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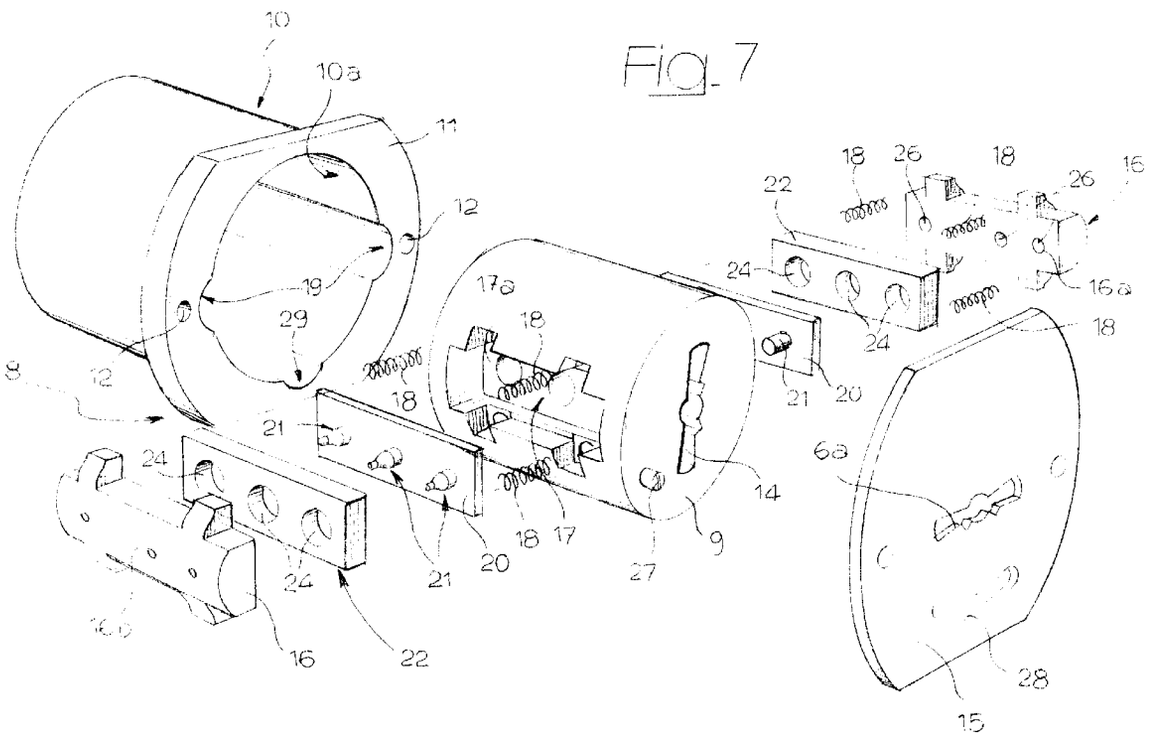
(54) Lock with a safety device for enabling a key to be introduced into the lock

(57) A safety lock provided with a safety device (8) including a rotatable cylindrical body (9) which is normally locked in a position in which the auxiliary keyhole (14) of the rotatable cylindrical body (9) is rotated with respect to the main heyhole (6) of the lock. The key (7) is provided with permanent magnets (25) which operate pins (21) pivotally supported by the rotatable cylindrical body (9) in order to arrange these pins in pre-determined positions in which they enable key elements (16) which keep the rotatable cylindrical body (9) locked to be retracted. The key is thus able to rotate the cylindrical body (9) until aligning the auxiliary keyhole (14) with the main keyhole (6), so as to able to operate the inner mechanism of the lock.

Fig. 7



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Description

The present invention relates to safety locks, particularly for doors of dwellings, gates and the like, of the type comprising:

- a housing, and
- a lock mechanism arranged within the housing which can be actuated by a key to be introduced within the housing through a keyhole provided in a front wall of the housing.

The object of the present invention is that of providing a lock of the above indicated type which has a higher safety degree with respect to the locks made to date. In particular, it is an object of the invention to provide a lock of the above indicated type in which a reproduction of the key for actuating the lock can not be carried out easily and rapidly by the conventional means for reproducing keys.

