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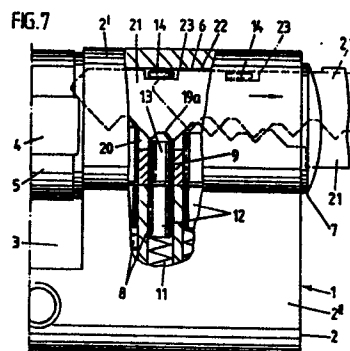
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The title of the invention has been amended (Guidelines for Examination in the EPO, A-III. 7.3).

54 Lock device of the cylinder type.

57 A lock cylinder (1) has at least one tumbler pin arrangement (12, 13, 14) which includes an intermediate element (14) between the housing and plug pins (12, 13). A conversion key (21) is provided with a pocket (23) in its back edge (22) for receiving the intermediate element (14) for removing the latter, thus to vary the tumbler configuration. A transverse groove (24) is formed in the cylinder plug (7) to enable the conversion key (21) to continue to operate the lock after conversion, by providing run-off surfaces (F) which cam the housing pin (12) out of rotation-preventing condition. A modified conversion key (21') can be provided for inserting an intermediate element (14) also, this key comprising a through-bore (26) for an element-ejecting rod (27).



Description

Lock Device

This invention is concerned with a lock device of the cylinder type, the cylinder of which comprises a plurality of co-operating housing and plug bores in each of which is accommodated a tumbler pin arrangement, at least one of which arrangements comprises an element disposed intermediate the housing and plug pins, there being provided in the cylinder plug a channel which extends to the open end of the cylinder and along which said intermediate element can pass, which cylinder is co-operable with a flat key having in its back edge a recess in which said intermediate element can be received, wherein, with the key inserted and rotated through 180°, the element is received in said recess and thereafter, after a further rotation through 180°, is disposed at the remote end of the channel in the cylinder, withdrawal of the key then serving also to remove the element.

One such device is disclosed in US-A 3078705. In using such a lock device "standard" key can be used, i.e. a key which does not have a recess in its back edge, and, when it is desired to change the configuration of the tumbler pin arrangements, a so-called conversion key is used, having the recess in its back edge, so that the element can be removed and thus allow the configuration to be altered. More particularly in using the device disclosed in US-A 3078705, once the conversion key has been used, and the intermediate element removed, neither the standard key nor the conversion key can thereafter be used for operating the lock, but rather a new "standard" key must be provided. Thus, not only is the original standard key no longer useable, but also the conversion key has no further use.

It is the object of the present invention to provide an improved lock device in which at least the conversion key can continue to be used after conversion.

This object is achieved, in accordance with the present invention in a lock device as set out in the first paragraph above, in that the cylinder plug is provided, in a region opposite the plug bore, with a transverse groove into which said channel opens, which groove provides run-off surfaces which, during rotation of the plug after the intermediate element has been removed, serve to allow the housing pin to project beyond the joint line during the movement of the channel therepast without preventing the rotation of the plug.

It will be appreciated that, using the lock device in accordance with the invention although the end of the housing pin can thus project into the recess of the conversion key, as it is rotated through 180°, nevertheless during continued rotation the run-off surface "downstream" of the channel has the effect of camming the housing pin back into the housing bore, so that its end portion again aligns on the joint line, and thus the rotation of the plug is not prevented. In this way, the conversion key can continue to be used while the original standard keys are rendered useless, since their bits (V-cuts) no longer match the new tumbler pin arrangement

configuration.

Conveniently, the "floor" of the groove is planar, thereby rendering machining straight-forward and also providing for a symmetrical arrangement about the channel formed in the plug bore. Moreover, preferably the maximum depth of the groove is equal to the depth of the element.

In order to vary the configuration of any one tumbler pin arrangement, furthermore, it may be desirable to insert an intermediate element and to this end it is a further object of the invention to provide a flat, key for use with a lock device as set above, by means of which key an intermediate element can be inserted.

Thus, the invention further provides a flat key for use with a device as set out above having a recess in its back edge for receiving an intermediate element, such key being characterised in that a through-bore is provided in the key blade, extending from the handle thereof and opening into said recess, along which through-bore passes a rod for ejecting an intermediate element accommodated in said recess.

