(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 299 037 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
23.03.2011 Bulletin 2011/12

(51) Int Cl.:
E05B 3/04 *(2006.01)*

(21) Application number: **10176654.1**

(22) Date of filing: **14.09.2010**

(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
Designated Extension States:
BA ME RS

(30) Priority: **14.09.2009 IT BS20090168**

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(54) Mechanical interconnection device for coupling with an hollow body

(57) A mechanical interconnecting device (1) for coupling with a hollow body (5) exhibiting a cavity (6), in particular for a handle for doors, the device comprising a stem (2) having a prevalent longitudinal development (3) provided with a first end (4) destined to be inserted in and extracted from the cavity (6) along a sliding direction (7) parallel to the longitudinal development axis (3), the first end comprising a seating having an opening (13) at an external surface (14) of the first end, the device further comprising a retaining element (50) having a predetermined perimeter edge (11) and being housed, at least partially, in the seating (12), where the seating (12) is configured to enable displacement of the retaining element (50) at least between a first operating position in which the retaining element (50) is arranged such as to enable sliding of the stem (2) into the cavity (6) along the sliding direction (7) and at least a second operating position in which at least a portion of the edge (11) of the retaining element (50) abuts on an internal surface (6a) of the cavity (6) and a lower end (52) of the retaining element (50) abuts on a bottom surface (21) of the seating (12) in order to prevent extraction of the stem (2) from the hollow element (5).

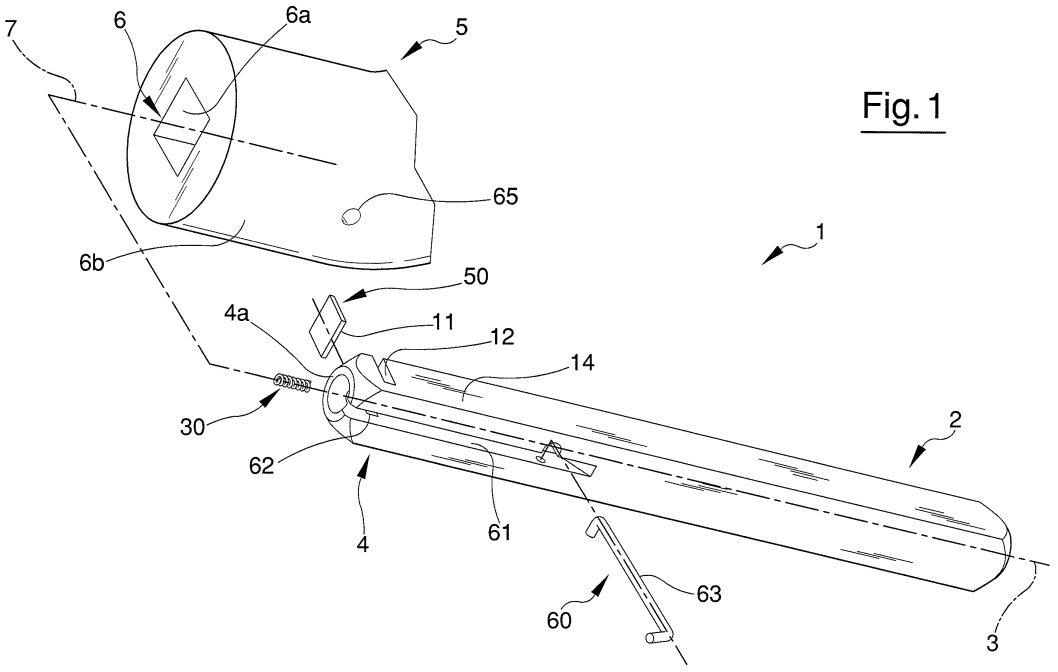

Fig. 1

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Description

[0001] The present invention relates to a mechanical interconnecting device for coupling with a hollow body. The invention is applicable for example in realising a mechanical interconnecting and/or fixing device for mounting handles on doors.

[0002] In the prior art, handles for doors are generally mounted on respective stems by inserting the stems in interconnecting openings afforded on a body of the handles and fixing the handles on the stems by means of fastening worm screws which are inserted and screwed in respective holes realised on the handle body. The worm screw is thus screwed up to constraining the stem internally of the handle body, possibly at a housing seating afforded on the stem, thus fastening handle and stem.

[0003] The known devices exhibit some drawbacks, in particular in relation to the laboriousness of the mounting and/or demounting operations of the handles on relative stems. To constrain or deconstrain the handle from the relative stem, the operator has to insert the stem in the coupling opening and then screw the worm screw, which is small, up to obtaining a correct handle mounting. The mounting operation is therefore laborious and requires times that while not long in a case of a single handle becomes relevant if we consider that often numerous handles are mounted contemporaneously on the doors of new buildings or in a case of replacement thereof.

[0004] Further, where an existing handle has to be replaced, it is first necessary to unscrew the screw from the old hand and then remount the new handle by screwing up the relative screw. Further, mounting with a fastening screw is unstable due to the limited area of the external surface of the stem on which the screw tightens, such as to operate the fastening of handle and stem, and is also subject to a build-up of mechanical play between stem and handle, following a high number of rotations of the handle, which can compromise the functioning of the mechanism.

[0005] Further, when the fastening of the screw is done at a housing seating afforded on the stem, the length of the portion of stem to be inserted in the handle body, which guarantees a correct interconnection of stem and handle, is fixed by the position of the housing seating of the screw.

[0006] In this situation the technical task at the basis of the present invention is to make available a mechanical interconnecting device with a hollow element which can obviate one or more of the above-cited drawbacks.

[0007] In the ambit of the technical task, one of the aims of the present invention in one or more of its various aspects is to realise a mechanical interconnecting device which is usable for mounting a handle for doors.

[0008] One of the possible aims of the present invention in one or more of its various aspects is to provide a mechanical interconnecting device able to considerably accelerate and simplify the mounting and/or demounting operations of the handles to doors (and/or in general hollow elements).

[0009] A possible aim of the present invention in one or more of its various aspects is to make available a mechanical interconnecting device which is usable with any handle and/or hollow element.

[0010] A further possible aim of the present invention in one or more of its various aspects is to provide a mechanical interconnecting device which is usable with handles having a coupling cavity exhibiting different depth.

[0011] A further possible aim of the present invention in one or more of its various aspects is that it makes available a mechanical interconnecting device which is more reliable and/or subject less to mechanical wear phenomena and/or requires little or no maintenance.

[0012] A further possible aim of the present invention in one or more of its various aspects is to make available a mechanical interconnecting device which is of simple and/or economical design and/or realisation and/or installation and/or configuration and/or operation and/or maintenance and/or storage and/or transport and/or elimination.

[0013] One of more of the above aims, which will better emerge during the course of the following description, are substantially attained by a mechanical interconnecting device with a hollow element as in one or more of the accompanying claims, each of which taken alone (without the relative dependent claims) or in any combination with the other claims, as well as according to the following aspects, variously combined, even with the above-mentioned claims.

[0014] In an aspect, the invention relates to a mechanical interconnecting device with a hollow element having a cavity, the device comprising a stem having a prevalent longitudinal development axis and provided with a first end destined to be inserted in and extracted from the cavity along a sliding direction parallel to the longitudinal development axis, the first end comprising a seating having an opening at an external surface of the first end, the device further comprising a retaining element having a predetermined perimeter edge and housed at least partly in the seating, where the seating is configured such as to enable a displacement of the retaining element at least between a first operating position in which the retaining element is arranged such as to enable sliding of the stem into the cavity of the hollow element along the sliding direction and at least a second operating position in which at least a portion of the edge of the retaining element abuts on an internal surface of the cavity and a lower end of the retaining element abuts on a bottom surface of the seating in order to prevent extraction of the stem from the element.

[0015] In an aspect the seating is afforded in a terminal portion of the first end.

[0016] In an aspect the seating is configured such as to enable displacement of the retaining element into a third decoupled position which is distinct from the first two. Typically, in at least the third decoupled position, or at least the third and the second, or in all three of the

positions, the retaining element is arranged such that a portion of the edge thereof exits from the stem area. Typically the portion of the retaining element which exits from the stem area is greater in the third decoupled position than in the first two operating positions.

[0017] In an aspect the seating has a front rest surface, a rear rest surface, facing and retracted with respect to the front surface in an insertion direction along the sliding direction, and a bottom surface interposed between the front surface and the rear surface.

[0018] The rear surface of the seating can advantageously be parallel to the front surface.

[0019] In an aspect the front surface of the seating has an upper edge in common with the external surface of the stem and a lower edge, for example in common with the bottom surface.

[0020] In an aspect, the distance between the front surface and the rear surface is greater than or equal to about 1.5 times the longitudinal thickness of the retaining element, preferably greater than or equal to twice the thickness. In an aspect, the distance is smaller than or equal to 3.5 times the longitudinal thickness of the retaining element, preferably less than or equal to about 3 times the thickness.

