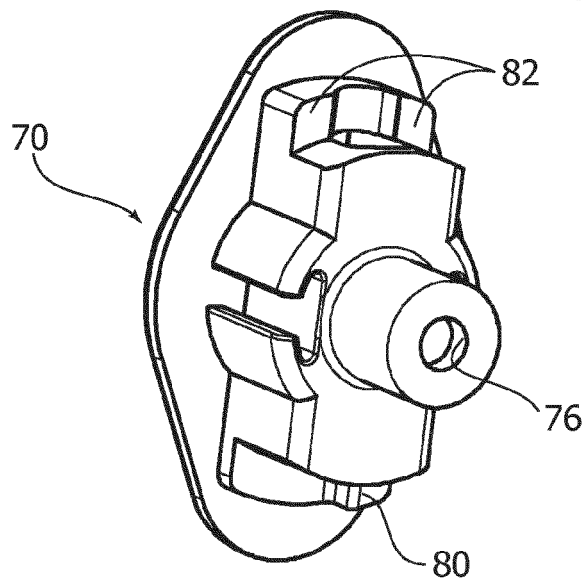


FIG. 4

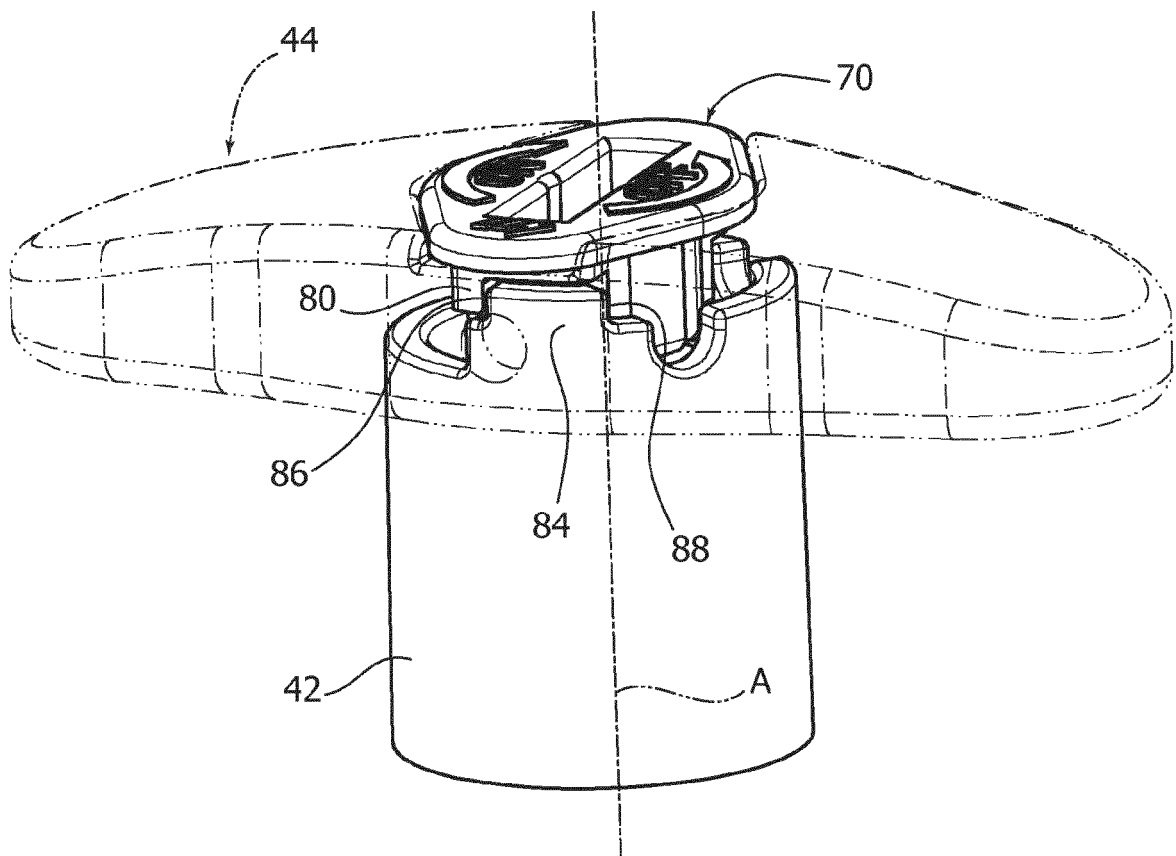


FIG. 5

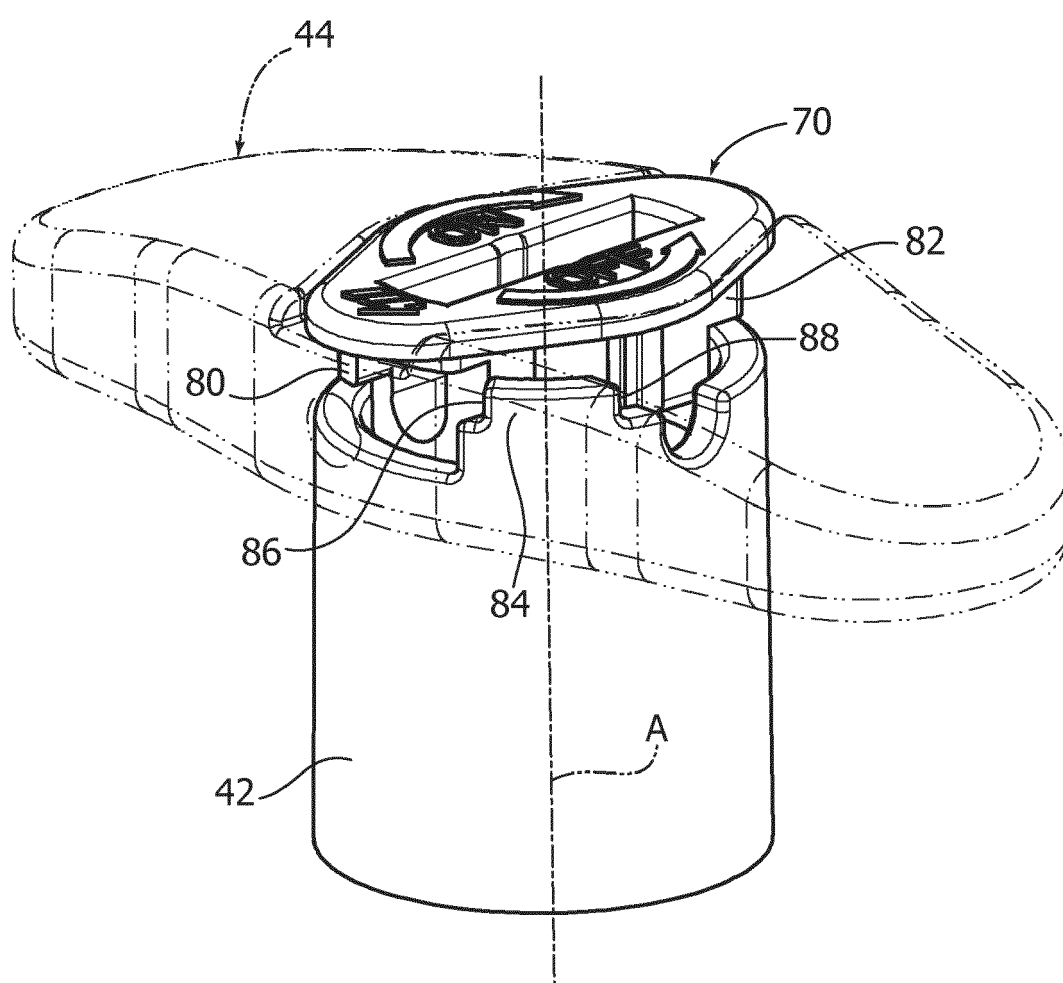


FIG. 6

