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(54) **Pilot device**

(57) A pilot device (1) for controlling/monitoring electrical circuits and/or apparatuses supplied via the circuits, comprising a tubular holder member (20) having a connector end (22) and an operator end (21). An operator element (10) is inserted in the operator end, the operator element being in operative contact with a contact block (30) inserted in the connector end such

that the central axes of the operator element and the contact block being coincident with a central axis (CL) of the holder member. The contact block has stationary (33,34) and moving (35) contact elements for opening/closing at least one electrical circuit running through the pilot device, the contacts being actuated through either one of an axial or rotating manipulation of said operator element.

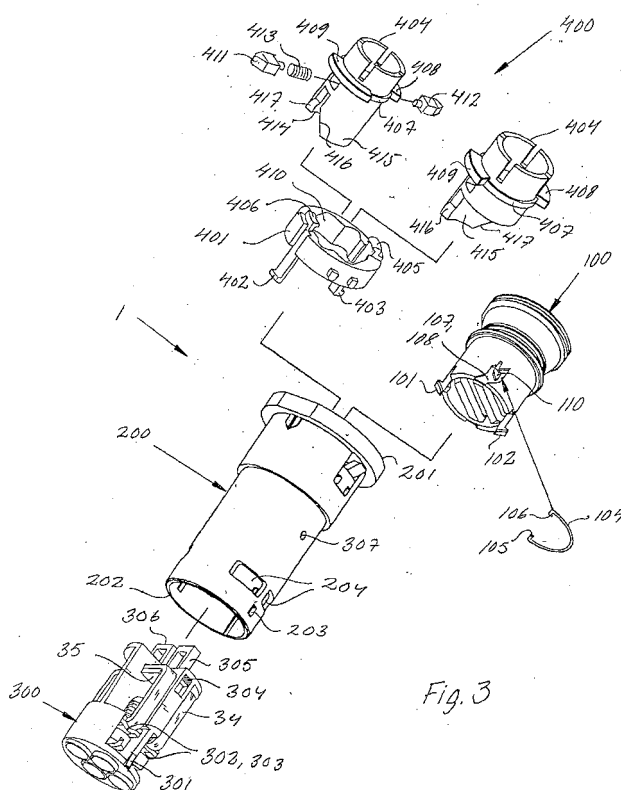


Fig. 3

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Description

TECHNICAL FIELD OF INVENTION

[0001] The present invention refers to pilot devices for controlling and/or monitoring the status of electrical circuits and apparatuses supplied via the circuits, in accordance with the preamble of claim 1.

BACKGROUND AND PRIOR ART

[0002] As used herein, the expression "pilot device" refers to an operator means for controlling and/or monitoring the status of electrical circuits and apparatuses supplied via the circuits. Non-limiting examples of pilot devices referred to are push buttons, selector switches, emergency stop push buttons, pilot lights, etc.

[0003] Conventionally, pilot devices referred to will typically be assembled in the operator's panel by securing an operator element such as a selector switch handle, a push button, a signal lamp lens etc., to a contact block holder. Separate contact blocks for each electrical circuit are then snapped to the reverse end of the holder and thus positioned for manipulation by the operator element that extends through the holder. The conventional pilot device may in this respect be regarded as a modular structure.

[0004] The invention aims to simplify assembly of an operator's panel and reducing the number of elements by integrating the contact blocks and operator element with the holder. A pilot device according to the invention may thus be regarded as an integrated structure.

[0005] In another aspect of the invention there is suggested a multifunctional base for a pilot device in an integrated system, providing great flexibility in assembly and structure when designing the operator's panel.

[0006] These and other objects and aims are met in a pilot device as defined through the technical features of claim 1. Preferred embodiments are further defined in the subordinated claims.

[0007] Briefly, the invention suggests a pilot device for controlling/monitoring electrical circuits and/or apparatuses supplied via the circuits, comprising a tubular holder member having a connector end and an operator end. An operator element is inserted in the operator end, the operator element being in operative contact with a contact system/contact block inserted in the connector end such that the central axes of the operator element and the contact block being coincident with a central axis of the holder member. The contact block has stationary and moving contact elements for opening and closing, respectively, at least one electrical circuit running electrically separated through the pilot device, the contacts being actuated through either a sliding or a rotating manipulation of the operator element.

