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(54) **MODULAR LOCK CYLINDER**

(57) Modular lock cylinder, in which both the front module (2) and the rear module (3), as well as possible constituent intermediate modules (4) of the modular lock cylinder (1), contain a chamber (5) parallel to the axis of the cylinder (6) distinctly separate from this and capable of receiving partially via either of its ends a fixing bolt (7) with circumferential recesses (8) of semi-circular section at these ends, which circumferential recesses (8) accom-

modate at least one fastening pin (9) of matching semi-circular section introduced transversally to the axis of the cylinder (6), which acts against the fixing bolt (7), and wherein both the front module (2) and the rear module (3), as well as possible constituent intermediate modules (4) of the modular lock cylinder (1), have a recess (12) at the ends of their chamber accomodating therotor capable of receiving a bushing (11).

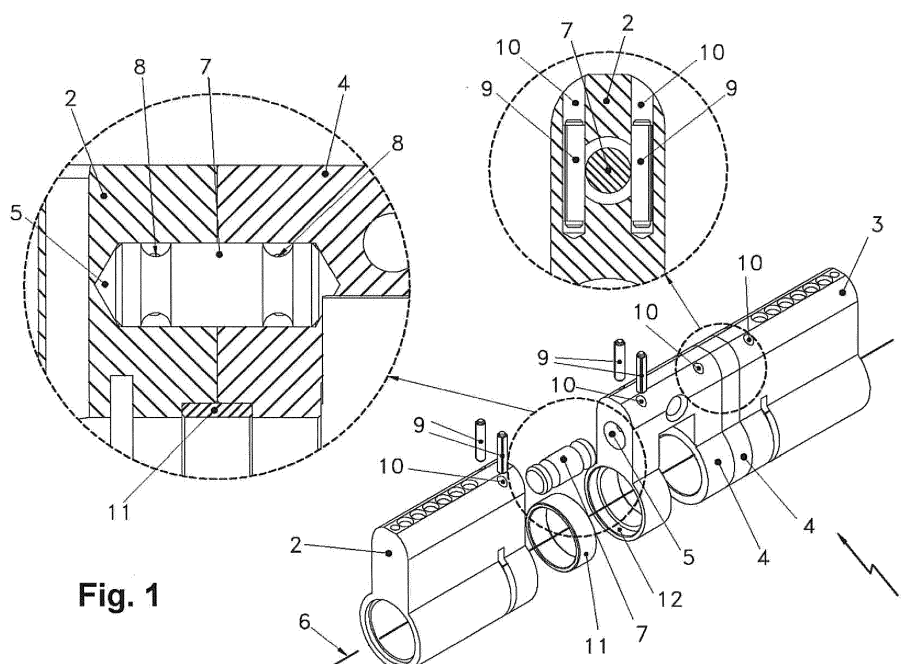


Fig. 1

Description

FIELD OF THE INVENTION

[0001] This invention relates to a modular lock cylinder, in particular a modular cylinder containing at least one front module and one rear module to receive the cylinder lock rotor.

PRIOR ART

[0002] At present and with regard to the state of the art it is common and known to use at least one front module and one rear module in modular lock cylinders, which are joined by means of a bolt or plate introduced in a direction that coincides with the axis of the lock cylinder, which bolt or plate is introduced in full or in part into both modules. These solutions that are in the market have the following disadvantages, however.

[0003] Firstly, many systems for connecting modules use threaded bolts, associated with threaded holes existing in the lock cylinder modules. The need to have the modules machined in order to create the threaded holes increases the costs of production of these modules. It is also normal for these threaded bolts to be threaded at just one end with other methods needing to be used to secure the other end, such as pins. Secondly, there are solutions that use bolts or plates with holes, via which a bolt or pin is introduced which holds them in position within the lock cylinder module. These solutions are less robust, since by making one or more holes in a part with small dimensions, the stress concentration within this part is increased and therefore it is more likely that it will fracture when the pins are introduced with tools such as hammers, used because these pins require pressure to be applied. Another disadvantage that this type of connection between lock cylinder modules has is that it is normal for the connection point to be far away from the axis of the cylinder, favouring the torque generated in the fixing bolt during a fraudulent attempt to open the lock.

