



(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
21.03.2012 Bulletin 2012/12

(51) Int Cl.:
E05B 47/00 (2006.01) E05B 65/10 (2006.01)
E05B 3/10 (2006.01)

(21) Application number: **10774578.8**

(86) International application number:
PCT/ES2010/000206

(22) Date of filing: **12.05.2010**

(87) International publication number:
WO 2010/130850 (18.11.2010 Gazette 2010/46)

(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 SE SI SK SM TR

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(30) Priority: **13.05.2009 ES 200901216**

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(54) **CLUTCH DEVICE FOR ELECTRIC MORTISE LOCKS WITH ANTI-PANIC FUNCTION**

(57) The invention relates to a clutch device for use in electric mortise locks having an anti-panic function, comprising a radial centre rest (5), a radial pin (6), a torsion spring (7), a follower (8) actuating the lock bolt, a supplementary outer follower part (9), an outer washer (10), a supplementary square bar (11) for the outer shaft (2), and a right-angled-U-shaped band-like fork (12). According to the invention, the radial centre rest (5) has a curved/concave front (5b) of identical radius to the central

axial hole (8b) in the follower (8) and a thickness that matches the width of a radial notch (8c) in the follower (8), in which the radial centre rest (5) is housed and positioned between the tang of the radial pin (6) and a second end (7c) of a torsion spring (7). The torsion spring is mounted on a torsion shaft (7a) and has a first end (7b) connected to the spindle (4a) of the electric motor (4) and a second end (7c) which extends through a filled lug (5a) of the radial centre rest (5).

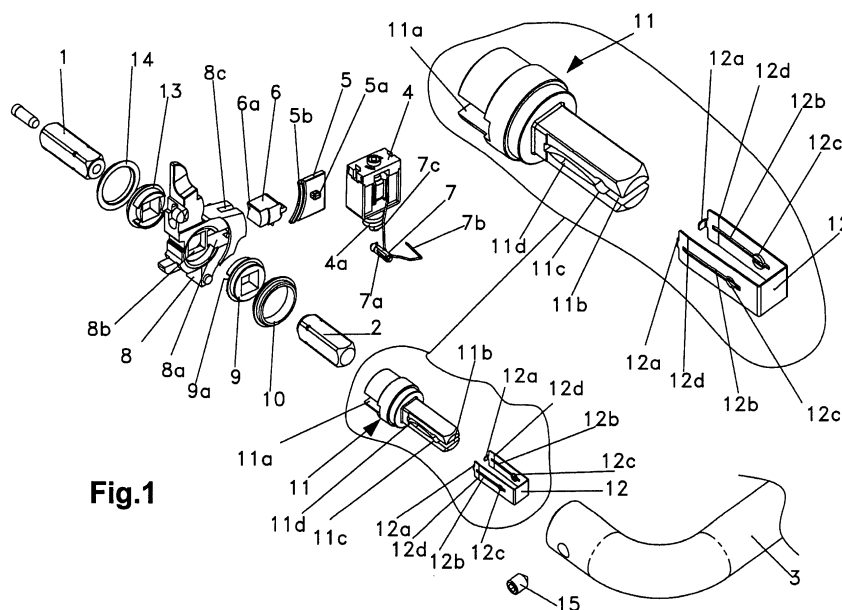


Fig.1

Description

TECHNICAL FIELD OF THE INVENTION

[0001] This invention concerns a clutch device that is especially designed for use in electric mortise locks having an anti-panic function, i.e. locks that can always be opened from the inside even if they cannot be opened from the outside.

[0002] In its general and usual form, this type of lock comprises - at the least - an inner square shaft in which an inner grip consisting of a handle or knob is installed, an outer square shaft with an outer handle, and an electric motor with a output spindle for the actuation of the actual clutch device; here and hereinafter, the designations "inner" and "outer" refer to the inside and outside of the lock.

BACKGROUND TO THE INVENTION

[0003] The design of this type of lock is subject to problems since a large number of features (electric actuation, anti-panic function, clutch function) need to be combined. This means that a large number of components must be used within a relatively small space.

[0004] Thus, in this field solutions must be found that use a reduced number of components and have simple structures and easy functional interrelations that give rise to reliable functioning and a long product lifetime without malfunctions; the various implementations around today meet certain of these objectives with a greater or lesser degree of success.

