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(54) **Coaxial double-barrel lock.**

(57) A coaxial double-barrel lock operable by a tubular key comprises, in the inside of two cylindrical hollow plugs (10a, 10b), two rotatively coupled oppositely horizontally extending stems (20a, 20b), each whereof is able of sliding in the related hollow plug (10a, 10b), including at the ends thereof adjacent the lock bit a respective portion (18a, 18b), one (18a) whereof is normally kept in rotary engagement with a through opening (24) in the lock bit by a spring (25), and the other (18b) is rotatively engageable in the opening upon displacement of its stem (20b) axially by the insertion of the tubular key.

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This invention relates to a coaxial double-barrel lock which can be operated with a tubular key and comprises a bit rotatably supported between the barrels, wherein each barrel includes a hollow cylindrical body and has a cylindrical plug coaxially rotatable within said hollow body and formed with a coaxial cylindrical passageway, wherethrough there extends a stem defining an annular space for the insertion of the key therein, and wherein the hollow body and the cylindrical plug are provided with radial holes or bores intended for accommodating pins and tumblers which, under the action of springs and at a pre-determined position of the cylindrical plug relative to the hollow body, are mutually aligned, and upon insertion of the key, enable the cylindrical plug to be rotated, whereas with the key removed, they rest on said stem. With such locks, on introducing the key into the annular space, the meeting surface between the pins and tumblers will coincide with the so-called "shear surface" defined by the adjacent cylindrical surfaces of the cylindrical plug and of the body. The key being provided with means adapted for rotary engagement in the cylindrical plug, by turning the key, one is enabled to rotatively entrain the cylindrical plug and accordingly actuate the bit which acts on the latch.

Tubular key operated locks are known already, e.g. from U.S. Patent No. 913,942. The increased

constructional complexity of such locks over traditional locks using a flat type of key, is compensated for by their greater resistance to burglarious raising and by the higher number of
5 codifications achievable.

However, conventional tubular key locks are only of the one-way type, i.e. one which can only be operated from one side of a door or gate. By contrast, when the lock is to be operated from
10 either sides of a door or gate, traditional twin coaxial barrel locks, as operated by means of flat keys, are utilized. In those locks, the bit is carried rotatably between the barrels.

This invention sets out to provide a lock having
15 two coaxial barrels which can be operated with a tubular key from either sides.

According to one aspect of the present invention, there is provided a coaxial double-barrel lock, which can be operated with a tubular key and
20 comprises a bit rotatably supported between the barrels, each barrel comprising a hollow cylindrical body and a cylindrical plug coaxially rotatable inside said hollow body and formed with a coaxial cylindrical passageway, wherethrough
25 there extends a stem defining an annular space for the insertion of said tubular key therein, said hollow body and cylindrical plug being provided with radial bores for accommodating pins and tumblers therein, said pins and tumblers, under
30 the action of springs and at a determined position

of said cylindrical plug relative to said hollow
body, being mutually aligned, and, upon insertion
of said tubular key, enabling said cylindrical plug
to be rotated, whereas with said tubular key removed,
5 said pins and tumblers rest onto said stem, said lock
being characterized in that said stems are rotatively
coupled to, but axially slidable in the inside of a
respective one of said cylindrical plugs and include,
at the ends thereof adjacent said bit, respective
10 portions, one whereof is normally kept in rotary
engagement with a through opening in said bit by
resilient means, and the other is rotatively
engageable in said opening when said stem is
displaced axially by the insertion of said tubular key.

15 If a key is left inserted in one barrel and
the same is rotated with respect to its insertion
or withdrawal position, with such a lock it would
be impossible to insert another key into the opposite
barrel.

20 However, the need to do so is often felt in
order to gain access to a room which, for a reason
whatever, has its door locked from the inside with
the key left inserted into the lock. In cases such
as this, one may wish to unlock the door from the
25 outside with an emergency key.