EXPLANATION OF THE INVENTION AND ADVANTAGES

[0004] In view of this state of affairs, the present invention refers to a modular lock cylinder, containing the rotor of the lock cylinder, wherein both the front module and the rear module, as well as possible constituent intermediate modules of the modular lock cylinder, contain a chamber parallel to the axis of the cylinder distinctly separate from this and capable of receiving partially via either of its ends a fixing bolt with circumferential recesses of semi-circular section at these ends, which circumferential recesses accommodate at least one fastening pin of matching semi-circular section introduced transversally to the axis of the cylinder, which acts against the fixing bolt, and wherein both the front module and the rear module, as well as possible constituent intermediate modules

of the modular lock cylinder, have a recess at the ends of their chamber accommodating the lock rotor capable of receiving a bushing.

[0005] Thanks to this configuration the various modules of the lock cylinder can be successfully connected in a simple manner. The fixing bolts, to be introduced coaxially with regard to the axis of the cylinder, can be introduced into the parallel chambers disposed in the various modules via either of their ends, because both ends are the same and no specific position is required. In addition, to secure these fixing bolts and prevent them from leaving their position within the chamber parallel to the axis of the cylinder, fastening pins are arranged transversally which connect with the circumferential recesses of semi-circular section existing in these fixing bolts, preventing their axial displacement. As a second method of securing the modules to one another bushings are used which are positioned between the various modules, accommodated in the recesses existing at the ends of the chambers accommodating the lock rotor, such that this chamber is properly aligned. Furthermore, the distance from the axis of the cylinder to the parallel chamber accommodating the fixing bolt is reduced to avoid the torque occurring when an attempt is made to force the modular lock cylinder being sufficiently great to lead to its fracturing.

[0006] It is necessary to stress the importance of creating the circumferential recesses in the fixing bolt with a semi-circular section as opposed to other designs, since these increase the resistance of the modular lock cylinder and its security against attempts to force the lock.

DRAWINGS AND REFERENCE NUMERALS

[0007] For a better understanding of the nature of the invention the attached drawings show an industrial embodiment which has the character of a merely illustrative and non-limiting example.

Figure 1 is an isometric exploded view of the modular lock cylinder (1), showing the various constituent elements, and with enlarged details to illustrate the relationship between the fixing bolts (7) and the fastening pins (9).

Figure 2a is a sectional view along the vertical axis of the modular lock cylinder (1), showing the position adopted by the fixing bolts (7) in the axial chambers (5).

Figure 2b is a sectional view transversal to the axis of the cylinder (6), showing the relationship between the fixing bolt (7) and the fastening pins (9).

- 1.- Modular lock cylinder.
- 2.- Front module.
- 3.- Rear module.
- 4.- Intermediate module.
- 5.- Parallel chamber.
- 6.- Cylinder axis.
- 7.- Fixing bolt.

- 8.- Circumferential recess.
- 9.- Fastening pin.
- 10.- Transversal chamber.
- 11.- Bushing.
- 12.- Recess.

DESCRIPTION OF A PREFERRED EMBODIMENT

[0008] With reference to the drawings and reference numerals listed above, the attached diagrams illustrate a preferred mode of carrying out the subject matter of the invention, relating to a modular lock cylinder, containing the cylinder lock rotor, in which both the front module (2) and the rear module (3), as well as possible constituent intermediate modules (4) of the modular lock cylinder (1), contain a chamber (5) parallel to the cylinder axis (6) distinctly separate from this and capable of receiving partially via either of its ends a fixing bolt (7) with circumferential recesses (8) of semi-circular section at these ends, which circumferential recesses (8) accommodate at least one fastening pin (9) of matching semi-circular section introduced transversally to the cylinder axis (6), which acts against the fixing bolt (7), and wherein both the front module (2) and the rear module (3), as well as possible constituent intermediate modules (4) of the modular lock cylinder (1), have a recess (12) at the ends of their chamber accommodating the rotor capable of receiving a bushing (11).