Using such a key, an intermediate element accommodated in the recess of the conversion key can be inserted into the lock cylinder, and the rod serves to eject the element from the recess into the housing bore and to retain it in the bore until rotation of the key to move the recess out of alignment with the housing bore is completed.

It will thus be appreciated that, in accordance with the present invention, a ready conversion of the configuration of the tumbler pin arrangements of a cylinder lock can be achieved without the need for dismantling the lock, and indeed either by the removal or insertion of an intermediate element. Furthermore, the key which is utilised for effecting such conversion can continue to be used after the configuration change has been made.

There now follows a detailed description, to be read with reference to the accompanying drawings, of a lock device in accordance with the invention and of a conversion key, and a modification thereof, for use with the device. It will of course be appreciated that this lock device and these keys have been selected for description merely by way of non-limiting example of the invention.

In the accompanying drawings:-

Figure 1 shows a view of a lock cylinder;

Figure 2 shows a view of a "standard" flat key for use with the cylinder of Figure 1, having no pocket for receiving an intermediate element;

Figure 3 shows, partly in full and partly in section, and on an enlarged scale, the lock cylinder with the key inserted;

Figure 4 shows a view corresponding to Figure 3, wherein a conversion key having a pocket for receiving an intermediate element is inserted in the lock cylinder;

Figure 5 is a section along the line V-V of Figure 4;

Figure 6 is a section corresponding to Figure 5, wherein a plug of the lock cylinder is rotated

through 180° using the conversion key, whereby the intermediate element is received in the receiving pocket of the key;

Figure 7 is a view corresponding to Figure 4, wherein the intermediate element lies in the receiving pocket of the flat key;

Figure 8 is a cross-section through the lock cylinder shown in Figure 7, but with the intermediate element removed;

Figure 9 is a view corresponding to Figure 8, more particularly in an intermediate rotational position of the cylinder plug;

Figure 10 shows on an enlarged scale a new "standard" key, the V-cuts of which correspond to those on the conversion key;

Figure 11 shows, partly in full and partly in section, the lock cylinder with a modified conversion key, the latter being rotated through 180°, an ejector rod of said key having been inserted into a through-bore formed in the key and serving to urge the intermediate element into the pin bore; and

Figure 12 is a section along the line XII-XII of Figure 11.

The lock cylinder 1, which, as seen in Figure 1, is a half-cylinder, has a cylinder housing 2 with a profiled cross-section. A cut-out 3 runs from the upper end thereof for a thrower ring 5 carrying a thrower 4. The ring 5 is connected with the inner end of a cylinder plug 7 journaled in a plug bore 6 of the cylinder housing 2, which plug 7 in known manner is secured in the axial direction against movement in the cylinder housing.

The plug bore 6 is provided in a section 2' of the housing which is circular in cross-section. A flange-like housing section 2'' extends radially therefrom. In the latter section are disposed, in the central longitudinal plane of the housing, pin bores 8 lying one behind the other in a row, which bores are aligned with pin bores 9 of the cylinder plug 7. The pin bores 8 are closed at their lower ends by grooved pins 10 against inner ends of which abut springs 11 which in turn act on housing pins or drivers 12. The drivers 12 cooperate with plug pins 13 and constitute therewith, for each co-operating set of pin bores 7, 8, a tumbler pin arrangement. The second tumbler pin arrangement, viewed from the left, has an intermediate element 14 disposed between the pin 13 and driver 12.

A flat key 15 which locks the above-described lock cylinder 1 comprises a key blade 16 and key handle 17. At the narrow edge 18 opposite the back edge 22 thereof are V-cuts or notches 19 of different depths. When the flat key 15 is inserted into the keyway 20, which lies in the same plane as the plug pins 13, the V-cuts 19 so arrange the pins 12, 13 that their joint line lies at the level of the plug joint line G. In the case of said second tumbler pin arrangement, which includes the intermediate element 14, the latter lies inside the pin bore 9 of the cylinder plug 7, such that the joint line T between the intermediate element and the driver is disposed at the level of the plug joint line G. This arrangement allows the cylinder plug to be rotated for locking by means of the flat key 15.