[0021] In an aspect, the front surface has a dimension, from the upper edge to the lower edge, which is greater than or equal to about once the distance between the front and rear surface, preferably greater than or equal to 1.5 times. In an aspect, the front surface has the dimension that is smaller than or equal to about 3 times the distance between the front and rear surface, preferably less than or equal to twice.

[0022] In an aspect, the bottom surface of the seating has a front edge, for example in common with the front edge and/or a rear edge, for example in common with the rear surface.

[0023] In an aspect the front and/or rear surface of the seating is inclined to an angle comprised between 4° and 15°, and preferably between 5° and 9°, with respect to an orthogonal plane arranged perpendicular to the longitudinal development axis and with the upper edge more retracted from the lower edge with respect to a terminal surface of the first end of the stem.

[0024] In an aspect the front surface of the seating, and/or the rear surface and/or the bottom surface is substantially flat.

[0025] In an aspect the seating is orientated in such a way that there exists at least a straight line lying on the front surface and/or a straight line lying on the rear surface and/or a straight line lying on the bottom surface, perpendicular to the sliding direction.

[0026] In an aspect the bottom surface of the seating forms, with the front surface, an angle comprised between 95° and 105°.

[0027] In an aspect, the retaining element has a substantially plate-shaped conformation which preferably exhibits a quadrangular plan.

[0028] In an aspect the retaining element is provided with an upper end at the seating opening, and a lower end, opposite the upper end, at the bottom surface of the seating. Typically the edge portion belongs to the upper end.

[0029] In an aspect the retaining element has a front surface facing towards the front surface of the seating and a rear surface facing toward the rear surface of the seating.

[0030] In an aspect the retaining element has an upper surface which is substantially perpendicular to the above-cited front surface and rear surface and connecting the front and rear surfaces at the upper end (e.g. at the edge portion of the retaining element destined to abut against the internal surface). The upper surface is typically facing towards the outside of the stem.

[0031] In an aspect the upper end of the retaining element is provided with a first edge, for example in common between the front and upper surfaces of the retaining element, facing towards the terminal surface of the first stem end.

[0032] In an aspect, the lower end of the retaining element is provided with a second edge facing towards the terminal surface of the first end of the stem. The second edge can coincide with a lower edge of the front surface, for example coinciding with an edge of a lower surface.

[0033] In an aspect the device further comprises an elastic element, typically housed in the stem, interposed between the retaining element and the stem in order to maintain the retaining element pushing in the sliding direction and in the same direction as the sliding direction (or towards the front surface of the seating). The elastic element is preferably abutting the front or rear surface of the retaining element, preferably at the lower end.

[0034] In an aspect, the elastic element is a compression spring (e.g. arranged upstream of the retaining element with respect to the insertion direction) or a traction spring (e.g. arranged downstream of the retaining element with respect to the insertion direction).

[0035] In an aspect, the retaining element, when in the first operating position, has the upper end (e.g. the front surface or first edge) in contact with the front surface (e.g. the upper edge of the front surface) of the seating and with the lower end (e.g. the second edge) in contact with the bottom surface of the seating e.g. along a contact segment of the bottom surface arranged between the front and rear edges of the bottom surface at a certain distance from each edge.

[0036] In an aspect, in the first operating position the retaining element is preferably arranged in such a way as to form an angle comprised between -5° and +5° with respect to the perpendicular plane, the retaining element being preferably substantially perpendicular to the sliding direction.

[0037] In an aspect, in the first operating position the upper surface (or at least a portion of the upper surface) of the retaining element abuts against the internal surface of the cavity, when the stem is inserted in the cavity, and the two opposite edges of the upper surface are orien-

tated with respect to the internal surface in such a way as to enable dragging contact of the upper surface against the internal surface and thus the sliding of the stem internally of the cavity. Typically neither of the two edges exerts a shear action against the internal surface.

[0038] In an aspect, the retaining element is maintained in the first operating position, for example during extraction of the stem from the cavity, by the thrust exerted thereon by the elastic element, and the constraining reaction by the front surface (e.g. at the upper edge) on the upper end (e.g. on the front surface) of the retaining element and the constraining reaction by the bottom surface (e.g. at the contact segment of the bottom surface) on the lower end (e.g. on the second edge) of the retaining element. Typically the retaining element is also subjected to the constraining reaction of the internal surface of the cavity at the upper surface.

[0039] In an aspect the retaining element, when in the second operating position, is obliquely inclined (for example it forms an angle which is greater than or equal to +5°, preferably +7° and/or less than or equal to +20°, preferably +15%) with respect to the orthogonal plane, and the upper end (e.g. the first edge) of the retaining element is in contact with the internal surface of the cavity of the hollow element, when present, and the lower end (e.g. the second edge) of the retaining element is in contact with the bottom surface (e.g. along the front edge of the bottom surface). Typically, in the second position the first edge is further than the second edge from the terminal surface of the first end.

[0040] In an aspect, the retaining element, when in the second operating position, is destined to enable a progressive insertion of the stem internally of the cavity of the hollow element along an insertion direction and is destined to prevent extraction of the stem from the cavity along an extraction direction.

[0041] In an aspect, in the second operating position the retaining element is destined to interpose with all its length between the internal surface of the cavity and the bottom surface of the seating, such that a force applied to the stem for extraction thereof generates a torque force acting on the retaining element and such that the retaining element is subjected to mechanical constraints by the seating and the internal surface which prevent it from rotating following application of the above-mentioned torque force.

[0042] In an aspect, the retaining element in the second operating position is inclined by an angle which is such as to determine a shear action, by the first edge of the upper end, acting on the internal surface of the cavity of the hollow element and destined, e.g. when the stem is subjected to an insertion or extraction force or by effect of the thrust of the elastic element, to generate a constraining reaction on the retaining element by the internal surface.

[0043] In an aspect the retaining element is maintained in the second operating position when the stem is subjected to an extraction force from the cavity, as a consequence of a constraining reaction of the internal surface of the cavity on the first edge, the thrust exerted thereon by the elastic element and the constraining reaction of the bottom surface (e.g. along the front edge of the bottom surface) on the second edge of the retaining element. Typically the composition of these forces results in a torque force that would tend to rotate the element (e.g. about the contact segment of the bottom surface), in the direction which corresponds to the nearing of the first edge to the terminal surface of the first end of the stem. This rotation is not enabled when the retaining element is in the second operating position (with the stem inserted in the cavity) given the blocking of the first edge against the internal surface and the blocking of the second edge on the bottom surface, and thus the impossibility that the retaining element can occupy a more rotated position in the direction that corresponds to the nearing of the first edge to the terminal surface.

[0044] Typically the snagging of the retaining element in this condition determines, consequent to a force on the stem in the extraction direction, an unloading of the forces on the structure of the retaining element, which is subjected to a compression and flexion stress.

[0045] In an aspect, the retaining element is maintained in the second operating position when the stem is subjected to a force in the insertion direction of the stem into the cavity, as a consequence of the constraining reaction of the internal surface of the cavity on the first edge, the thrust exerted thereon by the elastic element and the constraining reaction of the bottom surface (e.g. along the front edge of the bottom surface) on the second edge of the retaining element.

[0046] Typically in this configuration the constraining reaction of the internal surface on the first edge is directed into the opposite semi-space, with respect to the orthogonal plane, to that in which the terminal surface of the first end of the stem and the second edge is blocked striking on the bottom surface of the seating by effect of the thrust generated by the elastic element. Typically the composition of the above forces results in a torque force which tends to rotate the element about the contact segment of the bottom surface, in the direction to which corresponds the distancing of the first edge with respect to the terminal surface of the first end of the stem. This rotation determines an elastic response of the elastic element and a slight retraction, in the seating, of the upper end of the retaining element from the front surface the retaining element being thus able to drag, at the first edge, on the internal surface of the cavity during insertion of the stem.

[0047] In an aspect, the second operating position, in which the stem is subjected to a force in the insertion direction, is slightly different from the above-described second operating position in which the stem is subjected to a force in the extraction direction. Typically in the second operating position in which the stem is subjected to a force in the insertion direction the retaining element is slightly rotated with respect to the second operating po-

sition in which the stem is subjected to a force in the extraction direction, such that the first edge is slightly more retracted with respect to the terminal surface of the first end.

[0048] In an aspect, the dragging of the retaining element on the internal surface is enabled by the fact that the elastic thrust of the spring is smaller than the thrust on the stem during insertion. Typically the size and/or pre-load of the spring determines the force necessary for insertion of the stem into the cavity.

[0049] In an aspect, the retaining element, when in the third decoupled position, is arranged, in consequence of the thrust external thereon by the elastic element, with the front surface thereof resting (e.g. in contact with) on the front surface of the seating. Typically, in the third position the lower end of the retaining element (e.g. the second edge) is in contact with the bottom surface (e.g. along the front edge of the bottom surface). Typically the retaining element in the third decoupled position exits more from the stem area with respect to the dimension of the opening of the cavity (on the perpendicular plane) into which the stem is inserted.

