



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
19.12.2012 Bulletin 2012/51

(51) Int Cl.:
E05B 15/16 (2006.01) **E05B 9/04** (2006.01)

(21) Application number: **12171788.8**

(22) Date of filing: **13.06.2012**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

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(30) Priority: **14.06.2011 IT BS20110086**

(54) **Cylinder for a lock**

(57) Described is a cylinder (1) for a lock having a longitudinal axis (2) of main development, a first (4) and a second (5) longitudinal end and a continuum of sections orthogonal to the longitudinal axis, and comprising a main body (3) provided with a hollow (6), and a rotating body (7) turnably housed in the hollow and provided with a groove (8) for the introduction of a coded key, the cylinder comprising a coating body (10) distinct from the main body and having a bottom wall (11) and a side wall (12) defining a respective longitudinal hollow (13), wherein the main body comprises a first portion (15), arranged

on the side of the first end and having a tapering (16) on at least one portion of the peripheral development of its outer side surface considered on the orthogonal section, inserted longitudinally into the hollow of the coating body, wherein the shape of the coating body and of the main body are such that the contour of the outer surface of the cylinder on all the orthogonal sections considered on the longitudinal development of the coating body is the same as, or inscribed in, the contour (18) of the outer surface of the cylinder having its maximum size among all the orthogonal sections considered on the remaining part of the cylinder.

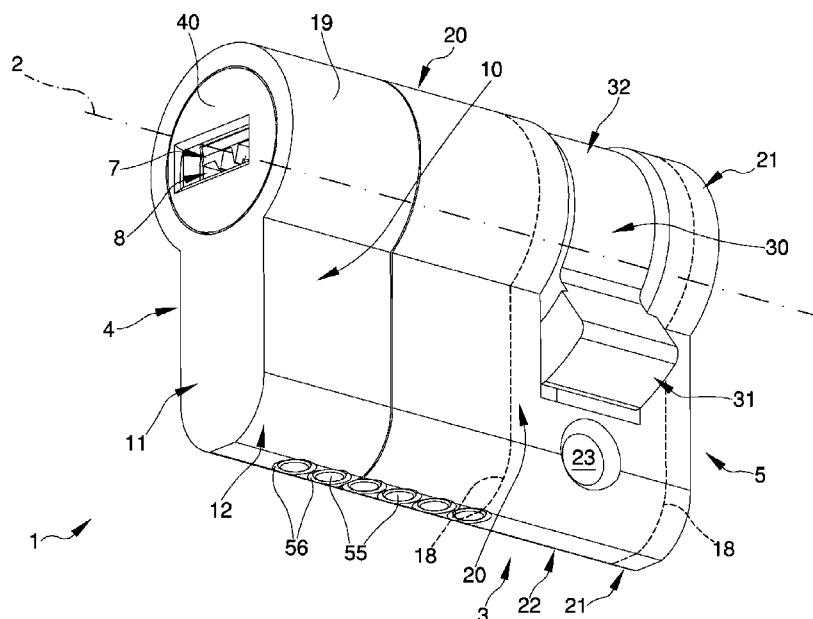


Fig. 1

Description

[0001] This invention relates to a cylinder for a lock, in particular a cylinder for a coded key, and a relative lock containing the cylinder.

[0002] There are prior art cylinders for locks comprising a main body (also known as stator) on which a cam (commonly known as pawl or revolving plug), having a protruding portion, is rotatably fixed. The contour of the orthogonal section of the main body can have various shapes, the most common being circular, oval or shaped (the latter also being known as European cylinders, having shape and dimensions of the section typically regulated by European standards). The cam is coupled mechanically to a rotating body (commonly known as rotor or core or barrel) contained in the main body and having a longitudinal groove for introducing the key. The main body and the rotating body each comprise at least one hole, typically a plurality of holes, designed to house the respective pins (also known as bolts), the counter-pins and, at least in the mechanically operated cylinders, the springs. The coded key for mechanically operated cylinders comprises a grip and an elongate body having orthogonal section shaped to match the section of the longitudinal groove of the rotating body, a bitting consisting of teeth or notches of various heights, which determine the coding or combination, and the end stop.

[0003] With the holes of the main body aligned with those of the rotating body, the introduction of the key up to the end stop causes a movement of each pin as a function of the height of the relative tooth on the key. If the key has the correct coding, the pins are all with the ends contacting the counter-pins at the outer circumference of the rotating body, a configuration which makes it possible to rotate the key and the rotating body relative to the main body, which corresponds with the rotation of the cam which in turn, when the cylinder is introduced in the lock, determines the snapping of the lock (for example, a translation of the bolt and/or of the latch of the lock due to the direct or indirect operation by the protruding portion).

[0004] A fundamental feature of cylinders for locks is the level of security, that is, the capacity to resist attempts at burglary and/or tampering and/or extraction. More specifically, it is desirable that the cylinders for locks are able to resist attempts at boring, for example with a drill, for accessing, and tampering with, the internal mechanism of the rotating body unit by at least one pin and/or a counter-pin.

[0005] It should be noted that typically the main body and the majority of the other components (with the exception of the cam which is typically made of steel) are made of brass, if necessary nickel or chrome plated. In effect, because of the complex and detailed machining which the various elements of a cylinder require, the use of a material which is more resistant to burglary but much less machinable than brass, such as steel, would mean a disproportionate increase in the production costs. One

of the systems used for making the cylinder resistant to boring is that of introducing inserts made of a resistant material, such as steel, inside the main body of the cylinder (for example, in the form of one or more pins inserted in orthogonal grooves made at its end from the part where the key is introduced) and/or of the rotating body (for example, in the form of balls housed in orthogonal grooves made at its end from the part where the key is introduced) for protecting the pins, which themselves are often made of hardened steel. Another system used for making the cylinder resistant to boring is that of preparing a further body (known in the jargon of the trade as 'defender'), outside and separate from the cylinder, made of steel, equipped with a hollow shaped to match the end portion of the cylinder and having dimensions, measured on the section orthogonal to the longitudinal development of the cylinder, greater than the dimensions of the cylinder, for example an area twice that of the cylinder. The further body also has a longitudinal through opening and is in communication with the above-mentioned hollow, for allowing the introduction of the key in the cylinder. The further body is inserted in a suitable seat of the door with the above-mentioned hollow facing the inside of the door, the end portion of the cylinder being inserted in the hollow. In that way, the above-mentioned further body constitutes a barrier protecting the sensitive parts of the cylinder.

[0006] The documents DE 87 16 645 U1, DE 10 2006 001267 B3, GB 2 161 537, US 2007/163315 A1 and DE 197 53 013 A1 describe further examples of prior art cylinders for locks.

