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(54) **Cylinder lock operable with a rotatable key**

Mit einem Drehschlüssel betätigbares Zylinderschloss

Serrure à barillet fonctionnant avec une clé rotative

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Description

Field of the invention

[0001] The present invention relates to a cylindrical lock operable with a rotatable key, said lock comprising a base body provided with a cylindrical bore, in which bore a set of annular, particularly concentric plates is arranged axially, said plates constituting at least catchers, said catchers being locked against unintended self-rotation and adapted for an engagement with a shank of the rotatable key, with at least one tumbler as well as with guiding means for aligning the catchers in a position enabling the rotatable key to be removed from the lock.

Background of the invention

[0002] An overwhelming majority of the down-to-date cylinder locks with rotatable keys, wherein key actuates lamellar catchers arranged perpendicularly to the former, such as the cylinder lock mentioned in the background section of the patent document US 5,388,438 or the cylinder lock disclosed in the European patent EP 0 989 262, comprises a base body provided with a cylindrical bore, in which a rotatable cylinder is placed, said cylinder being provided with an entry slot for the tumbler and accommodating a plurality of catchers, the particular arrangements of the latter creating diverse locking combinations, or additional discs enhancing the functionality of the cylinder lock, such as plugs having diverse thicknesses. For example, the additional discs enhancing the functionality of the cylinder lock may serve as lifters, as disclosed in EP 0 989 262.

[0003] A considerable problem of such cylinder lock assemblies consists in the difficult delimitation of the deviation tolerances along the longitudinal axis of the assembly, the total deviation tolerance being the sum of the thickness tolerances of the catchers and those of the additional discs, if any, and the length tolerance of the bore of the rotatable cylinder. In this respect, it is desirable that the deviation tolerances embracing those between the catcher sets with the additional discs, if any, and the rotatable cylinder as well as those between the individual catchers and the individual additional discs, if any, are mutually compensated so that the position of the combination tab of each catcher corresponds to the position of the respective combination tab on the rotatable key with the highest degree of accuracy possible.

[0004] Any delimitation of the deviation tolerances provided by inserting shims having diverse thicknesses between the catchers or the additional discs, if any, is accomplished in a statistical or empiric manner since it is not possible to determine the accurate dimensions in any particular point of the assembly in advance. The tabs on the catchers, which correspond to the combination tabs on the rotatable key, are made thinner so that the reduced area of the contact surfaces enables a better compensation of the deviation tolerances to be achieved. Nevertheless, it is not possible to completely eliminate the risk that the corresponding combination tabs on the catcher and on the rotatable key become longitudinally misaligned after the completion of the assembly of the lock due to disparate tolerances and the complete lock will have do be disassembled and readjusted.

[0005] The process of manufacturing the rotatable cylinder and, especially, the cylindrical bore for the insertion of catchers is demanding from the technological point of view, since the parts involved are typically machined ones.

[0006] Another exemplary drawback of the existing solution according to the disclosure of EP 0 989 262 consists in that the return rods, which serve to pre-align the catchers so that the latter form a through hole for the shank of the rotatable key enabling the latter to be removed from the lock, are guided by the edges of the catchers on one side and by the wall of the rotatable cylinder on the other side. Such a dual guiding arrangement is also inconvenient because, particularly in connection with small dimensions of the locks, the impacts of the manufacturing inaccuracies may stack up in a considerable extent.

[0007] While the above described cylinder lock according to EP 0 989 262 employs return rods for aligning the catchers to enable the insertion of the rotatable key, the solution constituting the prior art with reference to the patent US 5,388,438 contemplates the alignment of the catchers of the cylinder lock by means of the adjustable edges in the holes interacting with the rotatable key during the engagement of the latter with the catchers.

[0008] The prior art further includes various cylinder locks of the above mentioned type involving different solutions for locking the catchers against self-rotation (unintended rotation), the most commonly used technical solution consisting in utilising a friction force between the catchers and shims having diverse thicknesses for retaining the same. Said friction force is induced either by the elimination of the tolerances between the discs by means of variable shims and pressing the discs inside the cavity of the rotatable cylinder against each other as close as possible, which is the case with the cylinder lock according EP 0 989 262, or by means of additional spring-loaded elements. Another known technical solution is disclosed in GB 2266119, wherein the discs are subjected to the clamping force induced by a helical spring arranged behind the disc assembly.

[0009] US3797290 discloses a lock defined in the preamble of claim 1.

Summary of the invention

[0010] The objective of the present invention is to eliminate the above disadvantages and drawbacks of the existing technical solutions and to provide a cylinder lock that would enable the thickness tolerances of the catchers and the additional discs, if any, to be compensated in the most simple, accurate and reliable manner possible and that would simultaneously solve the problem relating to the alignment of the catchers and additional discs inside the cylinder lock in order to substantially simplify the process of manufacturing the same.

[0011] The above objectives are fulfilled and the above disadvantages and drawbacks are eliminated by a cylindrical lock operable with a rotatable key, said lock comprising a base body provided with a cylindrical bore, in which a set of annular plates constituting at least catchers is arranged axially, said catchers being locked against unintended rotation and adapted for an engagement with a shank of the rotatable key, with at least one tumbler as well as with guiding means for aligning the catchers in a position enabling the rotatable key to be removed from the lock, wherein a plurality of adjacent spacing shims is arranged axially in the cylindrical bore, the spacing shims being locked against relative movement, and a transversal slot for an insertion of the tumbler is provided in the circumferential area of each of the spacing shims, wherein at least the catchers are individually freely rotatably completely nested in the spacing shims, which are adapted for engagement with at least one tumbler, with means for locking the catchers against unintended rotation and with means for aligning the same in a position enabling the rotatable key to be removed and the shank of the key to pass through, the last spacing shim adjoining to a terminating element, while according to the invention a labyrinth hole for a pair of return rods is arranged opposite to the transversal slot and along the internal circumferential surface of the unilateral rim of each spacing shim, said hole being provided with two opposed guiding edges and with an abutment edge at either end, the edges merging into retaining grooves in the direction towards the internal circumferential surface of the unilateral rim of the spacing shim.

[0012] Preferably, each spacing shim comprises an annular plate provided with an outer contact surface and an internal surface as well as with a discontinuous unilateral rim terminated with a frontal contact surface, wherein the distance between the frontal contact surface and the internal surface exceeding the thickness of the respective catcher, and the unilateral rim is provided with an internal circumferential surface for holding the catcher in its functional position, and with an external circumferential surface for retaining the spacing shim inside the cylindrical bore of the base body, while an axial through bore for inserting the rotatable key is provided in the annular plate.

[0013] It is also advantageous, when at least one retaining protrusion extends from the frontal contact surface of the unilateral rim of each spacing shim and a shaped recess extending partially in the annular plate is provided in the unilateral rim behind the retaining protrusion.