[0050] In an aspect, during insertion of the first end of the stem into the cavity of the hollow element, the retaining element is pushed by the edge of the cavity of the hollow element at the portion of edge which exits and is taken from the third decoupled position to the second operating position e.g. via rotation about the second edge.

[0051] In an aspect, the device further comprises unhooking means, preferably housed in the stem, destined to exert a push on the retaining element in order to displace it from the second to the first operating position.

[0052] In an aspect the stem is provided with an activating opening destined to enable activation of the unhooking means housed in the stem, and the activating opening is afforded in a portion of the first end of the stem opposite the opening of the seating on the external surface of the stem.

[0053] In an aspect, the stem is provided with a through-cut at the lower edge of the front surface (i.e. the front edge of the bottom surface) and the cut enables the retaining element to be placed in contact with the unhooking means.

[0054] In an aspect, the unhooking means comprise a lever (e.g. a third-type lever), typically arranged parallel to the sliding direction, comprised in the area of the stem, and the lever is mobile, by effect of an external unhooking thrust, at least between a first rest position, in which the lever does not exert a thrust on the retaining element, and an unhooked position, rotated with respect to the rest position, in which the lever exerts a thrust on the retaining element, at least when the retaining element is in the second position. The movement of the lever preferably occurs in a perpendicular plane to the orthogonal plane.

[0055] In an aspect, the stem comprises a hole (having an axis lying on a parallel plane to the orthogonal plane of the stem) destined to house a first end of the lever which acts as a fulcrum in the rotary movement of the lever.

[0056] In an aspect, the lever further has a second end, longitudinally opposite the first end, destined to enter into contact with the retaining element (e.g. through the cut) and able to determine, when the lever is in the unhooked position, a displacement thereof from the second operating position to the first operating position.

[0057] In an aspect the second end of the lever acts, when in the unhooked position, on the lower end of the retaining element and opposes the forces, exerted by the elastic element and the internal surface of the cavity of the hollow element on the retaining element, which maintain the retaining element in the second operating position, determining passage of the retaining element into the first operating position.

[0058] In an aspect, the second end of the lever exhibits an inclined portion with respect to the orthogonal plane and the sliding direction, destined to enter into contact with the second edge of the retaining element in order to push it distancingly from the lower edge of the front surface of the seating. In an aspect, the thrust of the lever, destined to determine the passage of the lever from the rest position to the unhooked position, is a manual thrust and/or is effected by means of a mechanical tool. In an aspect, the thrust on the lever is directed along the orthogonal plane of the stem. In an aspect, the thrust exerted by the elastic element on the retaining element in contact with the second end of the lever in the cut, maintains the lever in the rest position, or determines the passage of the lever from the unhooked position to the rest position when there is not an external unhooking thrust.

[0059] In an aspect, the invention relates to an assembly comprising an interconnecting device, as in any one of the claims and/or the aspects cited above and/or any combination thereof, and the hollow element.

[0060] In an aspect the hollow element comprises an unhooking opening at the activating opening of the stem, when the stem is inserted in the hollow element, the hollow element passing from the external surface to the internal surface of the cavity, such that the activating of the unhooking means is done via the opening.

[0061] In an aspect, the invention relates to an assembly comprising the above-described assemble and in which the hollow element is part of a handle for doors.

[0062] In an aspect, the invention relates to a method for mounting a handle for doors, with a device as in any one of the claims and/or the above-described aspects and/or any combination thereof, comprising steps of mounting the stem to a door, inserting the first end of the stem in a cavity of a door handle by acting on the handle in order to push the stem internally of the cavity such as to determine the passage of the retaining element from the third decoupled position to the second operating position, and preferably pushing the stem by a determined amount through the cavity of the door handle.

[0063] Further characteristics and advantages will

more fully emerge from the detailed description that follows of some embodiments, among which also a preferred though not exclusive embodiment of a device for door handles as in the present invention. This description will now follow, with reference to the accompanying figures of the drawings, provided purely by way of non-limiting example, in which:

figure 1 is a perspective exploded view of a possible embodiment of the mechanical interconnecting device of the present invention;
figure 2 is a partial longitudinal section view of the device of figure 1;
figure 2a is a longitudinal section view of a portion of the device of figure 2, with some parts removed;
figure 3a is a longitudinal section view of the device of figure 1 in the condition in which the stem is inserted in the cavity of the hollow element and the retaining element is in a first operating position;
figure 3b is a longitudinal section view of the device of figure 1 in the condition in which the stem is inserted in the cavity of the hollow element and the retaining element is in a second operating position;
figure 3c is a longitudinal section view of the device of figure 1 in the condition in which the stem is removed from the body of the device and the retaining element is in a third decoupled position;
figure 3d is a longitudinal section view of a first variant of the device;
figure 3e is a longitudinal section view of a second variant of the device;
figure 3f is a longitudinal section view of a third variant of the device.

[0064] With reference to the accompanying figures of the drawings, a mechanical interconnecting device with a hollow element of the present invention is denoted in its entirety by reference number 1. In general, the same reference number is retained for elements which are the same or alike in the various variant embodiments.

[0065] The device 1 comprises a stem 2 having a prevalent longitudinal axis 3 and provided with a first end 4 destined to be inserted into and extracted from the cavity 6 of a hollow element 5 along a sliding direction 7 which is parallel to the longitudinal development axis 3, the first end 4 comprising a seating 12 having an opening 13 at an external surface 14 of the first end 4. The device 1 further comprises a retaining element 50 having a predetermined perimeter edge 11 and housed, at least partially, in the seating 12, as illustrated by way of example in figures 2 and 2a. In greater detail, the seating 12 is configured such as to enable displacement of the retaining element 50 at least between a first operating position (illustrated in figure 3a) in which the retaining element 50 is arranged such as to enable sliding of the stem 2 into the cavity 6 of the hollow element 5 along the sliding direction 7 and at least a second operating position (illustrated in figure 3b) in which at least a portion of the edge 11 of the retaining element 50 abuts an internal surface 6a of the cavity 6 and a bottom surface 21 of the seating 12 in order to prevent extraction of the stem 2 from the element 5. The shape of the stem section 2 and the cavity 6 complementarily-shaped thereto can preferably be any shape suitable for the objective, for example square (as in the embodiment of the figures), rectangular, circular, elliptic, triangular, polygonal, etc.

[0066] The seating 12 is preferably afforded in a terminal portion of the first end 4. The seating 12 can advantageously be configured such as to enable displacement of the retaining element 50 into a third decoupled position (illustrated in figure 3c), different from the first two positions. Typically, in at least the third but also the third and second or in all three positions, the retaining element 50 is arranged such that a portion of the edge 11 exits from the stem 2 area. Typically, as shown by way of example in figure 3c (in which the edge portion 11 exiting from the stem 2 area has been deliberately enlarged for the purpose of illustration) the portion of the retaining element 50 which exits from the stem 2 area is greater in the third decoupled position than in the first two operating positions.

[0067] As shown by way of example in the figures, the retaining element 50 preferably has a substantially plate conformation.

[0068] The retaining element 50 preferably has any plan configuration suitable for the purpose, for example square (as in the embodiment of the figures), rectangular, circular, elliptic, triangular, polygonal, etc.

[0069] The retaining element 50 can have an overall conformation which is different from the one illustrated; for example it can be spherical, or another shape. In these cases the conformation of the seating 12 can be suitably adapted to the conformation of the retaining element.

[0070] The seating 12 afforded in the stem 2 has a front rest surface 20, a rear surface 22, facing and retracted with respect to the front surface 12 relative to an insertion direction 7a along the sliding direction 7, and the bottom surface 21 interposed between the front and rear surfaces. These surfaces 20, 21 and 22 can advantageously be flat. In greater detail, the front surface 20 has an upper edge 20a, in common with the external surface 14 of the stem 2, and a lower edge 20b in common with the bottom surface 21. The bottom surface 21 preferably has a front edge 21 a in common with the front surface 20 and a rear edge 21 b in common with the rear surface 22. The lower edge 20b of the front surface 20 preferably coincides with the front edge 21 a of the bottom surface 21.

[0071] In the embodiment of the figures, the distance between the front surface 20 and the rear surface 22 is preferably 2.6 times the longitudinal thickness of the retaining element 50. By way of example, this thickness is about 0.9 mm and the distance is about 2.5 mm.

[0072] The front surface 20 of the seating 12 preferably has a dimension, from the upper edge 20a to the lower edge 20b, which is about 1.8 times the distance between

the front surface 20 and the rear surface 22. By way of example, this dimension is about 4.5 mm.

[0073] In greater detail, as illustrated in figure 1, the retaining element has a plate conformation with a square plan, with a base side of about 5 mm. The distance between the bottom surface 21 and the opening 13 on the external surface 14 of the stem 2 is preferably greater than half the longitudinal dimension of the stem 2 along a section that is perpendicular to the longitudinal development axis 3.

