

[54] LOCK ACTUATED ANTI-THEFT
DEVICE MAINLY FOR AUTOMOBILES

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[58] Field of Search.....70/360, 252, 455, 386, 453,
70/454

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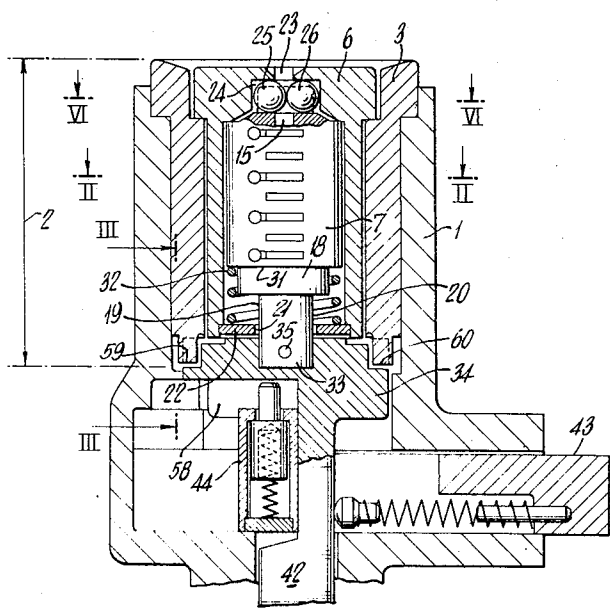
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[57] ABSTRACT

Cylinders or other suitably shaped rollers are provided in the direct vicinity of the key hole portion of the lock, for shifting axially and transversely of the lock along suitable wall portions of the lock. Operation of the key causes internal shifting of the rollers and then moves other lock portions into positions wherein the locking latch first becomes ready to lock and then actually locks. The locking position is fully established by total removal of the key from the lock. This leaves the rollers in a certain position, wherein they in turn hold the lock in shake-proof, locked condition, until the key is reinserted.