[0008] In a preferred embodiment the holder member provides a multifunctional base for a pilot device that may optionally be equipped with a selector switch oper-

ator or with a push button for actuation of the contact/contacts of the pilot device.

[0009] As used herein, a "push button" refers to an operator that is manipulated for axial actuation movement in the longitudinal direction of the pilot device. The "selector switch" on the other hand refers to an operator that is manipulated for a rotational actuation movement about the longitudinal axis of the pilot device. By the expression "depressible selector switch" is contemplated an operator designed for actuation through a manipulation which includes any combination of longitudinal and rotational movements, such as a toggle switch.

DRAWINGS

[0010] Embodiments of the invention are further specified below, reference being made to the attached drawings. In the drawings,

Fig. 1 is a prior art pilot device of modular structure;

Fig. 2 is a diagrammatic, partially sectioned view showing the principles of a pilot device of integrated structure according to the invention, and

Fig. 3 is an exploded perspective view showing the main parts incorporated in the new pilot device.

DETAILED DESCRIPTION OF THE DRAWINGS

[0011] With reference to Fig. 1, a typical set up of a prior art pilot device of modular configuration comprises an operator element here indicated by a push button A, a contact block holder B and one or several contact blocks C, D, E. The pilot device is assembled in an operator's panel F with the push button projecting on the operator side of the panel, and the contact block holder and contact block/contact blocks projecting on the reverse side of the panel. The push button extends through the holder for engagement with the contact blocks that are snapped into an end plane of the holder B. A sleeve G extends through the panel and secures the pilot device in the mounted position. The modular structure allows the pilot device to be configured with one, two or three contact blocks, or more if mounted in tandem as suggested by broken lines in the drawing. Each contact block typically is a single pole contact for making or breaking electrical contact. In practice, the prior art pilot device requires numerous details to be handled in stocks, when ordering, and on the mounting site.

[0012] With reference to Fig. 2, a typical set up of the new pilot device 1 of integrated configuration comprises an operator element here indicated by a push button 10, a holder member 20, and a contact block 30.

[0013] The holder member 20 is tubular in shape, having an operator end 21 and a connector end 22. In a preferred embodiment, the holder member 20 is a cyl-

inner sleeve that extends symmetrically about a central axis CL. The holder member 20 is internally formed with slots, flanges, shoulders etc., arranged to cooperate with similar formations on the push button 10 and the contact block 30, respectively, for receiving the push button and contact block in snap lock engagement with the holder member 20.

[0014] The push button 10 is externally formed for insertion in the holder member 20 from the operator end 21. Preferably, the push button 10 is a cylinder having a central axis that coincides with the central axis CL of the holder member in the inserted position. The push button is formed with snap lock means arranged to cooperate with above said formations on the holder member for an interlocking engagement while allowing the push button a limited axial movement relative to the holder member. Spring means may be arranged to bias the push button in either or both axial directions. The inner end of the push button 10 is formed to actuate the contacts arranged in the contact block 30.

[0015] The contact block 30 is externally formed for insertion in the holder member 20 from the connector end 22. Preferably, the contact block 30 is a cylinder having a central axis that coincides with the central axis CL of the holder member in the inserted position. The contact block is formed with snap lock means arranged to cooperate with above said formations on the holder member for an interlocking engagement that prevents relative axial and rotational movements between the holder member 20 and the contact block 30.

[0016] In figure 2, a partially sectioned contact block 30 is formed with two electrically separated sections 31,32, each section carrying a set of stationary contact elements 33,34 and a moving contact element 35 for making or breaking electrical contact. The stationary contacts 33,34 of each section 31,32 are similar in shape and arranged in parallel on separate sides of a central plane through the contact block 30. The moving contact element 35 extends transversely through the central plane, and is controlled in a linear motion for making or breaking electrical contact over the stationary contacts 33,34. In figure 2, the central plane coincides with the sectional plane of the sectioned portion of the contact block 30. Lead connectors 36,37 are arranged for connecting the contact block/pilot device to the two separate electrical circuits V_1 and V_2 . In the partially sectioned figure 2, only one stationary contact 33,34 and one lead connector 36,37 is visible from each section 31 and 32, electrically separated by a partition wall 38.