[0007] The Applicant has found that the current cylinders for locks are not without disadvantages and can be improved from various points of view.

[0008] More specifically, the Applicant has considered that the current systems for making anti-drill cylinders cause an undesirable increase in time, and/or complexity and/or costs of machining and/or installation, and/or an increase in the use of material.

[0009] For example, the prior art anti-drill cylinders require the additional operation of making suitable seats for housing the anti-drill pins and/or balls, as well as the making of the pins and/or balls themselves and their assembling.

[0010] As a further example, the Applicant has found that the prior art method for protecting the cylinders with a further body (defender) which acts as a protective barrier causes a general increase in the lock mounting operations, because the further body must be mounted on the door separately from the cylinder and requires a suitable dedicated seat. Moreover, the Applicant has realised that, to be mounted in such a way as to prevent its dismounting from the outside of the door, the further body must be fixed in a complex manner with fastening means inaccessible from the outside of the door and burglar-proof.

[0011] In this situation, a basic aim of this invention, according to its various aspects and/or embodiments, is

to provide a cylinder for a lock, in particular a cylinder for a coded key, and a relative lock containing the cylinder, that can overcome one or more of the above-mentioned disadvantages.

[0012] This aim, in addition to other possible aims, which will become clearer from the description given below, are substantially achieved by a cylinder for a lock and a relative lock containing the cylinder, with the technical features described in one or more of the accompanying claims, as well as according to the following aspects and/or example embodiments, variously combined, also with the above-mentioned claims.

[0013] According to one aspect, the invention relates to cylinder for a lock having a longitudinal axis of main development, a first and a second longitudinal end and a continuum of sections orthogonal to the longitudinal axis, and comprising a main body with a main longitudinal development and provided with a hollow with longitudinal development, a rotating body turnably housed in the hollow with an axis of rotation parallel to the longitudinal axis, the rotating body being provided with a groove with a main longitudinal development for the introduction of a coded key, so that the rotation of the key and of the rotating body, when the cylinder is mounted to the lock, causes either directly or indirectly the snapping of the lock.

[0014] According to one aspect, the cylinder also comprises a coating body distinct from the main body and having a bottom wall and a side wall with longitudinal development, which define a respective longitudinal hollow.

[0015] According to one aspect, the main body comprises a first portion, which is an end portion arranged on the side of the first end and having a tapering on at least one portion of the peripheral development of the outer side surface considered on the orthogonal section, the first portion of the main body being (completely) inserted longitudinally into the hollow of the coating body.

[0016] According to one aspect, the shape of the coating body and of the main body are such that the contour of the outer surface of the cylinder (including, therefore, the coating body) on (substantially) all the orthogonal sections considered on the longitudinal development of the coating body is the same as (preferably) or inscribed in, the contour of the outer surface of the cylinder having its maximum size among all the orthogonal sections considered on the remaining part of the cylinder. It should be noted that the contour of the outer surface of a body means the envelope of the actual contour. In the case of gaps (for example, between two separate adjacent elements) or small openings (such as holes for inserting screws or pins), the envelope joins the outer actual surface before and after the small recesses relative to the side surface with a smooth line which does not follow these recesses. The maximum size of a contour in a plurality of sections means that all the remaining contours in the plurality of sections are the same as, or inscribed in, the contour having maximum size. It should also be

noted that typically the cylinder comprises some elements (such as the rotating cam described below) which are able to assume a plurality of configurations to which a plurality of contours with different sizes correspond. In that case, the maximum size refers to a configuration of the cylinder in which these elements are positioned so as to minimise the size on the orthogonal section (for example, a configuration in which the rotating cam is positioned in such a way that its protrusion disappears inside the profile, or size, of the main body). 'Longitudinal' means parallel to the longitudinal axis of main development of the cylinder. 'Side' means having a development parallel to the longitudinal axis.

[0017] The Applicant believes that the combination of the above-mentioned technical features, in particular that the first portion of the main body has a tapering on at least one portion of the peripheral development of the outer side surface considered on the orthogonal section, that the first portion of the main body is inserted longitudinally into the hollow of the coating body, and that the contour of the outer surface of the cylinder on (substantially) all the orthogonal sections considered on the longitudinal development of the coating body is the same as or inscribed in the contour of the outer surface of the cylinder having its maximum size among all the orthogonal sections considered on the remaining part of the cylinder, provides a cylinder for locks wherein the coating body is designed to protect the mechanism inside the cylinder with a small increase in the manufacturing costs, because the coating body can be made from a hard material without the main body having to be necessarily made from the same hard material. At the same time, the installation of the cylinder on the door does not cause any additional work, because it is not necessary to make a seat having shape and dimensions dedicated to the coating body since the portion of cylinder corresponding with the coating body can be inserted in the same seat in which the remaining part of the cylinder is insertable.

[0018] According to one aspect, the contour of the outer surface of the coating body on at least one of the, preferably on a continuum of, more preferably on (substantially) all the orthogonal sections is the same as the contour of the outer surface of the main body having its maximum size among all the orthogonal sections considered along the longitudinal development of the cylinder. Preferably, the actual contour of the outer surface of the coating body on at least one continuum, preferable a plurality of continuums, of orthogonal sections is the same as the above-mentioned contour (that is, it does not encounter gaps or openings). According to one aspect, the main body comprises a second portion immediately adjacent to the first portion of the main body, wherein the contour of the outer surface of the cylinder, and/or of the main body, with the maximum size lies on or belongs to the second portion of the main body, respectively.

[0019] According to one aspect, the main body comprises a third portion which is an end portion arranged

on the side of the second longitudinal end, wherein the contour of the outer surface of the cylinder, and/or of the main body, with the maximum size lies on or belongs to the third portion of the main body, respectively.

[0020] According to one aspect, the main body comprises an intermediate portion interposed between, and joining with structural continuity, the second and third portion of the main body. Preferably, the main body, more preferably the intermediate portion, has a through hole orthogonal to the longitudinal axis for fixing the cylinder to the lock and/or to the door. Preferably, the contour of the outer surface of the intermediate portion on at least one continuum of orthogonal sections is inscribed in the contour of maximum size. According to one aspect, the first and/or second and/or third and/or intermediate portion of the main body has a contour of its respective outer surface which is constant on at least one continuum of longitudinal sections, preferably on all the orthogonal sections. Preferably, the contour of the outer surface of the second and third portion of the main body are the same.