If the configuration of the tumbler pin arrangements is to be changed, e.g. when the key 15 is lost, then a so-called "conversion" key 21, the second V-cut 19a, viewed from the left, of which has a lesser depth than the corresponding cut 19 of the flat key 15. The difference in depth between the two V-cuts 19 and 19a corresponds to the depth x of the intermediate element 14. In opposed relationship to the V-cut 19a there is formed in the back edge 22 of the key a recess or pocket 23 for receiving an intermediate element. The length y thereof is somewhat greater than the diameter of the intermediate element 14. Further, the depth z of the pocket 23 corresponds approximately to the depth x of the intermediate element 14. If the conversion key 21 is inserted into the keyway 20, because of the lesser depth of the V-cut 19a the corresponding tumbler pin arrangement is now operated in such a manner that the joint line T1 between the intermediate element 14 and the plug pin 13 lies at the level of the plug joint line G (compare Figures 3 and 4). The cylinder plug 7 can now be rotated by means of the conversion key 21 through 180° into the position shown in Figure 6. In so doing the intermediate element 14 is pushed into the receiving pocket 23 of the flat key 21 by the spring-urged driver 12. The joint line T between the intermediate element 14 and driver thereafter lies on the plug joint line G. In order that the intermediate element 14 can enter the receiving pocket 23, the keyway 20 has extending up to the open end of the plug an extension channel 20' in the region adjacent the back edge 22 of the key 21 when inserted. The channel 20' has a width of at least the diameter of the intermediate element.

The cylinder plug 7 also has a transverse groove 24 the floor of which is planar and provides two run-off surfaces F which lie flush with the base 23' of the receiving pocket 23 of the conversion key 21 when inserted, and with the base of the channel 20'. The width of the groove 24 corresponds to that of the receiving pocket 23.

After the intermediate element 14 has been received in the receiving pocket 23 of the key 21, the latter can be rotated together with the cylinder plug 7 into the initial position shown in Figure 7. Thereafter as indicated in chain-dot lines, withdrawal of the key 21 serves also to remove the intermediate element 14 from the lock cylinder 1. Thereafter a new flat key 25 as shown in Figure 10 can be used, which is identical with the conversion key 21 except that no pocket 23 is provided in the back edge thereof for receiving an intermediate element.

If it were now attempted to operate the lock cylinder by means of the original flat key 15, the second driver 12, viewed from the left, is now no longer moved out of the cylinder plug pin bore 9 lying in alignment therewith, and thus prevents rotation of the plug. Thus in a simple manner, by removal of the intermediate element, the lock cylinder 1 is converted to a different configuration.

If the previously described groove 24 is not provided in the cylinder plug 7, the conversion key 21 is purely a tool key, allowing only the removal of the intermediate element: if it were to be inserted after the removal of the intermediate element, it would not

be able to rotate the plug through 360° because the housing pin 12 would engage in the pocket during such rotation. In such a case the provision of a new key 25 would be necessary. On the other hand, the provision of the groove 24 allows the conversion key 21 to be used to operate, the run-off surfaces F provided thereby guiding the driver 12 in the manner illustrated in Figure 9.

A modified conversion key 21' is shown in Figures 11 and 12, the construction of which differs in that, in the region of its back edge 22, a through-bore 26 is provided extending from the receiving pocket 23 up to the key handle. This key 21' allows an intermediate element 14 which has been removed to be re-inserted. To this end the element is laid into the receiving pocket 23 and inserted into the cylinder plug by the insertion movement of the key 21'. After a rotation through 180° the intermediate element 14 is then aligned with the corresponding driver 12. A rod 27 for ejecting the intermediate element from the pocket 23 is then inserted into the through-bore from the handle side of the key 21' and urges the intermediate element 14 into the pin bore 8 on the housing side against the force of the pin spring, as shown in Figures 11 and 12. By means of this modified key 21' together with the rod 27 the intermediate element remains in the pin bore 8 when the cylinder plug is rotated back to its original position. After withdrawal of the key 21' together with the rod 27 the condition of the lock cylinder as shown in Figure 3 is achieved.

