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(54) Lock cylinder having two driving elements coupled rotatably together

(57) The invention relates to a lock cylinder (1) having two driving elements coupled rotatably together, one of which in the form of a sleeve (7) encases the other in the form of a core (6). The two driving elements are coupled to one another by a latch (8) that is arranged in the core (6), is spring-mounted in a radially outward direction with respect to the core, and engages in an opening (9) in the sleeve (7). The coupling is releasable by engagement of a tool in a radial opening (18) arranged in alignment with the latch displacement direction. The latch (8) is arranged to be displaced backwards into a latch deflection space (17). The radial depth of the latch deflection space (17) is greater than the back-travel of the latch (8) required for disengagement. The plurality of latches (8) operate independently of one another and are arranged in a common cross-sectional plane.

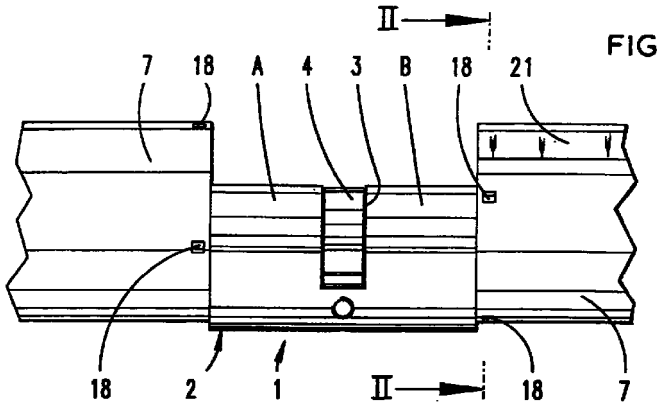

FIG. 1

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Description

[0001] The invention relates to a lock cylinder having two driving elements coupled rotatably together, one of which in the form of a sleeve encases the other in the form of a core, and the two driving elements are coupled to one another in the rotational axis direction by a latch that is arranged in the core, is spring-mounted in a radially outward direction with respect to the core, and engages in an opening in the sleeve, the coupling being releasable by engagement of a tool in a radial opening arranged in alignment with the latch displacement direction, the latch being arranged to be displaced backwards into a latch deflection space.

[0002] A construction of that kind is known from U 296 20 075.1, in which a gear output shaft coupled to a lock cylinder is arranged to be set in rotation by a geared motor received by the core. The core represents the one driving element, which is encased by the other driving element in the form of a sleeve. The co-rotation between the two is effected by the latch spring-mounted in the radially outward direction. The latch sits at the free end of a leaf spring received by a longitudinal channel of the core. When the sleeve has been mounted on the core, the latch enters a radial bore of the sleeve and connects the core and sleeve to one another. To be able to remove the sleeve, which constitutes a handle, of this electromotor-powered driving device, the latch is displaced by means of a tool into the longitudinal channel of the core and in the process becomes disengaged from the radial opening, so that the sleeve can subsequently be pulled off the core.

[0003] The invention is based on the problem of constructing a lock cylinder of the kind described in the introduction in such a manner that unauthorised removal of the sleeve-like driving element from the core-driving element is prevented.

[0004] That problem is solved first and foremost and substantially in a lock cylinder having the features of claim 1 in that the radial depth of the latch deflection space is greater than the back-travel of the latch required for disengagement.

