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(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), the contact-holder body (28) being movable along a longitudinal axis (A) between an open contacts position and a closed contacts position,
- elastic means (38) arranged between the housing (12) and the contact-holder body (28) and tending to push the contact-holder body (28) towards the open contacts position,
- a handle (44) rotatable about said longitudinal axis (A) between an open position and a closed position,
- a cam (64), fixed with respect to said contact-holder body (28),

wherein the handle (44) cooperates with said cam (64) to move said contact-holder body (28) from the open contacts position to the closed contacts position to the closed position, upon rotation of the handle from the open position to the closed position,
wherein said cam (64) has at least one first and at least one second active surface (70, 72), and said handle (44) has at least one first control member (54), which cooperates with the first active surface (70) and at least one second control member (56) which cooperates with the second active surface (72), said first and second active surfaces (70, 72) and said first and second control members (54, 56) being arranged in such a way that when the handle (44) rotates from the open position to the closed position, the first control member (54) cooperates with the first active surface (70) to move the contact-holder body (28) from the open contacts position to the closed contacts position, and when the handle (44) rotates from the closed position to the open position, the second control member (56) cooperates with the second active surface (72) to move the contact-holder body (28) from the closed contacts position to the open contacts position.

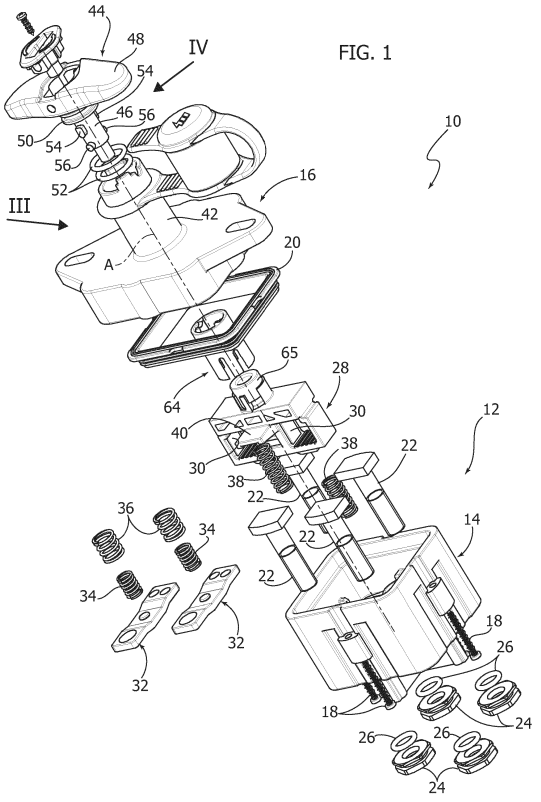

FIG. 1

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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. A handle is rotatable between an open position and a closed position, and cooperates with the contact-holder body to move it from the open contacts position toward the closed contacts position

[0003] For example, the document EP-A-1296343 of the same Applicant describes a switch comprising a supporting body carrying at least one pair of fixed electrical contacts, a movable element carrying at least one electrical contact and movable in a straight direction between an open contacts position and a closed contacts position, and vice versa, a rotatable control member configured to control the movement of the movable element towards the closed contacts position, elastic means which tend to push the movable element towards the open contacts position, mutually cooperating contact surfaces are provided on the control member and on the movable element for transforming the rotary movement of the rotatable control member into a linear movement of the movable element.

[0004] Typically, in the switches of this type, the force that moves the contact-holder body from the closed position towards the open position is provided with compressed elastic means arranged between the housing and the contact-holder body.

[0005] The elastic force of the springs may be insufficient to move the contact-holder body towards the open contacts position in the case where the movable contact remains adherent to the fixed contacts, for example due to incrustations or microwelding produced, for example, by discharges of current through the fixed contacts and the movable contact. In this case, even rotating the handle towards the open position would not obtain detachment of the movable contact from the fixed contacts.

Object and summary of the invention

[0006] The present invention aims to provide a switch that can overcome the aforesaid drawback.

[0007] According to the present invention, this object is achieved by a switch having the characteristics forming the subject of Claim 1.

[0008] The claims form an integral part of the disclosure provided in relation to the invention.