Claims

1. A lock device of the cylinder type, the cylinder (1) of which comprises a plurality of co-operating housing and plug bores (8,9) in each of which is accommodated a tumbler pin arrangement, at least one (12,13,14) of which arrangements comprises an element (14) disposed intermediate the housing and plug pins (12,13), there being provided in the cylinder plug (7) a channel (20') which extends to the open end of the cylinder (1) and along which said intermediate element (14) can pass, which cylinder (1) is co-operable with a flat key (21) having in its back edge (22) a recess (23) in which said intermediate element (14) can be received, wherein, with the key (21) inserted and rotated through 180°, the element (14) is received in said recess (23) and thereafter, after a further rotation through 180°, is disposed at the remote end of the channel (20') in the cylinder (1), withdrawal of the key (21) then serving also to remove the element (14), the device being characterised in that the surface of the cylinder plug (7) is provided, in a region opposite the plug bore (9), with a transverse groove (24) into which said channel (20') opens, which groove (24) provides run-off surfaces (F) which, during rotation of the plug (7) after the intermediate element (14) has been removed, serve to allow the housing pin (12) to project

beyond the joint line (G) during the movement of the channel (20') therepast without preventing the rotation of the plug (7).

2. A device according to Claim 1 characterised in that the floor of the groove (24) is planar.

3. A device according to Claim 2 characterised in that the maximum depth of the groove (24) is equal to the depth of the intermediate element (14).

4. A flat key for use with a device according to any one of the preceding Claims, having a recess (23) in its back edge (22) for receiving an intermediate element (14), characterised in that a through-bore (26) is provided in the key blade (18), extending from the handle (17) thereof and opening into said recess (23), along which through-bore (26) passes a rod (27) for ejecting an intermediate element (14) accommodated in said recess (23).

