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(11) **EP 1 327 735 A2**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:

**16.07.2003 Bulletin 2003/29**

(51) Int Cl.7: **E05B 27/00, E05B 19/12**

(21) Application number: **02020630.6**

(22) Date of filing: **13.09.2002**

(84) Designated Contracting States:  
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR**  
**IE IT LI LU MC NL PT SE SK TR**

Designated Extension States:  
**AL LT LV MK RO SI**

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(30) Priority: **11.01.2002 IT MI20020045**

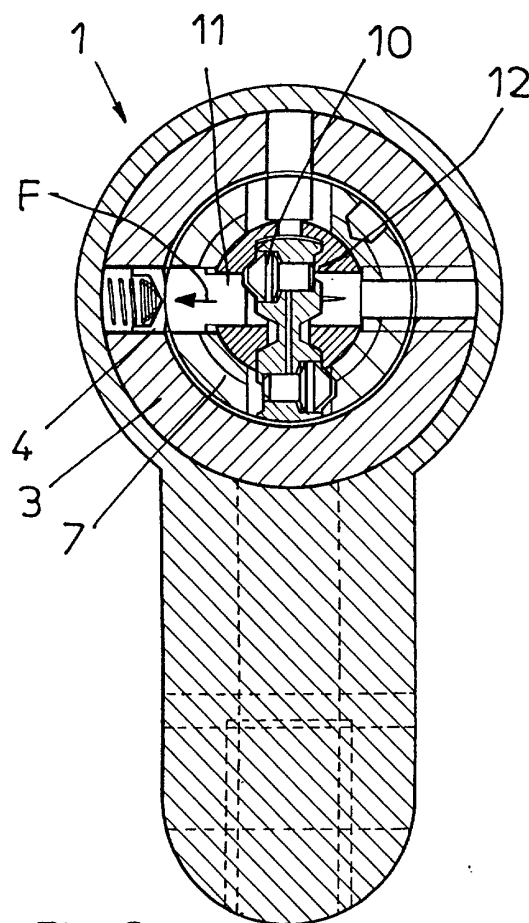
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(54) **High-security closing device and unlocking procedure**

(57) The high-security closing device comprises a lock which has a stator which carries a plurality of counterpegs, a rotor which carries a plurality of pegs which can be aligned with said counterpegs in an open configuration of said lock and a slot where a key can be housed.

The key has at least one pin which can move between a withdrawn position and a protruding position, and the rotor has at least one security peg which collaborates with the pin of the key so that, when the pin is in the protruding position, at least the security peg is in open configuration to allow the rotation of the rotor with respect to the stator.

The high-security unlocking procedure of a closing device comprising a lock and a key consists of making a pin come out of a seat of said key pushing it against a security peg of said lock, so as to take said security peg into open position to allow the rotation of a rotor with respect to a stator of said lock.



**FIG 3**

## Description

**[0001]** The present invention refers to a high-security closing device and unlocking procedure.

**[0002]** In particular, the device according to the present finding comprises a lock and a key which collaborate to take the aforementioned lock into an open or closed configuration.

**[0003]** Currently, locks comprise a stator equipped with a cylindrical hole in which a rotor which has a slot for the insertion of the key is rotatably inserted.

**[0004]** The stator and the rotor have a plurality of transversal holes where some counterpegs and pegs, respectively, are housed which collaborate with the key to open or close the lock (standard or direct lock).

**[0005]** The key is equipped with mechanical encryption, defined by protrusions or undercuts of its own profile.

**[0006]** In one particular example the key has mechanical encryption defined by a plurality of indentations realised on its own flat part, so that the pegs inserting into such indentations take the lock into open or closed configuration.

**[0007]** However, devices of the conventional type have numerous drawbacks, mainly due to the fact that it is possible to realise the key blanks (that is the key without the encryption) in a substantially simple manner.

**[0008]** Then, having the blanks available, it is possible to copy the key by realising the encryption on it in a substantially simple manner, using apparatuses currently on the market.

**[0009]** Moreover, the locks and the keys of the conventional type have a limited number of possible combinations.

**[0010]** Therefore, to increase the number of possible combinations it is necessary to increase the number of pegs (and thus of counterpegs and of holes in the stator and in the rotor) and consequently the number of indentations of the key, substantially increasing the complexity of the lock and of the key itself.