In view of achieving the aforesaid objects, the invention provides a lock of the above indicated type, characterized in that said lock comprises a safety device for enabling a key to be introduced within the lock housing, said safety device comprising a cylindrical body rotatably supported by the housing in front of said keyhole and having an auxiliary keyhole through which the key must be inserted in order to reach the main lock keyhole, said safety device further comprising means for normally keeping the cylindrical keyhole is rotated with respect to the main keyhole, so that the key can not be introduced within the main keyhole, and magnetically operable means, co-operating with complementar magnetically operable means provided on the key, in order to de-activate the locking means when the key is introduced within the auxiliary keyhole, so as to allow the cylindrical body to rotate until aligning the auxiliary keyhole with the main keyhole, thus enabling the key to be introduced within the housing of the lock.

Therefore, the key which is able to operate the lock has a double safety degree. On one hand, it has a profile able to operate the lock mechanism (be it for example either a lock mechanism of the rotatable cylinder type or of the double-bit type), arranged within the housing, while on the other hand the key has said magnetically operable complementar means (typically permanent magnets) arranged so as to cause the de-activation of the locking means when the key is introduced within said cylindrical body and the safety device.

Therefore, the reproduction of the key authorized to open the lock can not be carried out rapidly and easily by the conventional tools for reproducing keys.

In a preferred embodiment, the locking means comprises at least one key element radially slidable within a key-way formed in the outer surface of said cylindrical body and biassed by spring means towards a protecting position where it engages a co-operating housing, within which the cylindrical body is rotatably mounted. The aforesaid magnetically operable means comprises at least one pin arranged both radially within said key-way of the cylindrical body and pivotally around its central portion and having its radially inner end of ferromagnetic material able to cooperate with a permanent magnet provided on the lock key. Said key element has an inner surface with a hole adapted to mate with the radially outer end of said pin, when the latter reaches a pre-determined position as a result of the introduction of the lock key, so as to allow the key element to be retracted within said key-way as a result of a rotation of the cylindrical body.

Preferably, a series of many in-line pivotable pins of the above indicated type are provided, co-operating with an equal number of permanent magnets provided on the lock key.

In the preferred embodiment, two key elements diametrically opposite to each other are provided, each of which has on its inner surface a plurality of holes co-operating with an equal number of pivotable pins, which on their turn co-operate with an equal number of permanent magnets provided on two opposite faces of the lock key.

The invention will be now described with reference to the annexed drawings, given purely by way of non-limiting example, in which:

figure 2 is a cross-sectional view taken along line II-II of figure 1, at an enlarged scale,
figure 3 is a cross-sectional view corresponding to that of figure 2, which shows the lock in a different operative condition,
figure 4 is a cross-sectional view taken along line IV-IV of figure 2,
figures 5, 6 are cross-sectional views corresponding to that of figure 4, which show the lock in two further operative conditions, and
figure 7 is an exploded perspective view of the detail shown in figures 2-6 of the lock according to the invention.

With reference to the drawings, numeral 1 generally designates a safety lock comprising a housing 2 of sheet metal containing a lock mechanism of any known type (for example of the rotatable cylinder type or of the double-bit type) for operating a latch element 3 and a bolt including a plurality of locking fingers 4 slidable within the housing 2 between a retracted position (shown in figure 1) and an extracted position, in which fingers 4 are able to be received within co-operating seats (not shown) provided in one element secured to the fixed frame of the door, to provide the locking of the door in the closed condition. According to the conventional art, the housing 2 has a front wall 5 which is to face towards the outside of the door, with a keyhole 6 (see figures 2, 3) for introducing a key 7 within the lock housing constituted by a slot arranged horizontally (with reference to figure 1).

According to the invention, the lock 1 is provided with a safety device, generally designated by 8, arranged in front of the front wall 5, which enables the key 7 to be introduced within the housing 2 of the lock. With reference also to figure 7, the safety device 8 comprises a steel cylindrical body 9 rotatably supported around an axis perpendicular to the plane of the front wall 5, by a cup-shaped support body 10 having a base flange 11 provided with holes 12 for engagement of screws 13 for fixing the support body 10 to the front wall 5 of the housing 2.

The cylindrical body 9 is crossed by an auxiliary keyhole 14, through which the key 7 is introduced for reaching the main keyhole 6, which is also formed in a plate 15 (see figure 7, reference 6a) which is interposed between the flange 11 and the front wall 2.