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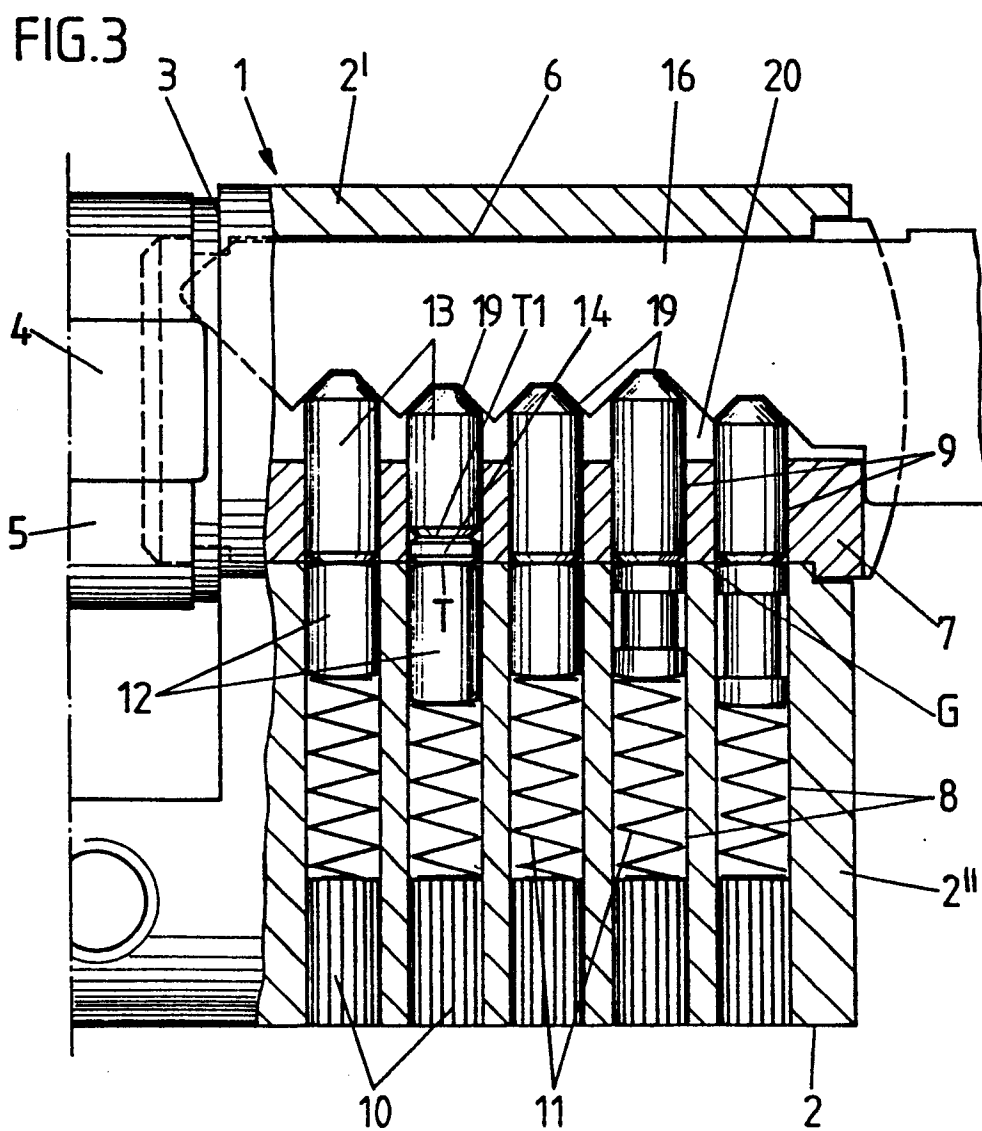
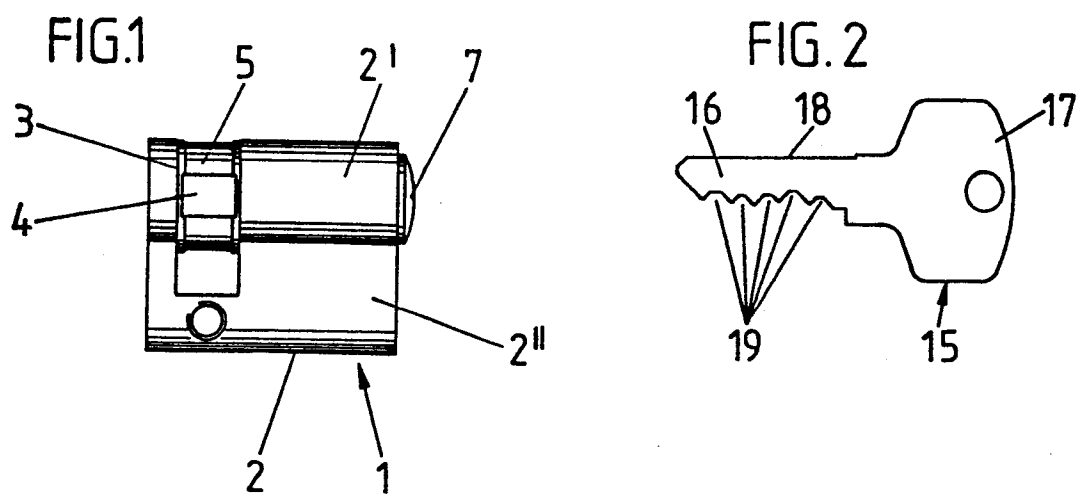