DESCRIPTION OF THE INVENTION AND ITS ADVANTAGES

[0005] The present invention proposes a different solution which to a large extent combines the objective of using a reduced number of components offered by certain simple designs and the objective of simple and reliable functioning. To meet these objectives, the envisaged clutch device comprises a radial centre rest, a radial pin, a torsion spring, a follower actuating the lock bolt, a supplementary outer follower part, an outer washer, a supplementary square bar for the outer shaft, and a right-angled U-shaped band-like fork that has a gap adjusted in accordance with the thickness of the supplementary square bar; whereby the radial centre rest has a curved/concave front with the same radius as the central axial hole of the follower, has a thickness in accordance with the width of the radial notch in the follower in which this radial centre rest is housed, and is positioned between the tang of the radial pin and the second end of a torsion spring that is mounted on a torsion shaft and that has a first end that is joined to the spindle of the electric motor, and whose second end extends through a filled lug in the radial centre rest; the follower has a radial opening that is connected with the radial notch and the central axial hole which, in its central inner body, has a permanent

connection to the inner square shaft via an inner follower part and an inner washer; the radial pin has an arced front with the same radius as the central axial hole of the follower and - to the rear - is supported against the curved/concave front of the radial centre rest, which is connected to the second end of the torsion spring, whilst this radial pin has a section in accordance with the said radial opening in which it is housed; the outer square shaft is permanently coupled with the supplementary outer follower part and - via the outer washer - with a slot cut into the inner end of the supplementary square bar. In accordance with this structure, the radial pin is able to operate between a retracted position against the torsion spring where the arced front is in line with the central axial hole of the follower and a forward position where the arced front penetrates the central axial hole of the follower at the same time as penetrating a radial casing of the said supplementary outer follower part which is coupled in the central outer body of the follower, whereby the radial casing is connected to the radial opening of the follower.

[0006] The entire width of the supplementary square bar is slit by a longitudinal slot with a width slightly smaller than the diameter of a stud bolt that faces it and which goes through the outer handle; both branches of the fork are positioned against the faces of the supplementary square bar which have a longitudinal slot; the branches have tabs at the end that point to the inside of the fork and which have a width in accordance with that of the longitudinal slot in the supplementary square bar; the branches are perforated along their length by tracks that travel the length of the sides of the longitudinal slot and are appropriately more narrow than this slot and, at their outer end, these branches form opposing protrusions that point towards the inside of the fork with dimensions in accordance with the widenings in the longitudinal slot.

[0007] This setup enables a compact size that can be accommodated perfectly in the small amount of space available in mortise locks.

[0008] The clutch function is realised as follows: when the motor is energised, its spindle moves the first end of the torsion spring, the second end of which drives the sliding radial centre rest which moves into the radial notch of the follower and which - in turn - moves the sliding radial pin so that it penetrates both the central axial hole of the follower and the radial casing of the supplementary outer follower part; since - via the outer square shaft and the supplementary square bar of this shaft - the outer handle is rotationally coupled with the supplementary outer follower part and the supplementary outer follower part is rotationally coupled with the follower, this causes the lock to open from the outside when the handle is actuated. As can be seen in detail below, during this process the torsion spring serves to ensure the engagement and disengagement processes, since when the spindle turns and the position of the parts does not yet permit the movement of the radial pin, the first end of the torsion spring is moved via the torsion shaft in a way that causes it to transmit a force to the second end of the torsion

spring, and this end is elastically charged to drive the movement of the radial pin once this radial pin is in a position that allows this.

[0009] Another function implicated in the proposed design concerns the measures envisaged for the coupling of the outer handle (naturally also valid for an internal handle). These measures comprise the supplementary square bar of the outer shaft and the U-shaped band-like fork; the function works in that the fork is coupled with the supplementary square bar in a way that means that the openings on the fork are overlaid with the sides of the longitudinal slot in the supplementary square bar; this assembly is then inserted into the handle to the desired position and is secured into place using the stud bolt. The fixation is extremely robust because the fact that the openings have a smaller width than the slots means that the entry of the stud bolt deforms the edges of the openings in the fork, causing the edges to wedge into the openings of the supplementary square bar. In addition to providing this strength, the mechanism facilitates the rectification of a possible error with regard to the fixed position, in that the used fork can be replaced by a new one. In contrast, the traditional system involves pushing the stud bolt against the smooth surface of the square bar inserted into the handle, whereby the tip makes a conical mark on the square bar and - if there is an error in the fixed position and the desired new position is near to the original position - the conical indentation formed by the original incorrect positioning of the stud bolt pulls the tip of the stud bolt into the incorrect position again.

[0010] Another feature of this invention is that in the proximity of the tabs the elastic branches of the band-like fork form a fold at the peak so that between the two branches there is a distance that is suitably larger than the dimension of the hollow in the outer handle for the supplementary square bar. This setup makes the most of the elasticity of the band of the fork so that - before the stud bolt is positioned - the coupling inside the handle is effected with a certain precision that facilitates the identification of the desired fixation point and the retention of this point whilst the stud bolt is inserted.

DRAWINGS AND LEGENDS

[0011] To better illustrate the nature of the present invention, the enclosed drawings show a representative manner of realisation as an example; they are purely illustrative and are not exclusive.

Figure 1 is an exploded perspective view that shows the assembly of the components of the clutch device as per the invention; it includes a blow-up of the supplementary square bar of the outer shaft (2) and of the band-like fork (12).

Figure 2 is an orthogonal cross-section that shows the proposed clutch assembly in its disengaged state.