[0074] The front surface 20 and the rear surface 22 are preferably inclined by an angle of about 7°, as shown in the figures, with respect to an orthogonal plane 70 arranged perpendicular to the longitudinal development axis 3 and with the upper edge 20a more retracted than the lower edge 20b with respect to a terminal surface 4a of the first end 4 of the stem 2. This can advantageously enable obtaining a positioning of the retaining element in the first operating position, which is substantially perpendicular to the sliding direction 7, an advantageous condition for the purposes of the functioning of the device, as will more fully emerge herein below.

[0075] The rear surface 22 of the seating 12 can advantageously be parallel to the front surface 20.

[0076] The seating 12 is preferably orientated such that there exists at least a straight line lying on the front surface 20, a straight line lying on the rear surface 22 and a straight line lying on the bottom surface 21 perpendicular to the sliding direction 7.

[0077] The bottom surface 21 preferably forms, with the front surface 20, an angle of about 100°, as in the embodiment shown in the figures. The angle advantageously increases the depth of the seating 12 progressively from the front surface 20 to the rear surface 22, and this can enable having an internal space in the seating 12, at the bottom thereof, which is useful for housing the retaining element 50 in its roto-translation during passage from the second to the first operating system, as will be more fully described herein below.

[0078] The lower edge 20b and the rear edge 21 b preferably lie on parallel planes with opposite surfaces of the external surface 14 of the stem 2. The retaining element 50 is provided with an upper end 51, at the opening 13, and a lower end 52, opposite the upper end 51, at the bottom surface 21 of the seating 12. Typically, the above-described edge portion belongs to the upper end. The retaining element 50 preferably further has a front surface 53 facing towards the front surface 20 of the seating 12 and a rear surface 54 facing towards the rear surface 22. The retaining element preferably has a further upper surface 55 substantially perpendicular to the front 53 and rear 54 surfaces and connecting the above-mentioned front 53 and rear 54 surfaces at the upper end 51 (e.g. at the portion of edge 11 destined to abut against the internal surface 6a). The upper surface 55 is typically facing towards the outside of the stem 2. The upper end 51 is preferably provided with a first edge 51 a, in common between the front 53 and upper 55 surfaces, facing towards the terminal surface 4a of the first end 4 of the stem 2. The lower end 52 is preferably provided with a second edge 52a facing towards the terminal surface 4a of the first end 4 of the stem 2 and coinciding with a lower edge of the front surface 53.

[0079] The device 1 can further advantageously comprise an elastic element 30, typically housed in the stem 2, interposed between the retaining element 50 and the stem 2 in order to keep the retaining element 50 pushing in the sliding direction 7 and in the inserting direction 7a (e.g. towards the front surface 20). The elastic element can preferably be a compression spring (as in the embodiment illustrated in the figures) or a traction spring. As shown in the figures, the spring can advantageously be located in a central position in the stem 2, for example along the longitudinal development axis 3. The compression spring can be arranged upstream of the retaining element 50 with respect to the insertion direction 7a, and abuts on the rear surface 54 at the lower end 52.

[0080] The retaining element 50 is preferably arranged, when in the first operating position (illustrated in figure 3a), with the front surface 53 in contact with the upper edge 20a of the front surface 20 of the seating 12 and with the second edge 52a in contact with the bottom surface 21, along a contact segment belonging to the bottom surface 21 and arranged at a certain distance between the front edge 21 a and the rear edge 21 b. In this configuration, the retaining element 50 is preferably arranged substantially perpendicular to the sliding direction 7.

[0081] In the first operating position the upper surface 55 (or at least a portion thereof) of the retaining element 50 is preferably abutting against the internal surface 6a, when the stem 2 is inserted in the cavity 6,and the two opposite edges of the upper surface are orientated, with respect to the internal surface 6a, such as to enable dragging contact of the upper surface 55 against the internal surface 6a and thus the sliding of the stem 2 internally of the cavity 6. Typically neither of the two edges exerts a shear action against the internal surface.

[0082] The retaining element 50 is preferably maintained in the first operating position during extraction of the stem 2 from the cavity 6 in consequence of the thrust exerted thereon by the elastic element 30, the constraining reaction by the front surface (typically as in figure 3a, at the upper edge) on the upper end of the retaining element (typically on the front surface) and the constraining reaction by the bottom surface (typically at the contact segment of the bottom surface) on the lower end of the retaining element 50 (typically on the second edge). Typically, the retaining element 50 is also subjected to the constraining reaction of the internal surface 6a of the cavity 6 at the upper surface 55.

[0083] As illustrated in figure 3a, in the first operating position the contact between the upper end 51 of the retaining element 50 and the internal surface 6a of the cavity 6 preferably takes place along the upper surface 55, such that the first edge does not interfere with the

internal surface, enabling sliding of the stem 12 internally of the cavity 6a.

[0084] In the first operating position the retaining element 50 is preferably arranged such as not to rotate during extraction of the stem 2 from the cavity 6a of the hollow element 6, in the direction corresponding to the nearing of the first edge 51 a with respect to the terminal surface 4a of the first end 4 of the stem 2 and during the insertion in the direction corresponding to the retraction of the first edge 51a with respect to the terminal surface 4a, in consequence of the mechanical constraints determined by the abutting of at least a portion of the upper surface 55 against the internal surface 6a of the cavity 6 and/or the resting of the second edge 52a on the bottom surface 21 and/or the resting of the first edge 51 a on the front surface 20.

[0085] The retaining element 50 in the second operating position is preferably inclined by an angle which is such as to determine a shear action by the first edge 51 a acting on the internal surface 6a of the cavity 6 and destined e.g. when the stem 2 is subjected to an insertion or extraction force, or by effect of the thrust of the elastic element 30, to generate a constraining reaction on the retaining element 50 by the internal surface 6a.

[0086] The retaining element 50 is preferably maintained in the second operating position, when the stem is subjected to an extraction force from the cavity 6 in consequence of the constraining reaction of the internal surface 6a on the first edge 51 a, of the thrust exerted thereon by the elastic element 30 and the constraining reaction of the bottom surface 21 on the second edge 52a. Typically the composition of the forces results in a torque which would tend to rotate the retaining element 50, for example about the contact segment of the bottom surface 21, in the direction corresponding to the nearing of the first edge 51 a to the terminal surface 4a of the first end 4. This rotation is not allowed when the retaining element 50 is in the second operating position (with the stem inserted in the cavity) given the blocking of the first edge 51 a against the internal surface 6a and the blocking of the second edge 52a on the bottom surface 21, and thus the impossibility for the retaining element 50 to occupy a more rotated position in the direction corresponding to the nearing of the first edge 51 a to the terminal surface 4a.

[0087] Typically the snagging of the retaining element 50 in this condition determines, in consequence of a force on the stem in the extraction direction, an unloading of the forces on the structure of the retaining element 50, which is subjected to a compression and flexion stress.

[0088] The retaining element 50 is preferably maintained in the second operating position when the stem is subjected to a force in the stem 2 insertion direction into the cavity 6, in consequence of the constraining reaction of the internal surface 6a on the first edge 51a, of the thrust exerted thereon by the elastic element 30 and the constraining reaction of the bottom surface 21 on the second edge 52a.

[0089] Typically in this configuration the constraining reaction of the internal surface 6a on the first edge 51a is directed into the opposite semi-space, with respect to the orthogonal plane 70, to the semi-space in which the terminal surface 4a of the first end 4 of the stem 2 is situated and the second edge 52a is blocked abutting on the bottom surface 21 of the seating by effect of the thrust generated by the elastic element 30. Typically the composition of the forces in this configuration results in a torque which tends to rotate the retaining element 50 about the contact segment of the bottom surface 21, in a direction corresponding to the retracting of the first edge 51 a with respect to the terminal surface 4a of the first end 4 of the stem. This rotation determines an elastic response of the elastic element 30 and a slight retraction, in the seating 12, of the upper end 51 of the retaining element 50 from the front surface 20, the retaining element 50 being thus able to drag, at the first edge 51a, on the internal surface 6a of the cavity 6 during insertion of the stem 2. The dragging of the retaining element 50 on the internal surface 6a is preferably enabled due to the fact that the elastic thrust of the spring is less than the thrust on the stem 2 during insertion.

[0090] The size and/or preloading of the spring preferably determines the force necessary for inserting the stem in the cavity. In greater detail, the imperceptible movement of the retaining element in the second operating position during insertion is possible only consequently of an inserting thrust of the stem which is greater than the thrust generated by the elastic element on the retaining element which maintains the first edge abutting on the internal surface.

[0091] The retaining element 50 is preferably arranged, when in the third decoupled position (illustrated in figure 3c) consequently of the thrust exerted thereon by the elastic element, with the upper surface 53 in contact with the front surface 20 of the seating 12.