11 Claims, 11 Drawing Figures



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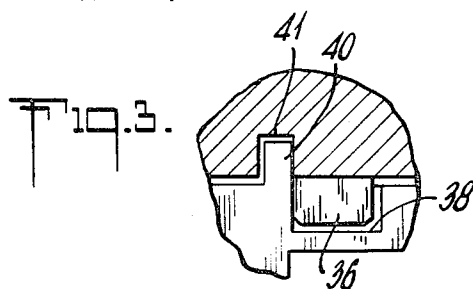
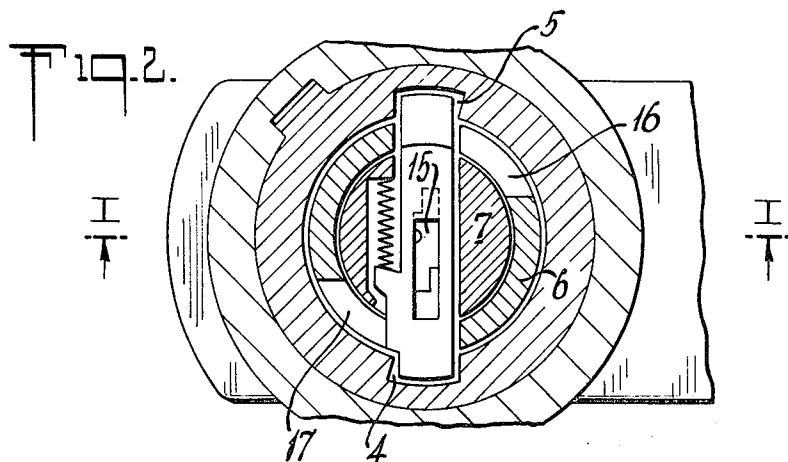
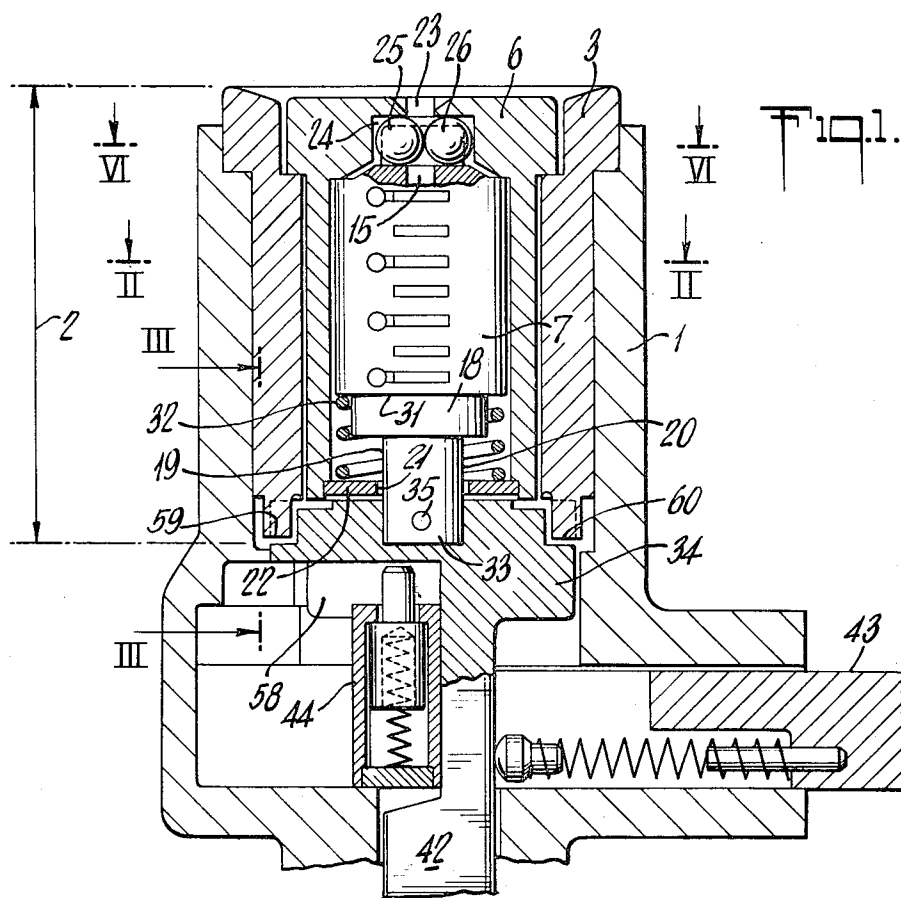


Fig. 4.