Figure 3 is similar to figure 2 but shows the state in

which elastic energy is accumulating for the engagement action.

Figure 4 is similar to figures 2 and 3 but shows the engaged state.

Figure 5 is similar to figures 2, 3, and 4 but shows the state in which elastic energy is accumulating for the disengagement action.

Figure 6 is an orthogonal side elevation of the supplementary square bar (11), showing the longitudinal slot (11b) head-on.

Figure 7 is similar to figure 6 but shows the band-like fork (12).

Figures 8 and 9 are top plan views of figures 6 and 7 respectively.

Figure 10 shows a longitudinal section of the assembly of the components shown in figures 8 and 9, and incorporates a blow-up of the coupling of the protrusions (12c) in the widenings (11c).

Figure 11 shows an elevated rear view of the outer handle (3) with the supplementary square bar (11) coupled with the handle.

Figure 12 shows the cross section marked XII-XII in figure 11, and incorporates a blow-up of the fixation of the components using the stud bolt (15).

[0012] In these diagrams, the following numbers are used to indicate components:

1. Inner square shaft
2. Outer square shaft
3. Outer handle
4. Electric motor
- 4a. Spindle of the electric motor (4)
5. Sliding radial centre rest
- 5a. Filled lug of the sliding radial centre rest (5)
- 5b. Curved/concave front of the sliding radial centre rest (5)
6. Sliding radial pin
- 6a. Arced front of the sliding radial pin (6)
7. Torsion spring
- 7a. Torsion shaft
- 7b. First end of the torsion spring (7)
- 7c. Second end of the torsion spring (7)
8. Follower
- 8a. Radial opening of the follower (8)
- 8b. Central axial hole of the follower (8)
- 8c. Radial notch of the follower (8)
9. Supplementary outer follower part
- 9a. Radial casing of the supplementary outer follower part (9)
10. Outer washer
11. Supplementary square bar of the outer shaft (2)
- 11a. Slot in the supplementary square bar (11)
- 11b. Longitudinal slot in the supplementary square bar (11)
- 11c. Widenings in the longitudinal slot (11b)
- 11d. Arced grooves in the longitudinal slot (11b)
12. Band-like fork

- 12a. Tabs of the fork (12)
- 12b. Openings in the fork (12)
- 12c. Protrusions of the fork (12)
- 12d. Fold at the peak of the branches of the fork (12)
- 13. Supplementary inner follower part
- 14. Inner washer
- 15. Stud bolt

DESCRIPTION OF PREFERRED EMBODIMENT

[0013] With regard to the drawings and legend listed above, the attached plans illustrate a preferred method of execution for the object of the invention, that being a clutch device for use in mortise locks with an anti-panic function, this having a general design comprising - at the least - an inner square shaft (1) on which an inner knob or handle is installed, an outer square shaft (2) with an outer handle (3), and an electric motor (4) with an output spindle (4a) for the actuation of the actual clutch device, whereby "outer" and "inner" respectively refer to the inside and outside of the lock. As can be seen in figure 1, the clutch described in the invention comprises a radial centre rest (5), a radial pin (6), a torsion spring (7), a follower (8) that actuates the lock bolt, a supplementary outer follower part (9), an outer washer (10), a supplementary square bar (11) for the outer shaft (2), and a right-angled U-shaped band-like fork (12) that - between its branches - has a gap adjusted in line with the thickness of the supplementary square bar (11); whereby the radial centre rest (5) has a curved/concave front (5b) with the same radius as the central axial hole (8b) of the follower (8) and has a thickness in accordance with the width of a radial notch (8c) in the follower (8) in which the radial centre rest (5) is housed and which is positioned between the tang of the radial pin (6) and a second end (7c) of a torsion spring (7) which is mounted on a torsion shaft (7a) and which has a first end (7b) that is jointed to the spindle (4a) of the electric motor (4), whereby this second end (7c) extends through a filled lug (5a) of the radial centre rest (5); the follower (8) has a radial opening (8a) that is connected with its radial notch (8c) and central axial hole (8b), which - in its central inner body - has a permanent connection to the inner square shaft (1) by means of a supplementary inner follower part (13) and an inner washer (14); the radial pin (6) has an arced front (6a) with the same radius as the central axial hole (8b) of the follower (8) and - to its rear - is supported by the curved/concave front (5b) of the radial centre rest (5), which is connected to the second end (7c) of the torsion spring, whilst this radial pin (6) has a section in accordance with the said radial opening (8a) in which it is housed; the outer square shaft (2) is permanently coupled with the supplementary outer follower part (9) and - via the outer washer (10) - with a slot (11a) cut into the inner end of the supplementary square bar (11). Below - with the help of figures 2 to 5 - the coupled and decoupled states of the proposed clutch are explained, these states deriving from the previously explained fact that the

radial pin (6) can operate between a retracted position against the torsion spring (7) where the arced front (6a) is in line with the central axial hole (8b) of the follower (8) and a forward position where its arced front (6a) penetrates the central axial hole (8b) of the follower (8) at the same time as a radial casing (9a) of the said supplementary outer follower part (9), which is coupled with the central outer body of the follower (8), this radial casing (9a) being connected with the radial opening (8a) of the follower (8).