**[0011]** Moreover, conventional locks can, in some cases, be taken into open configuration even if the encryption of the key is not correct.

**[0012]** This happens, in particular, when a lock of the passive type is used.

**[0013]** A lock of the passive type has a stator and rotor with the same structure as those used in locks of the direct type, with the difference that the transversal holes of the stator do not contain the counterpegs, but are left empty.

**[0014]** It is clear that a lock of this type is also opened when a key having deeper indentations with respect to those of the correct key is inserted into the slot of the rotor, due to the lack of the counterpegs which should prevent the rotation of the cylinder in this situation.

**[0015]** The technical task proposed of the present invention is, therefore, that of realising a high-security closing device and unlocking procedure which allow the

aforementioned technical drawbacks of the prior art to be eliminated.

**[0016]** In this technical task a purpose of the invention is that of realising a device in which the reproduction of the key is very difficult, so as to limit the risk of them being wrongfully duplicated.

**[0017]** Another purpose of the invention is that of realising a device in which the lock and the key have a very high number of possible combinations, without it being necessary to increase the number of pegs and, therefore, the complexity of the lock and of the key.

**[0018]** A further purpose of the present invention is that of realising a device which can only be taken into open configuration when the encryption of the key is correct.

**[0019]** The last but not least purpose of the present invention is that of realising a high-security closing device and unlocking procedure which are substantially cost-effective.

**[0020]** The technical task, as well as these and other purposes, according to the present invention are achieved by realising a high security closing device comprising a lock which has a stator which carries a plurality of counterpegs, a rotor which carries a plurality of pegs which can be aligned with said counterpegs in an open configuration of said lock and a slot where a key can be housed, characterised in that said key has at least one pin which can move between a withdrawn position and a protruding position, and said rotor has at least one security peg which collaborates with said pin of said key so that, when said pin is in said protruding position, at least said security peg is in open configuration to allow the rotation of said rotor with respect to said stator.

**[0021]** Advantageously, the present invention also refers to a high-security lock comprising a stator which carries a plurality of pegs which can be aligned with said counterpegs in an open configuration of said lock and a slot where a key can be housed, characterised in that said rotor has at least one security peg suitable for collaborating with a mobile peg of said key and means for actuating said peg between a withdrawn position and a protruding position, to take at least said security peg into open configuration to allow the rotation of said rotor with respect to said stator; moreover, the finding refers to a high-security key, characterised in that it has at least one pin which can move between a withdrawn portion and a protruding position, so as to take a lock into open configuration.

**[0022]** Suitably, the present finding also regards a high-security unlocking procedure of a closing device comprising a lock and a key, characterised in that it consists of making a pin come out of a seat of said key pushing it against a security peg of said lock, so as to take said security peg into open position to allow the rotation of a rotor with respect to a stator of said lock.

**[0023]** Further characteristics and advantages of the invention shall become clearer from the description of a

preferred but not exclusive embodiment of the high-security closing device and of the unlocking procedure according to the finding, where the lock and the key are illustrated for indicating and not limiting purposes in the attached drawings, in which:

figure 1 shows a sectioned portion of a lock with which a key is associated according to the finding; figure 2 shows a cross section of a lock according to the finding in correspondence with a traditional peg, with the key in the insertion step; figure 3 shows a cross section of a lock according to the finding in correspondence with a security peg according to the finding, with the key completely inserted in the rotor; figure 4 shows a side view of a key according to the finding; and figure 5 shows a cross section realised in correspondence with the line V-V of figure 4.

**[0024]** With reference to the quoted figures, a high-security closing device is shown which comprises a lock, wholly indicated with reference numeral 1, and a key, wholly indicated with reference numeral 2.

**[0025]** The lock 1 comprises a stator 3 which carries a plurality of counterpegs 4 slidably inserted in seats 5, capable of moving against springs and by the action of springs 6.

**[0026]** The lock comprises, moreover, a rotor 7 which carries a plurality of pegs 8, which can be aligned with the counterpegs 4 in an open configuration of the lock and which has a slot 9 where the key 2 can be housed.

**[0027]** The key 2 has at least one pin 10 (in the embodiment shown in the attached figures the key has two pegs to be reversible) which can move between a withdrawn position and a protruding position.