[0005] As a result of such a construction, a lock cylinder of the kind in question of enhanced security value is produced. The latch provides a tumbler-like connection between the core and the sleeve. If the latch is displaced too little by tool engagement, the latch blocks in the customary manner. If, on the other hand, it is displaced by too great a distance into the release position, the tool enters the latch deflection space and hence prevents the sleeve from being pulled off the core. Only when the requisite back-travel of the latch by means of the tool is observed, is it possible to disengage the two driving elements. In this connection, the security value is increased by a plurality of latches operable independently of one another. They can be arranged in a common cross-sectional plane. This means that the latches have to be brought simultaneously or in succession into their release position. Bringing just some of the latches into the release position does not provide the preconditions for removal of the sleeve from the core. According to the invention, the opening is formed by a circumferential annular groove, and the sleeve sits non-rotatably on the core by virtue of fixed positive locking means. Whereas in the prior art the radial opening serves to receive the latch, the radial opening is now secondary to the circumferential annular groove. This receives exclusively the latch in the engaged position. The radial opening, on the other hand, serves to bring the latch out of engagement with the annular groove. Further, because of this fact, the latch is released from rotary forces, the rotary forces being absorbed by fixed positive locking means between sleeve and core. Moreover, provision is made for the latches to sit at the end of resilient tongues, which are associated with a carrier clipped into an annular groove in the core. The annular groove in the core and the annular groove in the sleeve are consequently located in a common cross-sectional plane. The annular groove in the core serves to receive the carrier. It has proved ideal to provide two carriers, each of semi-circular form, with locking projections engaging in diametrically opposite locking recesses. Removal forces are consequently uniformly absorbed by the latches. Assembly is facilitated by the provision of a ramped surface on the sleeve rim. An additional obstacle to release of the latches is achieved by the provision of tool entry paths that extend for different lengths until back-travel of the latch required for disengagement is reached. The tool by means of which the latches can be disengaged is distinguished by a disengaging extension, which can be inserted into the radial opening, and by a stop shoulder, the length of the disengaging extension being so selected that the latch is displaced exactly by the back-travel required for disengagement when the tool is inserted into the radial opening as far as the stop shoulder. A disengaging extension inserted into the opening beyond the back-travel required for disengagement accordingly has an axially securing locking function. Furthermore, an advantageous feature consists in that the core is formed by a flange located on the cylinder core, and the sleeve is formed by an operating knob. By means of four latches lying in 90° arrangement, a stable connection between flange and core is produced, so that even relatively large removal forces can be absorbed without damage. Tool entry paths extending for different lengths until the back-travel of the latch required for disengagement has been reached can be realised in this way.

[0006] An exemplary embodiment of the invention is explained below with reference to the drawings, in which:

Fig. 1 is a view of a lock cylinder constructed in accordance with the invention of approximately actual size,

Fig. 2 shows, to an enlarged scale, the section along the line II-II in Fig. 1,

Fig. 3 shows the section along the line III-III in Fig. 2, and

Fig. 4 is a view comparable with Fig. 2, but with latches displaced by the appropriate amount and by too little and by too much.

[0007] Figure 1 shows that the lock cylinder 1 is a profiled double cylinder. This has a cylinder housing 2 comprising the two housing halves A and B. The cylinder housing 2 is provided centrally with a cut-out 3 for receiving a lock member 4. The latter is arranged to be coupled as desired to a cylinder core 5 indicated by dot-dash lines in Fig. 2. Coupling is effected by way of an electronic control means, not shown. The latter contains a circuit in the form of a reading device, by which the secret key code of an electronically coded key, not shown, can be scanned.

[0008] Each end of the cylinder core 5 carries a flange serving as core 6 fixedly connected to the core 5 and lying adjacent to the end face of the cylinder housing 2. The core 6 is enclosed by a cup-shaped sleeve 7. Both the core 6 and the sleeve 7 form two driving elements coupled rotatably together. To couple them, four latches 8 lying in 90° arrangement are used, which are provided in a common plane of cross-section and are operable independently of one another. The latches 8 engage in an opening 9 of the sleeve 7. The opening 9 is formed by a circumferential annular groove. The latches 8 lie at the end of resilient tongues 10, which are associated with a cater 12 clipped into a annular groove 11 of the core. Two semi-circular carriers 12 are provided, such that catch-like locking projections 13 located at the end of the carrier engage in diametrically opposite locking recesses 14 of the core 6. Each carrier 12 accordingly has two latches 8, which attempt, by virtue of the resilient tongues 10, to spring radially outwards. In the case of the sleeve 7 associated with the core 6, the latches 8 engage in the opening 9 of the sleeve in the form of an annular groove, and prevent the sleeve 7 from being removed from the core 6. Diametrically opposite positive locking means serve to prevent rotation of the sleeve 7 on the core 6. These positive locking means are in the form of ribs 15 protruding from the core, which engage in longitudinal channels 16 of the sleeve 7. Rotation of the sleeve 7 therefore constrains the core 6, and hence the cylinder core 5, to move with the sleeve 7. Both the opening annular groove 9 and the core annular groove 11 cross the two ribs 15 and the longitudinal channels 16.

[0009] A suitable spring steel is chosen for the carriers 12, which imparts the necessary resilience to the spring tongues 10 and restores the latches 8 in the radially outward direction when they have been correspondingly displaced. Other suitable materials could also be considered.

[0010] The spring tongues 10 are associated with the carrier 12 such that radially behind each latch 8 there is a space 17 into which the latch can deflect. This radial depth is greater than the return travel of the latch 8 required for disengagement.