[0014] The entire width of the supplementary square bar (11) is slit by a longitudinal slot (11b) with a width slightly smaller than the diameter of a stud bolt (15) that faces it and which goes through the outer handle (3); both branches of the fork (12) are positioned against the faces of the supplementary square bar (11) which have a longitudinal slot (11b); the branches have tabs (12a) at the end that point to the inside of the fork (12) and which have a width in accordance with that of the longitudinal slot (11b) in the supplementary square bar (11). The branches are perforated along their length by tracks (12b) that travel the length of the sides of the longitudinal slot (11) and are appropriately more narrow than this slot and, at their outer end, these branches form opposing protrusions (12c) that point towards the inside of the fork (12) and which are dimensioned in accordance with the widenings (11c) in the longitudinal slot (11b).

[0015] Another feature of the invention is that in the proximity of the tabs (12a) the elastic branches of the band-like fork (12) form a fold at the peak (12d) so that between the two branches there is a distance that is suitably larger than the dimension of the hollow in the outer handle (3) for the supplementary square bar (11).

[0016] Another feature of the invention is that the edges of the longitudinal slot (11b) have grooves (11d) that are arced in the longitudinal direction.

[0017] Figures 2 to 5 illustrate the assembly and function of the clutch as per the invention. Figure 2 shows the disengaged position, when the sliding radial pin (6) is in the retracted position and the torsion spring (7) is in its natural resting state; when the motor (4) is energised and the sliding radial pin (7b) cannot move forward, the first end (7b) of the torsion spring (7) moves up the spindle (4a) and tensions the second end (7c) of the torsion spring (7) so that, as soon as possible, it drives the output of the sliding radial pin (6) to bring about the engaged position shown in figure 4; figure 5 shows the opposite state to the previous state, when elastic charge on the second end (7c) of the torsion spring (7) is built up to carry out the disengagement action as soon as the sliding radial pin (6) is able to move back to the rest position shown in figure 2.

[0018] Figures 6 to 10 show the structure and mutual assembly between the supplementary square bar (11) for the outer shaft (2) and the band-like fork (12). With regard to the supplementary square bar (11), figure 6 clearly shows the longitudinal slot (11b) with its widenings (11c) and arced grooves (11d) and - in conjunction with

figure 10 - shows the slot (11a) for the outer square shaft (2). With regard to the band-like fork (12), its configuration is clearly shown in figures 7 and 9. Figure 10 illustrates the operative assembly of the involved parts, whereby the tabs (12a) are guided into the longitudinal slot (11b) until the internal protrusions (12c) of the fork (12) are coupled into the widenings (11c) of this longitudinal slot (11b). This achieves fixation that is so robust that the assembly can be transported without any risk of the band-like fork (12) coming off unintentionally; figure 10 clearly shows the fold at the peak (12d) of the branches of the band-like fork (12).

[0019] Figures 11 and 12 illustrate the coupling in the handle (3). The blow-up clearly shows how the insertion of the stud bolt (15) deforms the edges of the opening (12b), causing them to wedge onto the edges of the longitudinal slot (11b); the arced grooves (11d) encourage and consolidate the wedging effect.

Claims

1. A clutch device for use in electric mortise locks with an anti-panic function, comprising, at the least,

an inner square shaft (1) in which an inner grip comprising a handle or knob is installed,
an outer square shaft (2) with an outer handle (3), and
an electric motor (4) with an output spindle (4a) for the actuation of the actual clutch device,

whereby the terms "inner" and "outer" respectively refer to the inside and outside of the lock, the clutch device being **characterised by**

a radial centre rest (5), a radial pin (6), a torsion spring (7), a follower (8) that actuates the lock bolt, a supplementary outer follower part (9), an outer washer (10), a supplementary square bar (11) for the outer shaft (2), and a right-angled U-shaped band-like fork (12) that - between its branches - has a gap adjusted in line with the thickness of the supplementary square bar (11),

whereby

the radial centre rest (5) has a curved/concave front (5b) with the same radius as the central axial hole (8b) of the follower (8), has a thickness in accordance with the width of the radial notch (8c) in the follower (8) in which this radial centre rest (5) is housed, and is positioned between the tang of the radial pin (6) and the second end (7c) of a torsion shaft (7a) and that has a first end (7b) joined to the spindle (4a) of the electric motor (4), and whose second end (7c) extends through a filled lug (5a) in the radial centre rest (5),

the follower (8) has a radial opening (8a) that is

connected with the radial notch (8c) and the central axial hole (8b) which, in its central inner body, has a permanent connection to the inner square shaft (1) via a supplementary inner follower part (13) and an inner washer (14),

the radial pin (6) has an arced front (6a) with the same radius as the central axial hole (8b) of the follower (8) and - to the rear - is supported against the curved/concave front (5b) of the radial centre rest (5), which is connected to the second end (7c) of the torsion spring (7), whilst this radial pin (6) has a section in accordance with the said radial opening (8a) in which it is housed, and

the outer square shaft (2) is permanently coupled with the supplementary outer follower part (9) and - via the outer washer (10) - with a slot (11a) cut into the inner end of the supplementary square bar (11).

