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54 **Cylinder lock with axially extending plungers.**

57 A cylinder lock e.g. for an equipment cabinet comprises a housing (2) having an inwardly directed flange (6) at the front of the housing and a collar (4) forming an inwardly directed flange at the rear of the housing. A spindle assembly (7) comprising a body (9) having secured thereto a flange member (10) is located within the housing with the flange member (10) trapped between the housing flange (6) and the housing collar (4). Spring biased plungers (18) are located within bores in the flange member (10) and engage in recesses (20) in the flange (6) to lock the spindle assembly (7) to the housing (2) when no key is present. When the correct key is inserted the plungers (18) are depressed sufficiently to clear the recesses (20) but not so far as to extend into bores (21) provided in the collar (4). Torque is then applied to the spindle assembly by means of the lateral walls of the plunger receiving recesses (31) of the key and/or a projection (28) formed on the outer surface of the key thereby obviating the previous requirement for a keyway to be formed in the outer end (27) of the spindle assembly.

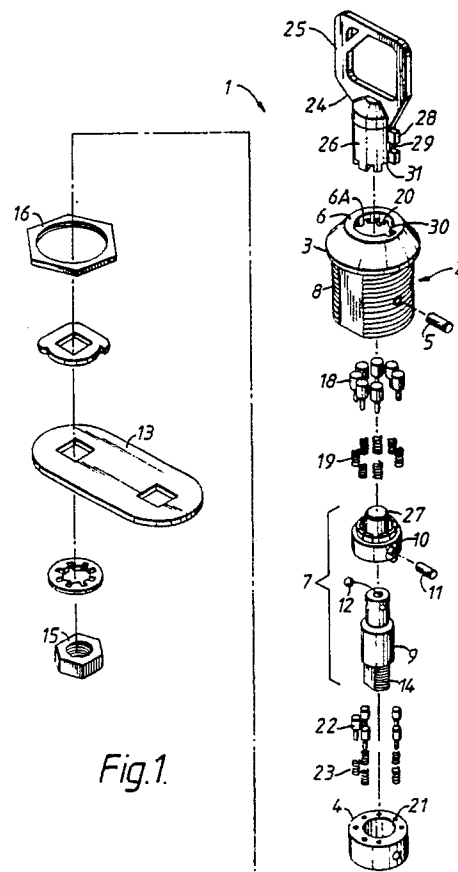


Fig.1.

CYLINDER LOCK WITH AXIALLY EXTENDING PLUNGERS

This invention relates to a cylinder lock having axially extending plungers, such locks also being known as "tubular key locks". Locks of this general type are well known and are used in many applications, for example to lock the cabinets of vending machines or to lock cabinets of electrical or mechanical equipment, for example cabinets housing alarm systems or cabinets housing electronic control equipment.

In conventional cylinder locks of this type the central spindle or cylinder typically includes a cylindrical front end region which extends forward to the front face of the lock, the end face of the cylindrical front end region forming the visible central region of the lock. The key necessary to operate such locks includes a tubular skirt which is inserted into the space between the central projection of the cylinder and the outer housing of the lock to depress pins within the lock. When the pins are depressed to the correct extent the cylinder is free to rotate, and is rotated by turning the key. For this purpose, the inner cylindrical surface of the tubular part of the key is provided with a projection which engages a mating keyway on the central projection of the spindle thereby facilitating the application of torque to the spindle.

It is recognized within the art that the provision of an axially extending slot in the central front part of the spindle is a disadvantage since it can be of assistance to those wishing to pick the lock. The preferred embodiment of the present invention enables a tubular key lock to be produced in which the front part of the central spindle or cylinder does not incorporate the axially extending groove of the prior art.

According to one aspect of the present invention a cylinder lock comprises a housing having a front end in which is formed a substantially circular opening; a central spindle rotatably mounted within the housing, the central spindle having a substantially cylindrical front end region which is received within the circular opening to define an annular space therebetween; a plurality of axial extending passages in said central spindle aligned with the annular space; locking means located in at least some of said passages for locking the central spindle to the body against relative rotation except when each locking means is located in a predetermined axial position; means biasing the locking means towards the front of the lock; and a tubular key for insertion into the annular space to depress the locking means to said predetermined axial positions, the key being adapted to rotate the central spindle after depression of the locking means, wherein the cylindrical front end region of the spin-

dle is devoid of grooves enabling torque to be applied to the spindle by means of a tool.

Preferably, the key has formed about the inner or outer periphery of the tubular portion thereof a plurality of grooves or recesses, the depth of each groove or recess measured from the leading face of the key being sufficient to produce the desired depression of the locking means when the key is fully inserted in the lock. With this arrangement, the lateral faces of the grooves or recesses may engage the lateral faces of the locking means to effect rotation of the central spindle.