[0092] Typically, in the third position, the second edge 52a is in contact with the bottom surface 21, for example along the front edge 21 a. Typically the retaining element 50 in this configuration exits from the stem area more greatly with respect to the dimension of the opening of the cavity 6 (on the perpendicular plane) in which the stem is inserted.

[0093] The device 1 can advantageously further comprise unhooking means 60, preferably housed in the stem 2, destined to exert a thrust on the retaining element 50 in order to displace it from the second to the first operating position. The stem 2 is preferably provided with an activating opening 61 afforded in a portion of the first end 4 which is opposite the opening 13 on the external surface 14 of the stem 2 and destined to enable activation of the unhooking means 60.

[0094] The stem 2 is preferably further provided with a through-cut 62, illustrated in figure 1, at the lower edge 20b and/or the front edge 21a which enables the retaining element 50 to be placed in contact with the unhooking means 60. The hooking means 60 can advantageously

comprise a lever 63, arranged parallel to the sliding direction 7, comprised in the stem 2 area. This lever 63 is mobile, by effect of an external unhooking thrust, at least between a first rest position, in which it does not exert a thrust on the retaining element 50, and an unhooked position, rotated with respect to the rest position, in which it exerts a thrust on the retaining element 50 at least when the retaining element is in the second position. The lever can be advantageously a lever of the third type. As in the embodiment illustrated in the figures, the movement of the lever 63 is performed in a perpendicular plane to the orthogonal plane 70.

[0095] The stem 2 preferably comprises a hole 64 (having an axis lying on a parallel plane to the orthogonal plane 70 of the stem 2) which is destined to house a first end 63a of the lever which acts as a fulcrum in the rotary movements of the lever 63.

[0096] The lever 63 can advantageously further have a second end 63b, longitudinally opposite the first end 63a, destined to enter into contact with the retaining element 50 (for example via the cut) and able to determine, when the lever is in the unhooked position, the displacement of the retaining element 50 from the second operating position to the first operating position.

[0097] The second end 63b preferably acts, when in the unhooked position, on the lower end 52 of the retaining element and opposes the forces, exerted by the elastic element 30 and the internal surface 6a of the cavity 6 on the retaining element 50, which maintain it in the second operating position, causing passage thereof into the first operating position.

[0098] As shown by way of example in the embodiment of the figures, the second end of the lever 63 has an inclined portion 66 with respect to the orthogonal plane 70 and the sliding direction 7, destined to enter into contact with the second edge 52a in order to push it distancingly from the lower edge 20b of the front surface 20 of the seating 12.

[0099] The thrust on the lever 63, destined to determine the passage of the lever from the rest position to the unhooked position, is preferably a manual thrust and/or it is performed by a mechanical tool. The thrust on the lever 63 is preferably directed along the orthogonal plane 70 of the stem 2.

[0100] The thrust exerted by the elastic element 30 on the retaining element 50, in contact with the second end 63b of the lever 63 in the cut 62, preferably maintains the lever 63 in the rest position, or determines passage of the lever 63 from the unhooked position to the rest position when no external unhooking thrust is present.

[0101] The decoupling of the stem 2 from the hollow element 5 preferably takes place by activating the unhooking means 60 through an unhooking opening 65 of the hollow element 5, the hollow element 5 passing from the external surface 6b to the internal surface 6a of the cavity and, when the stem 2 is inserted in the hollow element 5, being positioned at the activating opening 61. The hollow element 5 of figure 1 is illustrated, for the purpose of illustration, rotated by 180° about the insertion direction 7, with respect to the configuration assumed in the functioning of the device, in order to more clearly illustrate the position of the unhooking opening 65.

[0102] In the first variant of the device illustrated in figure 3d, the bottom surface 21 can exhibit a step 21 c, or change of level. This step 21c can be destined for example to facilitate the maintaining of the retaining element 50 in the first operating position and/or to reduce the risk of an accidental passage into the second operating position.

[0103] In this case the bottom surface 21 is sub-divided into two portions, one below the step 21 c and one above the step 21 c. The portion of the bottom surface 21 below the step can be inclined like the portion above the step 21c (as illustrated in the figures), or it can be inclined with a different inclination, or it can be without inclination, i.e. it can be parallel for example to the external surface 14. In the second variant of the device illustrated in figure 3e, the retaining element 50 can be provided with a reference recess 56, which can be a through-recess or not, destined to enable housing a terminal reference portion 31 of the elastic element 30 in order to reduce the risk of undesired displacements between the elastic element 30 and the retaining element 50. This detail can be adopted in any embodiment of the invention and with any conformation of the seating 12 and the retaining element 50.

[0104] In a third variant of the device, illustrated in figure 3f, the retaining element 50 can have a substantially spherical conformation, and in that case the seating 12 is configured specially to enable displacement of the retaining element 50 between the first operating position and the second operating position. The elastic element 30 is also arranged in an appropriate position in order to enable optimal action on the retaining element 50. In the third variant, the inclination of the bottom surface 21 and/or the inclination of the front rest surface 20 are destined and configured such as to enable effective retaining of the sphere on the internal surface 6a of the cavity 6, in order to guarantee the action of the device 1 on the hollow element 5. The inclination of the bottom surface 21 and/or the front rest surface 20 can be greater than the above-mentioned inclination in relation to the preceding embodiment of the device, such that the spherical retaining element 50 can guarantee a sufficient action on the internal surface 6a in order to prevent a relative displacement between the stem 2 and the hollow element 5. The front rest surface 20 can be vertical (i.e. perpendicular to the external surface 14) or inclined (as in the figure), as explained herein above. An auxiliary housing seating can also be provided, afforded on the internal surface 6a of the cavity 6 and destined to cooperate with the retaining element 50 in order to increase the action and retaining thereof on the internal surface 6a of the retaining element 50.

[0105] In the functioning of the device 1, the first end 4 of the stem 2 is inserted in the cavity 6 of the hollow element 5 (for example a door handle) and pushed in the

insertion direction, such that the retaining element 50 is pushed from the edge of the cavity at the edge portion 11 which exits, and is taken from the third decoupled position to the second operating position, by rotation about the second edge 52a. The stem 2 is then pushed for a determined run internally of the cavity 6; during this stage the retaining element 50 remains in the second operating position and the stem slides internally of the cavity with the first edge dragging on the internal surface of the cavity.

[0106] When the stem 2 is inserted in the hollow element 5 to the desired length, the retaining element 50 remains in the second operating position and prevents extraction of the stem 2 from the body 4 as an extraction force exerted in an extraction direction 7b determines a snagging of the retaining element 50 in the second operating position and a consequent interference with the stem 2, which remains coupled to the hollow element 5. The greater the extraction force of the stem 2, the greater the resistance exerted by the retaining element 50.

[0107] To enable removal of the stem 2 it is sufficient to act, for example using a key (not shown in the figure) inserted in the unhooking opening 65 and in the activating opening 61, on the lever 63 in order to displace the retaining element 50 towards the first operative position and thus free the stem 2 from the snagging of the retaining element 50, so that it can be extracted from the cavity 6. In greater detail, the thrust on the lever 63 is done at the second end 63b, causing a movement of the end towards the inside of the stem and consequently, by effect of the push on the second edge 52a by the inclined portion 66, the displacement of the retaining element 50 in the second operating position.

[0108] The present invention attains the set aims, obviating the drawbacks of the prior art. Firstly, as specified herein above, the mechanical interconnection of a stem with a hollow element is done following a simple push of the stem into the cavity and is thus rapid and simple. Consequently the mounting operations can be particularly rapid.

[0109] In particular, the device can enable easy assembly of a handle for doors. Further, the removal of the handle can also be very simple and rapid. Further, the device of the present invention can be usable with handles provided with a coupling cavity having a different depth. Further, the device can be usable with any handle. Further, the mechanical interconnecting device can be more reliable and/or less subject to mechanical wear phenomena and/or it will require less maintenance.

[0110] Further, the mechanical interconnecting device can be simple and/or economical in terms of design and/or realisation and/or installation and/or configuration and/or operation and/or maintenance and/or storage and/or transport and/or elimination.

Claims

1. A mechanical interconnecting device (1) for coupling with a hollow body (5) exhibiting a cavity (6), the device comprising a stem (2) having a prevalent longitudinal development axis (3) and provided with a first end (4) destined to be inserted in and extracted from the cavity (6) along a sliding direction (7) parallel to the longitudinal development axis (3), the first end comprising a seating having an opening (13) at an external surface of the first end, the device further comprising a retaining element (50) having a predetermined perimeter edge (11) and being housed, at least partially, in the seating (12), where the seating (12) is configured to enable displacement of the retaining element (50) at least between a first operating position in which the retaining element (50) is arranged such as to enable sliding of the stem (2) into the cavity (6) along the sliding direction (7) and at least a second operating position in which at least a portion of the edge (11) of the retaining element (50) abuts on an internal surface (6a) of the cavity (6) and a lower end (52) of the retaining element (50) abuts on a bottom surface (21) of the seating (12) in order to prevent extraction of the stem (2) from the hollow element (5).