According to a further aspect of this invention,
in order to afford the possibility of operating the lock
from one side even if on the other side a key has been left

inserted and turned in the keyhole, the lock is characterized in that one of said portions is normally held in rotary engagement with the bit through a coupling member the opposite ends whereof are inserted into
5 coaxial recesses of said portions such that it is axially rigid but rotatable in one portion and axially slidable in the other portion and rotatively coupled to the latter by means of radial lugs which extend radially through slots in said portion and
10 rotatively engage the cylindrical plug and the bit opening, between said coupling member and that portion with respect whereto it is axially slidable there intervening a return spring which, with the keys being removed from both sides of the lock, holds the
15 portions outside of the bit opening, whilst to cause one portion to be displaced to the position of engagement with the bit, the key comprises a tubular shank wherein a pin is guided coaxially which is held abutted against a shoulder by a stronger spring than
20 the one interposed between the coupling member and said portion, said pin being arranged such as to act on the stem before the key has reached its position of entrainment and rotation of the cylindrical plug.

Further features of this invention are to be
25 found in the appended subordinate claims.

Some embodiments of the invention are illustrated in the accompanying drawings, where:

Figure 1 is a view, in longitudinal section, of a double-barrel lock;

30 Figure 2 is a slightly enlarged sectional view,

taken along the line II-II of Figure 1;

Figure 3 is a longitudinal section view of a tubular key for operating the lock of Figure 1, to a slightly larger scale;

5 Figure 4 is a longitudinal section view of a double-barrel lock which can be operated with an emergency key even when another key has been left inserted on one side of the lock;

10 Figure 5 is a sectional view taken along the line V-V of Figure 4, to an enlarged scale;

Figure 6 is a sectional view taken along the line VI-VI of Figure 4; and

15 Figure 7 is a longitudinal section view of a tubular emergency key for operating the lock of Figure 4.

With reference to Figures 1-3, the lock comprises two barrels 1a, 1b including cylindrical cases 2a, 2b which are coaxial to each other and have, at the bottom, projections or extensions 3a, 3b.

20 The barrels 1a, 1b are interconnected by an insert 4 having two coaxial shanks 4a, 4b which penetrate two holes 5a, 5b in the projections 3a, 3b and are secured by pins 6a, 6b. The insert 4 is formed with a threaded hole 7 for receiving a screw
25 whereby the lock can be affixed to a door.

Inside the cases 2a, 2b, there are inserted tubular bodies 8a, 8b which are locked in position by means of pins 9a, 9b, and accommodate cylindrical plugs 10a, 10b for rotation therein. The cylindrical
30 plugs are provided, at their outer ends, with flanges

11a, 11b the peripheries whereof are surrounded by annular portions 12a, 12b of the tubular bodies 8a, 8b.

5 The cylindrical plug ends which lay opposite to the flanges 11a, 11b extend into an opening 13 defined between the barrels 1a, 1b. The cylindrical plugs are retained axially by rings 14a, 14b which engage in annular grooves on the cylindrical plugs themselves and are clamped between the tubular bodies
10 8a, 8b and inner collars 15a, 15b of the cases 2a, 2b. Coaxial cylindrical passageways 16a, 16b for the introduction of a tubular key are provided lengthwise to the cylindrical plugs. The passageways form, on the side facing the opening 13, cylindrical seats
15 17a, 17b of larger diameters, wherein portions 18a, 18b in the form of cylindrical bodies are slidable. The portions 18a, 18b are provided externally with longitudinal keys 19a, 19b and with stems 20a, 20b which extend coaxially into the passageways 16a, 16b,
20 thus defining annular key-receiving spaces. The keys 19a, 19b run in longitudinal grooves 21a, 21b of the seats 17a, 17b, thereby the portions 18a, 18b are rotatively rigid with their respective cylindrical plugs but axially slidable therein.

25 The ends of the cylindrical plugs 10a, 10b which protrude into the opening 13, carry pivotally the hub 22 of the bit 23, intended for acting on a latch or other device mounted on the door. The hub 22 has a through opening 24 with the same cross-sectional
30 area as the portions 18a, 18b and such as to enable

these portions to engage therewith. In particular, it should be noted that when one portion is engaged in the opening 24, a rotary coupling is established between the hub 22 and said portion.

5 The seat 17b also accommodates a spring 25 which acts on the portion 18b and holds it normally engaged in the opening 24. The tubular bodies 8a, 8b and the cylindrical plugs 10a, 10b are provided with radial bores 26a, 26b and 27a, 27b for accommodating
10 the pins 28a, 28b and tumblers 29a, 29b therein. The bores are arranged to lay on angularly equidistant radial planes and such that, with the cylindrical plugs in a determined angular position, the bores or holes in the latter are aligned with the bores in the
15 tubular bodies.