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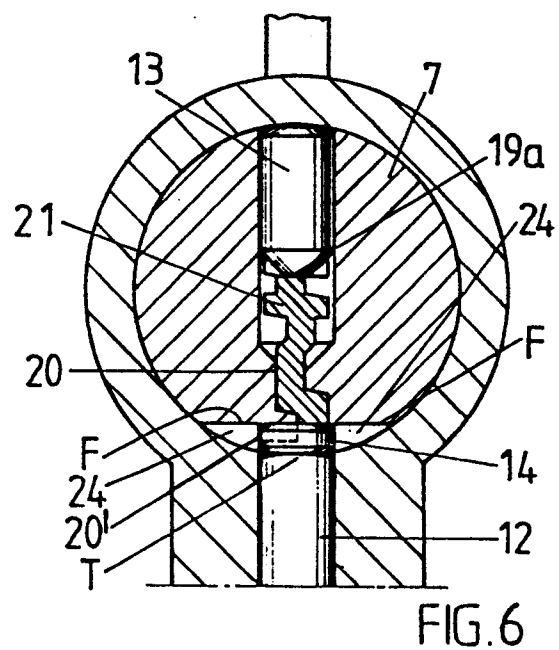
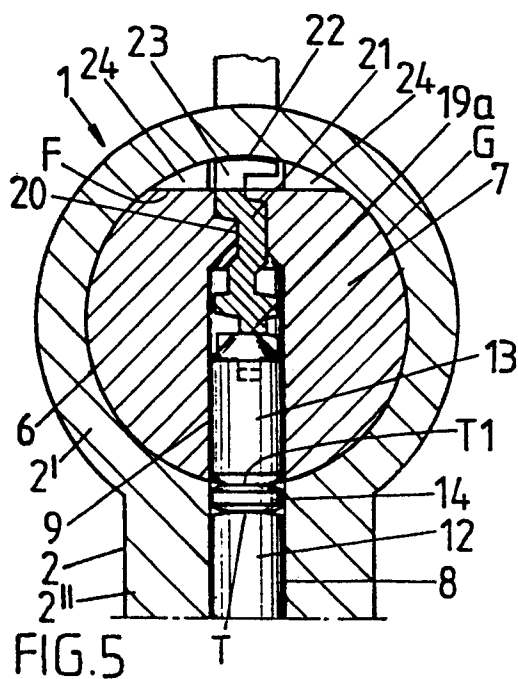
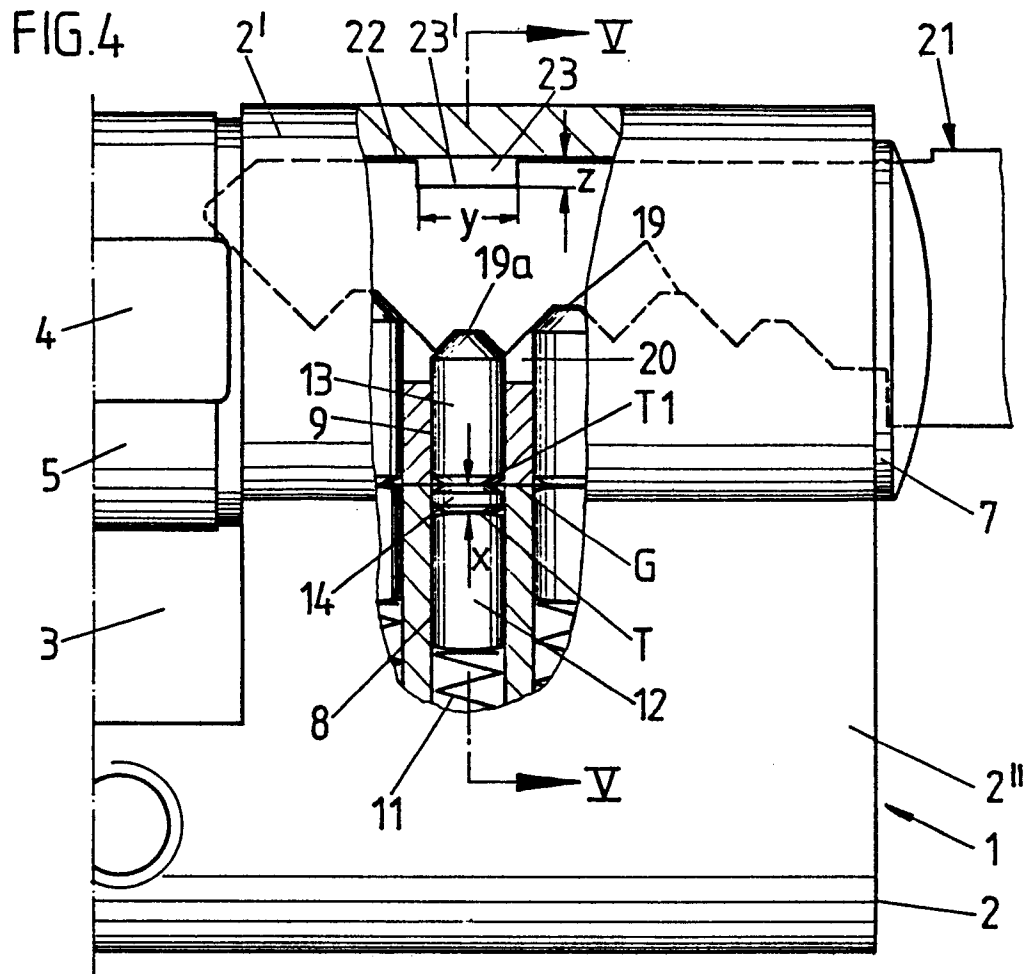