[0011] In the cross-sectional plane of the opening annular groove 9, the sleeve 7 has a radial opening 18 aligned with each one of the latches 8. Engagement of a tool in the radial openings 18 will therefore displace the latches 8 backwards into the deflection space 17, to enable the sleeve 7 to be disconnected from the core 6.

[0012] To be able to mount the sleeve 7 without using tools, the sleeve rim has a ramped surface 19. As the sleeve 7 is pushed axially onto the core 6, the ramped surface 19 bears against the ends of the latches 8 projecting beyond the periphery of the core 6, whereupon the latches are displaced radially inwards; once the sleeve has been pushed on, the latches emerge again, in so doing engaging in the opening annular groove 9 of the sleeve 7. The extent to which the sleeve 7 can be pushed on can be limited, for example, in that the longitudinal channels 16 form stop shoulders 20, against which the relevant edges of the ribs 15 press, cf. Fig. 3. For the purpose of dissemblance when displacing the latches 8 occupying their projecting position, different length tool engagement paths are provided. In the embodiment, this is achieved in a simple manner in that the external circumferential contour of the sleeve 7 is not circular. On both sides of a flattened-off portion 21 of the sleeve 7 there are in-fill pieces 22 merging continuously into the outer wall of the sleeve, which run into the region of the radial openings 18 associated with them. The thickness of the sleeve 7 is consequently greater here than in the remaining region forming the two other radial openings 18.

[0013] Fig. 4 shows two regulation diametrically opposite disengaging tools 23, 24 with a respective disengaging extension 23', 24', which can be inserted into the radial opening 18. Adjoining the disengaging extension 23', 24', each disengaging tool 23, 24 forms a respective stop shoulder 23", 24". The positioning of the same and the length of the disengaging extension are selected so that when the tool is inserted into the radial opening 18 as far as the stop shoulder, the latches 8 are displaced by exactly the back-travel required for disengagement. The latches 8 controlled by these two disengaging tools 23, 24 lie with their circumferential edge in the turning gap of the sleeve 7 on the core 6, which permits the sleeve to be removed from the core. This is only possible, however, when all latches 8 have been disengaged by means of appropriately shaped tools allocated to them.

[0014] Fig. 4 shows that two unsuitable tools 25, 26 have been inserted. The tool 25 displaces its associated latch 8 too far into the deflection space 17, so that the end of the tool then enters the annular groove 11 of the core and consequently forms a lock against withdrawal.

The tool 26, on the other hand, does not displace the latch 8 far enough, so that the latch 8 continues to project into the opening annular groove 9 and thus block the withdrawal movement. Regulation disengaging tools which displace all latches 8 synchronously or in succession by the back-travel required for disengagement must therefore be used. For example, all disengaging tools can have a common handle, which facilitates the release process.

[0015] Fig. 4 shows that the disengaging extensions 23', 24' of the latches 23, 24 are of different lengths because of the non-circular outer circumferential contour of the sleeve 7 forming an operating knob.

[0016] All the disclosed features are essential to the invention. The disclosure of the application fully includes the disclosure content of the associated/accompanying priority documents (copy of the prior application), also for the purpose of incorporating features of these documents into claims of the present invention.

Claims

1. A lock cylinder (1) having two driving elements coupled rotatably together, one of which in the form of a sleeve (7) encases the other in the form of a core (6), and the two driving elements are coupled to one another by a latch (8) that is arranged in the core (6), is spring-mounted in a radially outward direction with respect to the core, and engages in an opening (9) in the sleeve (7), the coupling being releasable by engagement of a tool in a radial opening (18) arranged in alignment with the latch displacement direction, the latch (8) being arranged to be displaced backwards into a latch deflection space (17), characterised in that the radial depth of the latch deflection space (17) is greater than the back-travel of the latch (8) required for disengagement.

2. A lock cylinder according to claim 1 or in particular according thereto, characterised by a plurality of latches (8) operable independently of one another.

3. A lock cylinder according to one or more of the preceding claims or in particular according thereto, characterised by a plurality of latches (8) arranged in a common cross-sectional plane.

4. A lock cylinder according to one or more of the preceding claims or in particular according thereto, characterised in that the opening (9) is formed by a circumferential annular groove and the sleeve (7) sits non-rotatably on the core (6) by means of fixed positive locking means (15, 16).