The cylindrical body 9 is provided with lock means which keep it normally locked in a position in which the auxiliary keyhole 14 is directed vertically (see figure 1) i.e. perpendicularly with respect to the direction of the main keyhole 6, so that by introducing any key through the auxiliary keyhole 14, this key will not be able to enter into the housing 2, since it will abut against plate 15. This locking of the cylindrical body 9 is obtained by means of two key elements 16 radially slidably mounted within two slots 17 formed at diametrically opposite areas of the outer surface of by a plurality of helical springs 18 interposed between the bottom wall 17a of the respective slot 17 and the radially inner planar surface 16a of the key element 17 towards a radially extracted position, in which the key element 16 engages a complementar axial slot 19 formed in the inner surface 10a of the cup-shaped support body 10.

Within each slot 17, at a position spaced both from the bottom 17a of slot 17, and from the respective key element 16, there is fixed a plate 20 which pivotally supports a plurality of radial pins 21 around their central portions. A spacer plate 22 locks the plate 20 above an abutment surface 23 of slot 17 (see figure 3) and has a plurality of wide holes 24 which avoid the interference of plate 22 with the radially outer ends of pins 21.

The outer surface 16b of each key element 16 has a curved profile which corresponds also to the profile of slots 19 formed in the inner surface 10a of the support body 10. Therefore, if the key 7 is introduced within the auxiliary keyhole 14 of the cylindrical body 9 and is then rotated so as to impart a rotation to this cylindrical body 9, the reciprocal engagement of the curved contact surfaces between the key elements 16 and the slots 19 would provide a cam-like effect causing a retraction of the key elements 16 within the respective slots 17, with a resulting possibility of a rotation of the cylindrical body 9 which would take place with a sliding of the surfaces 16b of the key elements 16 10. However, the retraction of the key elements 16 within slots 17 is normally prevented by the radial pins 21, whose outer ends impinge against the inner surface 16a of the respective key element 16.

The key 7 which is authorized to operate the lock is however provided on each of its two opposite faces with a plurality of permanent magnets 25, fitted within the body of the key, and able to co-operate with the radially inner ends, of ferromagnetic material, of the pins 21. When the key 7 is introduced within the auxiliary keyhole 14, the magnets 25 attract the respective inner ends of pins 21 thus causing a pivotal movement of these pins around their central portion until they reach pre-determined positions (see figure 3) in which the radially outer ends of the pins 21 face co-operating holes 26 formed in the respective key element 16. Therefore, in this condition, a retraction of the key element 16 within the respective slot 17 is possible, since the radially outer ends of pins 21 are received within co-operating holes 26, so that there is no interference between pins 21 and the key element 16. Therefore, once the key 7 has been introduced within the auxiliary keyhole 14, it can be rotated causing a corresponding rotation of the cylindrical body 9 and a retraction of the key elements 16 within slots 17 as a result of the cam-like effect determined by the reciprocal engagement of the curved surfaces 16b and 19. The key can then be rotated until the auxiliary keyhole 14 reaches a horizontal position, can be further moved forwardly within the housing 2 of the lock in order to operate the mechanism of the latter. The angular stroke of the cylindrical body 9 between the locked position with the auxiliary keyhole 14 arranged vertically and the position in which the auxiliary keyhole 14 is aligned with the horizontal keyhole 6, 6a, is defined by the engagement of an axial pin 27 projecting from one end of the cylindrical body 9, within an arched slot 28 of plate 15.

Figure 2 of the annexed drawings shows the safety device 8 before introduction of the key 7, with the pins 21 arranged in the normal radial positions, in which they prevent a retraction of the key elements 16.

Figure 3 shows the safety device 8 after the introduction of the key 7 into the auxiliary keyhole 14 and the resulting pivotal movement of pins 21 to the positions in which their outer ends come to face the respective holes 26.

Figure 4 is a cross-sectional view of the safety device 8 in a plane perpendicular to the axis of the rotatable cylindrical body 9, before introduction of the key. Figure 5 shows the same cross-section of figure 4 after the introduction of the key and before rotation of the cylindrical body 9. Figure 6 is a cross-section corresponding to that of figure 5 which shows the cylindrical body at an intermediate stage of its rotation from the locked position to the position enabling introduction of the key 7 within the lock. As shown, in this condition the two key elements 16 slide In the enabling position in which the auxiliary keyhole 14 is aligned with the main keyhole 6, one of the two key elements enters into engagement with a third slot 29 of the support body 10 having an arched profile.

As clearly apparent from the foregoing description,

the safety device according to the invention provides a high safety degree for the lock and renders impossible to carry out rapidly and easily the reproduction of the key able to operate the lock with the conventional means for reproducing keys.