**[0028]** The rotor 7, accordingly, has at least one security peg 11 (in the embodiment represented in the attached figures the rotor 7 has a single security peg 11) which collaborates with the pin 10 of the key 2 so that, when the pin 10 is in protruding position, at least the security peg 11 is in open configuration to allow the rotation of the rotor 7 with respect to the stator 3.

**[0029]** Advantageously, moreover, the rotor 7 comprises actuation means 12 of the pin 10 between the withdrawn position and the protruding position.

**[0030]** The actuation means 12 comprise an element of the rotor 7 which protrudes inside the slot 9; correspondingly, the key 2 has a groove 13 connected to a seat 14 of the pin 10, for the actuation of the pin 10 when the protruding element 13 inserts into the groove 13.

**[0031]** Suitably, the seat 14 is connected to the groove 13 in correspondence with a portion of its own base; another base portion 15 of the seat 14, on the other hand, is blind.

**[0032]** In a different embodiment of the key 2, the blind portion 15 of the seat 14 is left out.

**[0033]** The seat 14 has, moreover, a raised radial por-

tion 16 which partially closes its front opening.

**[0034]** Such an annular portion is realised, for example, by deforming the front edge of the seat 14 or else, in another embodiment, by connecting an annular element to the end of the seat 14.

**[0035]** The pin 10 has an enlarged head inserted into an enlarged portion of the seat 14 and preferably the enlarged head is substantially frustum of cone-shaped.

**[0036]** Advantageously, moreover, the pin 10 is misaligned with respect to the conventional pegs 17 to allow the insertion of the key 2 into the slot 9.

**[0037]** Indeed, if the pin 10 were aligned with the conventional pegs 17, one would not be able to insert the key 2 in the slot 9.

**[0038]** Advantageously, the security peg 11 is aligned with the conventional pegs 17, so as to be able to use the conventional locks and, since the pin 10 is misaligned with respect to the conventional pegs 17, the security peg 11 has a flattened end portion to collaborate with the pin 10.

**[0039]** In particular, the end portion of the security peg 11 is cylindrical with an end suitable for collaborating, going into contact in correspondence with its peripheral portion, with the pin 10.

**[0040]** As shown by the attached figures, moreover, the key is reversible and the lock is suitable for receiving the reversible key.

**[0041]** The present finding also refers to a high-security unlocking procedure of a closing device, consisting of making the pin 10 come out of the seat 9 of the key 2 pushing it against the security peg 11, so as to take the security peg 11 into open position to allow the rotation of a rotor with respect to a stator of the lock.

**[0042]** The operation of the high-security lock and key according to the invention can be clearly seen from that which is described and illustrated and, in particular, is substantially the following.

**[0043]** When the key 2 is inserted the pin 10 is in the withdrawn position and does not interfere with the conventional pegs 17 since, as shown in figure 2, the pin 10 is misaligned with respect to the conventional pegs which have conical ends.

**[0044]** When the pin 10 is taken in correspondence with the security peg 11, as shown in figure 3, the pin, which is in the removed position since it is pushed out of the seat 14 by the element 12, makes the security peg 11 slide along the frustum of cone side wall making it slide as indicated by the arrow F, aligning the end of the security peg 11 with the surface of the rotor 7 and the end of the counterpeg 4 associated with it with the surface of the stator 3 and taking the lock into open position.

**[0045]** By withdrawing the key 2, on the other hand, the security peg 11 and the counterpeg 4 associated with it translate in the opposite direction to the one indicated by the arrow F and the aforementioned counterpeg 4 inserts between the rotor and the stator, preventing the mutual rotation.

[0046] Of course, the pin 10 can also be arranged in correspondence with the back of the key; in this case the security peg is housed in the vertical seats.

[0047] In practice it has been noted how the high-security closing device and unlocking procedure according to the invention are particularly advantageous, since they allow keys to be realised which are extremely difficult to copy and, at the same time allowing locks with an extremely high number of combinations to be realised, still without overly increasing the number of pegs. The high-security closing device and unlocking procedure thus conceived are susceptible to numerous modifications and variants, all covered by the inventive concept; moreover, all of the details can be replaced by technically equivalent elements.

[0048] In practice the materials used, as well as the sizes, can be whatever according to the requirements and the state of the art.