[0009] Figure 1 shows the various elements in the composition of this modular lock cylinder (1), which in the embodiment in the diagram is comprised mainly of a front module (2), a rear module (3) and two intermediate modules (4), which employ two fixing bolts (7) and three bushings (11) to connect them.

[0010] The various modules of the modular lock cylinder (1) in Figure 1 are secured to one another in the following way. Taking one of the connections, for example the connection between the front module (2) and the intermediate module (4), firstly the fixing bolt (7) is introduced via either of its ends into the chamber (5) parallel to the cylinder axis (6) of one of the modules to be connected. It should be pointed out that the fixing bolts (7) are reversible, since the method of connection is the same at both ends. Once the fixing bolt (7) reaches the maximum depth in the axial chamber (5) of the module into which it has been introduced, the fastening pins (9) are used by introducing them into the respective transversal chambers (10). As shown in Figure 2b, these fastening pins (9) prevent the axial displacement of the fixing bolt (7) as they are positioned in the circumferential recesses (8) disposed at the ends of this fixing bolt (7). Then, once one end of the fixing bolt (7) has been located in one of the modules, a bushing (11) is positioned in the recess (12) corresponding to this module, such that this bushing (11) is partially introduced into the chamber accommodating the rotor. Once this action has been taken, the other end of the fixing bolt (7) and the remainder of the bushing (11) are introduced into the parallel chamber

(5) and into the recess (12), respectively, of the adjacent module. Finally, it is again necessary to prevent the fixing bolt (7) from being movable axially within the parallel chamber (5), so that fastening pins (9) are once again used, which are introduced via the transversal chambers (10) of the module in which it is desired to perform the fastening and accommodated in the corresponding circumferential recesses (8).

[0011] The remaining modules are connected in the same way as described for the above connection.

[0012] As can be seen from the section of Figure 2a, both the fixing bolt (7) and the bushing (11) have been fully introduced between the various modules forming the modular lock cylinder (1). The main function of these fixing bolts (7) is to keep the front module (2), the rear module (3) and the intermediate modules (4) connected. The bushings (11) disposed in the chamber accommodating the rotor, have the function of providing a second way of fastening and also to provide the correct alignment of the chamber accommodating the rotor.

[0013] By means of the connections made between the lock modules a modular lock cylinder (1) is arrived at which is able to be used on doors of differing thickness, with high resistance to any fraudulent attempt to open them, since their connection is close to the cylinder axis (6), meaning that greater force is required to fracture it.

[0014] It should be pointed out that the semi-circular design of the circumferential recesses (8) lends greater resistance to the connection, due to a reduction in the stress concentration in these areas, avoiding a possible fracture in these areas of the fixing bolt (7).

[0015] The essence of this patent is not altered by any variation in materials, shape, size and arrangement of the constituent elements, which are described in a non-limiting manner.

Claims

1. A modular lock cylinder, in particular one comprising at least one front module and one rear module, containing the cylinder lock rotor, **characterised in that** both the front module (2) and the rear module (3), as well as possible constituent intermediate modules (4) of the modular lock cylinder (1), contain a chamber (5) parallel to the cylinder axis (6) distinctly separate from this and capable of receiving partially via either of its ends a fixing bolt (7) with circumferential recesses (8) of semi-circular section at these ends, which circumferential recesses (8) accommodate at least one fastening pin (9) of matching semi-circular section introduced transversally to the cylinder axis (6), which acts against the fixing bolt (7), and wherein both the front module (2) and the rear module (3), as well as possible constituent intermediate modules (4) of the modular lock cylinder (1), have a recess (12) at the ends of their chamber accommodating the rotor capable of receiving a bushing (11).

2. The modular lock cylinder in accordance with Claim 1, **characterised in that** in a preferred embodiment, the circumferential recesses (8) at the ends of the fixing bolt (7) are capable of receiving two fastening pins (9).