2. The device (1) of claim 1, where the seating is configured to enable displacement of the retaining element (50) into a third decoupling position distinct from the first two positions.

3. The device (1) of claim 1 or 2, where the seating (12) has a front surface (20), a rear surface (22), facing and retracted with respect to the front surface relative to an insertion direction (7a) along the sliding direction (7), and the bottom surface (21) interposed between the front surface and the rear surface, the distance between the front surface and the rear surface being greater than or equal to about 1.5 times a longitudinal thickness of the retaining element (50) and less than or equal to 3.5 times the longitudinal thickness of the retaining element (50).

4. The device (1) of any one of the preceding claims, wherein the front surface (20) has an upper edge (20a) in common with the external surface (14) of the stem (2) and a lower edge (20b) arranged on the opposite side to the upper edge, and the front surface and/or the rear surface of the seating is inclined at an angle comprised between 4° and 15°, with respect to an orthogonal plane (70) arranged perpendicularly to the longitudinal development axis (3) and with an upper edge (20a) that is more retracted than the lower edge (20b) with respect to a terminal surface (4a) of the first end (4) of the stem.

5. The device (1) of any one of the preceding claims,

wherein the bottom surface (21) of the seating (12) forms an angle comprised between 95° and 105° with the front surface (20).

6. The device (1) of any one of the preceding claims, wherein the retaining element (50) has a substantially plate conformation and is provided with an upper end (51) at the opening (13) of the seating (12), a lower end (52), opposite the upper end (51), at the bottom surface (21) of the seating, the edge portion (11) belonging to the upper end, a front surface (53) facing towards the front surface (20) of the seating and an upper surface (55) facing towards the outside of the stem (2), wherein the upper end (51) of the retaining element (50) is provided with a first edge (51a), in common between the front and upper surfaces of the retaining element (50), facing towards the terminal surface (4a) of the first end (4) of the stem, and the lower end (52) of the retaining element (50) is provided with a second edge (52a) facing towards the terminal surface (4a) of the first end (4) of the stem (2).

7. The device (1) of any one of the preceding claims, further comprising an elastic element (30), interposed between the retaining element (50) and the stem (2), for maintaining the retaining element (50) under thrust in the sliding direction (7) and in the insertion direction (7a) and/or for thrusting and maintaining the retaining element (50) in contact with the internal surface (6a) of the cavity (6), with the bottom surface (21) and/or with the front rest surface (20).

8. The device (1) of any one of the preceding claims, wherein in the first operating position the retaining element (50) is preferably arranged such as to form an angle comprised between -5° and +5° with respect to the orthogonal plane (70).

9. The device (1) of any one of the preceding claims, wherein the retaining element (50), when in the second operating position, forms an angle which is greater than or equal to +5°, and/or less than or equal to +20° with respect to the orthogonal plane (70), and the upper end (51) of the retaining element (50) is in contact with the internal surface (6a) of the cavity (6) of the hollow element (5), when present, and the lower end (52) of the retaining element is in contact with the bottom surface (21), the first edge (51 a) being further away than the second edge (52a) from the terminal surface (4a) of the first end (4).

10. The device (1) of any one of the preceding claims, further comprising unhooking means (60), destined to exert a thrust on the retaining element (50) in order to displace it from the second to the first operating position, the unhooking means comprising a lever (63) comprised in the stem area and mobile, by effect of an external unhooking thrust, at least between a first rest position, in which the lever does not exert a thrust on the retaining element, and an unhooked position in which the lever (63) exerts a thrust on the retaining element (50), at least when the retaining element (50) is in the second operating position.

11. The device (1) of any one of the preceding claims, wherein the bottom surface (21) of the seating is configured suitably inclined in order to maintain, in the second operating position, the retaining element (50) in contact with the internal surface (6a) of the cavity (6) and prevent extraction of the stem (2) from the hollow element (5).

12. The device (1) of any one of the preceding claims, wherein the front rest surface (20) of the seating is configured suitably inclined in order to maintain, in the second operating position, the retaining element (50) in contact with the internal surface (6a) of the cavity (6) and prevent extraction of the stem (2) from the hollow element (5).

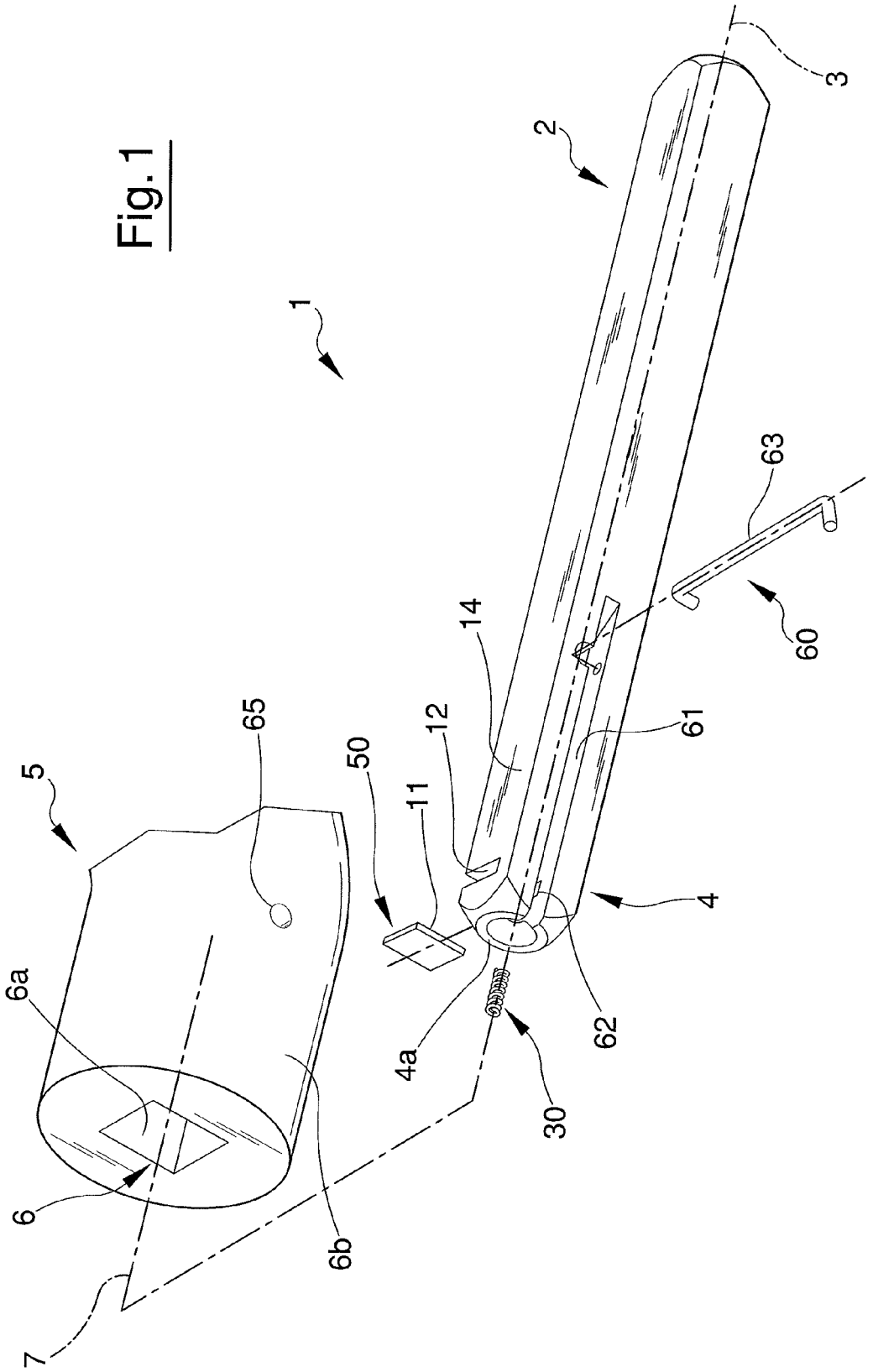
13. The device (1) of any one of the preceding claims, wherein the retaining element (50) is entirely housed in the seating (12) internally of the stem (2) at least in the first operating position and/or wherein the elastic element (30) is entirely housed internally of the stem (2).

14. An assembly comprising an interconnecting device (1) of any one of the preceding claims and the hollow element (5), wherein the hollow element (5) is part of a handle for doors.

15. A method for mounting a handle for doors by means of a device (1) as in any one of the preceding claims, comprising stages of:

mounting the stem (2) to a door;
inserting the first end (4) of the stem (2) in a cavity (6) of a handle for doors, by acting on the handle in order to push the stem (2) internally of the cavity (6) such as to determine passage of the retaining element (50) from the third decoupled position to the second operating position.