Brief description of the drawings

[0009] 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 switch according to the present invention,
- Figure 2 is a perspective view in axial section of the switch of Figure 1,
- Figure 3 is an exploded perspective and partially sectioned view of the part indicated by the arrow III in Figure 1,
- Figure 4 is a partially sectioned side view illustrating the elements indicated by the arrows IV in Figure 1,
- Figure 5 is a perspective view of the element indicated by the arrow V in Figure 4, and
- Figure 6 is a plan view according to arrow VI of Figure 5.

Detailed description of embodiments of the invention

[0010] With reference to Figures 1 and 2, 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.

[0011] 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 placed.

[0012] 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 of 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 provided.

[0013] 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 of the axis 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.

[0014] 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.

[0015] The contact-holder body 28 is movable along the longitudinal direction A between a closed contacts position, in which the two movable contacts 32 are pressed against the heads of the fixed electrical contacts 22, and an open contacts position, in which the movable contacts 32 are detached from the fixed 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.

[0016] With reference to Figures 2 and 3, the cover 16 of the housing 12 has an integral tubular neck 42, coaxial to the longitudinal axis A. A control handle 44 is inserted within the tubular neck 42, and is rotatable about the longitudinal axis A between an open position and a closed position. 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 provided, which form a seal on the inner surface of the tubular neck 42. 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] The tubular neck 42 of the cover 16 has a shoulder 58 projecting radially inwards 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 of the handle 44 into the neck 42 in the direction of the longitudinal axis A. The handle 44 is inserted in an angular position in which the engagement members 54, 56 are aligned with the openings 62 of the shoulder 58. The insertion position of the handle 44 is angularly offset with respect to the work positions. Therefore, when the handle rotates between the open position and the closed position, the first engagement members 54 are offset with respect to the openings 62 and prevent the extraction of the handle 44. Therefore, the handle 44 is free to rotate about the longitudinal axis A with respect to the housing 12, but is constrained within the housing 12 in the direction of the longitudinal axis A.

[0018] The switch 10 comprises a cam 64 fixed with respect to the contact-holder body 28. In the illustrated example, the cam 64 is a separate component that is snap-fixed to an appendage 65 of the contact-holder body 28. Alternatively, the cam 64 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 inwards from the side wall 66. In the illustrated example, the cam 64 has two inclined ramps 68. Each ramp 68 has two active surfaces 70, 72 opposite to each other. The first stop member 54 is located above the first active surface 70, and the second stop member 56 is located below the second active surface 72.

[0019] As is visible in Figures 4-6, each inclined ramp 68 has two notches 74, 76 on its first active surface 70, in which the first control member 54 engages, in the open position and the closed position of the handle 44, respectively.

[0020] With reference to Figures 4, 5 and 6, the cam 64 is provided with two stops 78 formed by ribs projecting radially inwards from the outer tubular wall 66. The stops 78 are arranged in positions that are angularly offset from each other by 180°. Each stop 78 is placed at the upper end of the corresponding inclined ramp 68. The control members 54, 56 come into abutment against the stops 78 in the insertion/extraction position of the handle 44 and in the closed position of the handle 44. Between the stops 78 and the lower ends of the inclined ramps 68, two free spaces 80 are formed, through which the second control members 56 can pass during insertion and extraction of the handle 44.

[0021] During operation, the control members 54, 56 are respectively arranged above the first active surface 70, and below the second active surface 72 of the respective inclined ramp 68. In the open position of the handle 44, the first control members 54 engage the respective notches 74 located at the lower ends of the respective inclined ramps 68. When the handle 44 is rotated towards the closed position, the first control members 54 slide on the first active surfaces 70 and push down the

contact-holder body 28, compressing the springs 38, which tend to push the contact-holder body 28 upwards.

[0022] In the closed position of the handle 44, the first control members 54 engage the notches 76 located at the upper ends of the active surfaces 70. The notches 76 stably hold the handle 44 in the closed position. In this position, the movable electrical contacts 32 are pressed in contact with the fixed electrical contacts 22.