 The pins 28a, 28b are acted upon by springs 30a, 30b which abut against the inner walls of the cases 2a, 2b, and in the position of alignment of the pins and tumblers, hold the tumblers to rest on the stems
20 20a, 20b.

 As can be observed in Figure 1, when the key is not inserted into the keyhole, the pins 28a will intersect the shear surface defined by the adjacent cylindrical surfaces of the cylindrical plugs and
25 tubular bodies. By contrast, when the key is inserted, the meeting surface between the pins and tumblers is coplanar with the shear surface, thereby the cylindrical plugs cannot be rotated. This position of the pins will be simply termed hereinafter "pin
30 alignment position", for simplicity.

Advantageously, one set of pins are axially offset with respect to the other sets, such as to allow but one position for the withdrawal of the key, which position will coincide with the position of hindered rotation of the cylindrical plugs by the pins.

The tubular key for operating the lock of Figure 1 comprises a tubular shank 31 having its free end 32 tapered and being attached to a grip 33 by means of a pin 34. At the root or base of the shank 31, there is provided a lug 35 for engagement in a notch 36a, 36b of the front flanges 11a, 11b. Aligned notches 37 are formed on the shank which are adapted for receiving the tumblers 29a, 29b in accordance with the code which allows the alignment position between the pins and tumblers.

The lock shown operates as follows. Upon insertion of the key into the passageway 16a of the barrel 1a, the key abuts against the outer end of the stem 20a with the bottom 31a of the tubular shank 31. (The same result could be achieved by arranging for the pointed tip 32 to contact the portion 18a). Thus, an axial displacement is produced of the portion 18a which, by engaging in the opening 24 of the bit hub, causes the portion 18b to move out against the bias of the spring 25. When the key is fully inserted into the passageway 16a, or more precisely into the space defined in the passageway 16a by the stem 20a, the lug 35 has penetrated the notch 36a and the tumblers 29a are in engagement

with the notches 37 such that the meeting surfaces between the pins 28a and tumblers 29a extend along the shear surface between the tubular body 8a and the cylindrical plug 10a. By rotating the key, it
5 now becomes possible to rotatively entrain the bit 23. As the key is withdrawn from the passageway 16a, the spring 25 will again urge the portion 18b into the opening 24, to cause the portion 18a to move out. It should be noted that the introduction of a key
10 into the passageway 16b only results in the pins being aligned in the position which allows the cylindrical plug 10b to be rotated.

It is a peculiar feature of this invention that the bit remains, even with the key removed, locked
15 against rotation and prevents the latch from sliding as the latter is being forced in its sliding direction as during a raising attempt.

To protect the pins and tumblers against burglarious attempts with drills and cutters, it is
20 possible to arrange pairs of half-circular plates 38a, 38b made of a hard material, such as hardened steel, in cutouts on the flanges 11a, 11b. The plates of each pair are preferably axially offset such as to result in an increased thickness of the material
25 to be removed. Similarly, to prevent the screw by means of which the lock is secured to the door from being cut by burglarious actions with drills and the like, the shanks 4a, 4b of the insert 4 are formed from a hard material and have their ends pointed
30 such as to deflect the tool bit out of the hole 7

wherein the lock mounting screw is threaded.

The embodiment shown in Figure 4 illustrates a lock which can be operated from one side even when another key has been left inserted on the other side.

5 To avoid unnecessary repetition, those components of the lock of Figure 4 which are technically similar or equivalent to those of this embodiment, have been designated with the same reference symbols. The essential difference resides in the provision of a

10 coupling element 38 comprising a cylindrical pin 39, one end whereof is provided with a pair of diametrical wings 40a, 40b and the other end is formed with an annular groove 41. The element 38 is inserted with its opposite ends in recesses 42a, 42b formed

15 coaxially in the portions 18a, 18b, and is axially secured to the portion 18b by a pin 43 engaging in the groove 41 to permit the cylindrical plug 10b to be rotated with respect to the element 38.