FIG.7

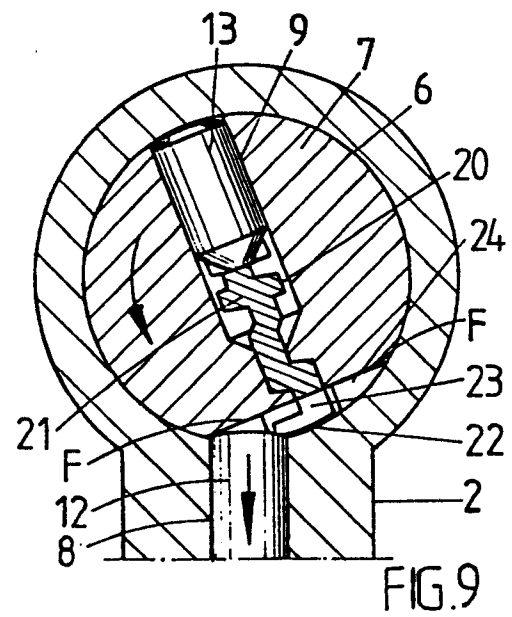
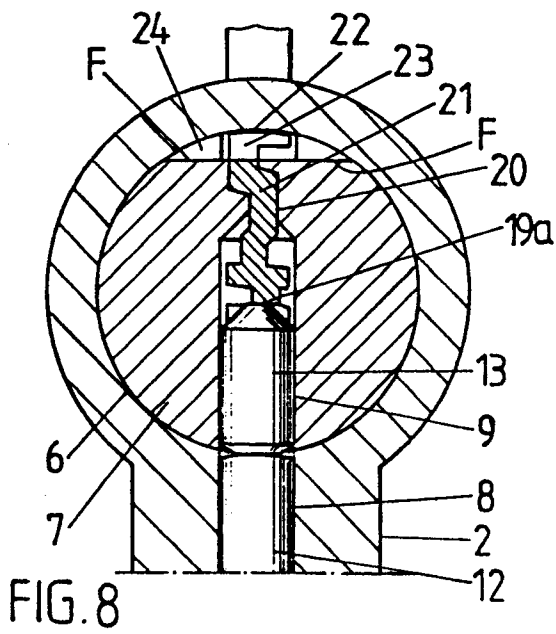
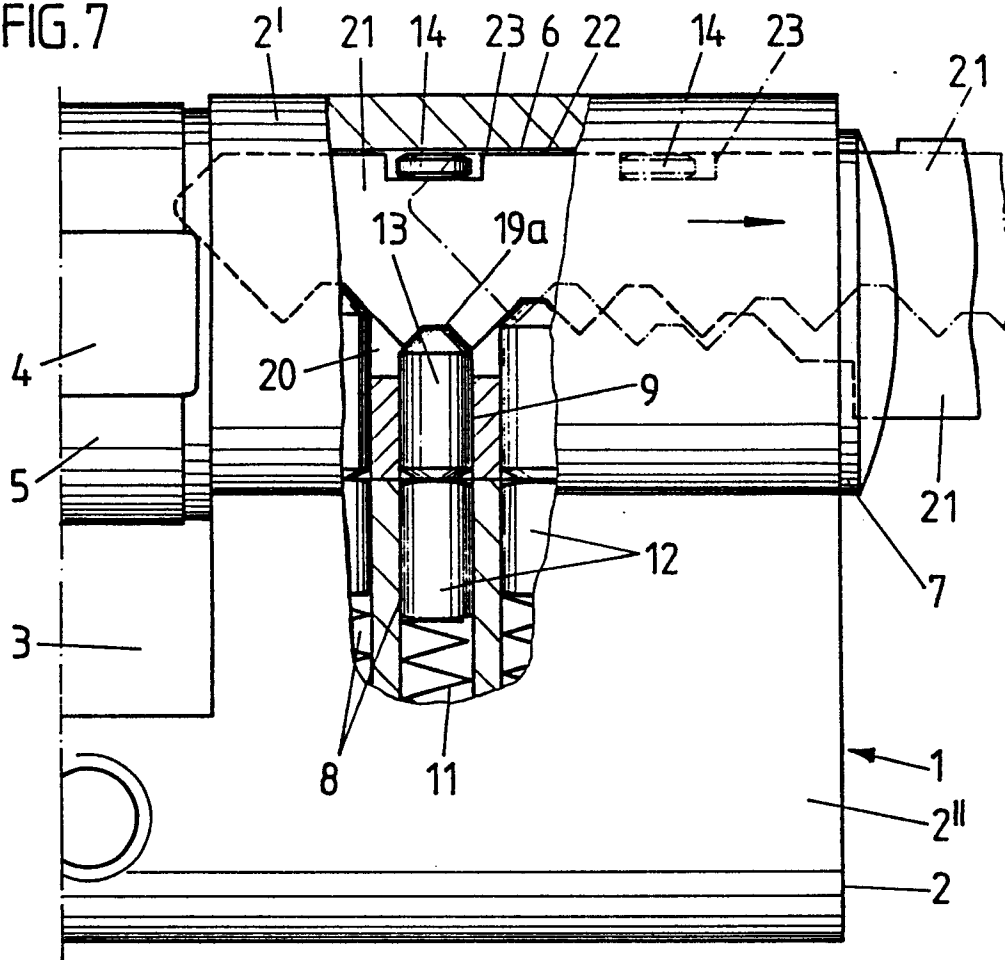