[0023] Starting from the closed position, when the handle 44 is rotated in the opening direction, the first control members 54 are disengaged from the respective notches 76. At this point, the springs 38 push the contact-holder body 28 upwards. The movable electrical contacts 32 are detached from the fixed electrical contacts 22, and the handle 44 rotates spontaneously toward the open position due to the action of the springs 38.

[0024] In the case wherein the movable electrical contacts 32 remain adherent to the fixed electrical contacts 22 due to incrustations or microweldings, the force of the springs 38 may not be able to push the contact-holder body 28 towards the open contacts position. In this case, the rotation of the handle 44 from the closed position towards the open position drags the cam 64 and the contact-holder body 28 upwards, thanks to the contact between the second control members 56 with the second active surfaces 72 of the inclined ramps 68.

[0025] In this way, there is the assurance that when the handle 44 is in the open position, the second electrical contacts 32 are effectively separated from the first electrical contacts 22. Therefore, the handle 44 exerts a positive action on the cam 64, both in the closing of the contacts step and during the opening of the contacts step. The upward dragging of the cam 64 of the contact-holder body 28 by the second control members 56 constitutes a safety feature as it ensures the opening of the contacts even in the event of abnormalities, such as the adhesion of the movable contacts 32 to the fixed contacts 22, or the failure of the springs 38.

[0026] The geometric expressions such as "high", "low", "upper", "lower" and the like refer to the position in which the switch 10 is arranged with the longitudinal axis oriented vertically and with the handle 44 upwards. These expressions have been provided only to facilitate the understanding of the operation. It is understood however that the switch 10 can be installed in any position.

[0027] 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), the contact-holder body (28) being movable along a longitudinal axis (A) between an open contacts position and a closed contacts position,
   - elastic means (38) arranged between the housing (12) and the contact-holder body (28) and tending to push the contact-holder body (28) towards the open contacts position,
   - a handle (44) rotatable about said longitudinal axis (A) between an open position and a closed position,
   - a cam (64), fixed with respect to said contact-holder body (28),

   wherein the handle (44) cooperates with said cam (64) to move said contact-holder body (28) from the open contacts position to the closed contacts position, upon rotation of the handle from the open position to the closed position,
   characterized in that said cam (64) has at least one first and at least one second active surface (70, 72), and said handle (44) has at least one first control member (54) which cooperates with the first active surface (70) and at least one second control member (56) which cooperates with the second active surface (72), said first and second active surfaces (70, 72) and said first and second control members (54, 56) being arranged in such a way that when the handle (44) rotates from the open position to the closed position, the first control member (54) cooperates with the first active surface (70) to move the contact-holder body (28) from the open contacts position to the closed contacts position, and when the handle (44) rotates from the closed position to the open position, the second control member (56) cooperates with the second active surface (72) to move the contact-holder body (28) from the closed contacts position to the open contacts position.

2. A switch according to Claim 1, **characterized in that** said cam (64) comprises an outer tubular wall (66) having at least one inclined ramp (68) projecting radially inwards from its inner surface, said active surfaces (70, 72) being formed on opposite sides of said inclined ramp (68).

3. A switch according to Claim 1 or Claim 2, **characterized in that** said control members (54, 56) are formed by pins projecting radially outwards, and spaced from each other in the direction of said longitudinal axis (A).

4. A switch according to Claim 1 or Claim 2, **characterized in that** said first active surface (70) is provided with two notches (74, 76) engaged by said first control member (54) in the open and closed positions

of said handle (44).