[0014] Also preferably, the terminating element is formed by a cylindrical body provided with a blind or through axial bore for an insertion of the end portion of the shank of the rotatable key and with at least one interconnecting protrusion and a shaped recess arranged on its frontal side, a peripheral area of the terminating element being further provided with an open-ended cutout for engagement with a pair of return rods, the open-ended cutout being provided with a frontal abutment surface and a bottom surface, which corresponds to a guiding edge arranged on the spacing shim proximally to the centreline of the same, and which is terminated with end recesses, while - in the opposite position with respect to the open-ended cutout - the peripheral portion of the terminating element is further provided with a longitudinal slot matching with a transversal slot of the spacing shim, and with a transversal notch engaging with an arresting latch.

[0015] The most significant advantage of the cylinder lock according to the invention consists in that the total deviation tolerance of the locking system is composed merely of the sum of the deviation tolerances of the outer thicknesses T3 of the spacing shims. The thickness tolerances of the catchers are compensated in that the dimensions of the catchers are included in the functional widths T1 of the spacing shims, i.e. between the frontal contact surface and the internal surface of the individual spacing shims. The above surfaces partly keep the catcher in a relatively stable position and partly enable the catcher to be displaced within a small axial range, which displacement compensates any possible deviation between the positions of the coding tab of the catcher and that of the rotatable key during the insertion of the key.

[0016] The solution according to the invention further enables the relatively long thin-walled rotatable cylinder, which is one of the parts that must be unavoidably manufactured by machining, to be replaced with a series of spacing shims, each being producible using a more effective manufacturing method, such as stamping or precise casting.

[0017] The solution according to the invention also enables the return rods, when the latter are included in the mechanism, to be guided in a relatively precise manner, namely by means of enclosed grooves formed in the spacing shims and the catchers to be more securely locked against self-rotation by means of the return bars, said bars being held in the locking positions by the relatively precise shaped edges of the above mentioned enclosed grooves.

Brief description of the drawings

[0018] An exemplary embodiment of the invention is shown in the attached drawing, wherein Fig. 1 shows the cylinder lock in a perspective exploded view, Fig. 2 shows the assembled cylinder lock in a front view, Fig. 3 shows the cylinder

lock in an enlarged partial sectional view, wherein the section is led through the plane III - III as indicated in Fig. 2, Fig. 4 shows a front view of one of the spacing shims, Fig. 5 shows the spacing shim in a vertical sectional view, wherein the section is led through the plane V - V as indicated in Fig. 4, Fig. 6 shows a perspective view of the terminating element, Fig. 7 shows a front view of the terminating element, Fig. 8 shows a side view of the terminating element, Fig. 9 shows a front view of the cylindrical collar, Fig. 10 shows an axial cross-sectional view of the cylindrical collar and Fig. 11 shows the perspective view of the assembly comprising the adjusting cylinder with the cylindrical collar along with a part of the series of the spacing shims with the catchers and lifters, with the pair of return rods and with the terminating element.

Exemplary embodiment of the invention

[0019] The cylinder lock according to the invention comprises a base body 1 (Fig. 1) provided with a cylindrical bore 2, in which a series of spacing shims 3 is arranged, in which arrangement standard individual freely rotatable catchers 4 and lifters 5 are embedded.

[0020] In Fig. 1, the first of the catchers 4 in the series shown is the one which is not embedded in the spacing shim 3, since it is possible to arrange the first catcher inside the internal space of a cylindrical collar 6 so that only the subsequent catcher 4 is placed in the first spacing shim 3. Especially the outer catchers 4 or lifters 5 may also be arranged outside the spacing shim 3.

[0021] The catchers 4 are provided with standard open-ended notches 7 having rounded bottom portions and outer edges 8, 9. The lifters 5 are also provided with standard open-ended notches 10 having rounded bottom portions and they are terminated by standard recesses 11, 12 interacting with a standard pair of return rods 13.

[0022] The front end of the above assembly adjoins to a standard adjusting means 14 which, in the present exemplary embodiment, comprises an adjusting cylinder 15 with a profiled opening 16 and is provided with a guiding element 17 protruding, when assembled, into the system of the spacing shims 3 with the catchers 4 and lifters 5. The adjusting cylinder 15 comprises a standard assembly of safety balls 18 and retaining balls 19 spaced inside the adjusting cylinder 15 of the cylinder lock by means of expander springs 20. The adjusting cylinder 15 is inserted in the cylindrical collar 6 along with a shield 21 provided with a guiding opening 22. On one of its sides, the cylindrical collar 6 is provided with at least one element enabling non-rotational interconnection with the first spacing shim 3. Besides that, the spacing shims 3 may be provided with special elements enabling the same to be interconnected with the cylindrical collar 6. In the present exemplary embodiment, said elements enabling non-rotational interconnection of the cylindrical collar 6 and the first spacing shim 3 (Figs. 1, 4 and 5) are formed by interconnecting projections 23 arranged mirror-symmetrically on the cylindrical collar 6 and by transversal notches 24 (Fig. 4) arranged on the spacing shims 3. The cylindrical collar 6 (Fig. 9) is also adapted for the insertion of the ends of the standard pair of return rods 13 through a labyrinth cutout 25 with recesses 26 a 27, into which the ends of the return rods 13 enter when the mechanism of the cylinder lock is rotated. Opposite to the labyrinth cutout 25, a blind slot 28 for the insertion of an end portion of a tumbler 29 is arranged. An annular shoulder 30 encloses a frontal pocket 31 for the insertion of the first catcher 4 of the series. At its opposite end, the cylindrical collar 6 is provided with a cylindrical recess 32 for inserting the adjusting cylinder 15. At the same end, the collar is also adapted (in a manner which is known in the art) for engagement with a projection 33 formed on the adjusting cylinder 15 and provided with a pair of opposed grooves 34, also known in the art, for accommodating the safety balls 18. Fig. 1 shows only one of the grooves 34.

[0023] On the opposite side, the series of spacing shims 3 is adjoined by a terminating element 35 provided with a pair of compression springs 36 and with an arresting latch 37. On the reverse side, the terminating element 35 accommodates a carrier 38, which simultaneously engages with a finger 39 for controlling an adjoining mechanism (not shown) of the cylinder lock. Between the terminating element 35 and the finger 39, a disc spring 40 is arranged.