5. A lock cylinder according to one or more of the preceding claims or in particular according thereto, characterised in that the latches (8) sit at the end of resilient tongues (10), which are associated with a carrier (12) clipped into an annular groove (11) in the core.

6. A lock cylinder according to one or more of the preceding claims or in particular according thereto, characterised by two caters (12), each of semi-circular form, with locking projections (13) engaging in diametrically opposite locking recesses (14).

7. A lock cylinder according to one or more of the preceding claims or in particular according thereto, characterised by a ramped surface (19) on the sleeve rim.

8. A lock cylinder according to one or more of the preceding claims or in particular according thereto, characterised by tool entry paths that extend for different lengths until the back-travel of the latch (8) required for disengagement is achieved.

9. A lock cylinder according to one or more of the preceding claims or in particular according thereto, characterised by a disengaging tool (23, 24) having a disengaging extension (23', 24'), which can be inserted in the radial opening (18), and a stop shoulder (23'', 24''), the length of the disengaging extension (23', 24') being so selected that the latch (8) is displaced exactly by the back-travel required for disengagement when the tool (23, 24) is inserted into the radial opening (18) as far as the stop shoulder (23'', 24'').

10. A lock cylinder according to one or more of the preceding claims or in particular according thereto, characterised in that a disengaging extension inserted into the opening beyond the back-travel required for disengagement has an axially securing locking function.

11. A lock cylinder according to one or more of the preceding claims or in particular according thereto, characterised in that the core (6) is formed by a flange located on the cylinder core (5), and the sleeve (7) is formed by an operating knob.

12. A lock cylinder according to one or more of the preceding claims or in particular according thereto, characterised by four latches (8) lying in 90° arrangement.

13. A lock cylinder according to one or more of the preceding claims or in particular according thereto, characterised in that the external circumferential contour of the sleeve (7) is not circular.

14. A lock cylinder according to one or more of the pre-

ceding claims or in particular according thereto, characterised in that the wall thickness of the sleeve in the circumferential direction varies such that different disengaging extensions (23', 24') are required for disengaging the latches (8).