[0021] According to one aspect, the tapering is such that the contour of the outer surface of the first portion of the main body considered on each orthogonal section is (strictly) inscribed in the contour of the outer surface having its maximum size among all the orthogonal sections considered on the remaining part of the main body.

[0022] According to one aspect, the tapering is such that the contour of the outer surface of the first portion of the main body considered on each orthogonal section is the same as (preferably), or inscribed in, the contour of the outer surface of the first portion of the main body considered on any orthogonal section furthest away from a face of the first longitudinal end relative to each section.

[0023] According to one aspect, the first portion of the main body has the tapering on the entire peripheral development of its outer side surface on the orthogonal section.

[0024] According to one aspect, the first portion of the main body is (completely) inserted longitudinally in the hollow of the coating body in such a way that an end face of the first portion of the main body is facing and/or at least partly in contact with the bottom wall.

[0025] According to one aspect, the first portion of the main body is (completely) inserted longitudinally in the hollow of the coating body without clearance between the main body and the coating body. According to one aspect, the main body has a shoulder abutment (preferably straight) between the first and the second portion. Preferably, an end face of the side wall of the coating body abuts onto the shoulder abutment, preferably in contact and without clearance.

[0026] According to one aspect, the coating body (and/or the cam and/or the pins and/or the rotating disk, described below) is made of a harder material than the material of the main body, preferably with a hardness above, or equal to, 120% (more preferably 200%) of the hardness of the material of the main body. The hardness

of the material can be measured against any scale, such as, for example, Mohs, Rockwell, Vickers or Brinell, preferably against the Vickers and/or Rockwell scales. According to one aspect, the coating body (and/or the cam and/or the pins and/or the rotating disk, described below) is made of a hard material, preferably having a hardness above or equal to 200 HV in the Vickers scale, more preferably above or equal to 300 HV, even more preferably above or equal to 400 HV. According to one aspect, the coating body (and/or the cam and/or the pins and/or the rotating disk, described below) is made of a steel, more preferably casehardened and/or tempered carbon steel (having a hardness of, for example, approximately 500 HV).

[0027] According to an alternative aspect, the coating body (and/or the rotating disk, described below) is made of ceramic material. According to one aspect, the main body and/or the rotating body (and/or the counter-pins and/or the plugs, described below) is made of a soft material, preferably having a hardness less than or equal to 200 HV in the Vickers scale, more preferably less than or equal to 150 HV. Preferably, the main body and/or the rotating body (and/or the counter pins and/or the plugs) is made of brass (for example, nickel plated) or of an alloy containing brass (having a hardness of, for example, approximately 120 HV). According to one aspect, the coating body comprises an opening passing through the bottom wall and continuing the longitudinal hollow of the coating body.

[0028] According to one aspect, the cylinder comprises a rotating disk rotatably housed in the longitudinal hollow of the coating body with longitudinal axis of rotation and interposed, preferably in contact, between the bottom wall and the main body, preferably the end face of the first portion of the main body. Preferably, the rotating disk is located at the opening passing the bottom wall of the coating body. Preferably, the rotating disk is free to rotate about its axis of rotation. In this way, advantageously, in case of an attempt at drilling the disk, it rotates as one with the drill bit, removing the capacity of the drill bit to penetrate. Preferably, the rotating disk comprises an opening passing longitudinally through the disk and located at the above-mentioned groove of the rotating body for allowing introduction of the key.

[0029] Preferably, the rotating disk is made of hard material, more preferably casehardened and/or tempered steel. Preferably, the coating body and the rotating disk are made of the same material. According to one aspect, the cylinder comprises a cam configured for being rotatable as one with the rotating body with the axis of rotation aligned with the axis of rotation of the rotating body, in such a way that the rotation of the rotating body and of the cam, when the cylinder is mounted on the lock, causes either directly or indirectly the snapping of the lock. Preferably, the cam, made in one piece, comprises a substantially cylindrical body with longitudinal axis and portion protruding from the cylindrical body orthogonal to the longitudinal axis. Typically, when the protruding

portion is aligned with the main body, the contour of the outer surface of the cam is the same as or preferably inscribed in the contour of maximum size (which it should be noted is considered with the protruding portion aligned with the main body). According to one aspect, the rotating body comprises an end portion from the side opposite the first end inserted in the cam. Preferably, an open metal ring, for example, a circlip, engages a groove on the outer side wall of the end portion, so as to prevent the withdrawal of the rotating body.

[0030] According to one aspect, the main body and the rotating body comprise each at least one hollow, preferably a plurality of hollows, having the same section (preferably circular) and with a development orthogonal to the longitudinal axis, which can be aligned two by two, that is, such that there is an angular position of the rotating body in which each hollow of the main body is aligned with a respective hollow of the rotating body. Preferably, the hollows of the plurality of hollows are parallel to each other and positioned along a longitudinal row. Preferably, the hollow or the hollows of the rotating body develop from the outer surface of the rotating body to the relative groove with a mainly longitudinal development. Preferably, the hollow or the hollows of the main body develop from the outer side surface of the rotating body (preferably at least at the above-mentioned first portion, more preferably at the first and second portion) to the longitudinal housing hollow of the rotating body. Preferably, the hollows of a first sub-set of the plurality of hollows develop at the above-mentioned second portion. Preferably, the hollows of a second sub-set of the plurality of hollows complementary to the first sub-set develop at the first portion of the main body.

[0031] According to one aspect, the cylinder comprises at least one pin (preferably a plurality of pins, each) inserted at least partly in the at least one hollow (respectively in a respective hollow of the plurality of hollows) of the rotating body and/or in the at least one hollow (respectively in a respective hollow of the plurality of hollows) of the main body alignable (or aligned) with it. Preferably, when the rotating body is in the above-mentioned angular position of alignment, the pin can move from one to another of the two aligned hollows.

[0032] According to one aspect, the cylinder comprises a counter-pin for each of the above-mentioned pins, inserted at least partly in the respective hollow of the rotating body and/or in the respective hollow of the main body alignable (or aligned) with it. Preferably, when the rotating body is in the above-mentioned angular position of alignment, the counter-pin can move from one to another of the two aligned hollows.

[0033] According to one aspect, the cylinder comprises a spring (made, for example of phosphor bronze) for each of the above-mentioned counter-pins, inserted in the respective hollow of the main body and having an end abutting against the respective counter-pin.

[0034] According to one aspect, the cylinder comprises a plug for each of the above-mentioned hollows of the

main body, inserted at least partly in the respective hollow of the main body. Preferably, each plug has a first end close to (typically falling slightly within) the outer surface of the cylinder. Preferably, each plug has a second end abutting against a respective spring.