[0024] As shown in Figs. 4 and 5, each of the spacing shims 3 is provided with an annular plate 69 having an outer contact surface 43 and an inner surface 42. A part of the peripheral area of the spacing shim 3 is provided with a discontinuous unilateral rim 70 concluded with a frontal contact surface 41, wherein the distance between the frontal contact surface 41 and the internal surface 42 equals the inner functional width T1 of the spacing shim 3. Said inner functional width T1 always exceeds the thickness T2 (Fig. 3) of the respective insertion element, i.e. the catcher 4, or that of the lifter 5, if any. Each of the spacing shims 3 is further provided with an opposite contact surface 43 (Fig. 5) arranged on the reverse side of the spacing shim 3 and extending in parallel with respect to the frontal contact surface 41, the distance between the frontal contact surface 41 and the outer contact surface 43 being equal to the outer functional width T3 of the spacing shim 3. The discontinuous unilateral rim 70 of each of the spacing shims 3 is further provided with an internal circumferential surface 44 for holding the respective catcher 4 in its functional position as well as with an external functional surface 45 for retaining the respective spacing shim 3 inside the cylindrical bore 2 of the base body 1 of the cylinder lock (Fig. 1). The annular plate 69 of each of the spacing shims 3 is further provided with an axial bore 46, which may be circular in shape, for inserting a rotatable key (not shown) and with a transversal slot 47 arranged in the circumferential portion and adapted for guiding the standard tumbler 29 (Fig. 1, 4, 5). Furthermore, each spacing

shim 3 is provided with a labyrinth hole 48 arranged along the unilateral rim 70 and opposite to the transversal slot 47, said hole adapted for accommodating a pair of standard return rods 13 being arranged along the entire length of the assembly of the spacing shims 3 and extending into the terminating element 35 and the cylindrical collar 6. The labyrinth hole 48 is provided with two opposed guiding edges 49, 50 and with two abutment edges 51, 52 at either end, the latter merging into retaining grooves 53, 54 in the direction towards the internal circumferential surface of the spacing shim 3. Each of the spacing shims 3 is provided with at least one retaining protrusion 55 extending from the frontal contact surface 41 of the unilateral rim 70, wherein the shaped recess 56 is formed in the unilateral rim 70 behind the retaining protrusion 55 and it extends partially in the annular plate 69 of the spacing shim 3. In the exemplary embodiment, four retaining protrusions 55 with four respective shaped recesses 56 are shown. Each of the retaining protrusions 55 of the respective spacing shim 3 extends into the shaped recess 56 of the adjacent spacing shim 3 within the assembly of the cylinder lock. Thus the adjoining spacing shims 3 are locked against relative rotational movements.

[0025] The terminating element 35, which has the shape of a relatively low cylinder, is provided with at least one element enabling a non-rotational interconnection with the last spacing shim 3. In the exemplary embodiment, the terminating element 35 (Figs. 6, 7, 8) is provided with two interconnecting projections 57 and four shaped recesses 58. The terminating element 35 is further provided with an, at least blind, axial bore for the insertion of the end portion of the shank of the rotatable key (not shown). In the exemplary embodiment, the terminating element 35 is provided with a through bore 59 adjoining to the axial bores 46 of the spacing shims 3.

[0026] In its circumferential portion, the terminating element 35 is provided with an open-ended cut-out 60 for the insertion of the standard return bars 13. A frontal abutment surface 61 of the open-ended cut-out 60 delimits the end positions of the return bars 13 and the bottom surface 62 along with end recesses 63, 64 of the open-ended cut-out 60 are intended for guiding the return bars 13 during their functional movements. The terminating element 35 is further provided with a longitudinal slot 65 having the same purpose as the transversal slots 47 of the spacing shims 3, namely to enable an insertion of the tumbler 29. The opposite side of the terminating element 35 may be adapted for an interconnection with various adjoining parts (not shown). According to the present exemplary embodiment, the terminating element 35 is provided with a segmented collar 66 for the shape-based connection with the carrier 38 and for retaining the disc spring 40 slipped over the same.

[0027] The terminating element 35 is further provided with a transversal notch 67 created therein in a known manner and serving for the insertion of the compression springs 36 and the arresting latch 37, the latter engaging with a corresponding cut-out (not shown) created in the base body 1. The design and the functions of the compression springs 36 and the arresting latch 37 are analogous to the embodiments known in the art, which means that the above parts serve to retain the set of the spacing shims 3 and to lock it against rotation during the alignment of the catchers 4 enabling the latter to assume the positions that are necessary for the insertion of the shank of the rotatable key.

[0028] The spacing shims 3 may also be provided with special means enabling the interconnection with the terminating element 35. In the exemplary embodiment the above means are formed by the transversal notch 24 for the insertion of the interconnecting projection 57 of the terminating element 35 and by the retaining protrusion 55 that engages with the shaped recess 58 of the terminating element 35.

[0029] The cylindrical bore 2 of the base body 1 of the cylinder lock is provided with a longitudinal notch 68 formed therein (Fig. 3), into which the tumbler 29 partially extends.

[0030] The above mentioned standard pair of return bars 13 acts as usual means for transferring the torque from the lifters 5 to the spacing shims 3, as a means for returning the catchers 4 into the positions enabling the rotatable key to be removed and as a means for preventing any unintended rotation of the catchers 4, since in the idle condition of the cylinder lock each of the return bars 13 is pushed by the guiding edges 49 of the labyrinth holes 48 into one of the recesses 11, 12 of the respective lifter 5 and simultaneously abuts against one of the outer edges 8, 9 of the open-ended notches 7 formed in the catchers 4. The return bars 13 are held in the recesses 11, 12 in that the rounded bottom surfaces of the open-ended notches 10 formed in the lifters 5 extend into the space between the guiding edges 49, 50 of the labyrinth holes 48, thus preventing the return bars 13 from protruding into the same space.

[0031] The operation of the above described cylinder lock according to the invention is as follows:

[0032] When the rotatable key (not shown) is being inserted into the cylinder lock, the shank (not shown) of the former first passes through the guiding opening 22 formed in the sheet 21 arranged inside the cylindrical collar 6 and then it passes through the profiled opening 16 formed in the adjusting cylinder 15. Afterwards, the shank passes through the guiding element 17, by which it is held and guided, and simultaneously through the set of spacing shims 3 that accommodate the corresponding catchers 4 and lifters 5. Thus, the guiding element 17 prevents the frontal face of the shank of the rotatable key from coming into direct contact with the catchers 4 and lifters 5. In this manner, the latter are protected from any undesirable or inadvertent manipulation. During the final stage of the insertion process, the end of the shank of the rotatable key reaches the end of the guiding element 17 and enters into the terminating element 35, which causes the adjusting cylinder 15 to be unlocked with respect to the cylindrical collar 6, said unlocking action being accomplished by means of the safety balls 18 and retaining balls 19, i.e. in a generally known manner. When accomplished, the above unlocking action enables the adjusting cylinder 15, the guiding element 17 and the key itself to be rotated.

[0033] The rotation of the rotatable key (not shown) causes the cylinder lock to be locked or unlocked in a completely known manner. During such action, the coding projections (not shown) formed on the shank of the rotatable key come into contact with the coding tabs (also not shown) formed in the catchers 4. Since the catchers 4 are arranged inside the corresponding spacing shims 3 with a certain amount of clearance and, at the same time, very precisely longitudinally aligned with respect to the shank of the rotatable key, the coding projections on the shank very precisely engage with the coding tabs in the catchers 4, driving the latter successively in rotation.