In the preferred embodiment of the invention the central spindle incorporates a flange within which the passages are formed. In the assembled lock, the flange is held captive within the housing between two inwardly directed flanges of the housing. In this case, the front flange of the housing preferably incorporates recesses or bores within which the front of the locking means are received when the key is not present in the lock. In this manner, the locking means extend between the passages of the central spindle and the recesses or bores of the housing in order to lock the spindle relative to the housing against rotation when no key is inserted within the lock.

Preferably, the housing flange on the rear side of the spindle flange is formed with passages or bores which the locking means will enter if they are depressed beyond the predetermined axial location necessary for unlocking. This arrangement ensures that if the locking means are depressed beyond the correct position in an attempt to pick the lock the spindle will remain locked against rotation relative to the housing.

Preferably, the passages of the rear housing flange receive auxiliary locking means in the form of pins spring loaded towards the front of the lock. The length of the pins of the auxiliary locking means is chosen such that if a particular one of the first locking means is not depressed sufficiently to reach the predetermined position necessary for release of the lock the corresponding pin of the auxiliary locking means extends into the corresponding passage of the central spindle flange to prevent relative rotation of the central spindle and the housing.

In a particularly preferred embodiment of the invention the rear housing flange incorporates a passage corresponding to each of the passages of the central spindle flange and most, but not all, of the passages of the rear flange incorporate auxiliary locking means.

The invention will be better understood from the following description of a preferred embodi-

ment thereof, given by way of example only, reference being had to the accompanying drawings wherein:

Figure 1 is an exploded view of a preferred embodiment of the invention;

Figure 2 is a schematic view illustrating a key in engagement with the central spindle of the lock of Figure 1;

Figure 3 is a cross section on the line A-A of Figure 2; and

Figure 4 is a schematic view illustrating the pins or plungers of the lock of Figure 1.

The cylinder lock 1 illustrated in the drawing comprising a housing 2 formed by a body 3 and a collar 4. After assembly, the collar 4 is permanently retained within the body 3 by a pin 5. The front end of the body 3 provides an inwardly extending flange 6 having a central substantially circular opening 6A. The collar 4, when mounted and retained within the body 3, forms an inwardly projecting flange spaced rearwardly of the flange 6.

A central spindle 7 is rotatably mounted within the housing 8. The spindle 7 is, in the illustrated embodiment, produced by securing a flange member 10 to a body member 9 by means of a pin 11. When mounted within the housing 8 the flange formed by the flange member 10 is located between the flange 6 of the body and the flange formed by the collar 4 to retain the central spindle in position. Preferably a ball 12 of a suitable hard material is located within a bore provided at the front end of the spindle 7 in order to prevent drilling out of the spindle.

A locking arm 13 is secured to the rearward threaded end region 14 of the central spindle by means of a nut 15 in conventional manner. Similarly, a nut 16 is provided in conventional manner for securing the entire lock assembly to a panel, e.g. of a vending machine or equipment housing cabinet.

The flange member 10 is provided with a multiplicity of equi-angularly spaced through passages 17 for receiving a corresponding multiplicity of locking means 18 in the form of pins slidably mounted within the passages. Each pin 18 may have associated therewith a spring 19 biasing the pin towards the front of the lock. The springs 19, if provided, are seated on suitable shoulders provided within the passages 17. The rearward side of the flange 6 is provided with a multiplicity of bores or recesses 20 whereby the front end of each pin 18 is biased into an associated bore or recess 20 by the spring 19 when no key is present in the lock. The length of the pins 18 is such that when the front end of each pin is located within its associated bore or recess 20 the majority of the pin is still located within its associated passage 17. Thus, when no key is present in the lock the pins

18 are effective to lock the central spindle 7 against rotation relative to the housing.

The collar 4 is provided with a multiplicity of blind bores 21 corresponding in number to the number of passages 17. The bores 21 are located such that when the lock is in the "locked" condition each passage 17 is aligned with a corresponding blind bore 21 of the collar 4. At least some of the bores 21 house auxiliary locking means in the form of pins 22 biased towards the front of the lock by springs 23. As more particularly shown in Figure 4, when no key is present within the lock the pins 22 extend from the bores 21 into the corresponding passage 17 in order to provide additional means locking the central spindle relative to the housing.

The above described lock is operated by means of a key 24 of the tubular type - that is to say the key 24 incorporates a manually graspable handle portion 25 and a tubular skirt 26. In the assembly condition of the lock the substantially cylindrical front end region 27 of the central spindle extends into the substantially circular opening 6A defined by the flange 6 to define therebetween an annular space within which the tubular portion 26 of the key is a snug fit. Preferably, the key incorporates an axially extending projection 28 having a ward 29. The opening 6A includes a slot 30 for receiving the projection 28, and the width of the ward 29 is sufficient to accommodate the thickness of flange 6 so that the projection 28 will not interfere with rotation of the key once the ward 29 has been aligned with the flange.