[0035] According to one aspect, the side wall of the coating body comprises at least one through hollow with a development orthogonal to the longitudinal axis and aligned with a respective hollow (of the first portion) of the main body, preferably having the same section (preferably circular). Preferably, the side wall of the coating body comprises a plurality of hollows, the hollows being preferably parallel to each other and positioned along a longitudinal row, each hollow being aligned with a respective hollow (of the first portion) of the main body. Preferably, the cavities of the side wall of the coating body are equal in number to the hollows of the second sub-set of hollows of the main body. Preferably, the hollow or the hollows of the coating body pass through the entire side wall, that is, they develop from the outer surface of the coating body to the hollow in which the first portion of the main body is inserted.

[0036] According to one aspect, at least one of the above-mentioned plugs (preferably a plurality of the above-mentioned plugs, more preferably a sub-set of the plurality of plugs) is partly inserted also in the respective hollow of the side wall of the coating body. In this way the plug or the plugs advantageously fix the coating body to the main body.

[0037] According to one aspect, an adhesive is interposed between, and fixed between, the coating body and the first portion of the main body.

[0038] According to one aspect, the main body and/or the rotating body and/or the coating body and/or the cam are each a single body.

[0039] According to one aspect, the invention relates to an assembly comprising the cylinder according to this invention and a coded key having a longitudinally elongate portion configured for being inserted in the groove of the rotating body and comprising a coding. According to one aspect, the coding comprises a plurality of teeth and/or notches of different size positioned on the elongate portion of the key.

[0040] According to one aspect, the invention relates to a lock comprising the cylinder according to this invention and a box-shaped body comprising a mechanism for operating a latch and/or a bolt and a through hollow in which the cylinder is inserted so as to form a mechanical coupling of the cylinder with the operating mechanism.

[0041] Other features and advantages will become more apparent from the detailed description below of some embodiments, also including a preferred nonlimiting embodiment of a cylinder for a lock according to this invention. The description is set out below with reference to the accompanying drawings which are provided solely for purposes of illustration without restricting the scope of the invention and in which:

- Figure 1 shows a schematic perspective view of a cylinder for a lock according to this invention;
- Figure 2 shows a partly exploded perspective view of the cylinder of Figure 1;
- Figure 3 shows a partly exploded perspective view of the cylinder of Figure 1 from another viewpoint relative to Figure 2;
- Figure 4 shows a partly cutaway perspective view of the cylinder of Figure 1;

[0042] With reference to the accompanying drawings, a cylinder for a lock according to this invention is denoted overall with the numeral 1. In general, the same reference number is used for the same elements in their embodiment variations.

[0043] The cylinder is typically configured and designed for being mounted in a lock (not illustrated, for example of known type) comprising a box-shaped body comprising a mechanism for operating a latch and/or a bolt and a through hollow shaped to match the outer side surface of the cylinder (typically the orthogonal section of the hollow of the lock is constant along the entire development of the hollow and/or regulated by specific regulations) for allowing the insertion of the cylinder so as to form a mechanical coupling of the cylinder with the operating mechanism (for example, a mechanical coupling between the protruding projection of the cam, described below, with a toothed gearing of the operating mechanism).

[0044] The cylinder has a main longitudinal axis 2 of development, a continuum of sections orthogonal to the longitudinal axis and a first 4 and second 5 (portion of) opposite longitudinal ends. The cylinder comprises a main body 3 with main longitudinal development and with at least the first longitudinal end 4 provided with a hollow 6 with longitudinal development and a rotating body 7 rotatably housed in the hollow with axis of rotation parallel to the axis of rotation. Typically, the rotating body is provided with a groove 8 with a main longitudinal development (preferably the groove passes the entire rotating body longitudinally) for the introduction of a coded key (not illustrated), so that the rotation of the key and of the rotating body, when the cylinder is mounted to the lock, causes either directly or indirectly the snapping of the lock. Typically, the groove has a suitably shaped orthogonal section.

[0045] For example, the coded key has an elongate longitudinal portion configured for being introduced in the groove 8 of the rotating body, the elongate portion having an orthogonal section shaped to match the orthogonal section of the groove 8 and comprising a coding. Typically, the coding comprises a plurality of teeth and/or notches or cells (in the case of flat keys, as in the example illustrated) of different size positioned along the elongate portion of the key. This invention, although described in particular with reference to mechanically operated cylinders (based on pins, counter-pins and springs for me-

chanically coded keys), is applicable to cylinders based on any type of operation (mechanical, electro-mechanical, magnetic, etc, for keys with teeth, cellular, with wave profile, magnetic etc), where a malicious individual may be interested in accessing by force the inside of the cylinder (for example with a drill) for tampering with or deactivating the internal mechanism of the cylinder, for example the mechanism for locking the rotating body (which typically occurs using at least one pin variously activated which engages a suitable hollow of the rotating body).

[0046] Preferably, the cylinder comprises a cam 30 rotatable as one with the rotating body with the axis of rotation the same as the axis of rotation of the rotating body. Preferably, the cam comprises a substantially cylindrical body 32 with longitudinal axis and a portion 31 protruding from the cylindrical body orthogonal to the longitudinal axis. Preferably, the rotating body comprises an end portion 33, from the side opposite the first end 4, inserted in a longitudinal hollow of the cam. Preferably, an open metal ring, for example, a circlip 34, engages a groove on the outer side wall of the end portion 33, so as to prevent the withdrawal of the rotating body. In the example illustrated, the mechanical rotational coupling between rotating body and cam is made, for example, using the key, when it is completely introduced in the cylinder. In this way, the rotation of the key causes the rotation in unison of the rotating body and of the cam and, when the cylinder is mounted on the lock, the snapping of the lock, for example by meshing of the protruding portion 31 with the rack of the lock.

[0047] Preferably, the cylinder also comprises a coating body 10 having a bottom wall 11 and a side wall 12 with longitudinal development, which define a respective longitudinal hollow 13 (preferably having a substantially constant orthogonal section). Preferably, the coating body comprises an opening 14 passing through the bottom wall and developing with continuity relative to the longitudinal hollow 13. Advantageously, the through opening 14 allows the introduction of the key in the slot 8.