FIG.10

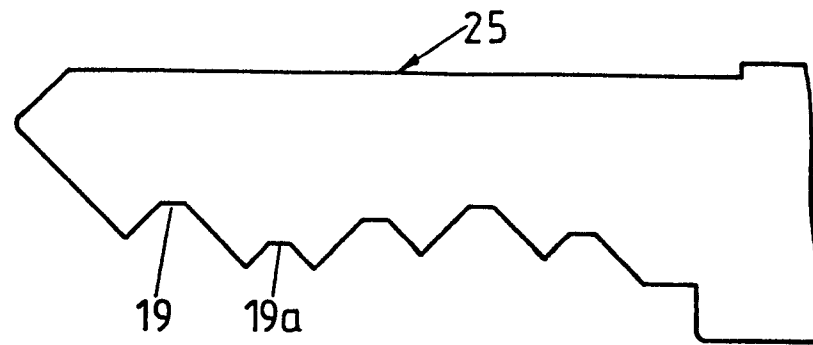


FIG.11

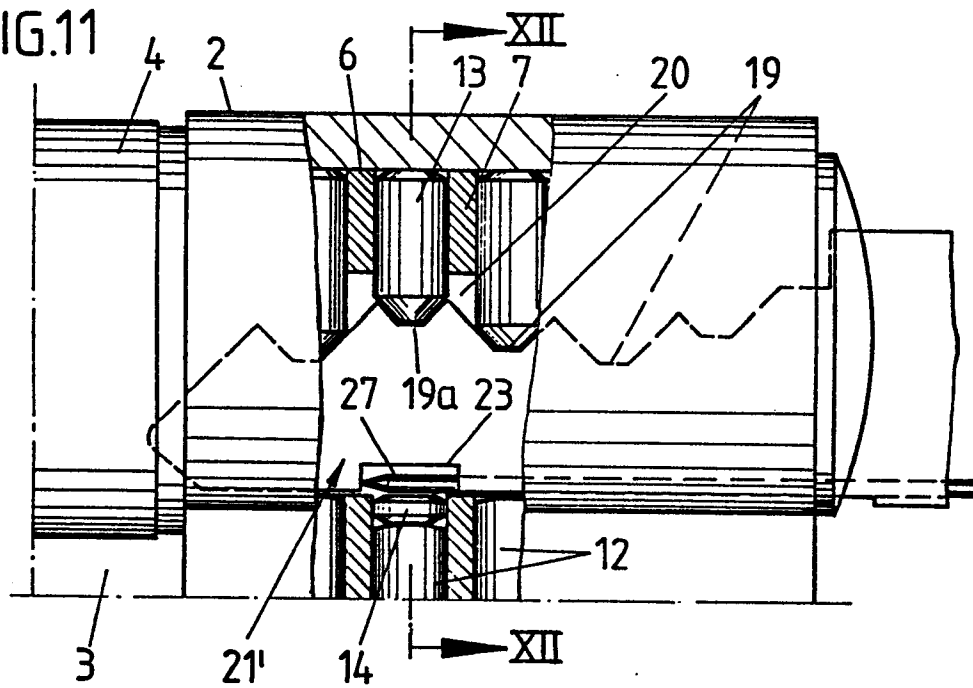


FIG.12