If one wishes to operate the lock with the authorized key 7, the latter is at first introduced within the auxiliary keyhole 14 of the safety device 8. To this end, the bottom wall of the cup-shaped support body 10 naturally has a keyhole 14a mating with keyhole 14 of the cylindrical body 9. Once the key 7 has been introduced within the cylindrical body 9, the key is rotated to cause the rotation of the cylindrical body 9. This rotation is not prevented by the key elements 16, since the latter may enter back into the respective slots 17 as a result of the pivotal movement of the pins 21 caused by the permanent magnets 25 carried by the key 7, to the positions shown in figure 3, in which the outer ends of the pins 21 face the respective holes 26 of the key elements 16. The rotation of the rotatable body 9 is continued until reaching the end position in which the auxiliary keyhole 14 is aligned with the main keyhole 6, so that the key 7 may be introduced within the housing 2 of the lock. In this cylindrical stem portion of the key 7, so that the latter is free to rotate to operate the inner mechanism of the lock.

The provision of permanent magnets 25 on key 7 renders impossible to reproduce the key easily and rapidly with the conventional tools for reproducing keys. At the same time, the magnetically operable safety mechanism with which the lock according to the invention is provided is much more efficient and reliable with respect to magnetically operable safety devices which have been proposed in the past for safety locks.

Naturally, while the principle of the invention remains the same, the details of construction and the embodiments may widely vary with respect to what has been described and illustrated purely by way of example, without departing from the scope of the present invention.

Claims

1. Safety lock, comprising:

- a housing (2),
- a lock mechanism arranged within the housing (2) and able to be operated by a key (7), which is to be introduced within the housing (2) through a keyhole (6) provided at a front wall (5) of the housing (2),

characterized in that said lock comprises a safety device (8) for enabling the key (7) to be introduced within the housing (2), said safety device (8) comprising a cylindrical body (9) rotatably supported by the housing (2) in front of the keyhole (6) of the lock and having an auxiliary keyhole (14) through which the key (7) must be inserted in order to reach the main keyhole (6) of the lock, said safety device (8) further comprising means (16, 19) for keeping the cylindrical body (9) normally locked in a position in which the auxiliary keyhole (14) is rotated with respect to the main keyhole (6), so that the key (7) can not reach the main keyhole (6), and magnetically operable means (21) co-operating with complementar magnetically operable means (25), in order to de-activate the locking means (16, 19) when the key (7) is introduced within the auxiliary keyhole (14), so as to enable the cylindrical body (9) to be rotated until aligning the auxiliary keyhole (14) with the main keyhole (6), thus enabling the key (7) to be introduced within the housing (2) of the lock (1).

2. Lock according to claim 1, characterized in that the locking means comprises at least one key element (16) radially slidable within a slot (17) formed in the outer surface of the cylindrical body (9) and biassed by spring means (18) towards an extracted position in which it engages a co-operating slot (19) formed in a support body (10), fixed to the lock housing (2), within which the cylindrical body (9) is rotatably supported.

3. Lock according to claim 2, characterized in that said magnetically operable means comprises at least one pin (21) arranged both radially within said slot (17) of the rotatable cylindrical body (9), and pivotally around its central portion and having its radially inner end of ferromagnetic material and able to co-operate with a permanent magnet (25) provided on the key (7), said key element (16) having an inner surface (16a) with a hole (26) able to mate with the radially outer end of said pin (21) when the latter is arranged in a pre-determined position as a result of the introduction of the key (7), so as to enable the key element (16) to be retracted within said slot (17) as a result of a rotation of the rotatable cylindrical body (9).

4. Lock according to claim 3, characterized in that said key element (16) co-operates with a series of in-line pins (21) whose radially inner ends co-operate on their turn with an equal number of permanent magnets (25) provided on the key (7).

5. Lock according to claim 4, characterized in that there are provided two key elements (16) diametrically opposite to each other, each of which co-operates with a corresponding series of pins (21) on their turn co-operating with a series of permanent magnets formed on each of the two opposite faces of the key (7).