A multiplicity of grooves or recesses 31 equal to the number of pins 18 is formed about the periphery of the tubular portion 26. The depth of each recess 31, measured from the leading face of the key, is matched to the length of the pins 18 such that, when the key is inserted to align the ward 29 with the flange 6 each pin is depressed to an extent that the front ends of the pins 18 have cleared the bores or recesses 20 and the rear ends of the pins do not project beyond the rear face of the flange member 10. In the case of pins 18 having associated therewith auxiliary pins 22 the rear face of the pins 18 is, in fact, positioned substantially at the rear face of the flange member 10 when the key is inserted as described above. With the locking means each depressed to this predetermined axial position the central spindle 7 will no longer be locked relative to the housing.

Actual turning of the central spindle 7 is effected by lateral engagement of one or more faces of the key 24 with faces on the central spindle 7 and/or on the pins 18. In the illustrated embodiment, the flange member 10 is formed with a groove 32 in which the projection 28 is received when the key is fully inserted. Accordingly, rotation of the key will cause a lateral face of the projection

28 to engage a lateral face of the recess 32 in order to rotate the central spindle. In addition, the lateral faces of each recess 31 will engage corresponding lateral faces of each pin 18 to apply torque to the central spindle as the key is rotated. Thus, the central spindle may be rotated without the provision of the groove in the cylindrical front region 27 of the spindle, as has been common in the prior art. It will be appreciated that whilst in the preferred embodiment of the invention the projection 28 is used to apply torque to the spindle, this is not strictly necessary and the projection 28 may be omitted or not be provided with a corresponding slot 32, whereupon the entire transmission of torque from the key to the spindle assembly will be via the lateral faces of the slots 31 and the pins 18.

If the wrong key is inserted into the lock and an attempt is made to turn the lock at least some of the pins 18 will either have been depressed too far (with the result that they will enter the blind bores 21 to prevent rotation of the central spindle), or will not have been depressed far enough (with the result that auxiliary locking members 22 will project into the passages 17 to prevent rotation of the central spindle). In the illustrated embodiment of the invention two of the pins 18 do not have corresponding pins 22. This arrangement is advantageous since if an attempt is made to pick the lock by depressing each pin 18 with the same applied force, the pins 18 having no corresponding pin 22 will be depressed further than those which do have a corresponding pin 22, with the result that the pins 18 not having corresponding pins 22 will enter the empty blind bores 21 to prevent picking of the lock.

The springs 19 shown in Figure 1 may be omitted in the case of the pins 18 having associated auxiliary pins 22, in which case the springs 23 are made of sufficient strength to bias both the pin 22 and the pin 18 associated with each spring into their forward position when no key is present in the lock.

The above described lock mechanism is particularly suitable for use as a cabinet lock or, is mounted to a suitable electric switch, as a lockable switch.

Claims

1. A cylinder lock comprising: a housing having a front end in which is formed a substantially circular opening; a central spindle rotatably mounted within the housing, the central spindle having a substantially cylindrical front end region which is received within the circular opening to define an annular space therebetween; a plurality of axial extending passages in said central spindle aligned

with the annular space; locking means located in at least some of said passages for locking the central spindle to the body against relative rotation except when each locking means is located in a predetermined axial position; means biasing the locking means towards the front of the lock; and a tubular key for insertion into the annular space to depress the locking means to said predetermined axial positions, the key being adapted to rotate the central spindle after depression of the locking means, wherein the front end region of the spindle is cylindrical characterized in that the front end region (27) is devoid of grooves which would enabling torque to be applied to the spindle (7) by means of a tool.

2. A cylinder lock according to claim 1 characterized in that the key (24) has formed about the inner or outer periphery of the tubular portion thereof a plurality of grooves or recesses (31), the depth of each groove or recess measured from the leading face of the key being sufficient to produce the desired depression of the locking means (18) when the key is fully inserted in the lock whereby the lateral faces of the grooves or recesses may engage the lateral faces of the locking means to effect rotation of the central spindle.

3. A cylinder lock according to claim 1 or claim 2 characterized in that the central spindle (7) incorporates a flange (10) within which the passages (17) are formed, and wherein in the assembled lock, the flange (10) is held captive within the housing (2) between two inwardly directed flanges (6 and 4) of the housing.

4. A cylinder lock according to claim 3 characterized in that the front flange (6) of the housing incorporates recesses or bores (20) within which the front of the locking means (18) are received when the key (24) is not present in the lock to lock the spindle (7) to the housing (2).

5. A cylinder lock according to claim 4 characterized in that the housing flange (4) on the rear side of the spindle flange (10) is formed with passages or bores (21) which the locking means (18) will enter if they are depressed beyond the predetermined axial location necessary for unlocking.