Fig. 1



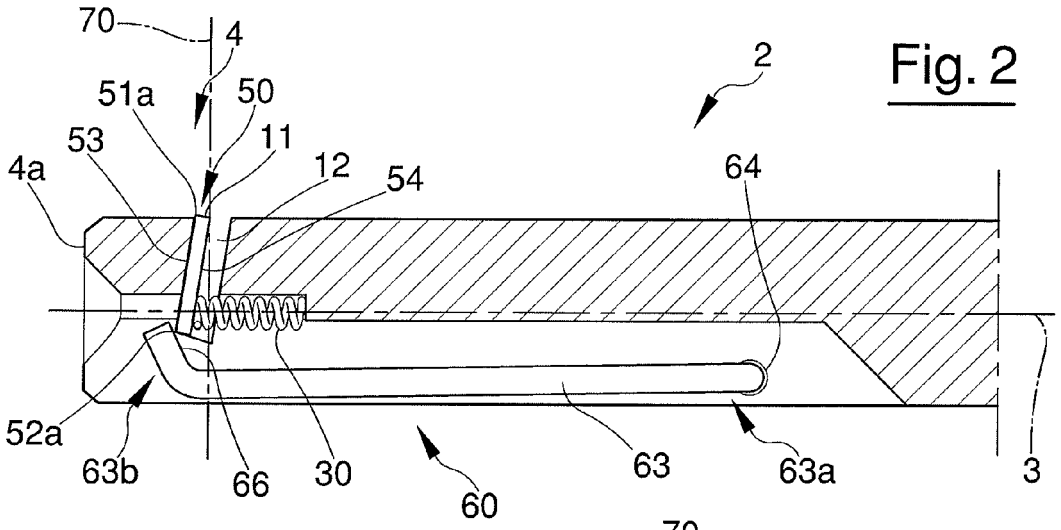


Fig. 2

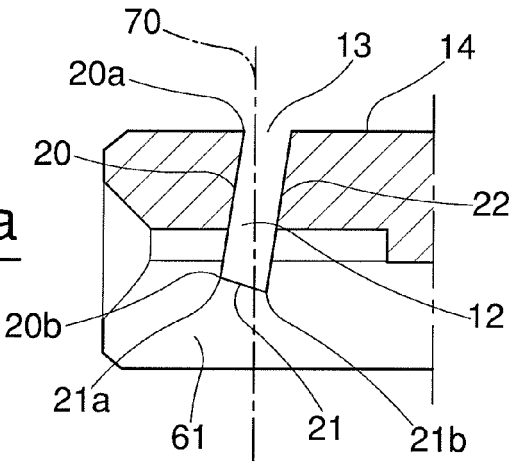


Fig. 2a

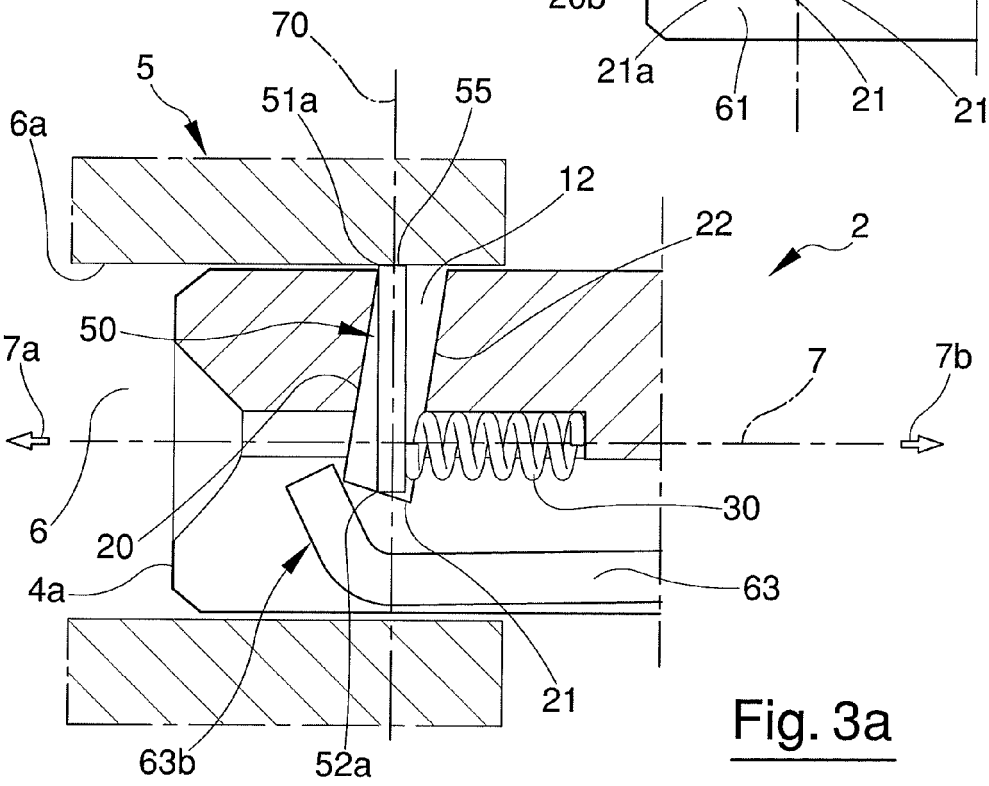
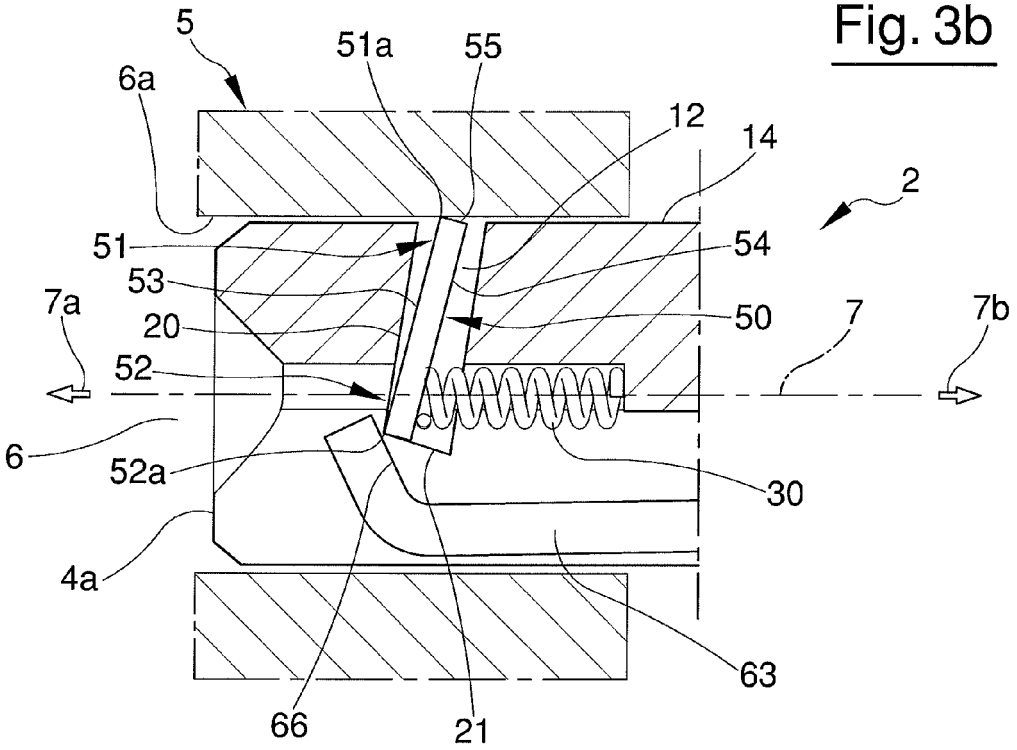


Fig. 3a

Fig. 3b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6a
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14
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7b
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4a
63
66
21