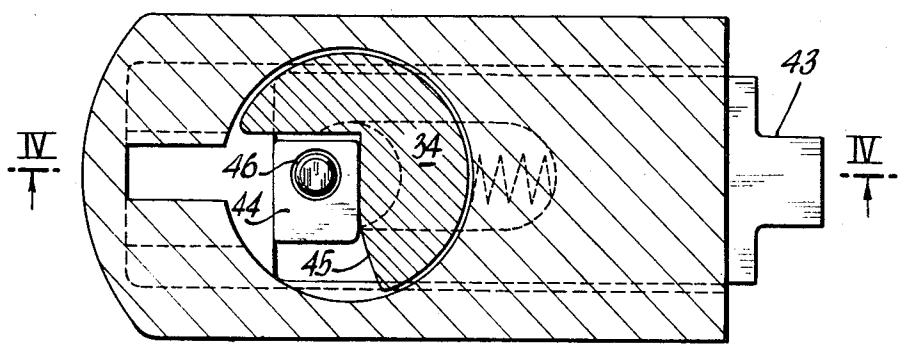
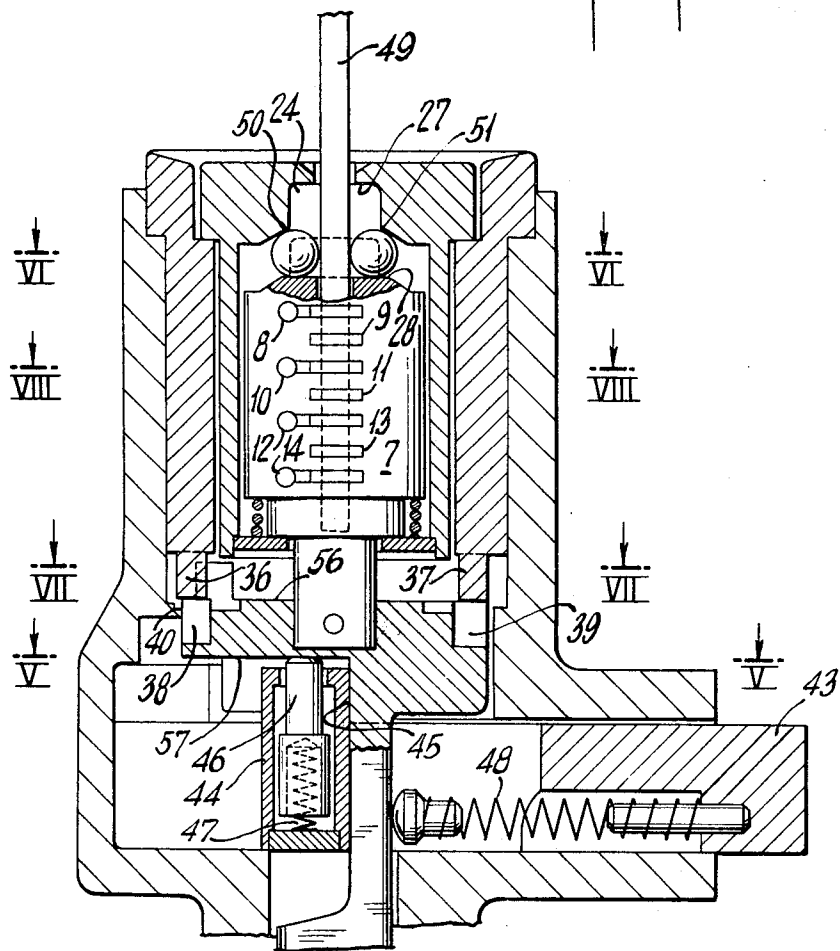


Fig. 5.

Fig. 6.

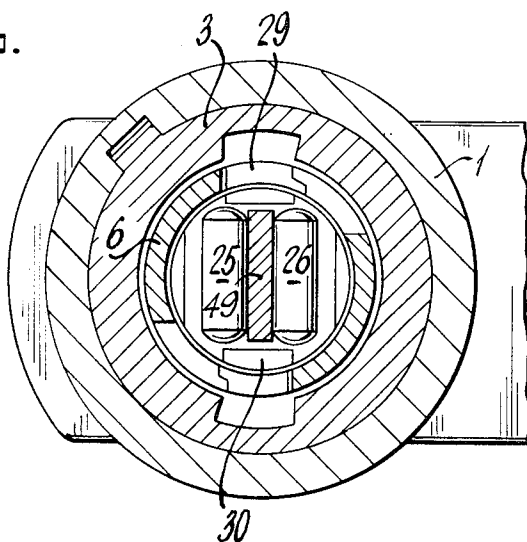


Fig. 7.

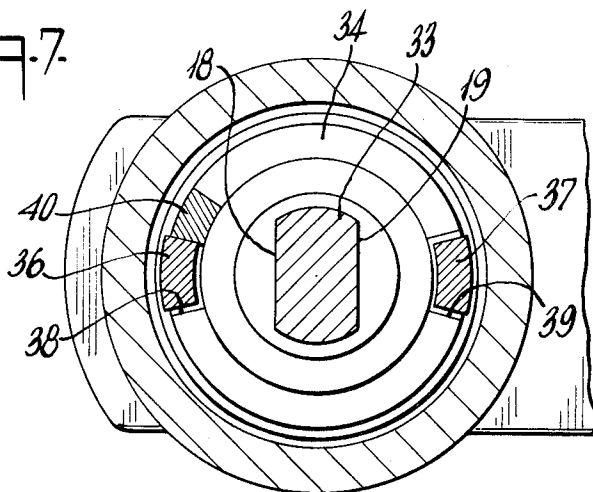
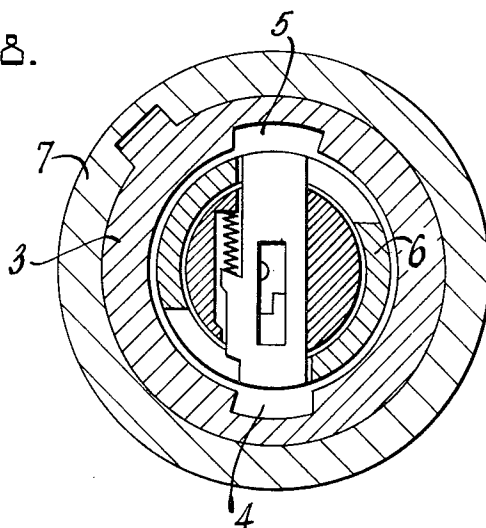