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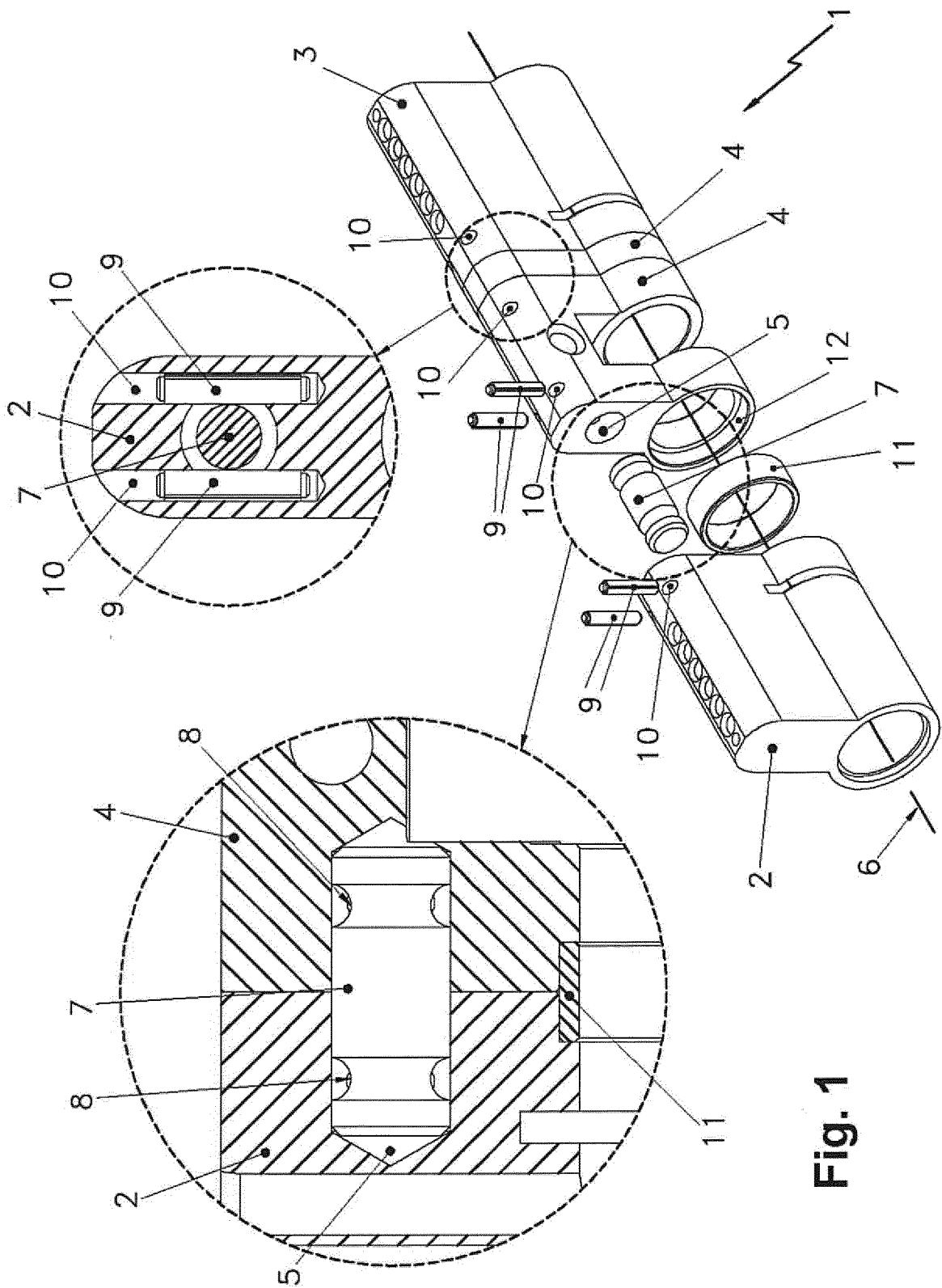