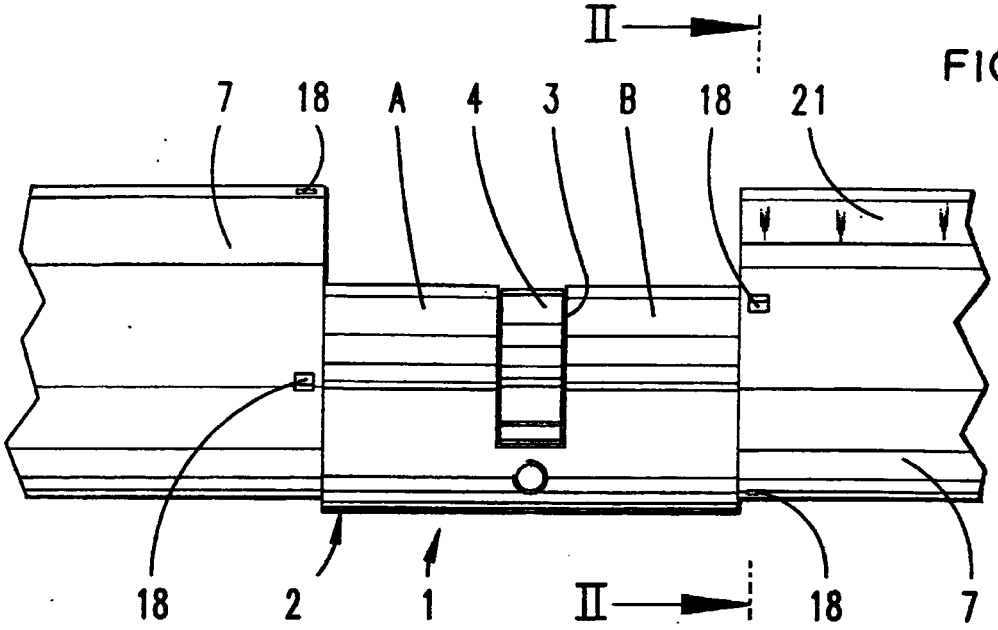
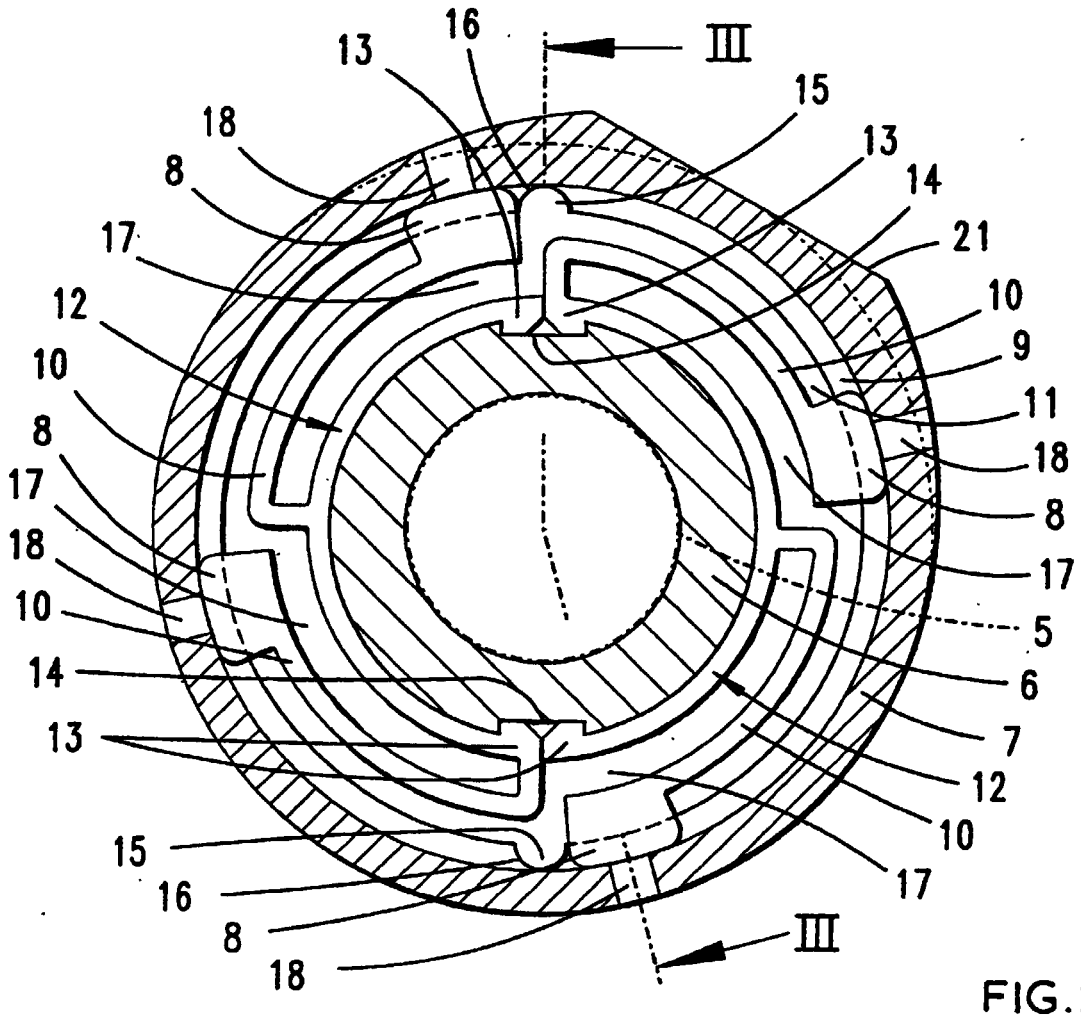

II
7
18
A
4
3
B
18
21
18
2
1
II
18
7

FIG. 1


16
III
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15
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11
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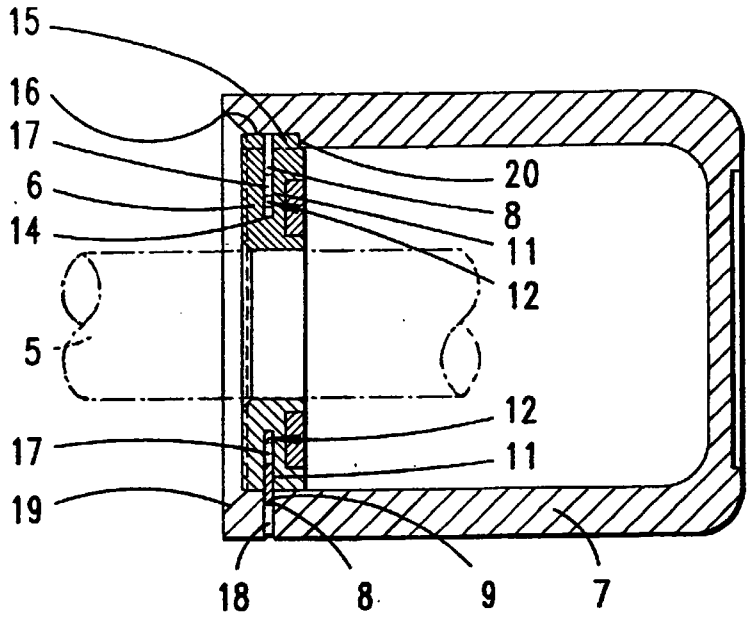
18
III