[0034] Simultaneously, the lifters 5 are also successively driven in rotation. Thus, the lifters 5 cause one of the return bars 13 to move in a well known manner. During its movement, the return bar 13 is guided by the guiding edges 49, 50 of the labyrinth holes 48 formed in the spacing shims 3, said guiding action preventing the return bar from touching the rounded bottom portions of the open-ended notches 7 formed in the catchers 4. Depending on the direction of rotation, the lifters 5 displace the driven return bar 13 up to the respective abutment edge 51, 52 of the labyrinth hole 48, where that driven return bar 13 strikes against the other return bar 13 (not shown), forcing the same into one of the respective retaining grooves 53, 54 formed in the corresponding labyrinth holes 48. The engagement of the return bars 13 with the respective abutment edge 51, 52 cause the spacing shims 3 to rotate. During the unlocking action, the rotation of the spacing shims 3 pushes the tumbler 29 out from the longitudinal notch 68 of the base body 1. After having been displaced from the longitudinal notch 68 of the base body 1, the tumbler 29 enters farther into the transversal slots 47 formed in the spacing shims 3 and into the longitudinal slot 65 formed in the terminating element 35. At the same time, tumbler 29 enters into the slots formed in the catchers 4 and lifters 5 that have been adjusted against the former by means of the movement of the rotatable key. This enables the entire internal arrangement of the cylinder lock to be driven in rotation and all the necessary operations to be accomplished.

[0035] During the rotational movement of the assembly, the respective return bar 13 and the tumbler 29 act as driving means causing those parts to rotate which are not in direct contact with the rotatable key, such parts particularly including the spacing shims 3 and also the terminating element 35. The additional driving means comprise the coupled retaining protrusions 55 and the shaped recesses 56 of the spacing shims 3 along with the means for interconnecting the last spacing shim 3 and the terminating element 35. During the initial stage of the rotational action of the key, the cylindrical collar 6 is locked by the adjoining spacing shim 3. After the spacing shims 3 have become unlocked by the tumbler 29, the cylindrical collar 6 is driven in the direction of rotation in a known manner, namely by the projection 33 formed on the frontal face of the adjusting cylinder 15 and also by means of the pair of return bars 13.

[0036] During the locking action, the tumbler 29 is pushed out of the slots formed in the catchers 4 and, also in a known manner, inserted back into the longitudinal notch 68 formed in the base body 1. This is accomplished by means of the inclined walls of the slots formed in the lifters 5 to facilitate the insertion of the tumbler 29.

[0037] The removal of the rotatable key is enabled in that the catchers 4 are aligned, again in the known manner. First, the key is turned to the position which enables the tumbler 29 to be aligned with the longitudinal notch 68 of the base body 1 and the arresting latch 37 to engage with the corresponding cut-out (not shown) formed in the base body 1, causing the terminating element 35 and hence also the spacing shims 3 to be locked against rotation. Afterwards, the rotatable key is turned in the opposite direction into such angular position that enables the catchers 4 to be aligned under the action of the return bars 13 so that the openings of the latter stop preventing the rotatable key from being removed from the lock.

Industrial applicability

[0038] The technical solution according to the invention may be utilized for designing and manufacturing cylinder locks with rotatable keys, particularly when a more sophisticated and accurate design and more cost-effective production are required.

List of reference signs

1	base body	7	open-ended notch
2	cylindrical bore	8	outer edge
3	spacing shim	9	outer edge
4	catcher	10	open-ended notch
5	lifter	11	recess
6	cylindrical collar	12	recess
15	adjusting cylinder	13	return bar
16	profiled opening	14	adjusting means
17	guiding element	44	internal circumferential surface
		45	external circumferential surface
		46	axial bore

(continued)

18	safety ball	47	transversal slot
19	retaining ball	48	labyrinth hole
20	expander spring	49	guiding edge
21	shield	50	guiding edge
22	guiding opening	51	abutment edge
23	interconnecting projection	52	abutment edge
24	transversal notch	53	retaining groove
25	labyrinth cutout	54	retaining groove
26	recess	55	retaining protrusion
27	recess	56	shaped recess
28	blind slot	57	interconnecting projection
29	tumbler	58	shaped recess
30	annular slot	59	through axial bore
31	frontal pocket	60	open-ended cut-out
32	cylindrical recess	61	frontal abutment surface
33	projection	62	bottom surface
34	groove	63	end recess
35	terminating element	64	end recess
36	compression spring	65	longitudinal slot
37	arresting latch	66	segmented collar
38	carrier	67	transversal notch
39	finger	68	longitudinal notch
40	Disc spring	T1	inner functional width
41	frontal contact surface	T2	thickness
42	internal surface	T3	outer functional width
43	opposite contact surface		

Claims

1. A cylindrical lock operable with a rotatable key, said lock comprising a base body (1) provided with a cylindrical bore (2), in which a set of annular plates constituting at least catchers (4) is arranged axially, said catchers (4) being locked against unintended rotation and adapted for an engagement with a shank of the rotatable key, with at least one tumbler (29) as well as with guiding means for aligning the catchers (4) in a position enabling the rotatable key to be removed from the lock, wherein a plurality of adjacent spacing shims (3) is arranged axially in the cylindrical bore (2), the spacing shims (3) being locked against relative movement, and a transversal slot (47) for an insertion of the tumbler (29) is provided in the circumferential area of each of the spacing shims (3), wherein at least the catchers (4) are individually freely rotatably completely nested in the spacing shims (3), which are adapted for engagement with at least one tumbler (29), with means for locking the catchers (4) against unintended rotation and with means for aligning the same in a position enabling the rotatable key to be removed and the shank of the key to pass through, the last spacing shim (3) adjoining to a terminating element (35) **characterized in that** a labyrinth hole (48) for a pair of return rods (13) is arranged opposite to the transversal slot (47) and along the internal circumferential surface (44) of the unilateral rim (70) of each spacing shim (3), said hole (48) being provided with two opposed guiding edges (49, 50) and with an abutment edge (51, 52) at either end, the edges (51, 52) merging into retaining grooves (53, 54) in the direction towards the internal circumferential surface (44) of the unilateral rim (70) of the spacing shim (3).

2. The cylindrical lock according to claim 1, **characterized in that** each spacing shim (3) comprises an annular plate (69) provided with an outer contact surface (43) and an internal surface (42) as well as with a discontinuous unilateral rim (70) terminated with a frontal contact surface (41), wherein the distance between the frontal contact surface (41) and the internal surface (42) exceeding the thickness of the respective catcher (4), and the unilateral rim (70) is provided with an internal circumferential surface (44) for holding the catcher (4) in its functional position, and with an external circumferential surface (45) for retaining the spacing shim (3) inside the cylindrical bore (2) of the base

body (1), while an axial through bore (46) for inserting the rotatable key is provided in the annular plate (69).

3. The cylindrical lock according to claim 1 or 2, **characterized in that** at least one retaining protrusion (55) extends from the frontal contact surface (41) of the unilateral rim (70) of each spacing shim (3) and a shaped recess (56) extending partially in the annular plate (69) is provided in the unilateral rim (70) behind the retaining protrusion (55).