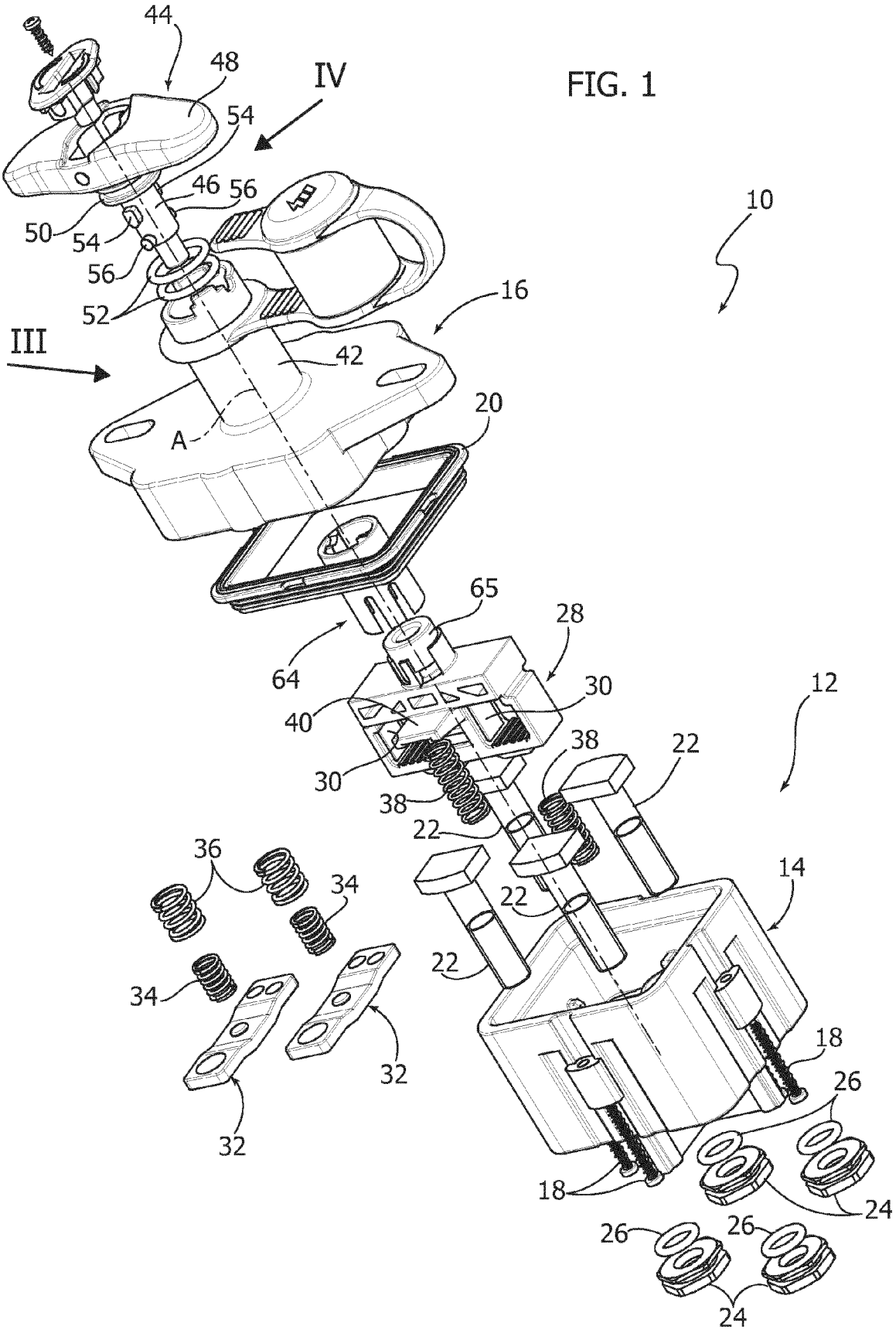
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FIG. 1