[0048] Preferably, a first portion 15 of the main body on the side of the first end 4 has a tapering 16 on all the peripheral development of the outer side surface 17 considered on the orthogonal section. Preferably, the first portion of the main body is completely inserted longitudinally in the hollow 13 of the coating body, the shape of the coating body and of the main body being such that the contour of the outer surface of the cylinder on all the orthogonal sections considered on the longitudinal development of the coating body 10 is the same as the contour 18 of the outer surface of the cylinder having its maximum size among all the orthogonal sections considered on the remaining part of the cylinder (that is, not at the coating body 10). It should be noted that Figure 1, purely by way of an example, illustrates the above-mentioned contour of maximum size 18 on a pair of sections selected conventionally amongst infinite possible sections having the same size. As already indicated, the section of maximum size refers to the configuration (not il-

lustrated) of the cylinder in which the rotating cam 30 is positioned in such a way that its protrusion 31 disappears inside the profile, or size, of the main body. It should be noted that as an anti-pull measure the cam 30, when the key is extracted, typically remains rotated by several degrees (for example 30°, as illustrated in the drawings) relative to the alignment or minimum size configuration, in such a way that it protrudes from the contour of the remaining part of the cylinder and opposes the extraction of the cylinder. To align the cam it is typically necessary to introduce the appropriate key and rotate it until the protrusion disappears inside the shape of the main body.

[0049] Preferably, as shown by way of an example in the drawings, the contour of the outer surface 19 of the coating body on all the orthogonal sections along the longitudinal development of the body 10 is the same as the contour 18 of the outer surface of the main body having its maximum size among all the orthogonal sections considered along the longitudinal development of the cylinder.

[0050] Preferably, the main body comprises a second portion 20 immediately adjacent with continuity to the first portion of the main body. For example, the contour 18 of the outer surface of the cylinder, and of the main body, having the maximum size belonging to the second portion of the main body.

[0051] Preferably, the main body comprises a third portion which is an end portion 21 arranged on the side of the second longitudinal end 5, the contour 18 of the outer surface of the main body having the maximum size, as described above, belonging to the third portion of the main body. Preferably, the third portion has a longitudinal through hollow 22 aligned with the above-mentioned longitudinal hollow 6 of the main body.

[0052] In an alternative embodiment not illustrated, the cylinder may have a plane of symmetry orthogonal to the longitudinal axis and passing through the middle section of the cam 30. In another embodiment not illustrated, the cylinder may comprise a second mechanism for operating the cam on the opposite side relative to the latter one (so the cylinder comprises, for example, two rotating bodies inserted in two longitudinal hollows of the main body), but without a separate coating body (because it is not typically necessary to provide anti-burglary from one of the two sides of the lock). In the jargon of the trade, the cylinder shown by way of an example is known as "half cylinder", whilst the cylinder with double operating mechanism is known as "double cylinder". In yet another embodiment not illustrated, the cylinder may comprise on the side opposite the key operation an operation of the cam with a knob instead of with a key.

[0053] Preferably, the main body comprises an intermediate portion 22 interposed between, and joining with structural continuity, the second and third portion of the main body, located typically at the cam 30. Preferably, the intermediate portion has a through hole 23 (typically threaded) orthogonal to the longitudinal axis for fixing the cylinder to the lock and/or to the door, for example using

a screw. Preferably, the contour of the outer surface of the intermediate portion on all the orthogonal sections is inscribed in the contour of maximum size 18. Preferably, as shown by way of an example in the drawings, the first, second, third portion and the intermediate portion of the main body have a contour of their respective outer surface which is constant on all the orthogonal sections of their longitudinal development.

[0054] Preferably, the tapering 16 is such that the contour of the outer side surface 17 of the first portion of the main body considered on each orthogonal section is strictly inscribed in the contour 18 of the outer surface having its maximum size among all the sections of the remaining part of the main body.

[0055] Preferably, the tapering is such that the contour of the outer surface 17 of the first portion of the main body considered on each orthogonal section is the same as (as illustrated, having a constant section), or inscribed in (not illustrated, in the case of longitudinal tapering), the contour of the outer surface of the first portion of the main body considered on any orthogonal section furthest away from the first longitudinal end 4 relative to each section.

[0056] Preferably, the first portion of the main body is completely inserted longitudinally and without clearance in the hollow 13 of the coating body in such a way that an end face 25 of the first portion of the main body is facing and/or at least partly in contact with the inner face of the bottom wall 11.

[0057] Preferably, the main body has a shoulder abutment 26 (preferably straight, as shown in the drawing, but it can also be flared) between the first and the second portion. Preferably, an end face 27 of the side wall of the coating body abuts onto the shoulder abutment, preferably in contact and without clearance.

[0058] Preferably, the cylinder comprises a rotating disk 40 rotatably housed in the longitudinal hollow 13 of the coating body with longitudinal axis of rotation, and interposed in contact between the bottom wall 11 and the end face 25 of the first portion of the main body. Preferably, the rotating disk is free to rotate about its axis of rotation. Preferably, the rotating disk comprises an opening 26 passing longitudinally through the disk and located at the above-mentioned groove 8 of the rotating body.

[0059] Preferably, the main body and the rotating body comprise each a plurality (in the example, six) of hollows (50 and 51, respectively), having the same circular section and with a development orthogonal to the longitudinal axis, which can be aligned two by two (as illustrated in Figure 4). Preferably, the hollows of each body are parallel to each other and positioned along a longitudinal line. Preferably, the hollows of the rotating body develop from the outer surface of the rotating body to the groove 8. Preferably, the hollows of the main body develop from the outer surface of the main body to the longitudinal hollow 6 for housing the rotating body. Preferably, a first sub-set of hollows (in the example, four hollows on the side of the cam) develop at the second portion. Preferably,

bly, a second sub-set of hollows (in the example, two hollows on the side of the first end 4) develop at the first portion of the main body. Preferably, the cylinder comprises a plurality of pins 52, each inserted at least partly in a respective hollow of the rotating body in such a way that, when the rotating body is in the above-mentioned angular position of alignment, the pins can move from one to another of the two aligned hollows.

[0060] Preferably, the cylinder comprises a counter-pin 53 for each of the above-mentioned pins, inserted at least partly in the respective hollow of the rotating body and/or in the respective hollow of the main body aligned with it, in such a way that, when the rotating body is in the above-mentioned angular position of alignment, the counter-pins can move from one to another of the two aligned hollows.

[0061] Preferably, the cylinder comprises a spring 54 (made, for example of phosphor bronze) for each of the above-mentioned pins, inserted in the respective hollow of the main body and having an end abutting against the respective counter-pin. Preferably, the cylinder comprises a plug 55 for each hollow of the main body, inserted at least partly in the respective hollow of the main body. Preferably, each plug has a first end falling slightly within the outer surface of the cylinder and a second end abutting against a respective spring.