Fig. 3c

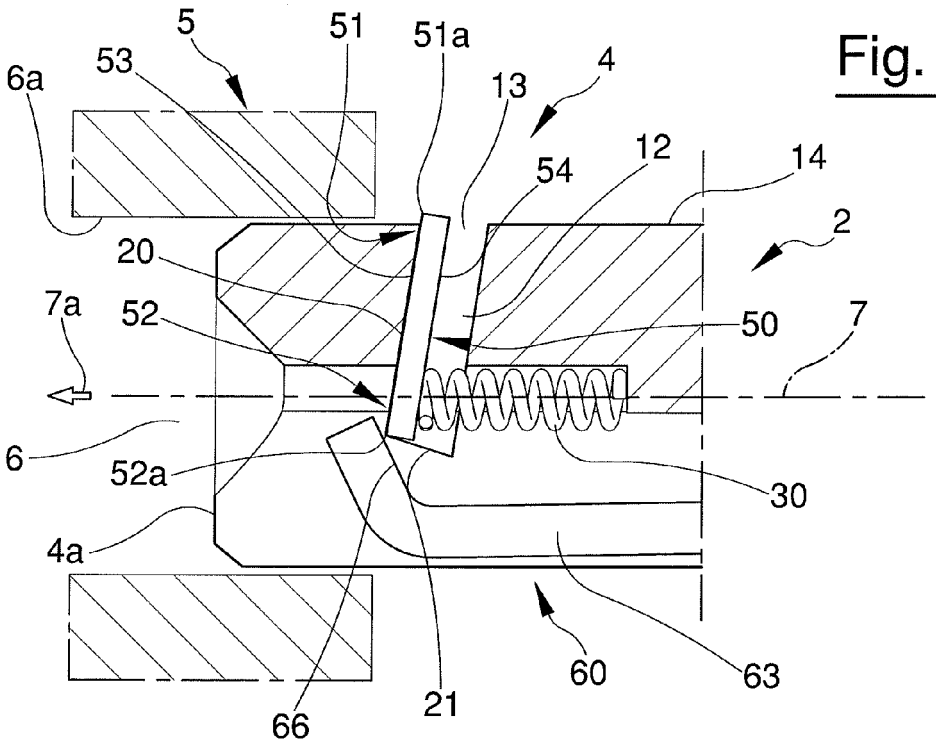
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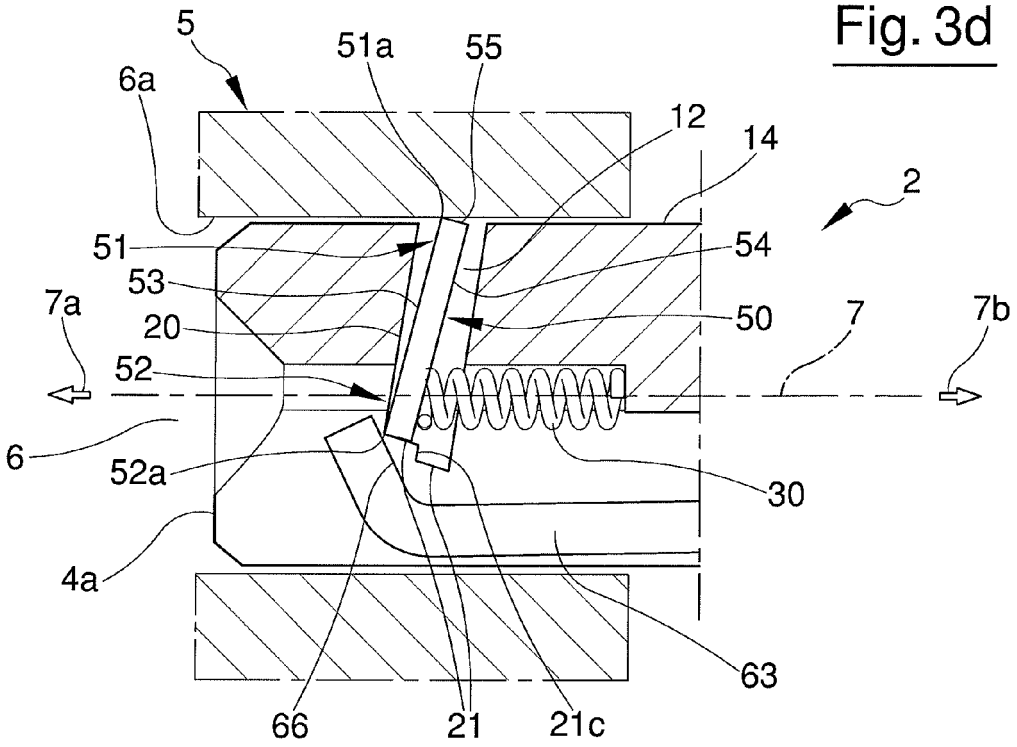
Fig. 3d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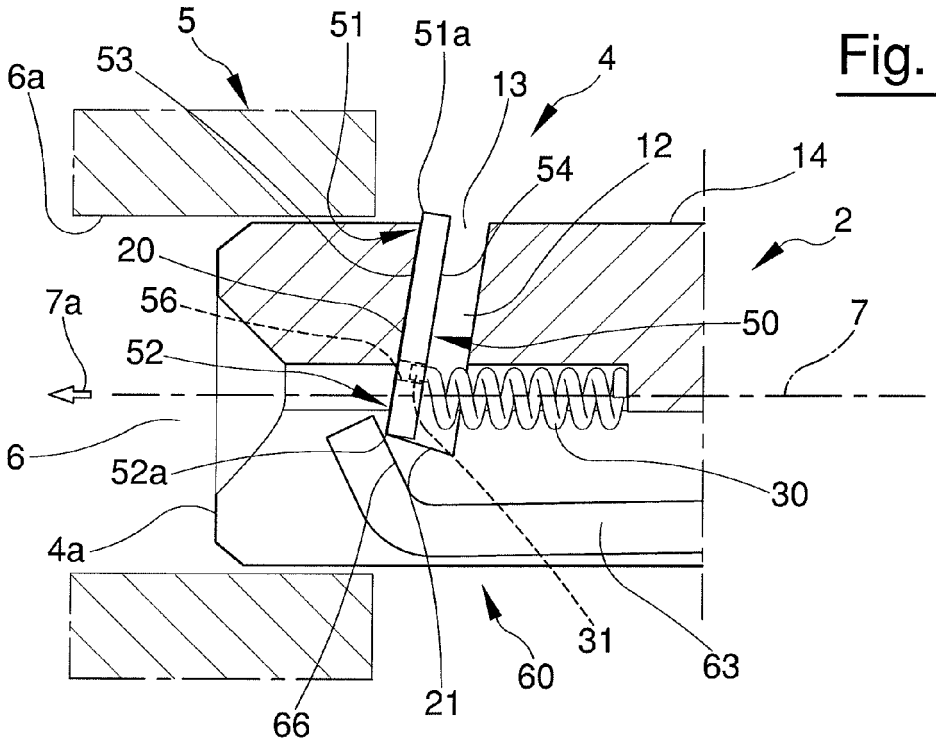
21c

Fig. 3e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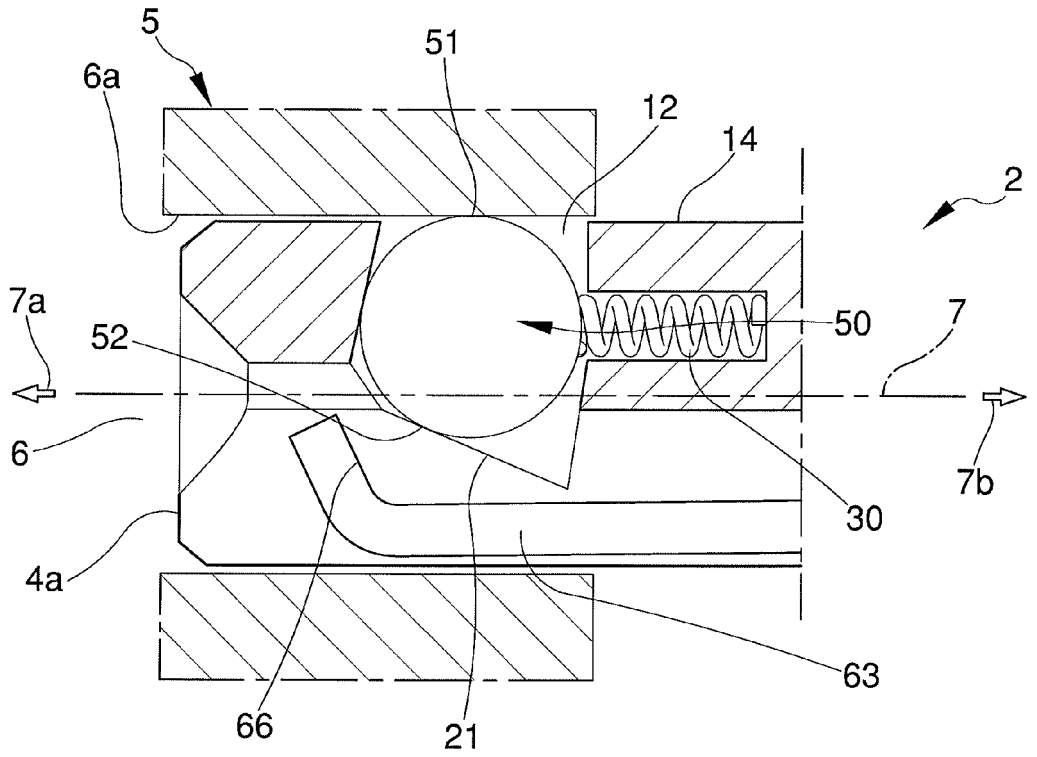

Fig. 3f

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EUROPEAN SEARCH REPORT

Application Number
EP 10 17 6654

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 1 683 933 A2 (HOPPE AG [IT]) 26 July 2006 (2006-07-26) * column 4, paragraph 12 - column 16, paragraph 77; figures 1-19 *	1-15	INV. E05B3/04
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E05B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	10 December 2010	Friedrich, Albert

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10-12-2010

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