FIG. 2

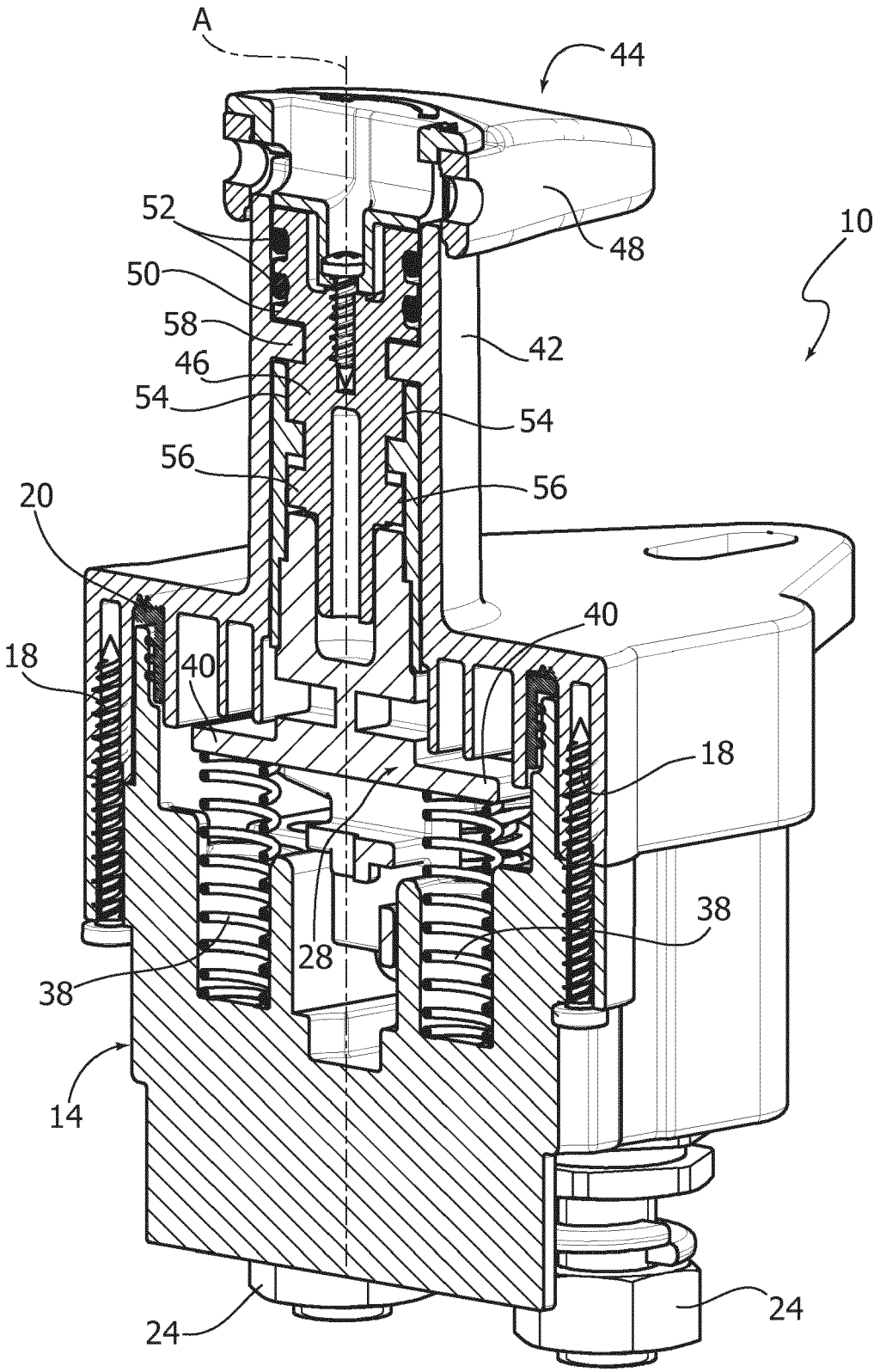


FIG. 3

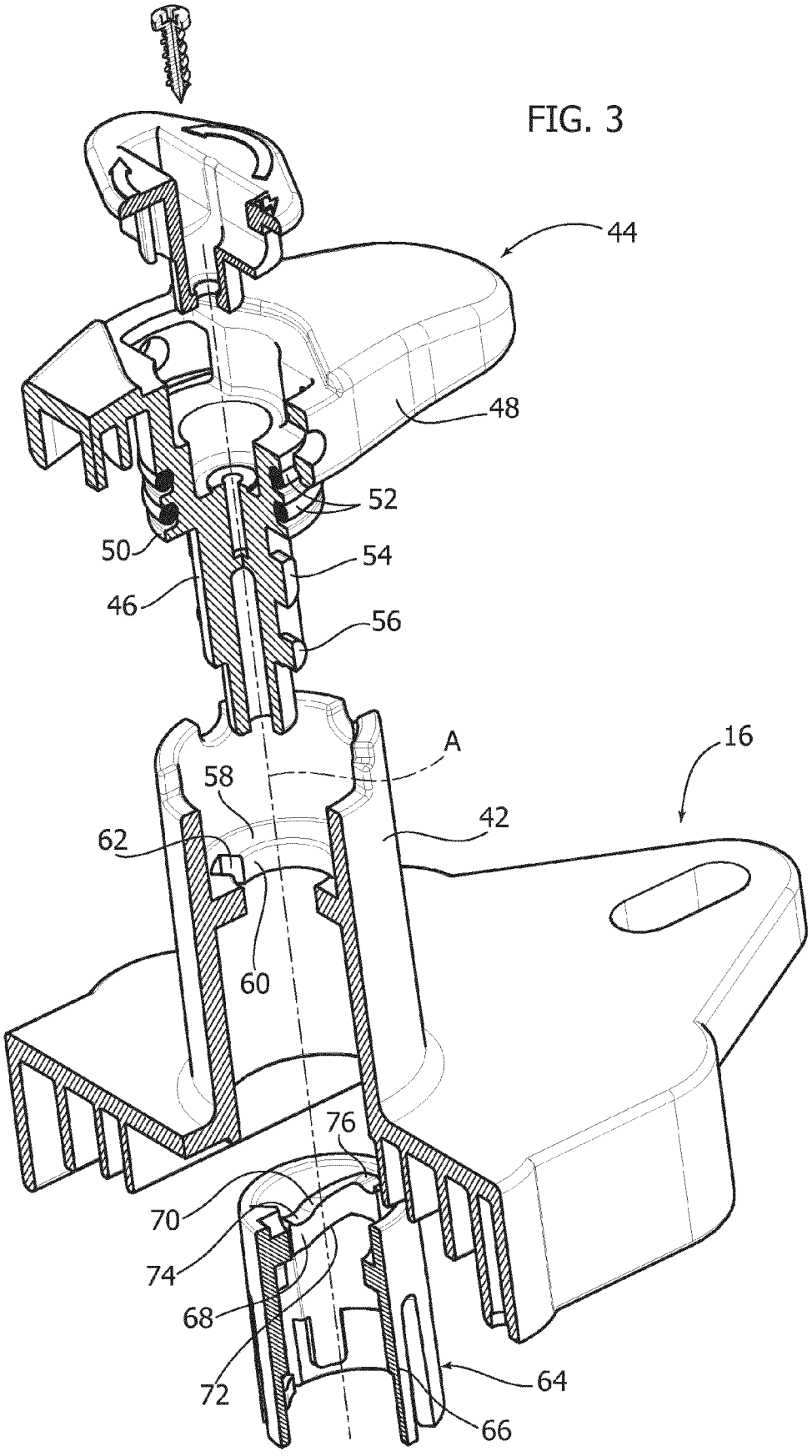


FIG. 4

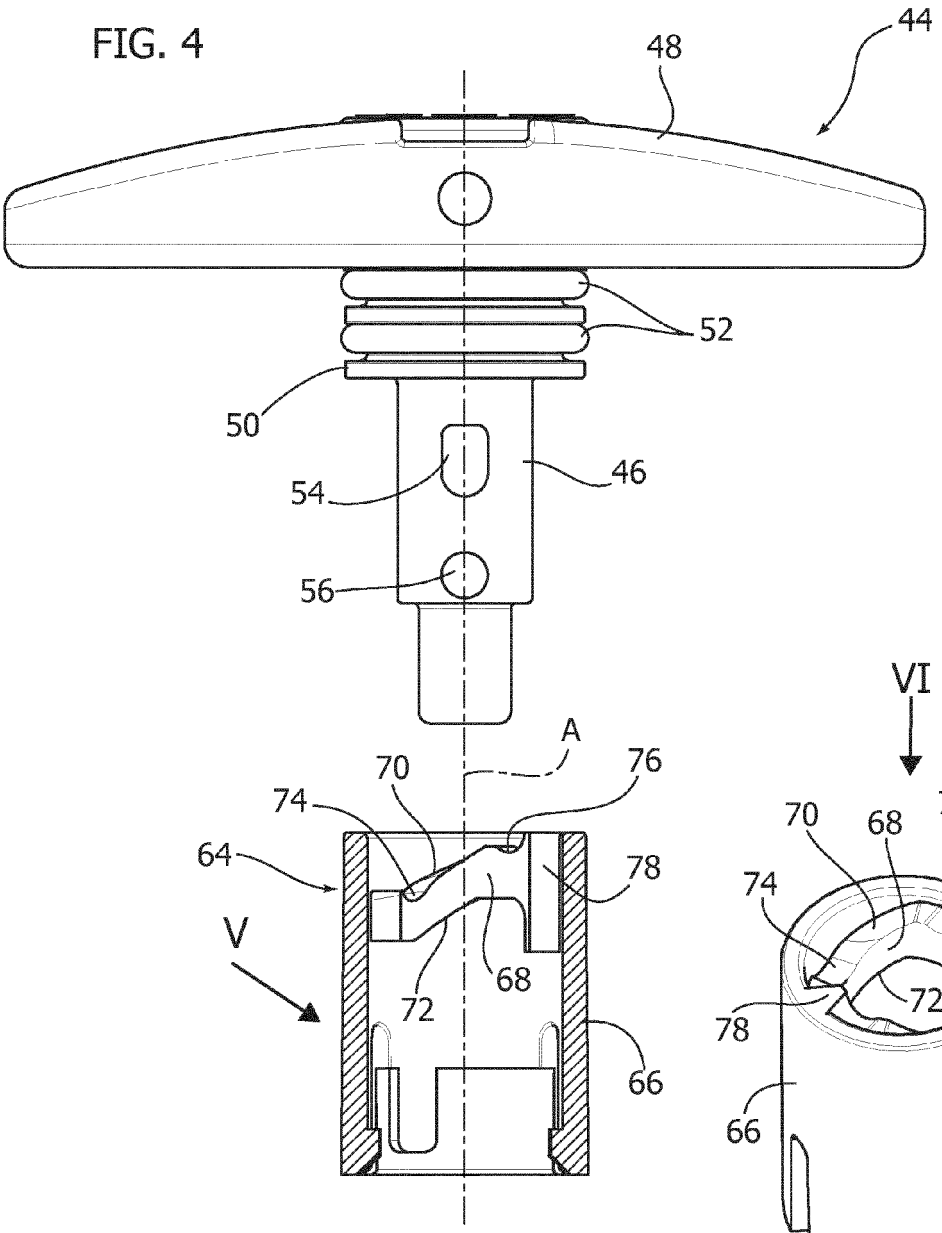


FIG. 5

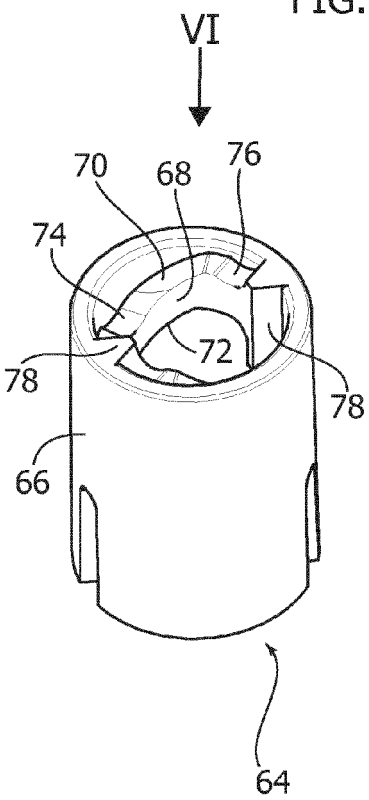
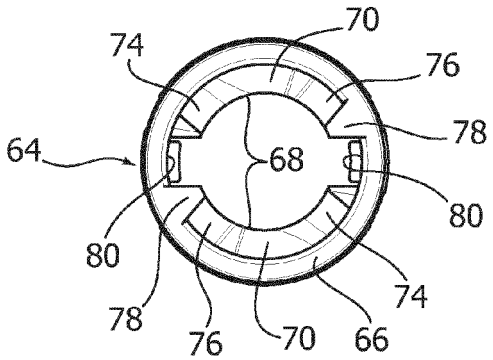


FIG. 6



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EUROPEAN SEARCH REPORT

Application Number
EP 14 16 0649

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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	Date of completion of the search	Examiner
Munich	6 August 2014	Simonini, Stefano

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