2. A clutch device for use in electric mortise locks with anti-panic function in accordance with claim 1, **characterised in that** the entire width of the supplementary square bar (11) is slit by a longitudinal slot (11b) with a width slightly smaller than the diameter of a stud bolt (15) that faces it and which goes through the outer handle (3), both branches of the fork (12) are positioned against the faces of the supplementary square bar (11) which have a longitudinal slot (11b), with the branches having tabs (12a) at the end that point to the inside of the fork (12) and which have a width in accordance with that of the longitudinal slot (11b) in the supplementary square bar (11), the branches also being perforated along their length by tracks (12b) that travel the length of the sides of the longitudinal slot (11) and are appropriately more narrow than this slot and, at their outer end, these branches form opposing protrusions (12c) that point towards the inside of the fork (12) and which are dimensioned in accordance with the widenings (11c) in the longitudinal slot (11b).
3. A clutch device for use in electric mortise locks with anti-panic function in accordance with the previous claims, **characterised in that** in the proximity of the tabs (12a) the branches of the band-like fork (12) form a fold at the peak (12d) so that between the two branches there is a distance that is suitably larger than the dimension of the hollow in the outer handle (3) for the supplementary square bar (11).
4. A clutch device for use in electric mortise locks with anti-panic function in accordance with the previous claims, **characterised in that** the edges of the longitudinal slot (11b) have grooves (11d) that are arced in the longitudinal direction.