4. The cylindrical lock according to claim 1, **characterized in that** the terminating element (35) is formed by a cylindrical body provided with a blind or through axial bore (59) for an insertion of the end portion of the shank of the rotatable key and with at least one interconnecting protrusion (57) and a shaped recess (58) arranged on its frontal side, a peripheral area of the terminating element being further provided with an open-ended cutout (60) for engagement with a pair of return rods (13), the open-ended cutout (60) being provided with a frontal abutment surface (61) and a bottom surface (62), which corresponds to a guiding edge (49) arranged on the spacing shim (3) proximally to the centreline of the same, and which is terminated with end recesses (63, 64), while - in the opposite position with respect to the open-ended cutout (60) - the peripheral portion of the terminating element is further provided with a longitudinal slot (65) matching with a transversal slot (47) of the spacing shim (3), and with a transversal notch (67) engaging with an arresting latch (37).

Patentansprüche

1. Ein mit einem Drehschlüssel betätigbares Zylinderschloss, wobei das Schloss einen Grundkörper (1) umfasst, der mit einer zylindrischen Bohrung (2), in der ein Satz von kreisringförmigen, zumindest Sperrelemente (4) bildenden Plättchen in axialer Richtung angeordnet ist, wobei die Sperrelemente (4) gegen ungewünschte Drehung gesichert und für den Eingriff mit dem Schaft eines Drehschlüssels angepasst sind, mit wenigstens einer Zuhaltung (29) sowie mit Führungsmitteln zur Ausrichtung der Sperrelemente (4) in einer das Herausnehmen des Drehschlüssels aus dem Schloss ermöglichenden Stellung versehen ist, wobei in der zylindrischen Bohrung (2) ferner eine Vielzahl von benachbarten Distanzscheiben (3) in axialer Richtung angeordnet ist, wobei die Distanzscheiben (3) gegen die relative Drehbewegung gesichert und mit je einem in ihrem Umfangsbereich quer verlaufenden Schlitz (47) zum Einschieben der Zuhaltung (29) versehen sind, wobei zumindest die Sperrelemente (4) einzeln frei drehbar in den Distanzscheiben (3) völlig versenkt sind, welche Distanzscheiben für den Eingriff mit zumindest einer Zuhaltung (29) angepasst sind, mit Verriegelungsmitteln zur Absicherung der Sperrelemente (4) gegen ungewünschte Drehung sowie mit Führungsmitteln zur Ausrichtung derselben in einer das Herausnehmen des Drehschlüssels aus dem Schloss und das Durchführen des Schlüsselschaftes ermöglichenden Stellung, wobei die letzte Distanzscheibe (3) an einem Abschlusselement (35) anliegt, **dadurch gekennzeichnet, dass** eine labyrinthartige Öffnung (48) für ein Paar von Rückstellstäben (13) gegenüber dem quer verlaufenden Schlitz (47) und zugleich entlang der inneren Umfangsoberfläche (44) des einseitigen Ansatzes (70) jeder Distanzscheibe (3) angeordnet ist, wobei die Öffnung (48) mit zwei gegenüberliegenden Führungskanten (49, 50) und mit je einer an jedem ihrer Enden ausgebildeten Anschlagkante (51, 52) versehen ist, wobei die Kanten (51, 52) in die jeweiligen Auffangnuten (53, 54) in Richtung der inneren Umfangsoberfläche (44) des einseitigen Ansatzes (70) der entsprechenden Distanzscheibe (3) übergehen.

2. Zylinderschloss nach Anspruch 1, **dadurch gekennzeichnet, dass** jede der Distanzscheiben (3) ein kreisringförmiges Plättchen (69) umfasst, das mit einer äußeren Kontaktfläche (43) und einer inneren Oberfläche (42) sowie mit einem mit einer vorderen Kontaktfläche (41) abgeschlossenen einseitigen Ansatz (70) versehen ist, wobei der Abstand zwischen der vorderen Kontaktfläche (41) und der inneren Oberfläche (42) grösser ist als die Dicke des jeweiligen Sperrelementes (4) und wobei der einseitige Ansatz (70) mit einer inneren Umfangsoberfläche (44) für das Zuhalten des Sperrelementes (4) in seiner Funktionsstellung sowie mit einer äußeren Umfangsoberfläche (45) für das Zuhalten der Distanzscheibe (3) innerhalb der zylindrischen Bohrung (2) des Grundkörpers (1) versehen ist, wobei im kreisringförmigen Plättchen (69) eine axiale Durchgangsbohrung (46) zum Einschieben eines Drehschlüssels ausgebildet ist.

3. Zylinderschloss nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** wenigstens ein Sperrvorsprung (55) aus der vorderen Kontaktfläche (41) des einseitigen Ansatzes (70) jeder Distanzscheibe (3) herausragt und dass der einseitige Ansatz (70) mit einer hinter dem Sperrvorsprung (55) ausgeformten und teilweise in das kreisringförmige Plättchen (69) hineinragenden Aussparung (56) versehen ist.

4. Zylinderschloss nach Anspruch 1, **dadurch gekennzeichnet, dass** das Abschlusselement (35) von einem zylinderförmigen Körper gebildet ist, der mit einer axialen Grund- oder Durchgangsbohrung (59) zum Einschieben des

Endabschnittes des Schaftes eines Drehschlüssels sowie mit wenigstens einem an seinem vorderen Seite angeordneten herausragenden Verbindungssteg (57) und einer gleichartig angeordneten Formaussparung (58) versehen ist, wobei der Umfangsbereich des Abschlusselements ferner mit einem halboffenen Ausschnitt (60) für den Eingriff mit dem Paar von Rückstellstäben (13) versehen ist, wobei der halboffene Ausschnitt (60) mit einer vorderen Anschlagfläche (60) und mit einer Bodenfläche (62) versehen ist, wobei die Bodenfläche einer an der Distanzscheibe (3) angeordneten und deren Mittelachse zugewandten Führungskante (49) entspricht und mit je einer Endaussparung (63, 64) abgeschlossen ist, während - in einer dem halboffenen Ausschnitt (60) gegenüberliegenden Lage - der Umfangsbereich des Abschlusselements ferner mit einer mit dem quer verlaufenden Schlitz (47) der Distanzscheibe (3) übereinstimmenden Längsnut (65) sowie mit einem quer verlaufenden und mit einer Rastnase (37) im Eingriff stehenden Kerb (67) versehen ist.

Revendications

1. Une serrure cylindrique pouvant être actionnée par une clé rotative, ladite serrure comprenant un corps (1) de base pourvu d'un alésage (2) cylindrique, dans lequel un ensemble de plaques annulaires constituant au moins des capteurs (4) est disposée axialement, lesdits capteurs (4) étant verrouillés contre une rotation involontaire et adaptés pour une mise en prise avec une tige de la clé rotative, avec au moins une gâchette (29), ainsi que avec des moyens de guidage pour aligner les capteurs (4) dans une position permettant à la clé rotative à être retirée de la serrure, pendent qu'une pluralité de cales (3) d'espacement adjacentes est disposée axialement dans l'alésage (2) cylindrique, les cales (3) d'espacement étant bloquées contre un mouvement relatif, et une fente (47) transversale pour une insertion de la gâchette (29) est pourvue dans la zone circonférentielle de chacune des cales (3) d'espacement, pendent qu'au moins les capteurs (4) sont individuellement complètement librement emboîtés de façon rotative dans les cales (3) d'espacement, qui sont adaptées pour venir en prise avec au moins une gâchette (29), avec des moyens pour verrouiller les capteurs (4) contre la rotation involontaire et avec des moyens pour aligner la même dans une position permettant d'enlever la clé rotative et la tige de la clé de passer à travers, la dernière cale (3) d'espacement adjacente à un élément (35) de terminaison, **caractérisé en ce qu'**un trou (48) de labyrinthe pour une paire de tiges (13) de retour est disposé en face opposée de la fente (47) transversale et le long de la surface (44) circonférentielle interne de la bordure (70) unilatérale de chaque cale (3) d'espacement, ledit trou (48) étant pourvu de deux bords (49, 50) opposés de guidage et avec un bord (51, 52) de butée à chaque extrémité, les bords (51, 52) fusionnant dans des rainures (53, 54) de retenue dans la direction vers la surface (44) circonférentielle interne de la bordure (70) unilatérale de la cale (3) d'espacement.