The wings 40a, 40b are passed through the

20 portion 18a in slotted holes 44a, 44b of the portion 18a and engage in notches 45a, 45b of the cylindrical plug 10a. A spring 46, accommodated in the recess 42a and acting on the element 38, holds the portions 18a, 18b apart, such that neither of them engages in

25 the opening 24 of the hub 22. In that spaced-apart position, the wings 40a, 40b are partly inserted in respective cutouts 47a, 47b of the opening 24.

In the inoperative condition, that is with the key removed, the lock has the portion 18a rotatively

30 coupled to the bit through the element 38.

Now, as a key is inserted as shown in Figure 3, into the passageway 16b, similar to the preceding example, there occurs a displacement of the portion 18b. The wings 40a, 40b are moved out of the cutouts 47a, 47b, and the end of the portion 18b penetrates the opening 24. The cylindrical plug 10b is allowed to rotate by the portion 18b being enabled to rotate on the element 38 while remaining rigidly connected thereto. Similarly, when the key is inserted into the passageway 16a, the portion 18a is inserted through the opening 24, whilst the wings 40a, 40b remain engaged in the cutouts 47a, 47b.

With a lock as described, one is enabled to rotate the bit by means of an emergency key even if a key has been left inserted in one barrel and turned through an angle whatever from the withdrawal position. The emergency key differs in that, inside the shank 31, there is guided a pin 48 formed with a collar 49 against which acts a spring 50 accommodated in a seat 51 of the key grip. The spring 50 is more rigid than the spring 46.

For a clearer understanding of the emergency key mode of operation, it will be assumed that a key has been introduced into the passageway 16b and that the same is rotated from its withdrawal position. In this situation, the portion 18b will be in engagement with the opening 24. The sliding movement of the stem 20b (and similarly for the stem 20a) is selected so that the portion 18b will only engage one half of the opening 24 thickness, as shown in

dotted lines in Figure 4. To operate the lock, the emergency key is inserted into the passageway 16a until the pin 48 is brought to abut against the end of the stem 20a. Since the portion 18a cannot
5 penetrate the opening 24, owing to the bit being in a rotated position, the key cannot complete its travel of insertion into the passageway 16a to take the position of alignment of the pins which allows the cylindrical plug 10a to be rotated. However,
10 by further pushing the key in, the pin 48 will yield against the bias of the spring 50, which enables the shank 31 to complete the additional displacement movement as required to realize the alignment of the pins and tumblers. Of course, the shank 31 will have
15 a shorter length than the stem 20a. Now, the cylindrical plug 10a can be rotated until the portion 18a faces the opening 24 wherein it will engage under the urge of the spring 50. Similar in principle is the operation of the lock when a key has been left
20 inserted into the barrel 1a and the emergency key must be introduced into the barrel 1b.

It should be noted that the wings 40a, 40b allow the bit to remain rotatively locked even when the key is removed. In fact, the wings are rotatively
25 associated, in addition to the bit hub, also to the cylindrical plug 10a through the slots 44a, 44b of the portion 18a.

CLAIMS

1 1. A coaxial double-barrel lock, which can be
2 operated with a tubular key and comprises a bit
3 rotatably supported between the barrels,
4 each barrel comprising a hollow cylindrical body and
5 a cylindrical plug coaxially rotatable inside said
6 hollow body and formed with a coaxial cylindrical
7 passageway, wherethrough there extends a stem
8 defining an annular space for the insertion of said
9 tubular key therein, said hollow body and
10 cylindrical plug being provided with radial bores
11 for accommodating pins and tumblers therein, said
12 pins and tumblers, under the action of springs and
13 at a determined position of said cylindrical plug
14 relative to said hollow body, being mutually aligned,
15 and, upon insertion of said tubular key, enabling
16 said cylindrical plug to be rotated, whereas with
17 said tubular key removed, said pins and tumblers
18 rest onto said stem, said lock being characterized
19 in that said stems (20a, 20b) are rotatively coupled
20 to, but axially slidable in the inside of a respective
21 one of said cylindrical plugs (10a, 10b) and
22 include, at the ends thereof adjacent said bit,
23 respective portions, (18a, 18b), one whereof is
24 normally kept in rotary engagement with a through
25 opening (24) in said bit (23) by resilient means
26 (25, 46), and the other is rotatively engageable
27 in said opening when said stem is displaced
28 axially by the insertion of said tubular

29 key.