FIG. 2


15
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5
17
19
20
8
11
12
12
11
18
8
9
7

FIG.3

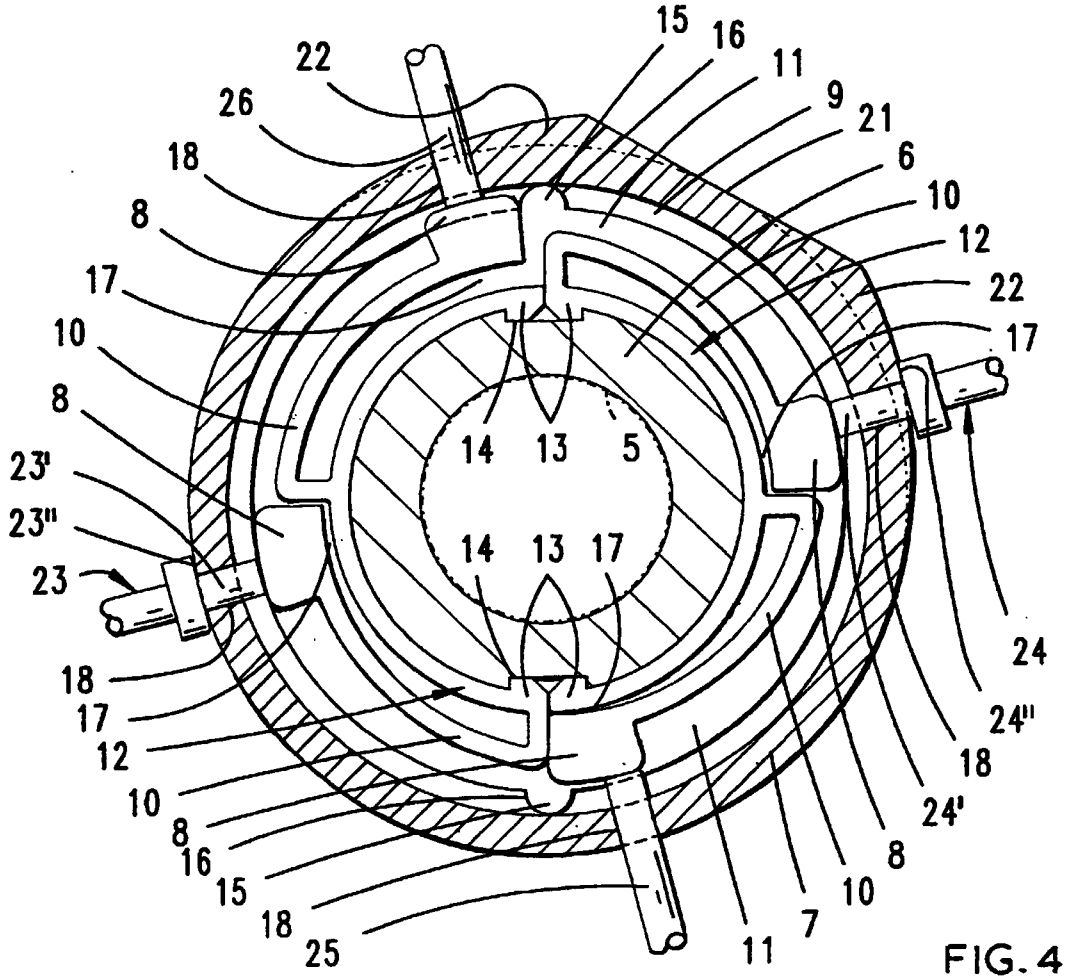
22
26
18
8
17
10
8
23'
23''
23
18
17
12
10
8
16
15
18
25
15
16
11
9
21
6
10
12
22
17
14
13
5
14
13
17
24
24''
18
24'
8
10
7
11

FIG.4