2. La serrure cylindrique selon la revendication 1, **caractérisé en ce que** chaque cale (3) d'espacement comprend une plaque (69) annulaire pourvue d'une surface (43) de contact externe et d'une surface (42) interne, ainsi que d'une bordure (70) unilatérale discontinue terminée par une surface (41) de contact frontale, pendant que la distance entre la surface (41) de contact frontale et la surface (42) interne étant supérieure à l'épaisseur du capteur (4) respectif, et la bordure (70) unilatérale est pourvue d'une surface (44) circonférentielle interne pour maintenir le capteur (4) dans sa position fonctionnelle, et avec une surface (45) circonférentielle externe pour retenir la cale (3) d'espacement à l'intérieur de l'alésage (2) cylindrique du corps (1) de base, tandis qu'un alésage (46) axial traversant pour l'insertion de la clé rotative est pourvue dans la plaque (69) annulaire.

3. La serrure cylindrique selon la revendication 1 ou 2, **caractérisé en ce qu'**au moins une protrusion (55) de retenue se prolonge à partir de la surface (41) de contact frontale de la bordure (70) unilatérale de chaque cale (3) d'espacement et un évidement (56) en forme se prolongeant partiellement dans la plaque (69) annulaire est pourvue dans la bordure (70) unilatérale derrière la protrusion (55) de retenue.

4. La serrure cylindrique selon la revendication 1, **caractérisé en ce que** l'élément (35) de terminaison est formé par un corps cylindrique muni d'un trou (59) borgne ou traversant axial pour l'insertion de la partie d'extrémité de la tige de la clé rotative et avec au moins une protrusion (57) d'interconnexion et un évidement (58) profilé disposé sur son côté frontal, une zone périphérique de l'élément de terminaison étant en outre pourvue d'une découpe (60) à extrémité ouverte pour venir en prise avec une paire de tiges (13) de retour, la découpe (60) à extrémité ouverte étant pourvue d'une surface (61) frontale de butée et d'une surface (62) inférieure, ce qui correspond à une arête (49) de guidage disposée sur la cale (3) d'espacement proximalement à l'axe de ce dernier, et qui est terminée par des évidements (63, 64) d'extrémité, tandis que - dans la position opposée par rapport à la découpe (60) à extrémité ouverte - la partie périphérique de l'élément de terminaison est en outre pourvue d'une fente (65) longitudinale correspondant à la fente (47) transversale de la cale (3) d'espacement, et d'une encoche (67) transversale venant en prise avec un verrou (37) de blocage.

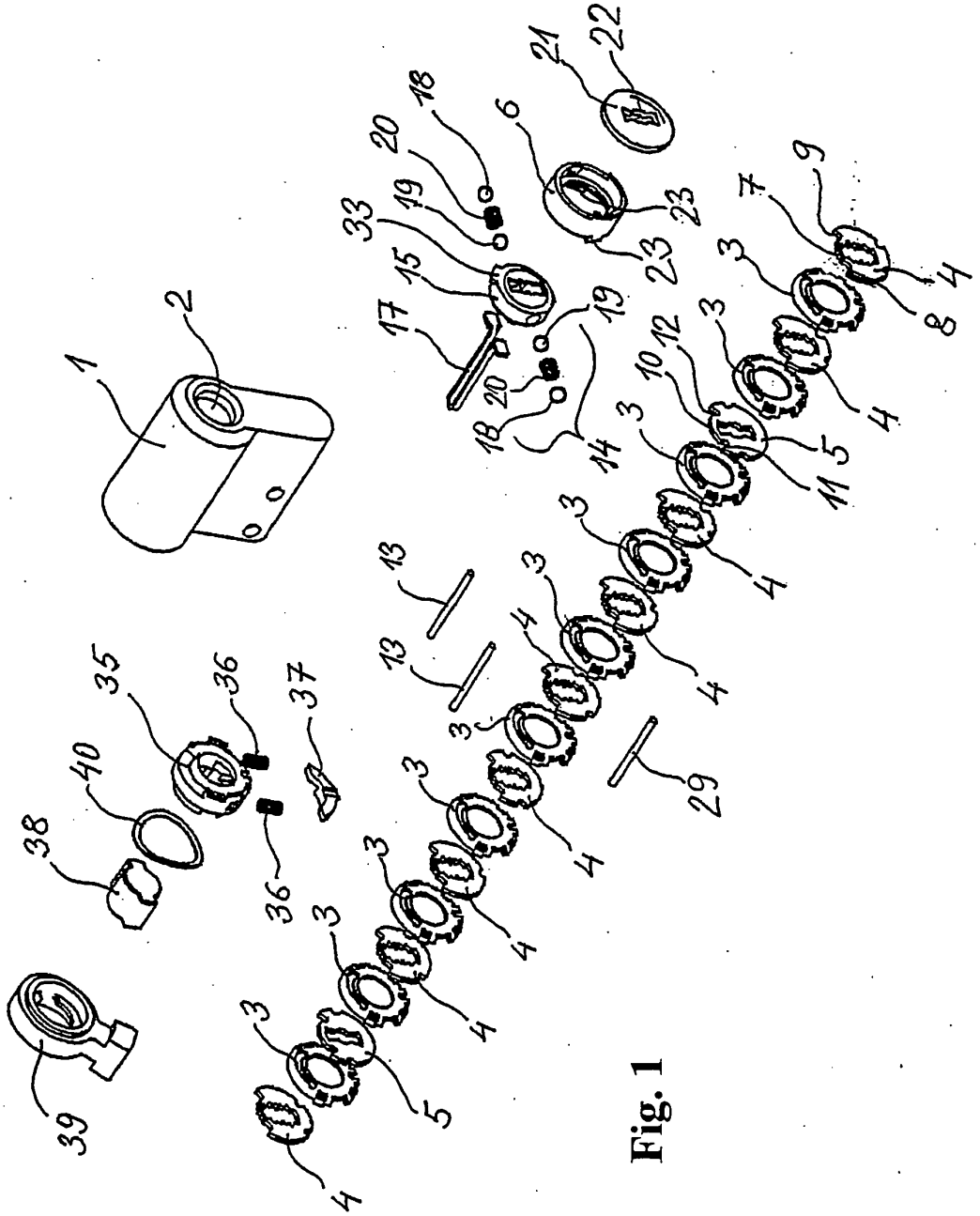
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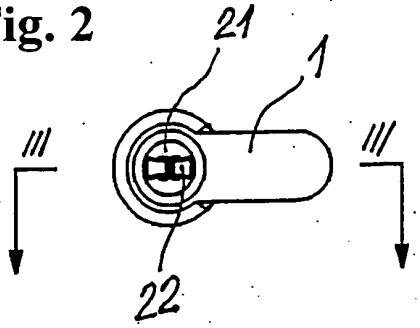
Fig. 1