Fig. 1

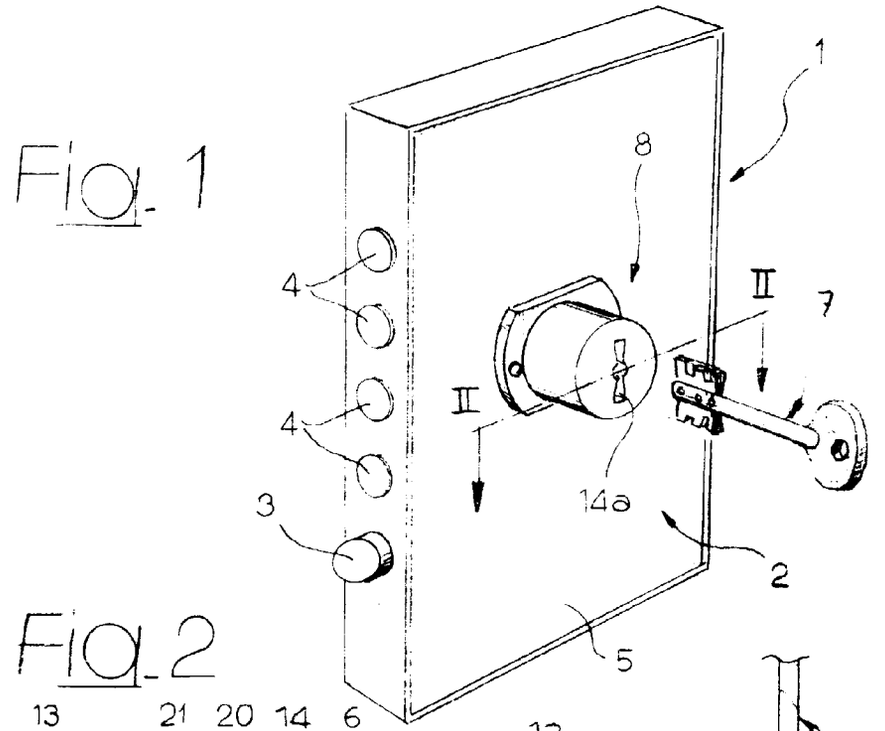


Fig. 2

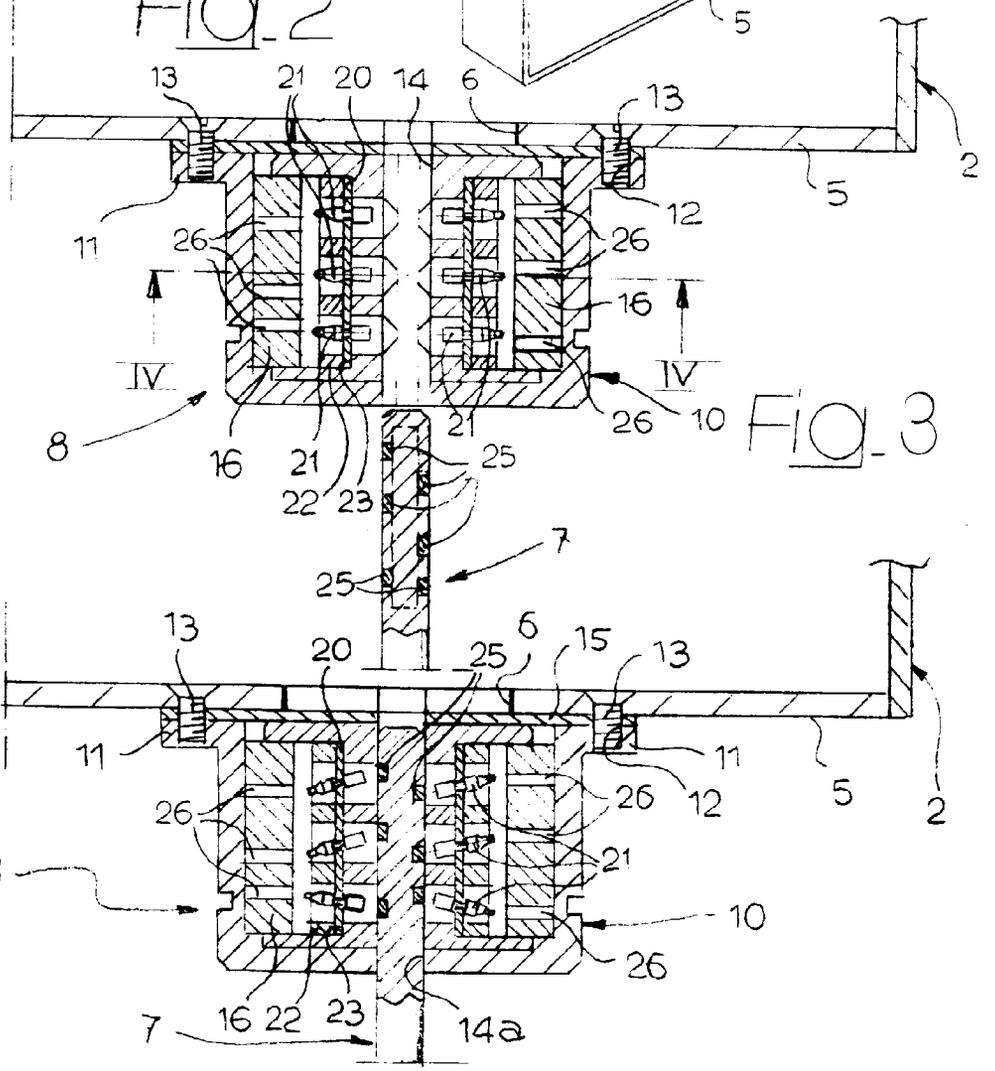


Fig. 3

Fig. 4