[0017] A moving contact carrier 39 is received in each separate section 31,32 of the contact block 30 and guided for sliding motion in longitudinal direction of the contact block. The moving contact element 35 is supported in the carrier 39 and biased from a spring 40 towards arresting formations 41 arranged on the moving contact carrier 39. The carrier 39 is biased from a spring 42, operative for urging the moving contact element 35 into

electrical contact with the stationary contact element 34 as shown with reference to section 31 (normally closed, NC), or alternatively as shown at section 32, out of electrical contact with the stationary contact element 33 (normally open, NO). The operative status of the two contacts may be concurrently altered through a depression of the push button, acting with its inner end on the moving contact carriers 39.

[0018] Equipped with a push button as disclosed above, the pilot device 1 may be alternatively configured for simultaneously controlling at least two electrically separated circuits. Alternative configurations include one contact being normally closed (NC); one contact being normally open (NO); both contacts being normally closed; both contacts being normally open, and one contact being normally closed while the other contact being normally open.

[0019] The main components building up a multifunctional pilot device 1 is explained with reference to the exploded view of Fig. 3. A tubular holder member 200 of circular section is formed with an operator end 201 and a connector end 202. Holes 203 are formed through the wall of the holder member 200. A cylinder shaped contact block 300 has external lugs 301 that snap into the holes 203 as the contact block is inserted from the connector end of the holder member. In the inserted position, lead connectors 302,303 are accessible through openings 204 made through the wall of the holder member. Each connector has a tightening screw that is accessible from the end plane of the contact block 300. In the inserted position, an identification code 304 on each moving contact carrier 305,306 of the contact block 300 will be positioned behind a respective window 307 formed through the wall of the holder member, thus providing an indication, such as a color mark, indicating the operative status of the corresponding electrical circuit running through the subject section of the contact block.

[0020] The holder member 20,200 is internally formed for cooperation with a push button 10,100 as previously mentioned. For interlocking purposes, spring lugs 101,102 on the push button 10,100 engage an axially inner end surface of a radial shoulder 23 (see Fig. 2) formed on the inside of the holder member 20,200, when the push button 10,100 is inserted from the operator end of the holder member. Axially running guides such as slots 24 (Fig. 2) formed on the inside of the holder member and extended from said inner end of the shoulder 23 receive the spring lugs to prevent a relative rotation, while allowing a relative axial movement between the push button and the holder member. The relative axial movement is limited between an outer end-position wherein the spring lugs engage the inner end of said shoulder, and an inner end-position wherein the push button abuts the inner end of the contact block while depressing the contact carriers 305,306. A spring element 104 is received between the outer wall of the push button and the inner wall of the holder member. The spring 104 is effective for arresting the push button in a de-

pressed position, towards the connector end 202. For this purpose, the spring has a semi circular shape with ends 105,106 that are bent to project diametrically towards the radial center of the push button. Said ends of the arcuate spring element 104 are received in recesses 107,108 formed on opposite sides of the push button 10,100. The recesses form a bi-directional passage for the spring ends, with an intermediate stop position 110 corresponding to the depressed mode wherein the push button is arrested by the spring 104 to be removable upon a repeated depression.

[0021] The specified structure of the holder member 200 provides a multifunctional base for a pilot device that may be alternatively equipped with a selector switch operator or with the push button mentioned before, by means of an interconnected adapter ring.

[0022] The selector switch 400 cooperates with an adapter ring 401, carrying corresponding spring lugs 402,403 for engagement with the above said shoulder 23 on the inner wall side of the holder member 20,200. The diameter of the ring 401 and the axial lengths of the spring lugs 402,403 are dimensioned relative to the radial width and axial length of the shoulder 23 for axially arresting the ring in the holder member 20,200 through abutting contact with both axial ends 23a,23b of the shoulder. In mounted position, the above said axial guides 24 formed on the inside of the holder member prevent the interconnected ring and holder member from relative rotation about the axis C.L. A cylinder shaped selector switch sleeve 404 is received through the ring and is rotatable relative thereto. A knob or selector switch handle (not shown in the drawings) is formed to engage the operator end of the sleeve 404 in non-rotating relation. Spring lugs 405,406 extend axially from the ring 401 to engage the operator side of a flange 407, formed externally on the sleeve 404. Radial extensions 408,409 on the flange engage the ring in the spacings between the spring lugs 405,406. The sleeve 404 is thus axially arrested in the ring through the spring lugs 405,406 engaging the flange 407, and the radial extensions 408,409 supported in sliding contact with the planar end surface of the ring 401. The radially inner side of the ring is formed with a cam surface having indentations 410, and cam followers 411,412 project through the wall of the sleeve 404 for engagement with the cam surface as the sleeve is inserted through the ring 401. A spring element 413 between the cam followers is effective for biasing the cam followers in abutting contact with the cam surface of the ring 401. The indentations 410 and cam followers 411,412 provide the operator with an audible and physical confirmation of the new operation mode, when turning the selector switch sleeve 404. It will be understood, that rings 401 may be alternatively indexed with indentations 401 corresponding to different operational needs, such as two, three, or four position switches.