Fig. 2



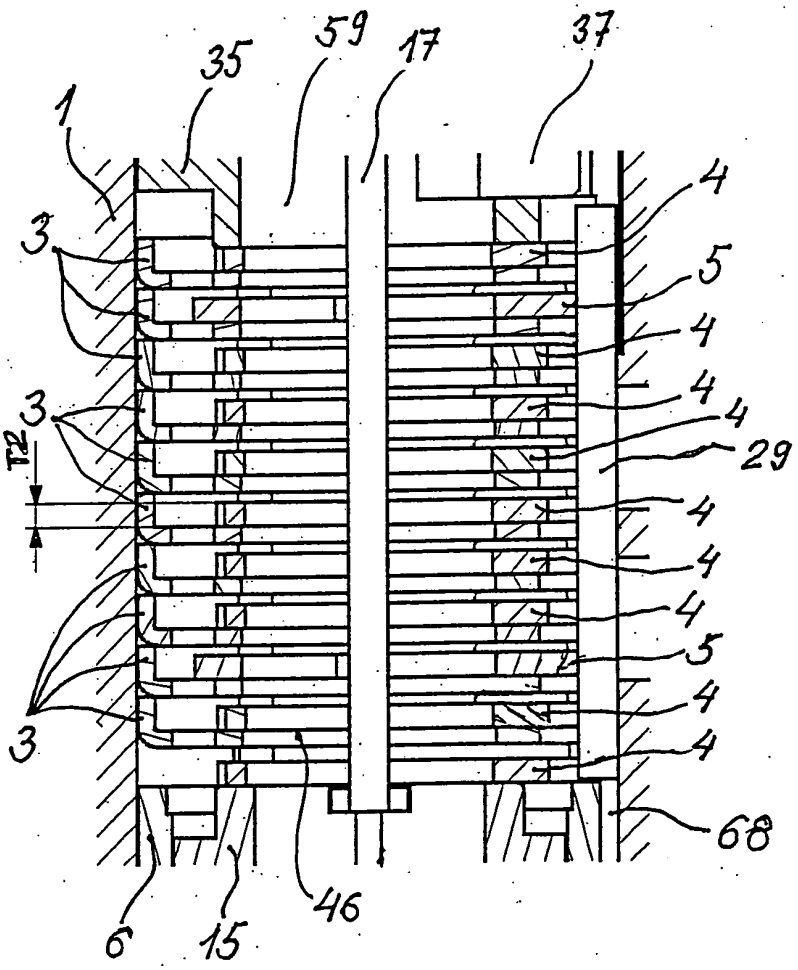
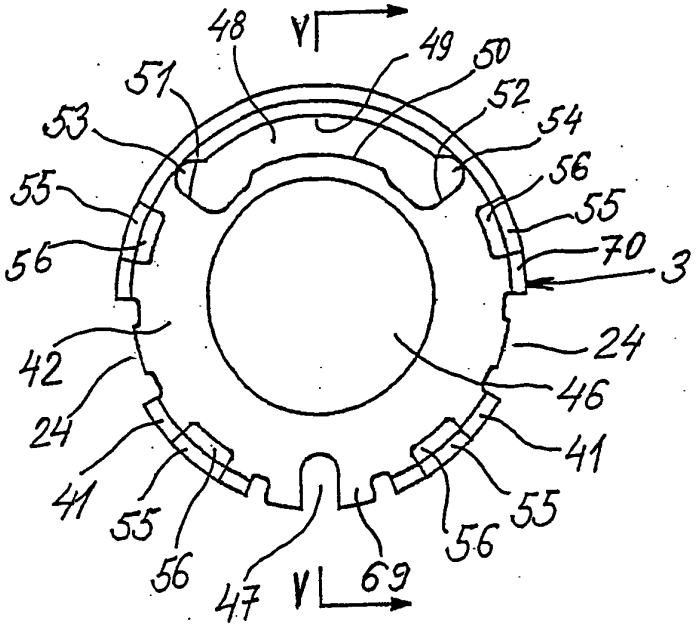


Fig. 3

Fig. 4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47
V
69

Fig. 5

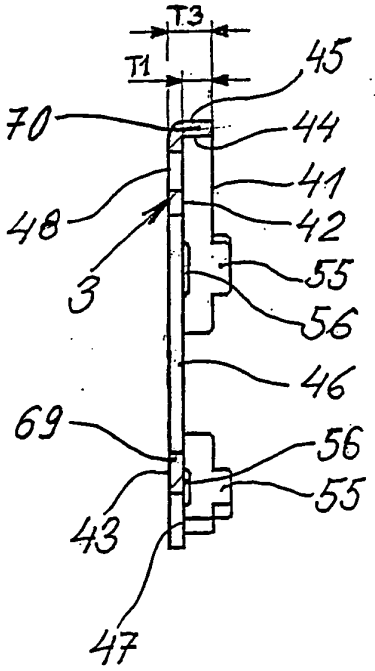
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Fig. 6