[0062] Preferably, the side wall of the coating body comprises a plurality of hollows 56 with development orthogonal to the longitudinal axis, the hollows being preferably parallel and positioned along a longitudinal line, each hollow being aligned with a respective hollow 50 of the main body, preferably with the same circular section. Preferably, the cavities 56 of the side wall of the coating body are equal in number to the hollows of the second sub-set of hollows 50 of the main body. Preferably, the hollows of the coating body pass through the entire side wall, that is, they develop from the outer surface of the coating body to the hollow 13 in which the first portion of the main body is inserted.

[0063] Preferably, a sub-set of the plurality of plugs 55 is partly inserted also in the respective hollow 56 of the side wall of the coating body.

Claims

1. A cylinder (1) for a lock having a longitudinal axis (2) of main development, a first (4) and a second (5) longitudinal end and a continuum of sections orthogonal to said longitudinal axis, and comprising a main body (3) with a main longitudinal development provided with a hollow (6) with longitudinal development, and a rotating body (7) turnably housed in said hollow with an axis of rotation parallel to said longitudinal axis, the rotating body being provided with a groove (8) with a main longitudinal development for the introduction of a coded key, so that the rotation of the key and of the rotating body, when the cylinder

is mounted to the lock, causes either directly or indirectly the snapping of the lock, the cylinder further comprising a coating body (10) distinct from said main body and having a bottom wall (11) and a side wall (12) with longitudinal development, which define a respective longitudinal hollow (13), wherein the main body comprises a first portion (15), which is an end portion arranged on the side of said first end, having a tapering (16) on at least one portion of the peripheral development of its outer side surface considered on the orthogonal section, said first portion of the main body being inserted longitudinally into said hollow of the coating body, and wherein the shape of the coating body and of the main body are such that the contour of the outer surface of the cylinder basically on all the orthogonal sections considered on the longitudinal development of said coating body is the same as, or inscribed in, the contour (18) of the outer surface of the cylinder having its maximum size among all the orthogonal sections considered on the remaining part of the cylinder.

2. The cylinder according to claim 1, wherein the contour of the outer surface of the coating body basically on all the orthogonal sections is the same as the contour (18) of the outer surface of the main body having its maximum size among all the orthogonal sections considered along the longitudinal development of the cylinder.

3. The cylinder according to any one of the preceding claims, wherein the main body comprises a second portion (20) immediately adjacent to said first portion of the main body, wherein said contour (18) of the outer surface of the cylinder, and/or of the main body, with the maximum size lies on or belongs to said second portion of the main body, respectively.

4. The cylinder according to any one of the preceding claims, wherein said first and/or second portion of the main body has a contour of its respective outer surface which is constant on all the orthogonal sections.

5. The cylinder according to any one of the preceding claims, wherein the main body has a shoulder abutment (26) between the first and the second portion, and wherein an end face (27) of the side wall of the coating body abuts onto the shoulder abutment.

6. The cylinder according to any one of the preceding claims, wherein the coating body is made of a harder material than the material of the main body, preferably with a hardness above or of 120% of the hardness of the material of the main body.

7. The cylinder according to any one of the preceding claims, wherein the coating body is made of a hard

material, preferably with a hardness of 200 HV or above in the Vickers scale.

8. The cylinder according to any one of the preceding claims, wherein the coating body is made of steel. 5
9. The cylinder according to any one of the preceding claims, wherein the main body and the rotating body comprise each at least one hollow (50, 51), preferably a plurality of hollows, having the same section and a development orthogonal to the longitudinal axis, which can be aligned two by two, i.e. such that there is an angular position of the rotating body in which each hollow (50) of the main body is aligned with a respective hollow (51) of the rotating body, wherein the cylinder comprises at least one pin (52) which can be inserted at least partially into said at least one hollow of the rotating body so as to prevent the latter from rotating. 10
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10. The cylinder according to any one of the preceding claims, wherein the side wall (12) of the coating body comprises at least one through hollow (56) with a development orthogonal to the longitudinal axis and aligned with a respective hollow of the first portion of the main body, and wherein the cylinder comprises at least one plug partially inserted both into the at least one hollow of the side wall of the coating body and into the respective hollow of the first portion of the main body. 25
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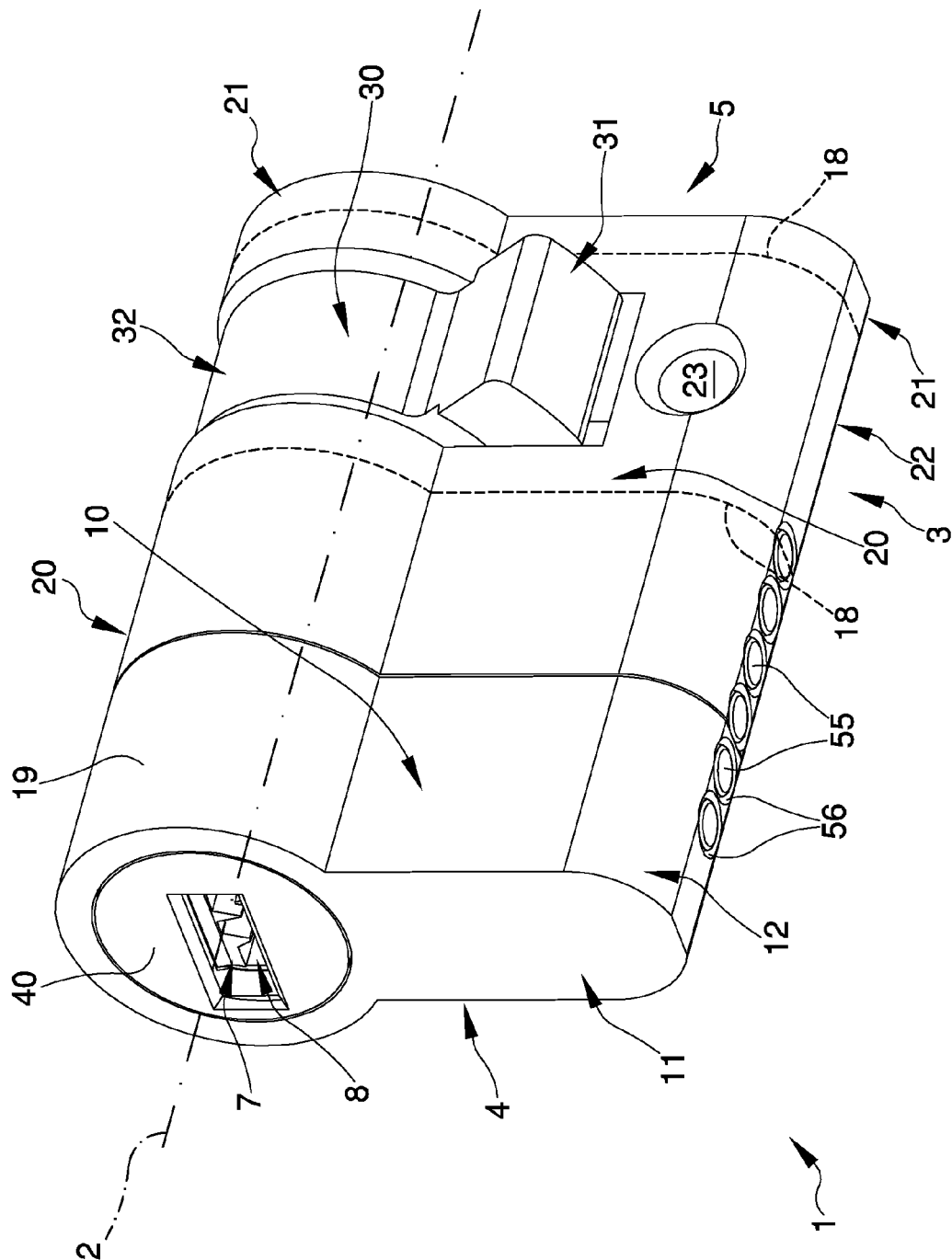
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Fig. 1