1 2. A lock according to Claim 1, characterized
2 in that one of said portions (18a) is normally held
3 in rotary engagement with said bit (23) through a
4 coupling element (38) the opposite ends whereof are
5 inserted into coaxial recesses (42a, 42b) of said
6 portions (18a, 18b) such as to be axially rigid but
7 rotatable in one portion (18b) and axially slidable
8 in the other portion (18a) and rotatively coupled
9 to the latter by means of radial lugs (40a, 40b)
10 extending radially through slots (44a, 44b) in said
11 portion and rotatively engaging said cylindrical
12 plug (10a) and said opening (24) in said bit, between
13 said coupling element (38) and that portion (18a)
14 with respect whereto it is axially slidable there
15 intervening a return spring (46) which, with the
16 keys being removed from both sides of the lock, holds
17 the portions outside of said bit opening whilst, to
18 cause one portion to be displaced to the position of
19 engagement with said bit, the key comprises a
20 tubular shank (31) wherein a pin (48) is guided
21 coaxially and held abutted against a shoulder by a
22 stronger spring (50) than said spring (46) interposed
23 between said coupling element and said portion, said
24 pin (48) being arranged such as to act on said stem
25 (20a, 20b) before the key has reached its position
26 of entrainment and rotation of said cylindrical
27 plug (10a, 10b).

1 3. A lock according to Claim 1, characterized
2 in that said elastic means comprise a spring (25)

3 accommodated in a seat (17b) on one of said portions
4 (18b), said spring urging the latter axially into
5 said opening (24) in said bit (23)..

1 4. A lock according to Claim 1, characterized
2 in that at the opposite ends of said cylindrical
3 plugs (10a, 10b) there are inserted plates (38a, 38b)
4 of a hard material arranged in transversal planes
5 to said cylindrical plug axes.

1 5. A lock according to Claim 1, characterized
2 in that the barrels (1a, 1b) have projections (3a,
3 3b) interconnected by an insert (4) provided with
4 coaxial shanks (4a, 4b) engaging holes (5a, 5b) in
5 said projections.

1 6. A lock according to Claim 5, characterized in
2 that said shanks (4a, 4b) are formed from a hard
3 material and have pointed ends.