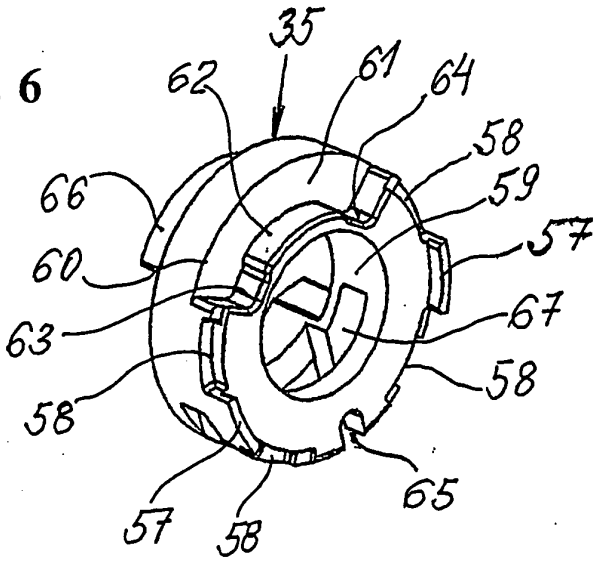


Fig. 7

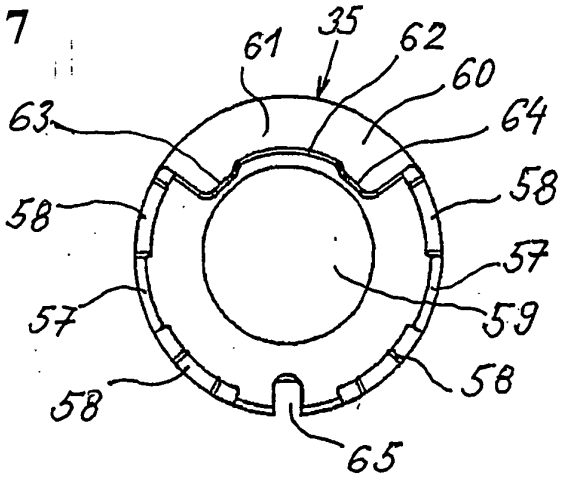


Fig. 8

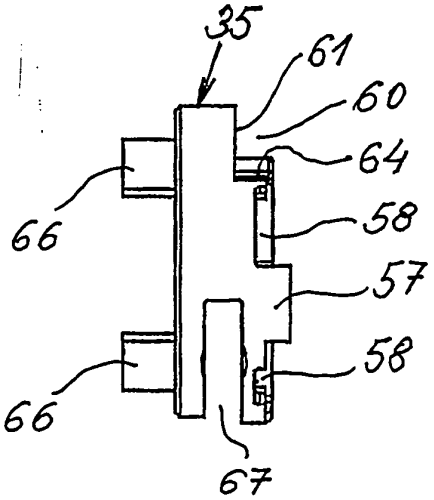


Fig. 9

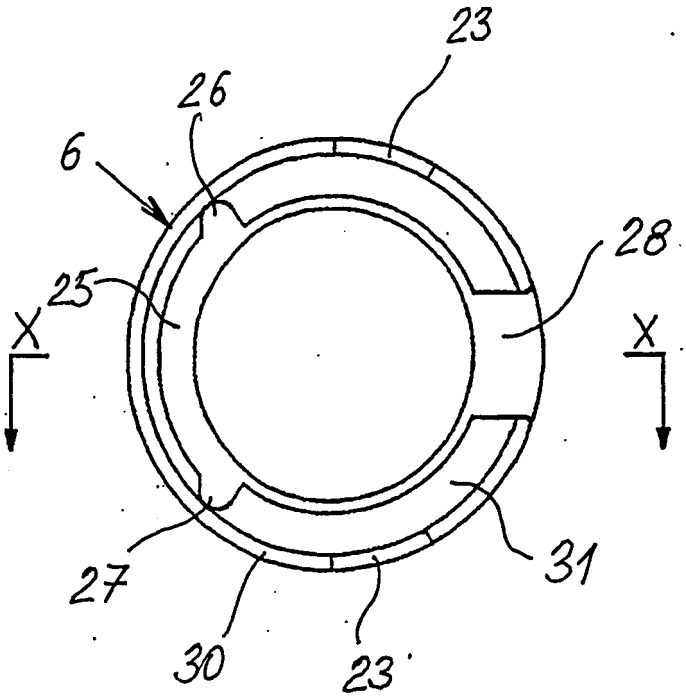


Fig. 10

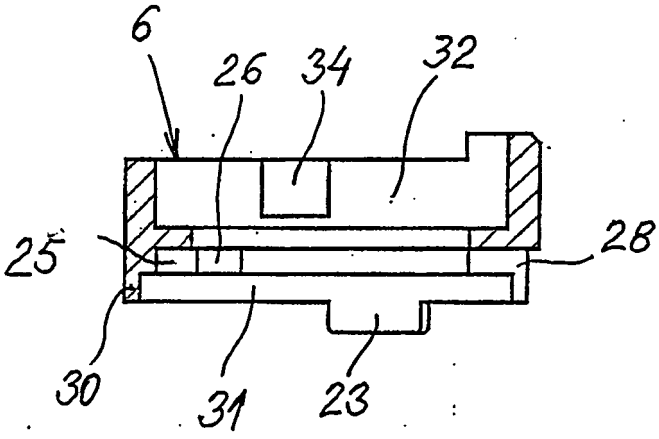
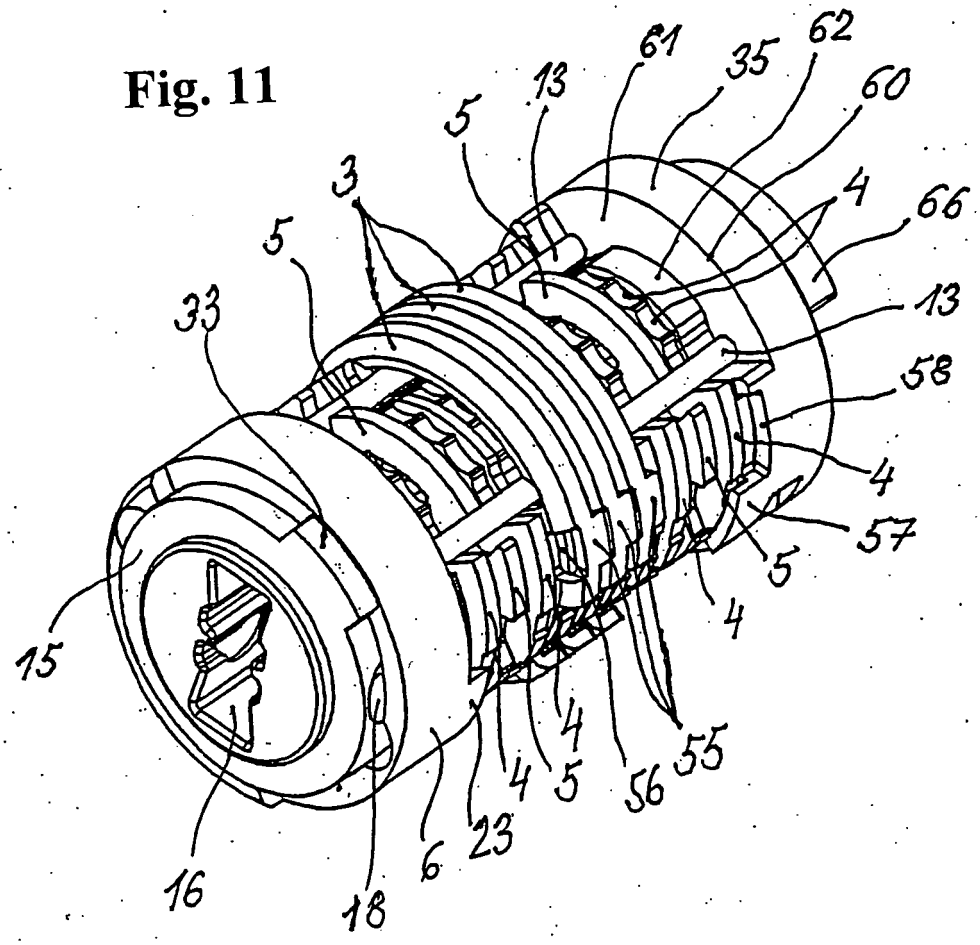


Fig. 11



REFERENCES CITED IN THE DESCRIPTION

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