[0023] In the connector end of the sleeve 404, one or two cams 414,415 project for engagement with the mov-

ing contact carriers 305,306 of the contact block 300. Each cam 414,415 is provided with slanting cam surfaces 416,417 for sliding engagement with the ends of the contact carriers upon turning of the selector switch. As will be understood, a double-cam embodiment provides simultaneous actuation of the two contacts, and a single-cam embodiment provides optional and individual actuation of either one of the contacts.

[0024] The selector switch operator 400 is manipulated for a rotational actuation movement about the longitudinal axis CL of the pilot device.

[0025] Yet another embodiment of the pilot device 1 foresees a toggle switch operator (not shown in the drawings) that effects actuation of the contacts through an operation which includes a combination of longitudinal and rotational movements. The toggle switch has an operator handle that is pivoted in either of two directions about an axis, transverse to the central axis CL of the pilot device. The toggle switch has radial extensions that act indirectly on the moving contact carriers of the contact block 300. For example, a plunger may be activated by the radial extensions for axial movement in the holder member, when the toggle switch is pivoted about the axis of rotation. The plunger may be biased from a spring towards a non-depressed position, corresponding to a neutral position of the toggle switch. The toggle switch, the pivot axis, the plunger and associated spring may be accommodated in a cylinder body that is inserted in the operator end of the holder member such that a central axis of the cylinder body coincides with the central axis CL of the holder member. Snap lock formations on the cylinder body engage mating formations on the inner wall of the holder member for axial and non-rotational fixation of the cylinder body relative to the holder member.

[0026] For completeness reasons, the holder member may be formed with external threads, spring lugs etc., effective for mounting the pilot device in the operator's panel. Modification to the details specified herein may be performed without departing from the suggested solution. One such modification may, for example, include an emergency push button operator that requires a depressing action for breaking electrical contact, and a turning action for making electrical contact. Another modification may include a security operator that requires both a depressing and a turning action for actuation of the contact/contacts. All such obvious modifications are included in the solution as defined by the accompanying claims.

Claims

1. A pilot device (1) for controlling or monitoring electrical circuits, comprising a tubular holder member (20; 200) having a connector end (22; 202) and an operator end (21; 201), an operator element (10; 100; 400) inserted in the operator end, the operator

element being in operative contact with a contact block (30; 300) inserted in the connector end, the central axes of the operator element and the contact block being coincident with a central axis (CL) of the holder member, said contact block having stationary contacts (33,34) and moving contact elements (35) for opening/closing at least one electrical circuit over the stationary contacts, **characterized in that** the holder member (20;200) is formed for receiving an operator element (10;100) that is effective for controlling the moving contact element/elements (35) through an axial manipulation of the operator element, and for optionally receiving an operator element (401,404) that is effective for controlling the moving contact element/elements (35) through a rotating manipulation of the operator element.

2. The pilot device of claim 1, wherein the holder member is formed for snap lock insertion of an operator element in axially sliding relation to the holder member, and for snap lock insertion of an adapter ring (401) shaped to receive an operator element (404) in rotatable relation to the holder member.

3. The pilot device of claim 2, wherein the contact block is formed with at least two sets of stationary (33,34) and moving (35) contact elements for opening/closing electrical circuits running electrically separated (31,32,38) through the pilot device, and the operator element is effective for simultaneous activation of the at least two moving contact elements.

4. The pilot device of claim 3, wherein the operator element is either a push button operator or a selector switch operator.

5. The pilot device of claim 3, wherein the operator element is a selector switch operator having two cam surfaces (416) simultaneously activating all moving contact elements.

6. The pilot device of claim 2, wherein the contact block is formed with at least two sets of stationary (33,34) and moving (35) contact elements for opening/closing electrical circuits running electrically separated (31,32,38) through the pilot device, and the operator element is effective for separate activation of each one of the at least two moving contact elements.