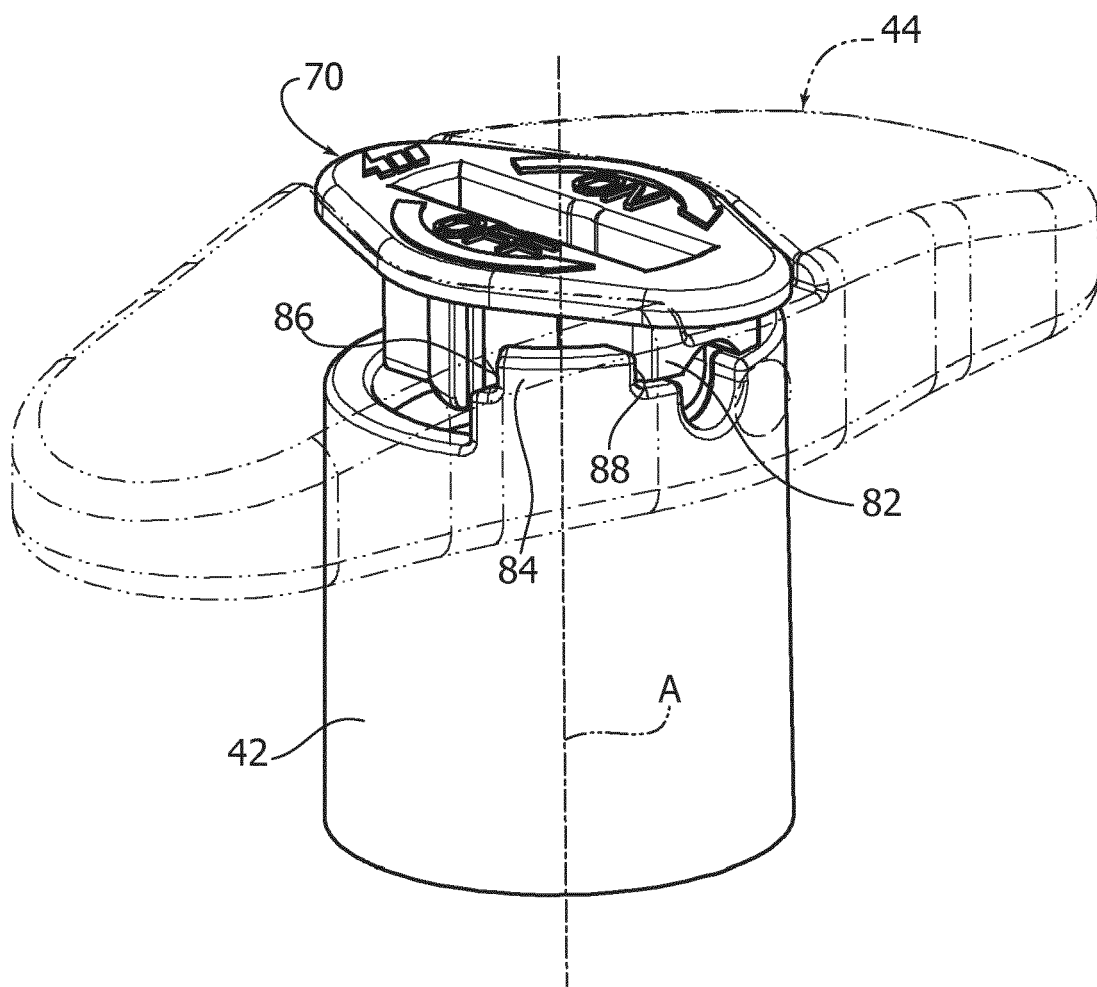


FIG. 7

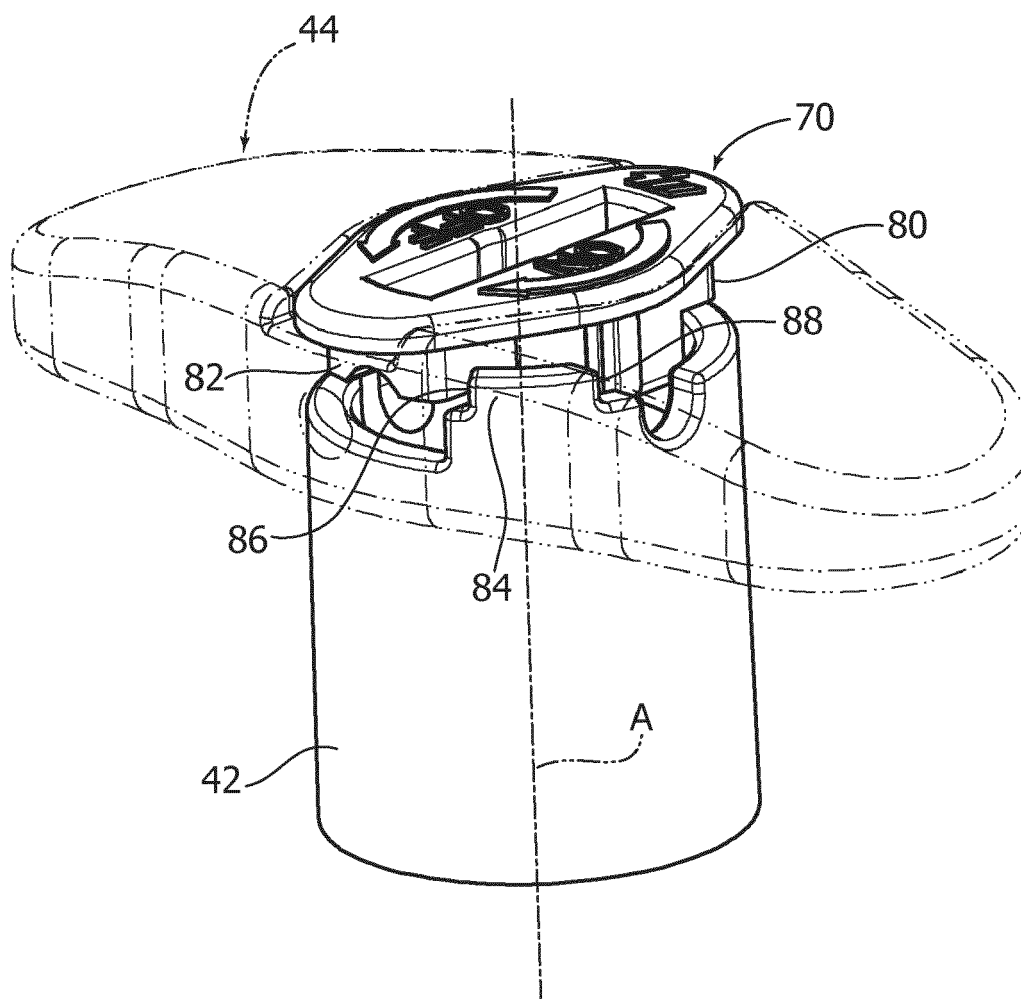
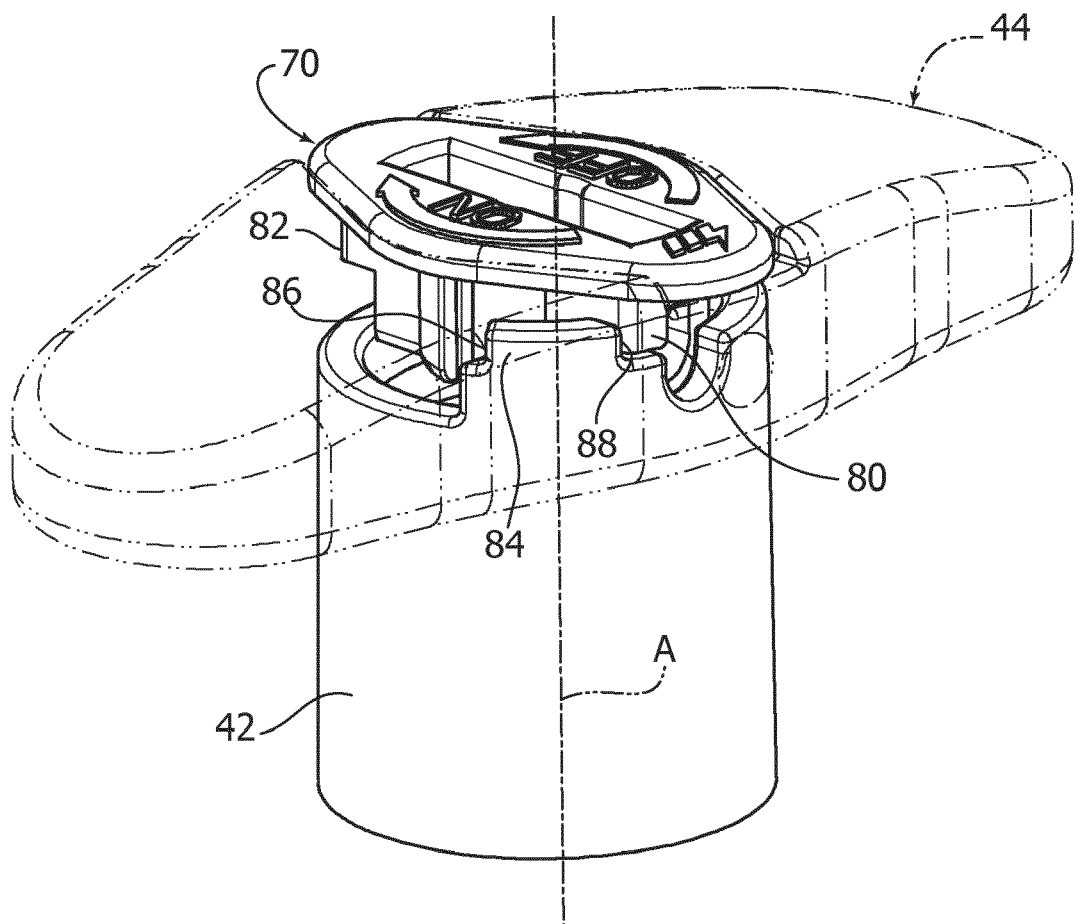


FIG. 8





EUROPEAN SEARCH REPORT

Application Number
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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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			TECHNICAL FIELDS SEARCHED (IPC)
			H01H
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 4 August 2014	Examiner Simonini, Stefano
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