## Claims

1. High-security closing device comprising a lock which has a stator which carries a plurality of counterpegs, a rotor which carries a plurality of pegs which can be aligned with said counterpegs in an open configuration of said lock and a slot where a key can be housed, **characterised in that** said key has at least one pin which can move between a withdrawn position and a protruding position, and said rotor has at least one security peg which collaborates with said pin of said key so that, when said pin is in said protruding position, at least said security peg is in open configuration to allow the rotation of said rotor with respect to said stator.
2. Device according to claim 1, **characterised in that** said rotor comprises actuation means of said pin between said withdrawn position and said protruding position.
3. Device according to one or more of the previous claims, **characterised in that** said actuation means comprise an element of said rotor protruding into said slot and, correspondingly, said key has a groove connected to a seat of said pin, for the actuation of said pin when said protruding element inserts into said groove.
4. Device according to one or more of the previous claims, **characterised in that** said seat has a portion of said base blind.
5. Device according to one or more of the previous claims, **characterised in that** said seat has a raised radial portion which partially closes its front opening.
6. Device according to one or more of the previous claims, **characterised in that** said pin has a widened head inserted into a widened portion of said seat.
7. Device according to one or more of the previous claims, **characterised in that** said widened head is substantially frustum of cone-shaped.
8. Device according to one or more of the previous claims, **characterised in that** said pin is misaligned with respect to said conventional pegs, to allow the insertion of said key in said slot.
9. Device according to one or more of the previous claims, **characterised in that** said security peg has a flattened end portion.
10. Device according to one or more of the previous claims, **characterised in that** said security peg is aligned with the conventional pegs.
11. High-security lock comprising a stator which carries a plurality of pegs which can be aligned with said counterpegs in an open configuration of said lock and a slot where a key can be housed, **characterised in that** said rotor has at least one security peg suitable for collaborating with a mobile peg of said key and means for actuating said peg between a withdrawn position and a protruding position, to take at least said security peg into open configuration to allow the rotation of said rotor with respect to said stator.
12. Lock according to the previous claim, **characterised in that** said actuation means comprise an element of said rotor protruding into said slot.
13. High-security key, **characterised in that** it has at least one pin which can move between a withdrawn portion and a protruding position, so as to take a lock into open configuration.
14. High-security unlocking procedure of a closing device comprising a lock and a key, **characterised in that** it consists of making a pin come out of a seat of said key pushing it against a security peg of said lock, so as to take said security peg into open position to allow the rotation of a rotor with respect to a stator of said lock.
15. High-security closing device and unlocking procedure, all as substantially described, claimed and represented in the attached tables of drawings.