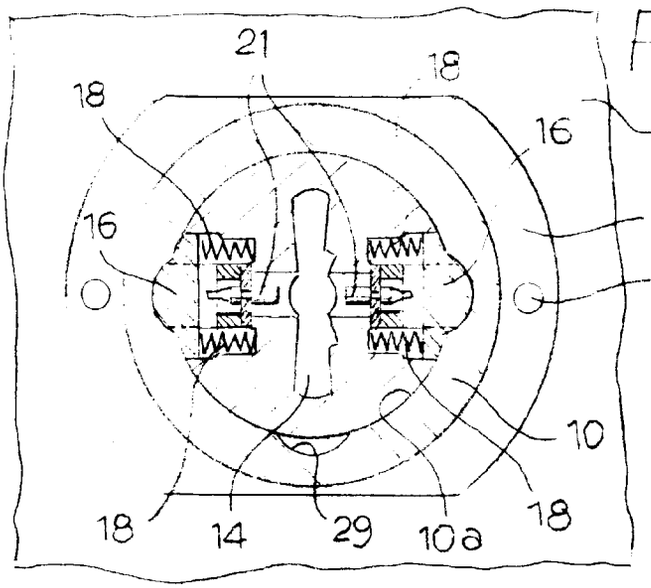


Fig. 5

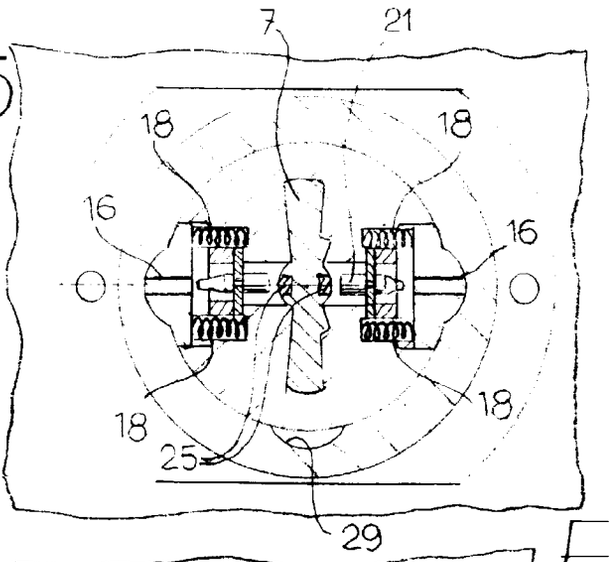


Fig. 6

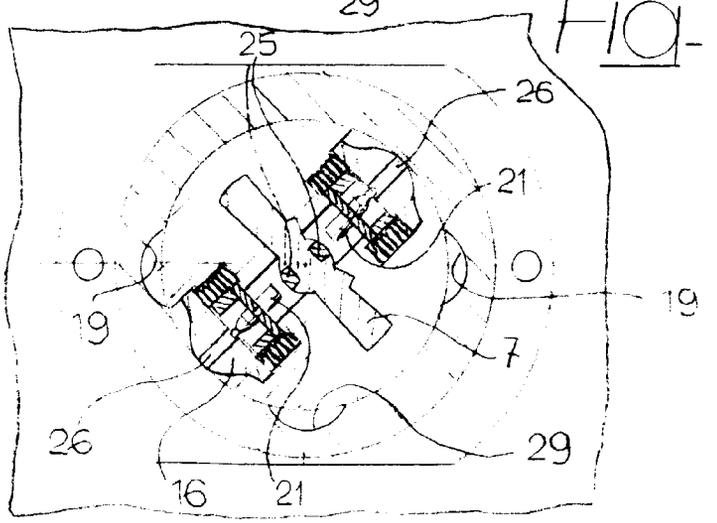