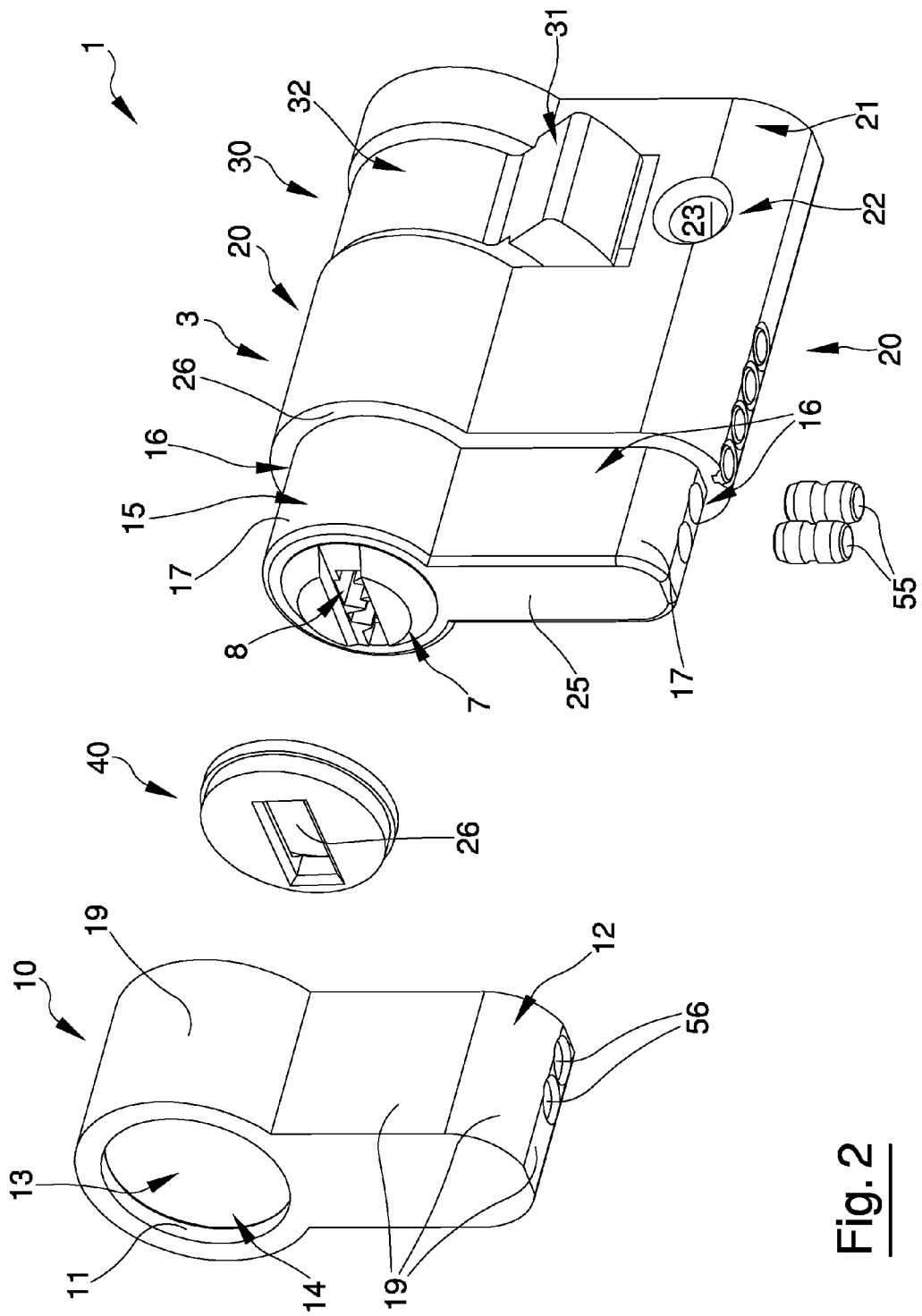


Fig. 2

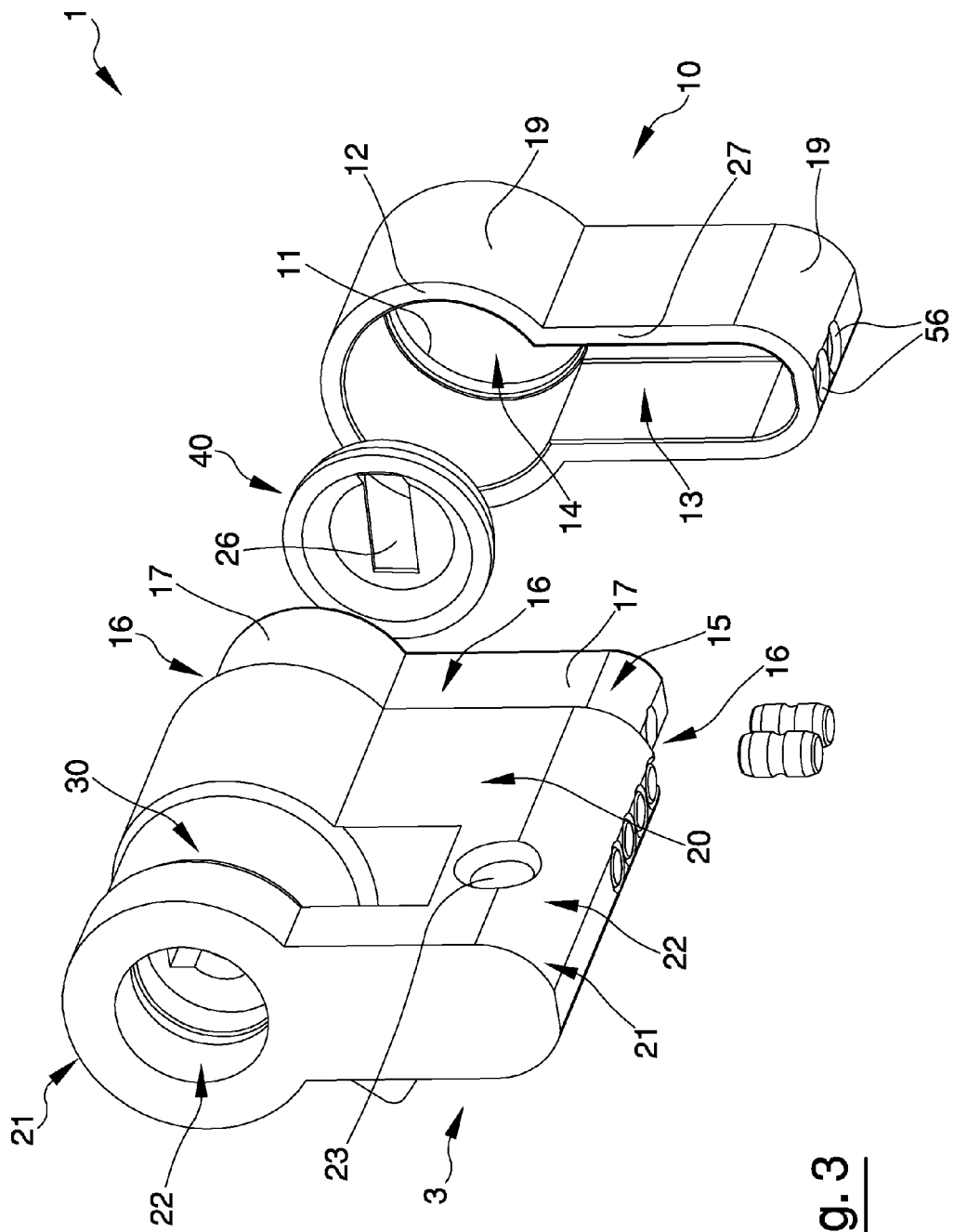


Fig. 3

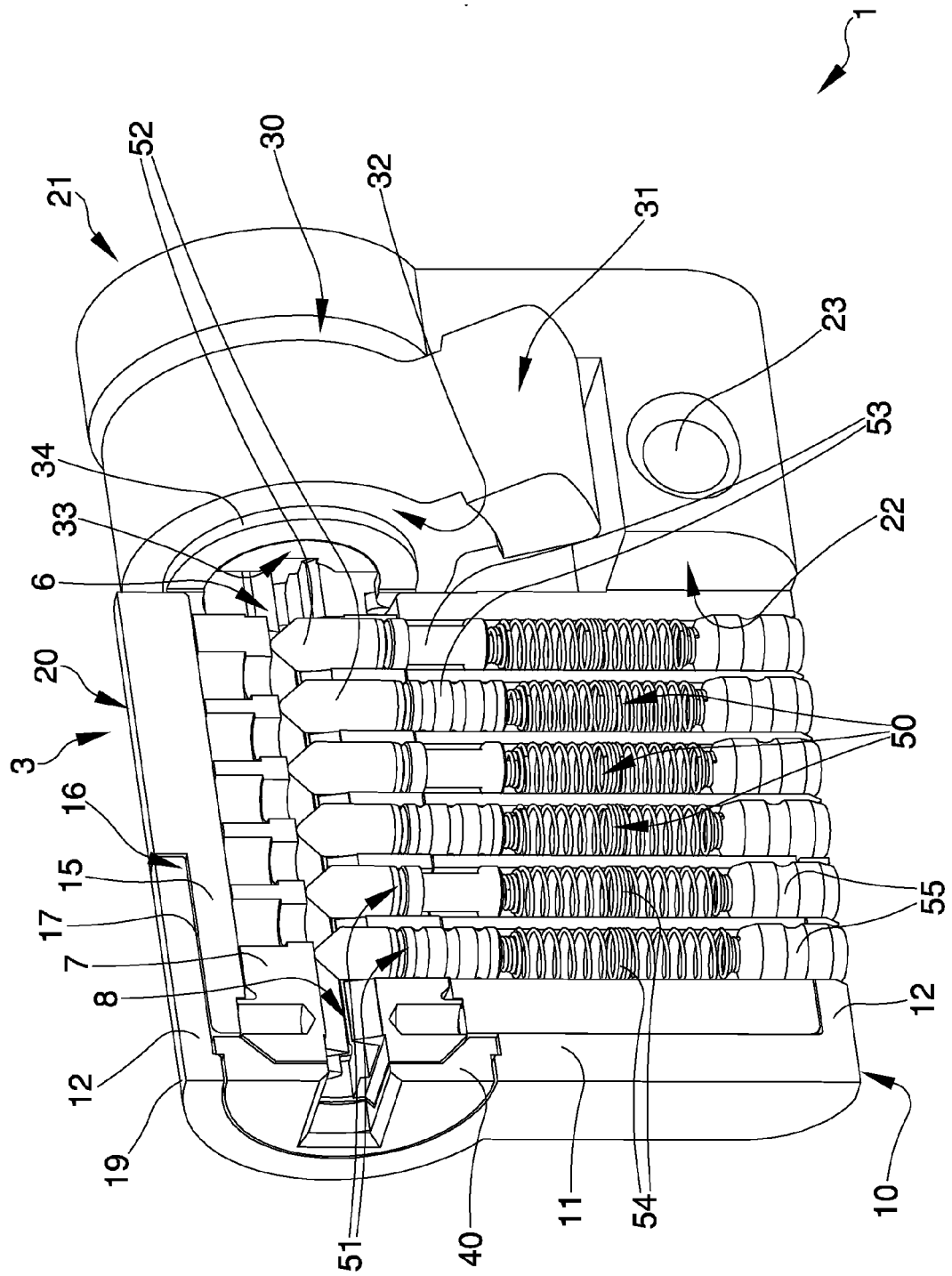


Fig. 4



EUROPEAN SEARCH REPORT

Application Number
EP 12 17 1788

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Place of search The Hague		Date of completion of the search 3 September 2012	Examiner Pérez Méndez, José F
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