Fig. 8.



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Fig. 9.

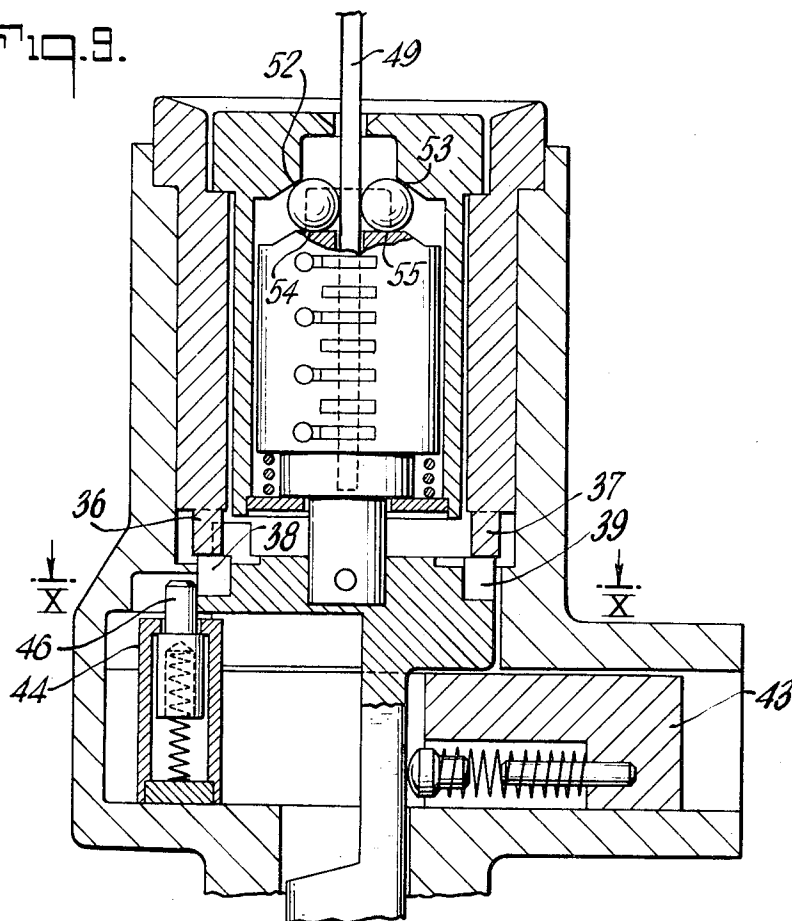


Fig. 10.

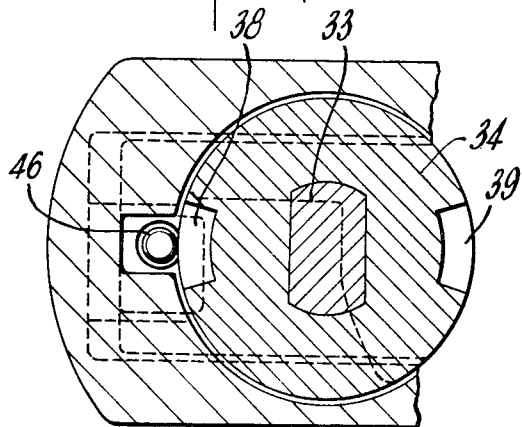
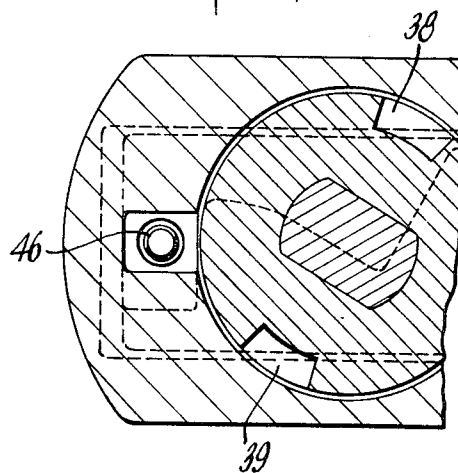