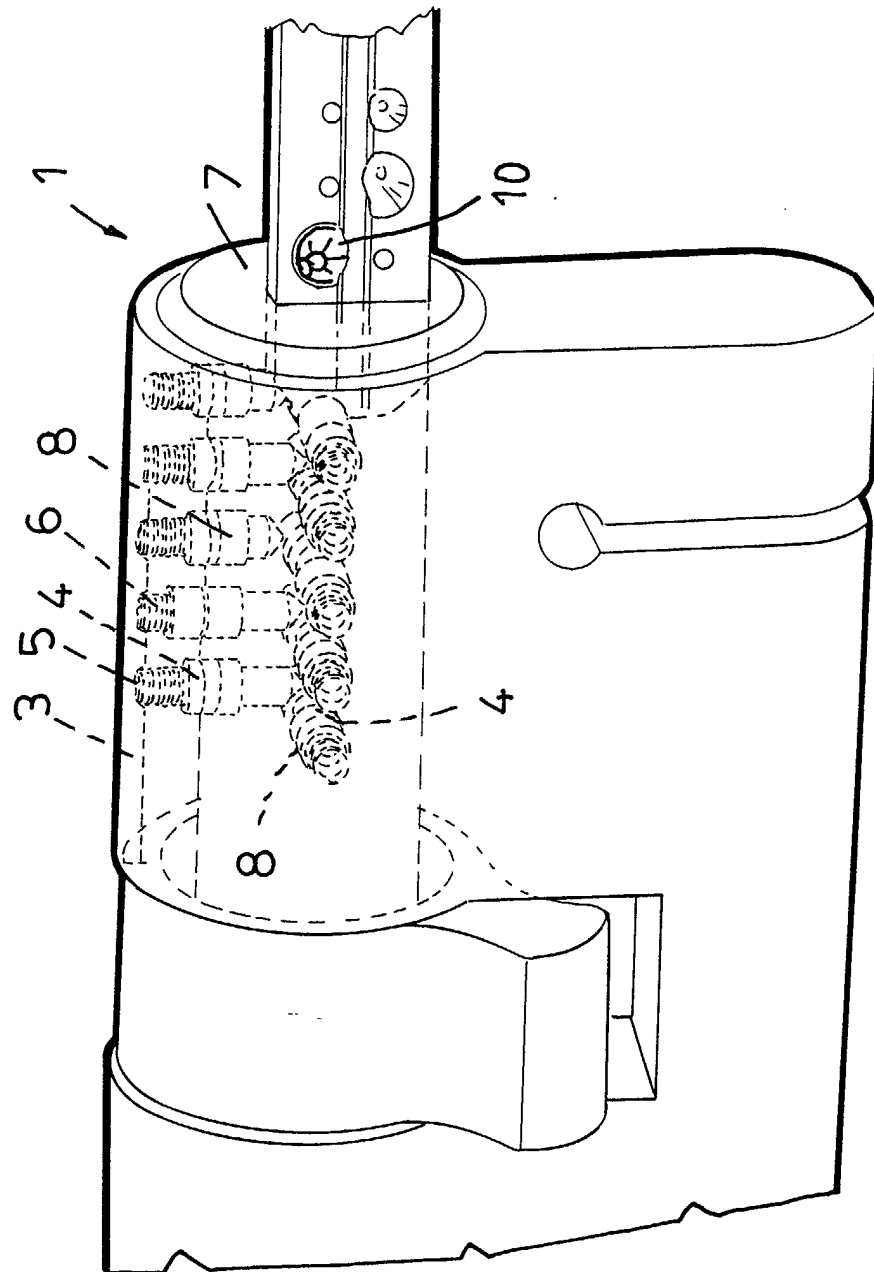
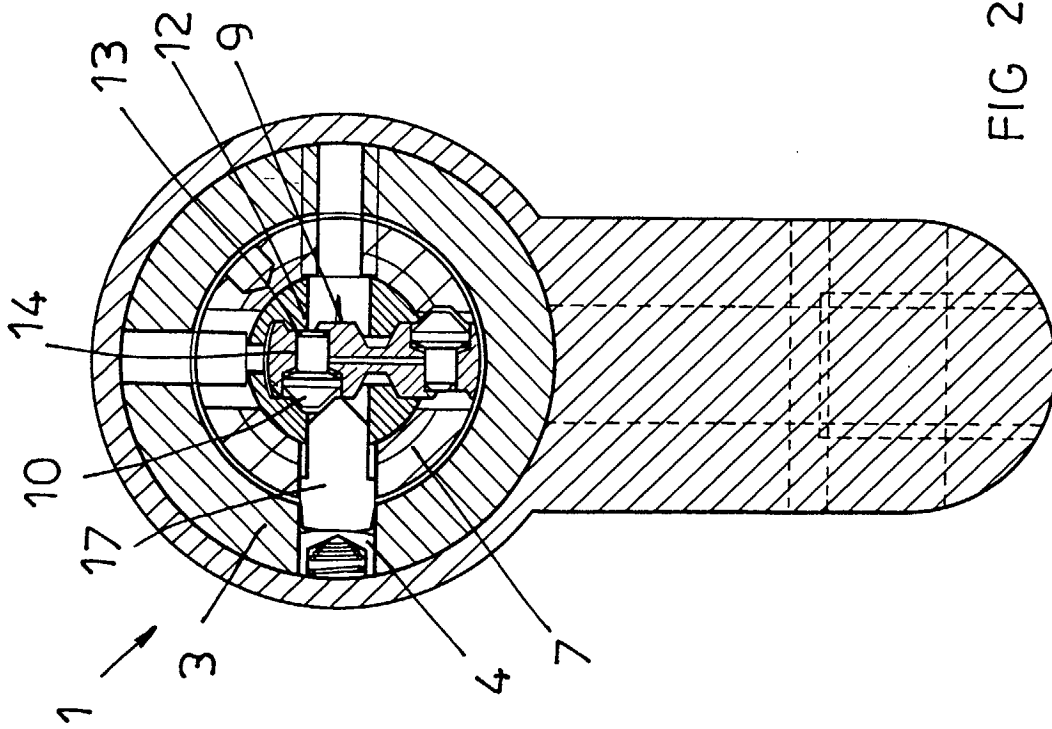
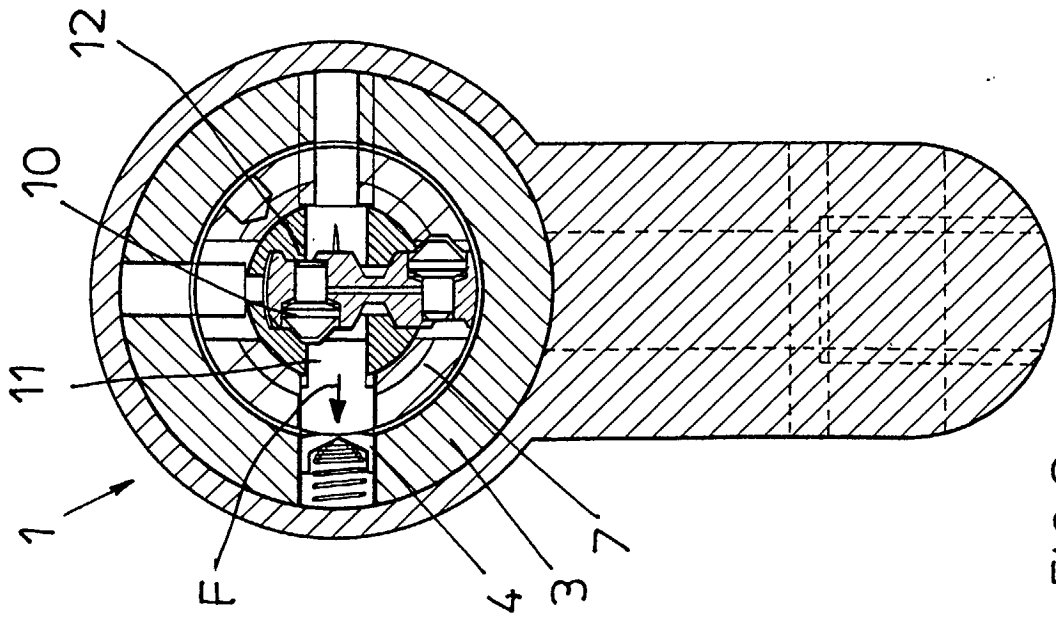