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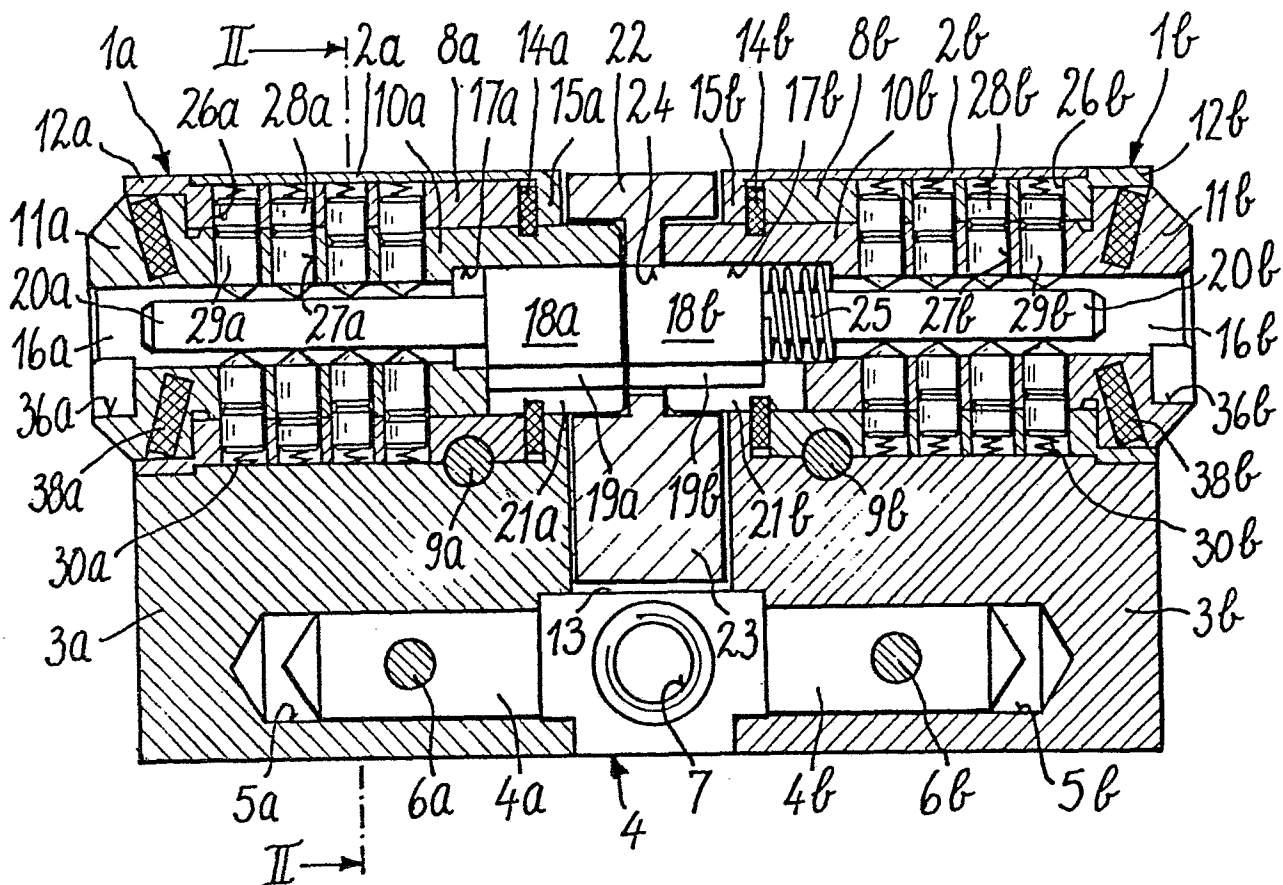