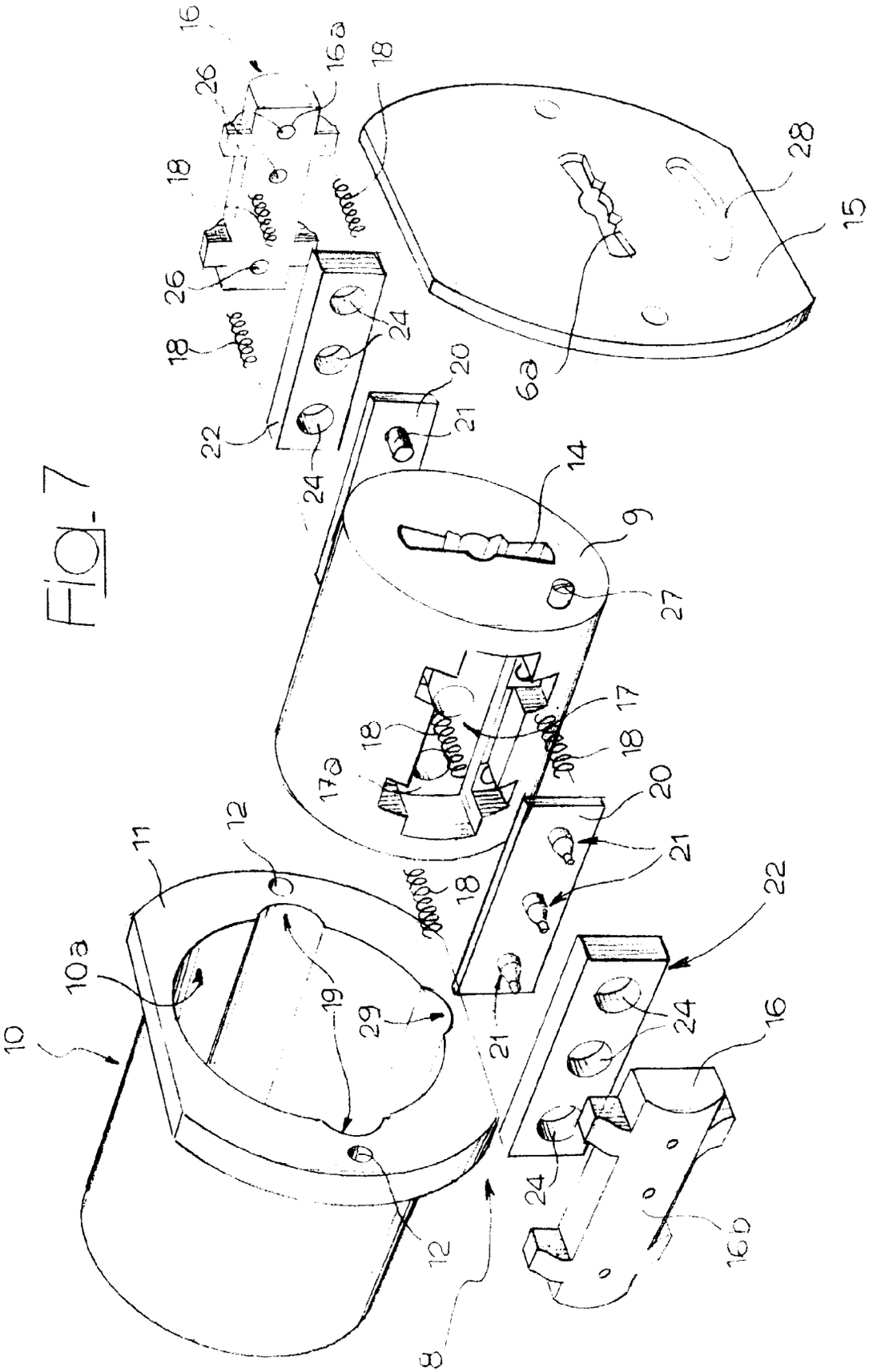


FIG. 7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