FIG. 1



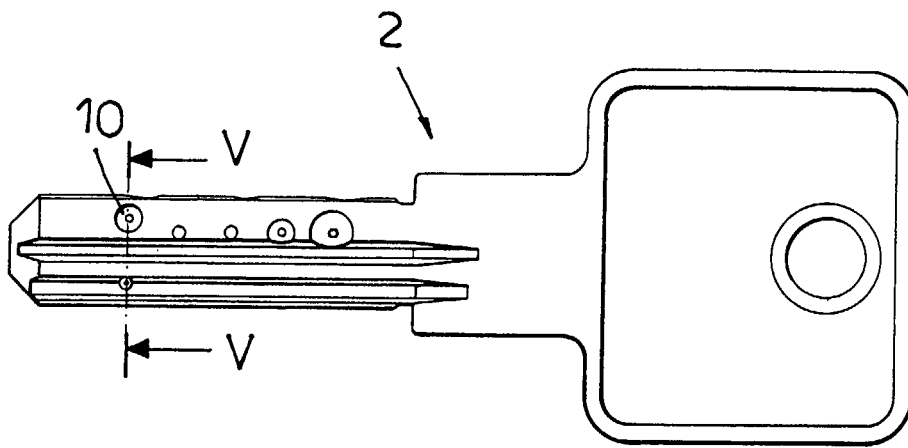


FIG. 4

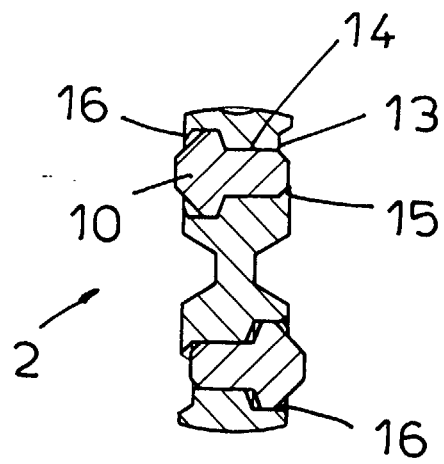


FIG. 5