Fig. 1

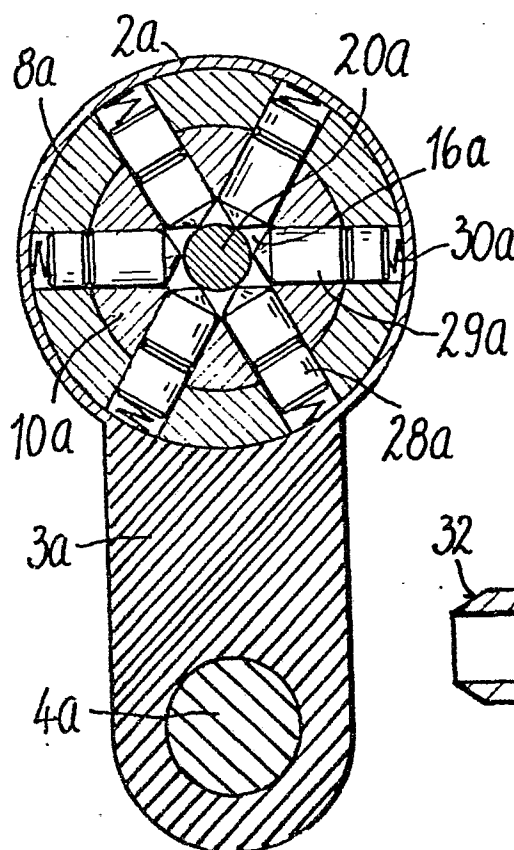


Fig. 2

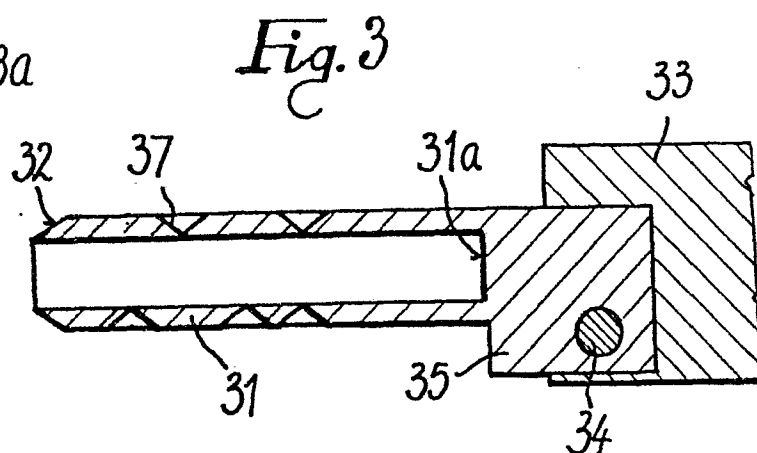
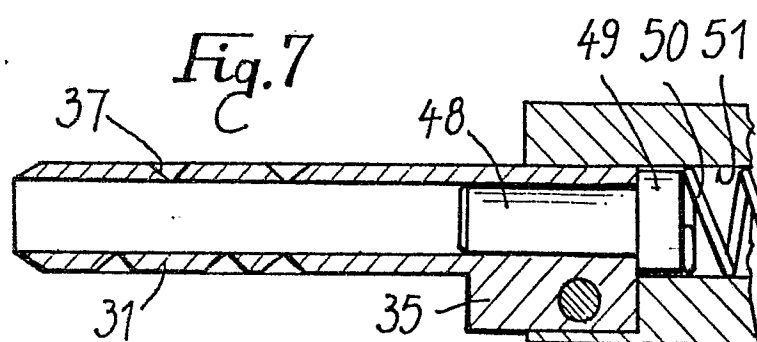
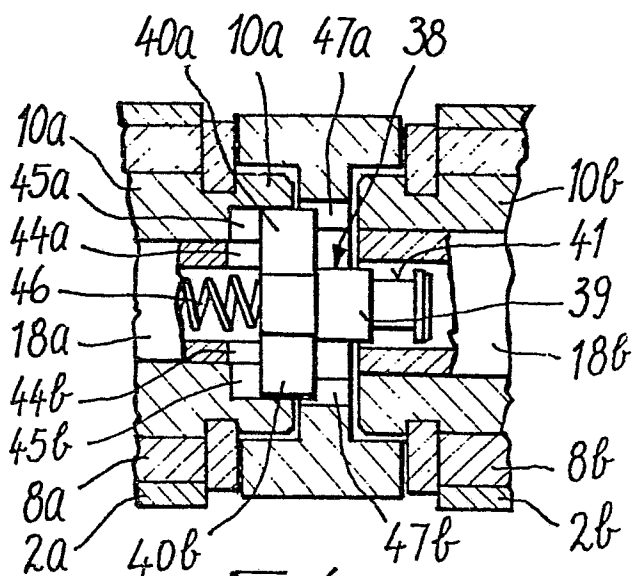
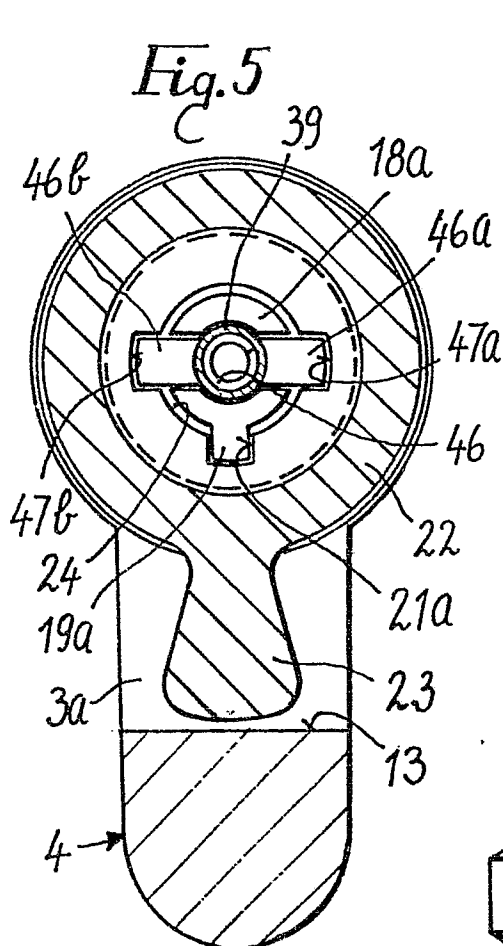
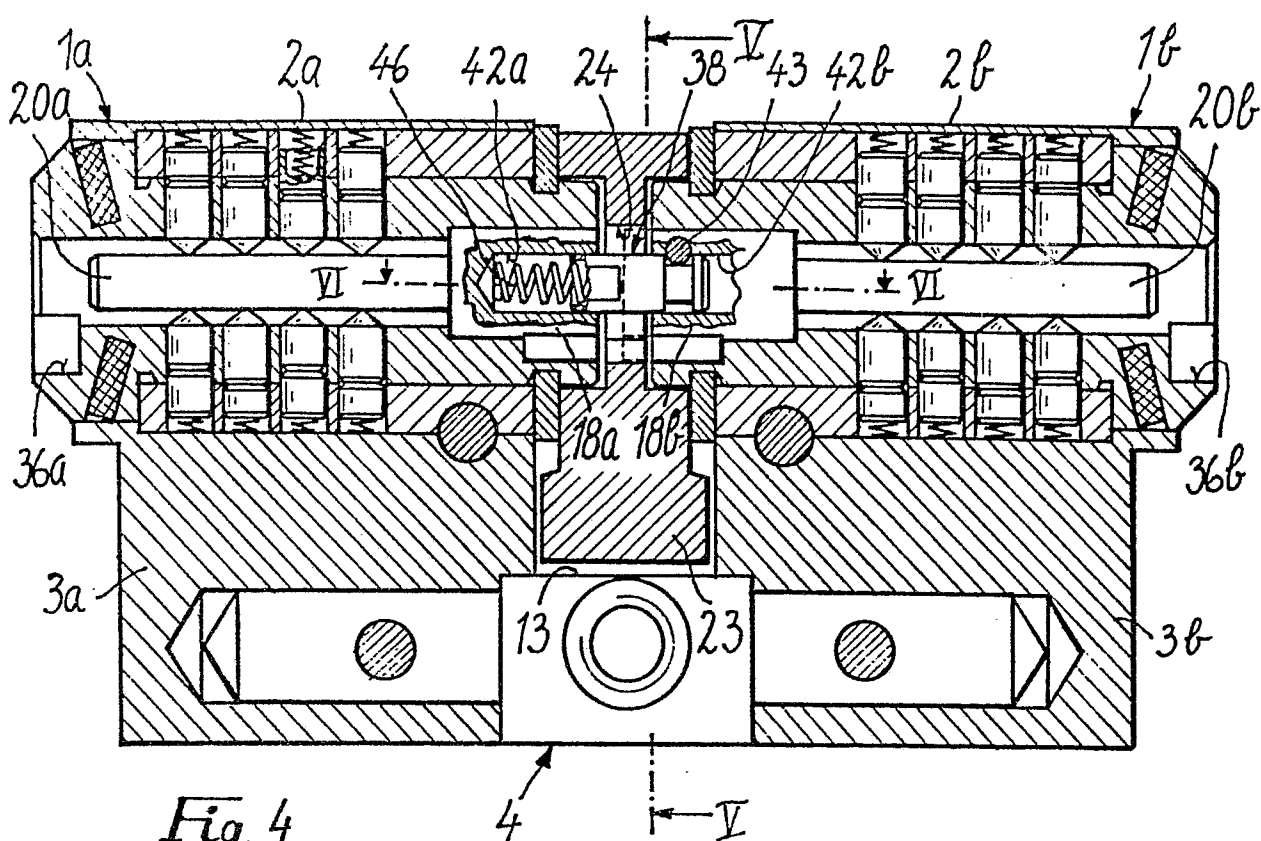


Fig. 3



0022233



European Patent
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EUROPEAN SEARCH REPORT

Application number
EP 80 10 3692

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
A	<u>NL - A - 77 05887</u> (CHUNG CHEN KU)		E 05 B 9/10 E 05 B 27/00
A	<u>DE - C - 478 784</u> (ZEISS-IKON)		
A	<u>US - A - 3 170 317</u> (PARLIER)		
A	<u>DE - A - 1 728 517</u> (FELIX)		

			TECHNICAL FIELDS SEARCHED (Int. Cl. ³)
			E 05 B
			CATEGORY OF CITED DOCUMENTS
			X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons
			&: member of the same patent family, corresponding document
☒ The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
The Hague	06-10-1980	BOGAERT	