7. The pilot device of claim 6, wherein the operator element is a selector switch operator having at least one cam surface (416) alternatively activating one of the moving contact elements.

8. The pilot device of any previous claim, wherein the contact block is formed with two electrically separated sections, each section carrying two stationary contact elements and a movable contact element, a movable contact carrier (39; 305,306) received in each section of the contact block and guided therein for sliding motion in longitudinal direction of the pilot device, each contact carrier through manipulation of the operator element moving the associated movable contact element for electrically connecting and disconnecting the stationary contact elements of that section, said movable contact carriers being biased from a spring element (42) into either one of a normally closed (NC) or a normally open (NO) position.

rated sections, each section carrying two stationary contact elements and a movable contact element, a movable contact carrier (39; 305,306) received in each section of the contact block and guided therein for sliding motion in longitudinal direction of the pilot device, each contact carrier through manipulation of the operator element moving the associated movable contact element for electrically connecting and disconnecting the stationary contact elements of that section, said movable contact carriers being biased from a spring element (42) into either one of a normally closed (NC) or a normally open (NO) position.

9. The pilot device of claim 8, wherein the movable contact carriers of said sections are both biased into the same normally closed or normally open position.

10. The pilot device of any previous claim 2-9, wherein the operator element is a selector switch operator (404) having cam followers (411,412) that are biased against a cam surface (410) formed internally on the adapter ring (401), the cam surface having indentations indicating the operational position of the selector switch.

11. The pilot device of any previous claim, wherein the wall of the holder member is formed with inspection windows (307) providing an indication of type of contact (NC/NO) in each electrically separated section of the contact block that is inserted in the holder member.