Fig. 1

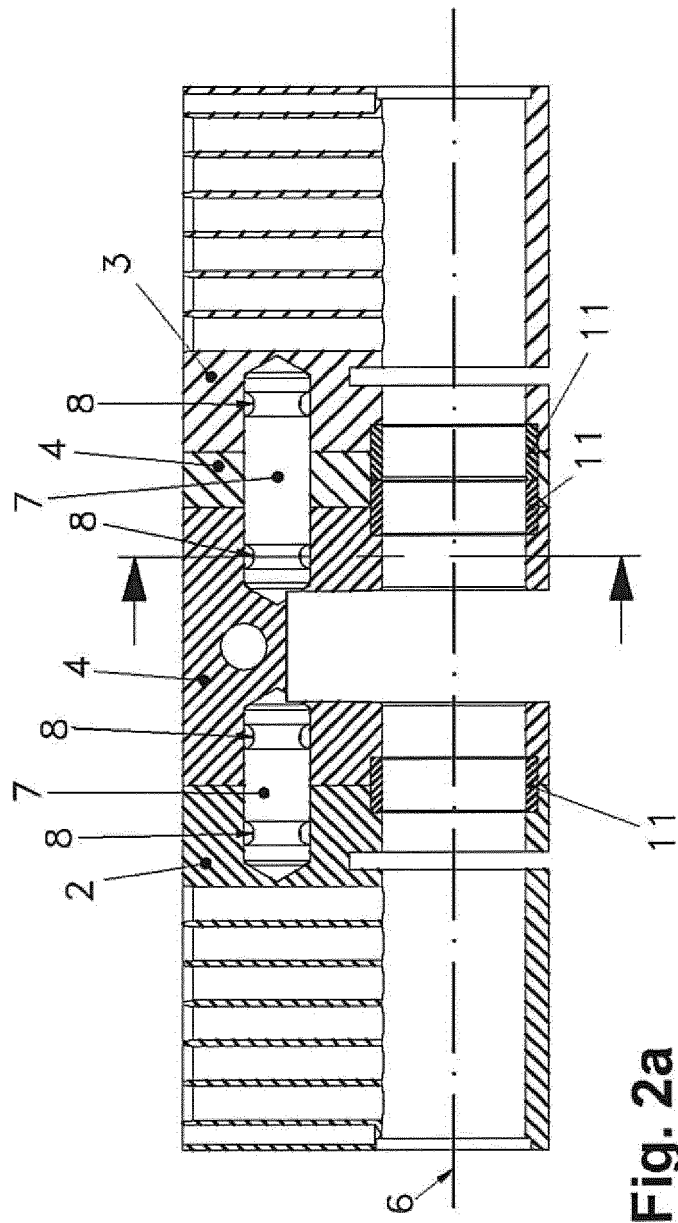


Fig. 2a

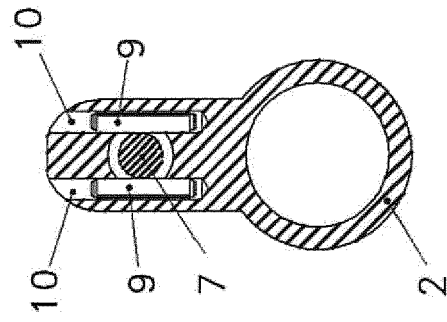


Fig. 2b



EUROPEAN SEARCH REPORT

Application Number
EP 16 17 0878

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	DE 37 38 832 A1 (GECO SICHERUNGSTECHNIK [DE]) 28 July 1988 (1988-07-28) * the whole document *	1,2	INV. E05B9/04
Y	EP 2 436 855 A2 (SECCOR HIGH SECURITY GMBH [DE]) 4 April 2012 (2012-04-04) * figures *	1,2	
Y	EP 2 525 022 A2 (SECCOR HIGH SECURITY GMBH [DE]) 21 November 2012 (2012-11-21) * column 10, line 6 - line 12; figures 1-3 *	1,2	
A	EP 1 201 852 A2 (SCHULTE C E GMBH [DE]) 2 May 2002 (2002-05-02) * the whole document *	1	
A	WO 2014/176647 A1 (MAUER LOCKING SYSTEMS OOD [BG]) 6 November 2014 (2014-11-06) * the whole document *	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			E05B
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 24 October 2016	Examiner Westin, Kenneth
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 16 17 0878

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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