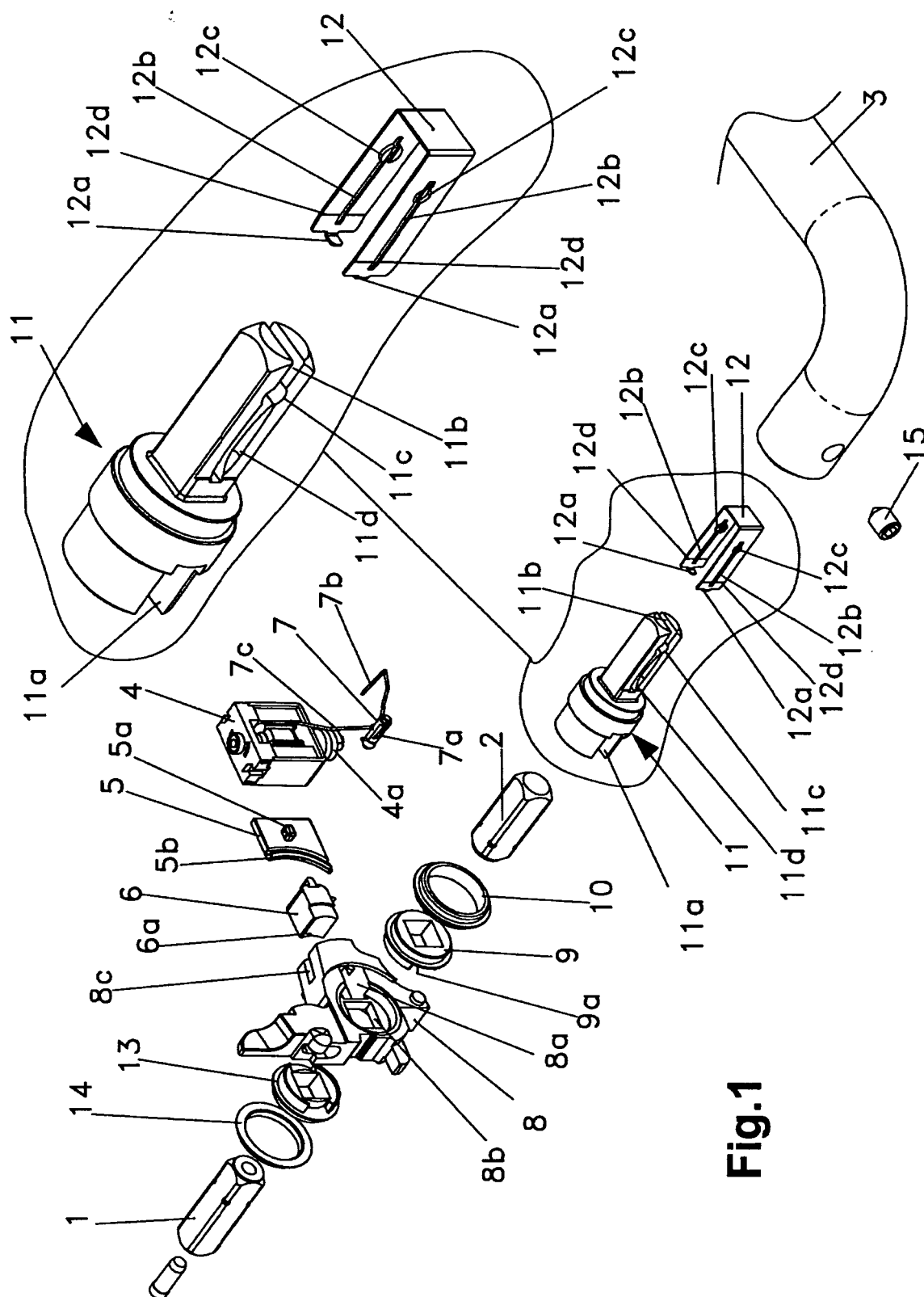


Fig.1

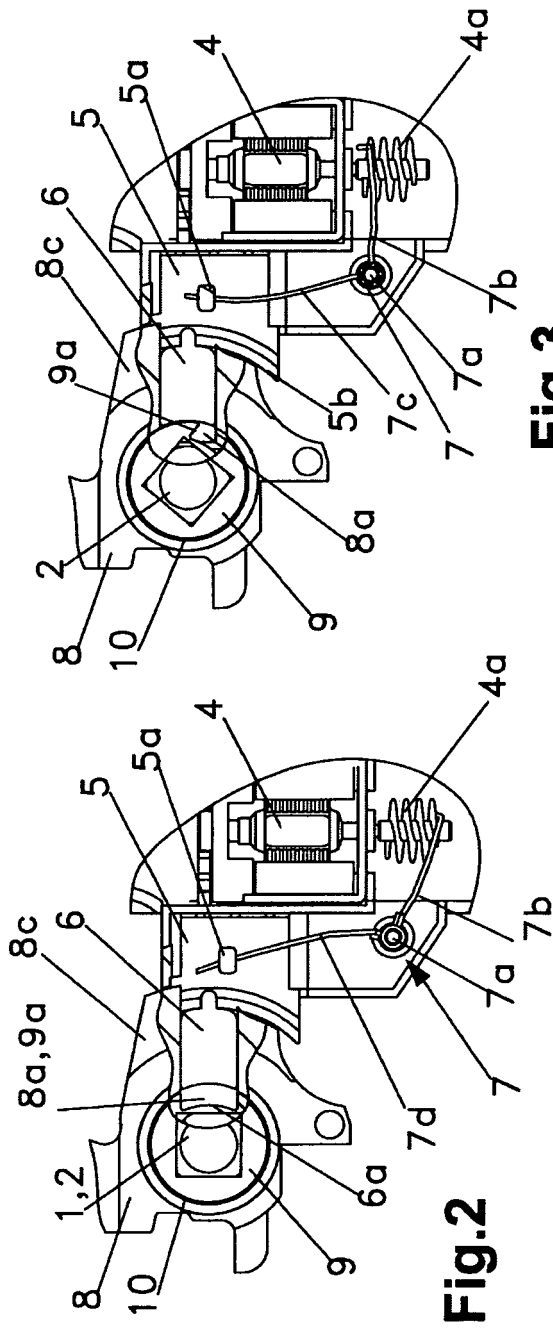


Fig. 3