PRIOR ART

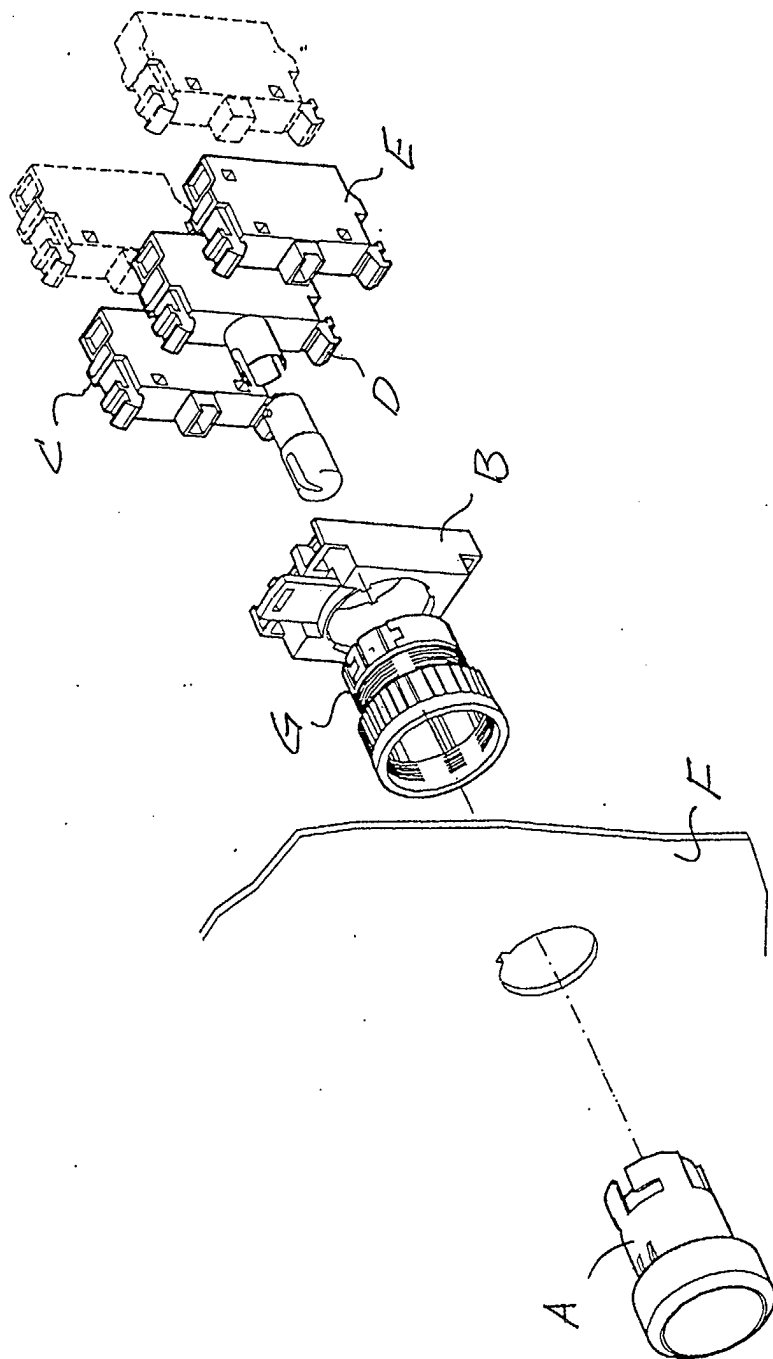


Fig. 1

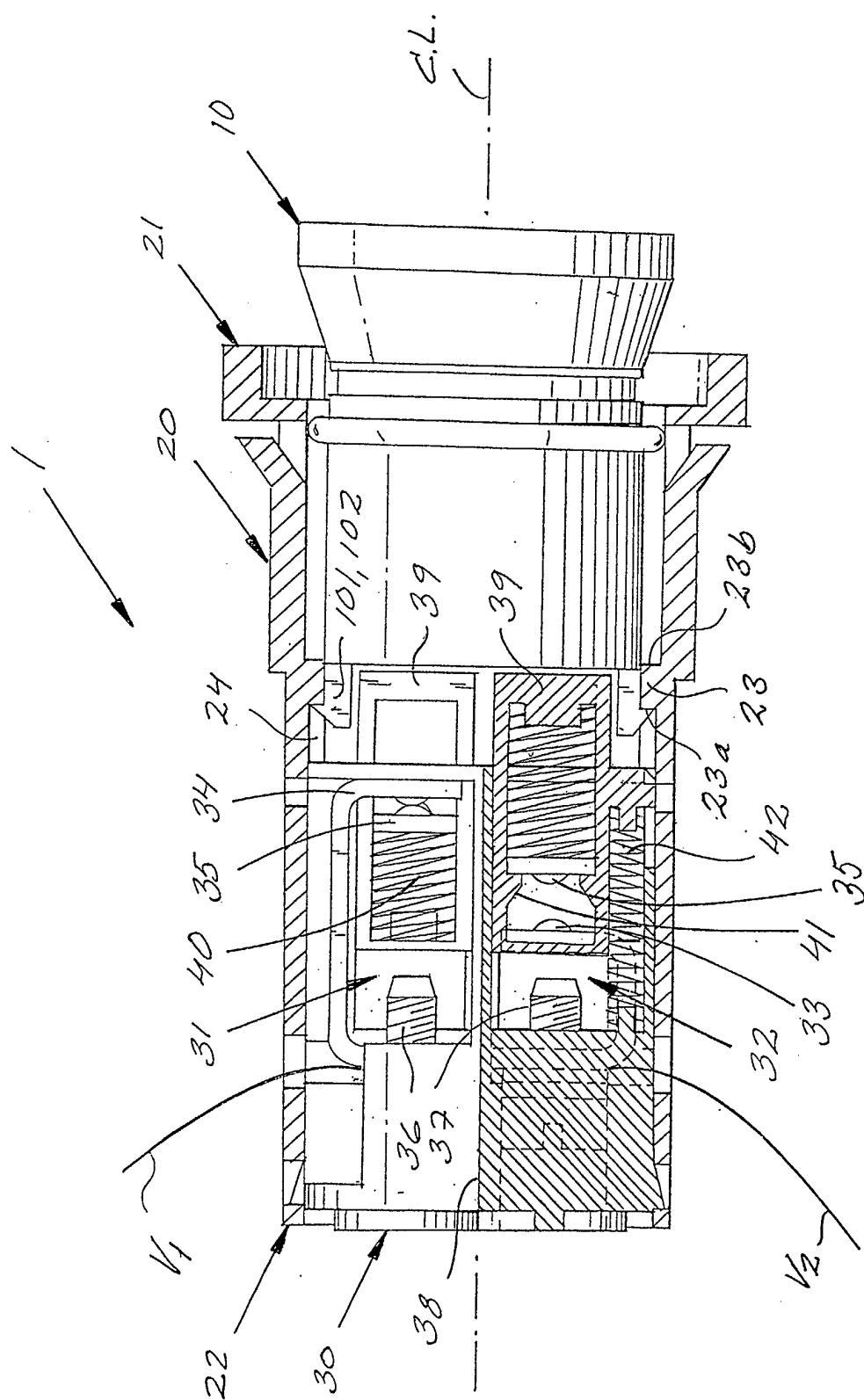


Fig. 2

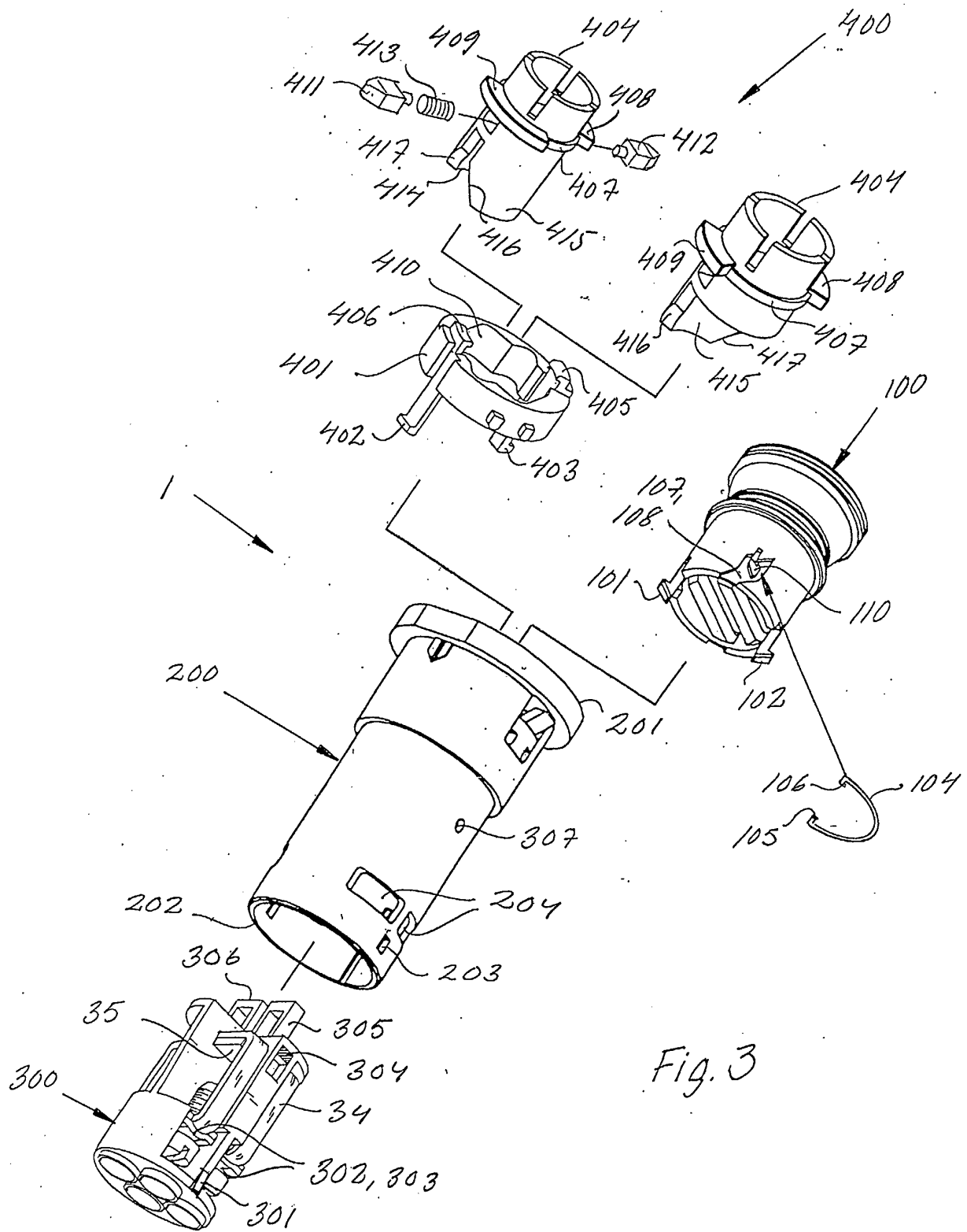


Fig. 3



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EUROPEAN SEARCH REPORT

Application Number
EP 03 07 5497

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
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Place of search		Date of completion of the search	Examiner
MUNICH		15 April 2003	Glamann, C
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 03 07 5497

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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