6. A cylinder lock according to claim 5 characterized in that the passages (21) of the rear housing flange (4) receive auxiliary locking means (22) in the form of pins spring loaded towards the front of the lock, the length of the pins of the auxiliary locking means being chosen such that if a particular one of the first locking means (18) is not depressed sufficiently to reach the predetermined position necessary for release of the lock the corresponding pin of the auxiliary locking means (22) extends into the corresponding passage (17) of the central spindle flange (10) to prevent relative rotation of the central spindle and the housing.

7. A cylinder lock according to claim 6 characterized in that the rear housing flange (4) incorporates a passage (21) corresponding to each of the passages (17) of the central spindle flange (10) and most, but not all, of the passages (21) of the rear flange (4) incorporate auxiliary locking means (22).

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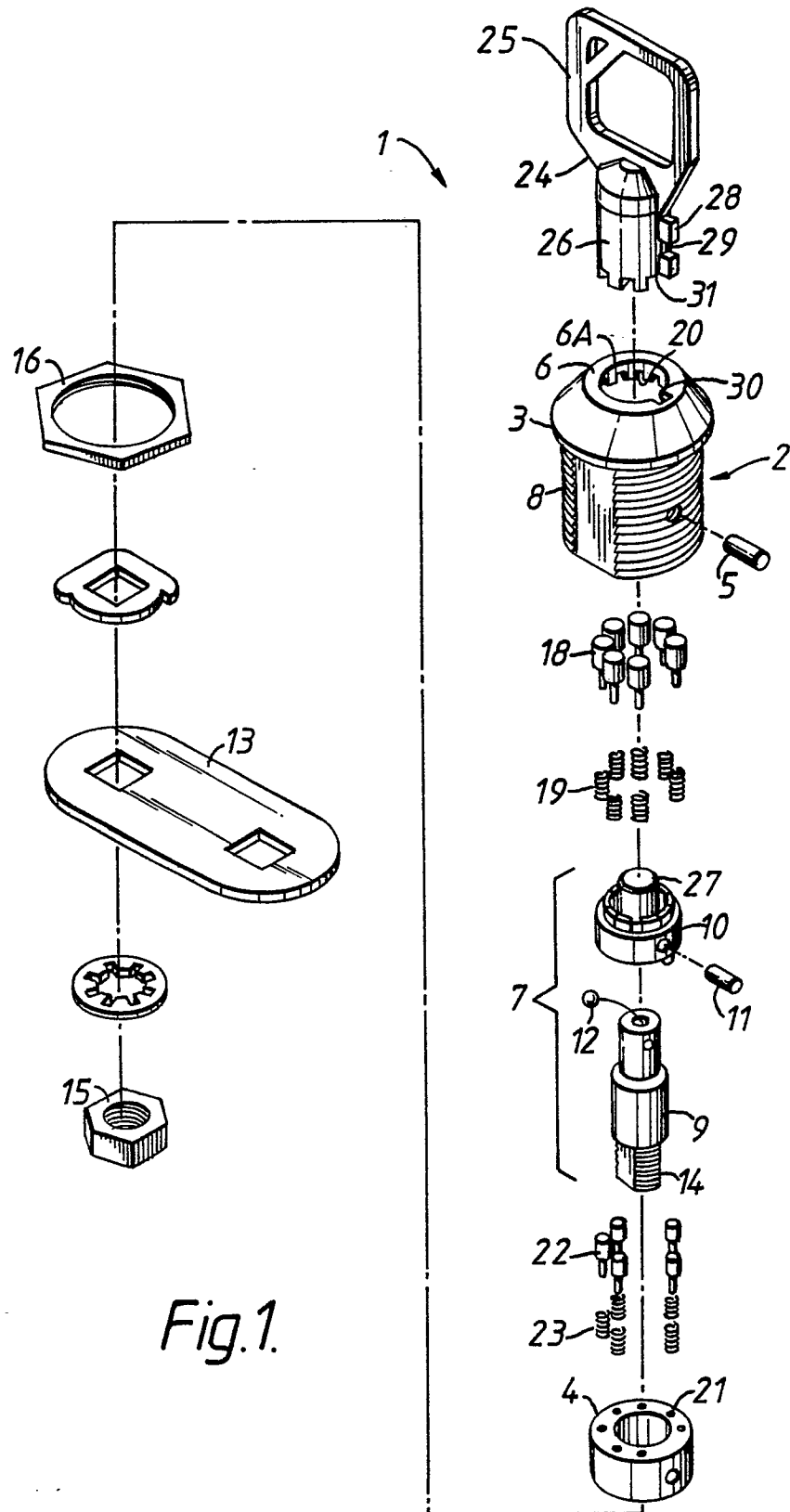


Fig.1.