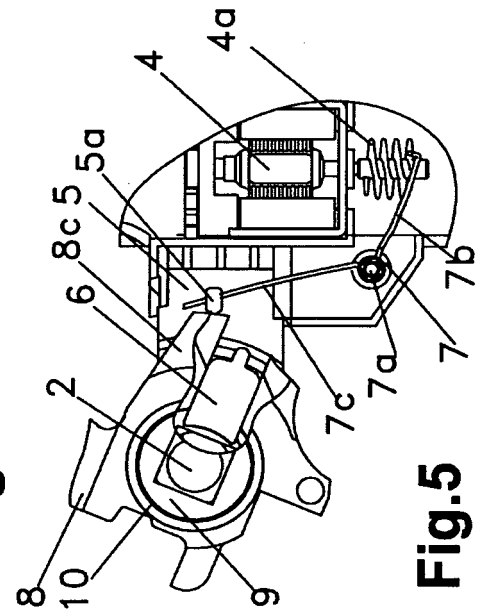
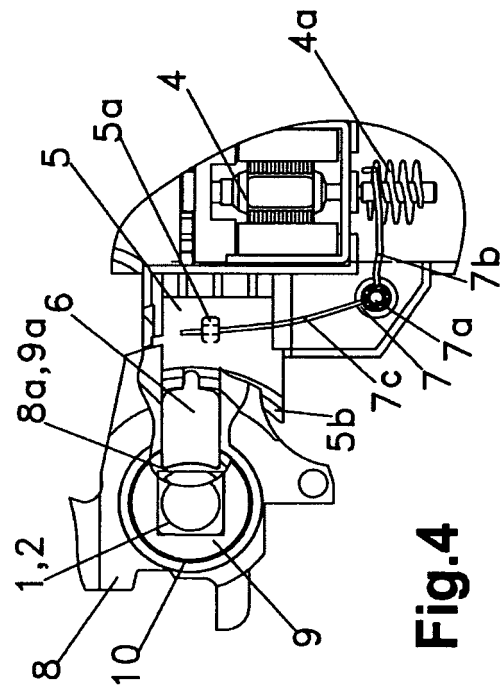
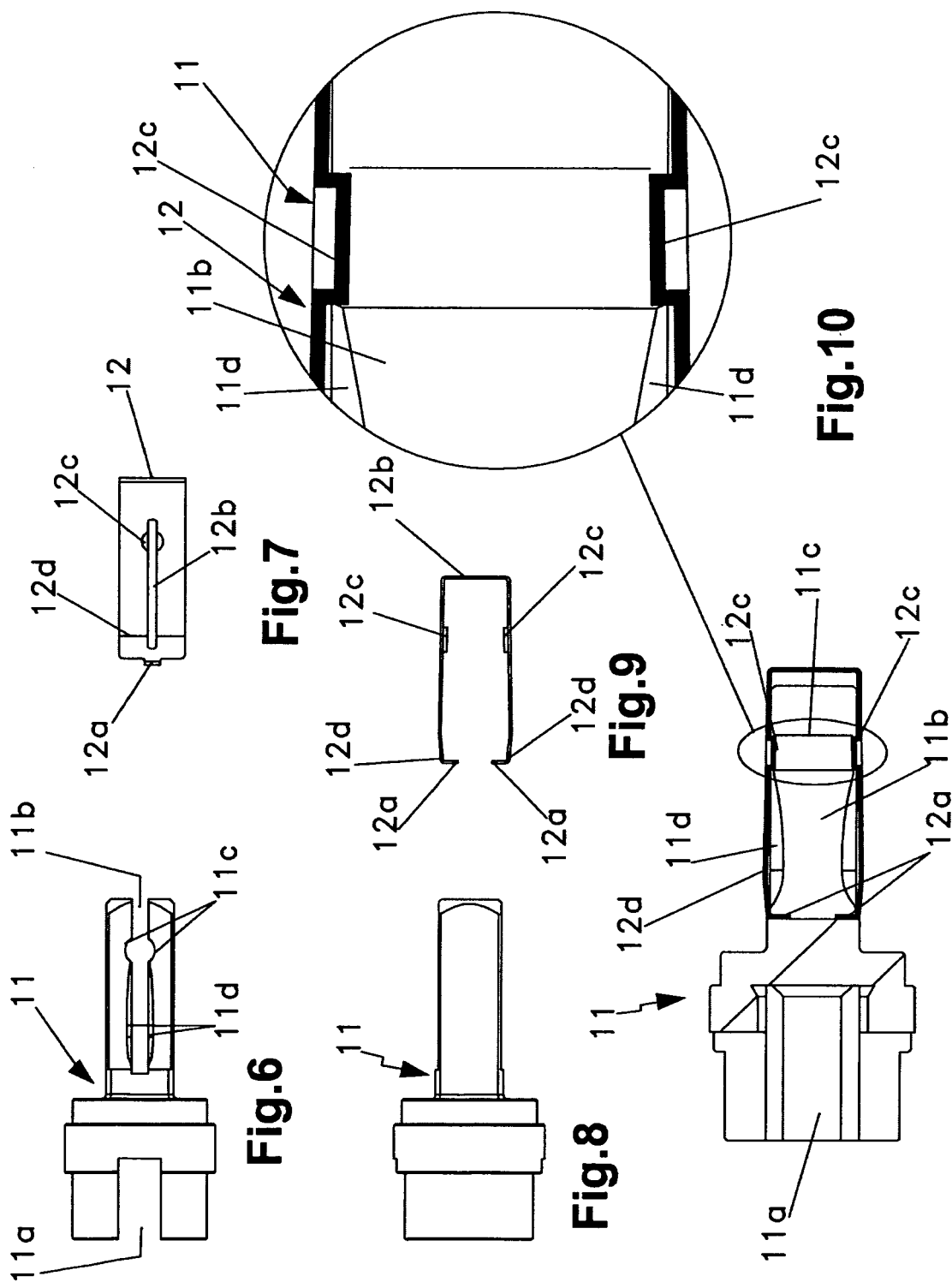


Fig. 5





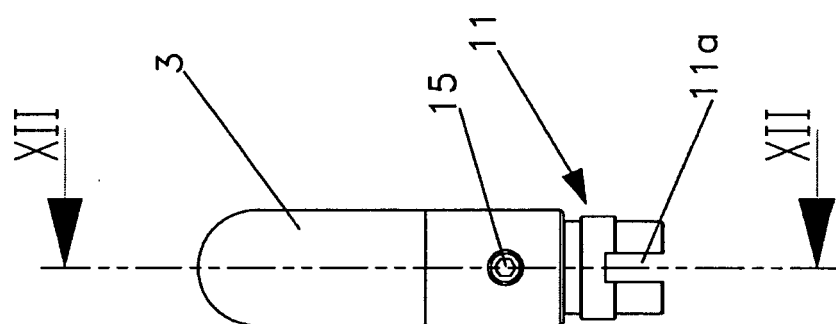


Fig.11

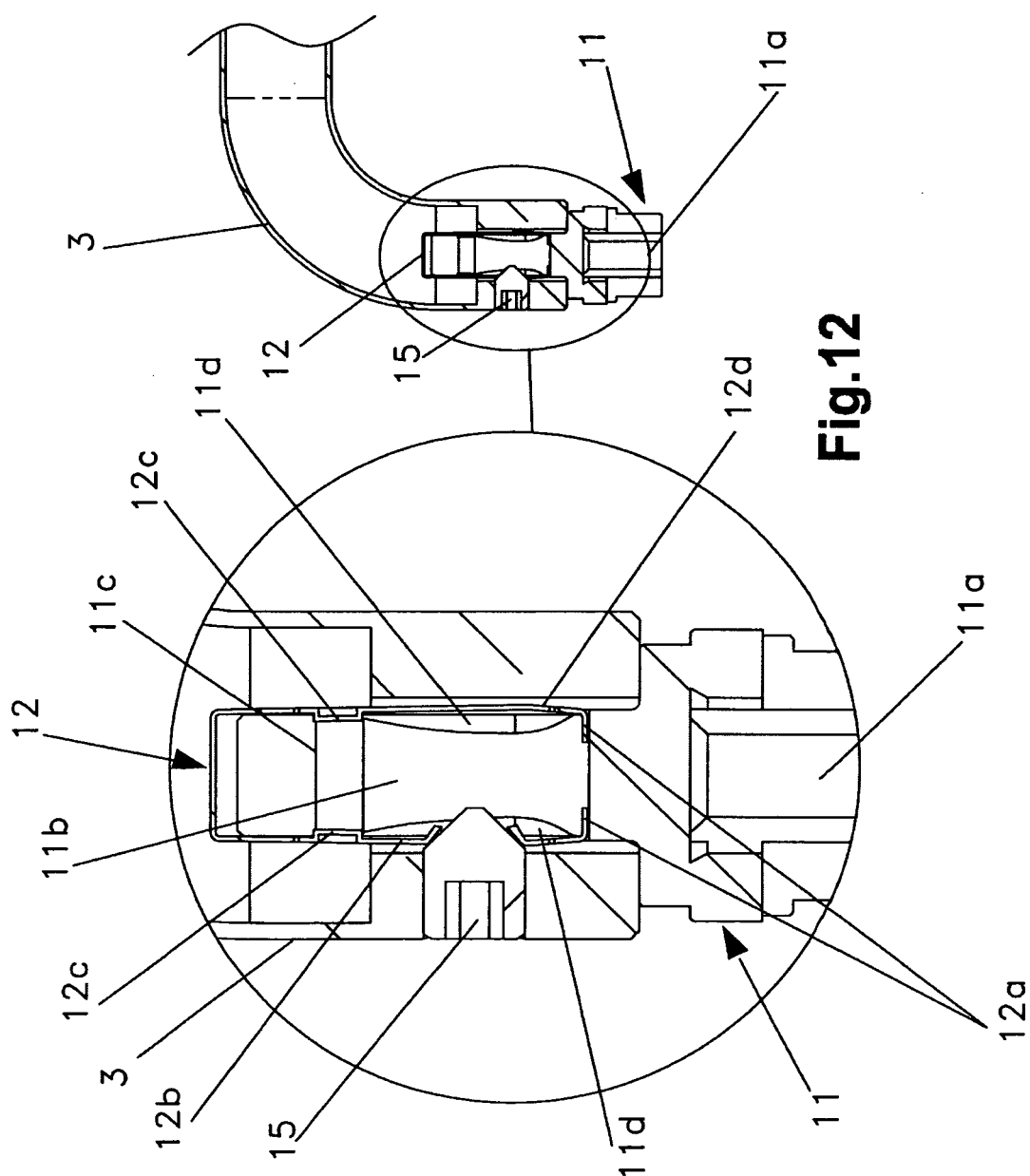


Fig.12

INTERNATIONAL SEARCH REPORT

International application No.

PCT/ ES 2010/000206

A. CLASSIFICATION OF SUBJECT MATTER

see extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

e05b

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

INVENES, EPODOC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:	"I"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance.		
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Date of the actual completion of the international search

23.July.2010 (23.07.2010)

Date of mailing of the international search report

(06/08/2010)

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/ES 2010/000206

C (continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of documents, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/ ES 2010/000206

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CLASSIFICATION OF SUBJECT MATTER

E05B 47/00 (2006.01)

E05B 65/10 (2006.01)

E05B 3/10 (2006.01)