Fig. 11.



LOCK ACTUATED ANTI-THEFT DEVICE MAINLY FOR AUTOMOBILES

BACKGROUND AND NATURE OF THE INVENTION

Certain locks and anti-theft devices are known wherein an attempt is made to immobilize an automobile. These locks usually immobilize a steering wheel or the like, when the ignition key has been fully removed from the key hole. They usually have a latch for the steering wheel, influenced by a spring and controlled by key and lock operations. These operations usually provide a so-called position of readiness for locking, which is made possible by the use of feelers in contact with the key profile near the key hole, such feelers cooperating with other parts to prevent actual transition of the latch into its locking position until the key has been removed so that it no longer provides a counter bearing for the feelers. It is also known to make the core of a lock axially movable, along with the switch drum. In such constructions, again the latching bar is held in unlatching position until the key is removed entirely from the lock and at the same time, the shiftable core or other lock portions are returned to initial position. Although such devices are quite effective and are used in many cars, they are not entirely free of drawbacks. The first-mentioned ones require relatively long feeler levers which must be made with high precision and which may tend toward oscillations. The other devices are relatively complicated, expensive to make, and not free of trouble in operation. They also require added skills of the driver which cannot always be presupposed and in the interest of security should not be presupposed.

The invention overcomes these drawbacks, adding to the security of operation while giving consideration to economic aspects. It does this by construction wherein axially and transversely shiftable cylinders or the like are provided in the key hole region and in contact with suitably shaped portions of this region, so that insertion of the key between the cylinders establishes a position wherein initially, turning of the key is made possible to establish the readiness for latching, which position can be terminated only when the cylinders are brought back to an earlier position, by substantially complete removal of the key. It is possible for example to use two cylinders symmetrically arranged, although this and other preferred details described hereinafter are not required in all variants of the invention.

DRAWING

FIG. 1 is a sectional view of a lock according to the invention, shown along lines 1 — 1 in FIG. 2 and in one of the several positions thereof (stopping position — key removed for anti-theft securement);

FIG. 2 is a sectional plan view of the lock according to FIG. 1, the section being taken along lines 2 — 2 in FIG. 1;

FIG. 3 is a fragmentary sectional view, taken along lines 3 — 3 in FIG. 1;

FIG. 4 is a view generally similar to FIG. 1, but showing the device in a different position (key inserted to initiate unlocking of lock bolt) and wherein the section is taken along lines 4 — 4 in FIG. 5 which correspond to lines 1 — 1 in FIG. 2;

FIGS. 5, 6, 7 and 8 are sectional views through the lock shown in FIG. 4, the views being taken respectively along lines 5 — 5, 6 — 6, 7 — 7 and 8 — 8 in that Figure;

FIG. 9 is another view generally similar to FIG. 1 and showing still another position of the device (stopping position — key still inserted);

FIG. 10 is a sectional plan view taken along lines 10 — 10 in FIG. 9; and

FIG. 11 is a sectional plan view generally similar to FIG. 10 but showing the parts in a different position (driving).

As basically shown in FIG. 1, there is provided a receptacle 1, which can be secured to the car or other structure to be controlled, by fastening means, not shown. On the side accessible to the driver or other operator, the receptacle contains lock cylinder 3, of suitable length 2, and which has anti-rotation channels 4, 5 formed therein as shown in FIG. 2, to control rotation of core sleeve 6 therein, as is known by itself. The sleeve has core piece 7 axially shiftable therein, which in turn contains the well-known plunger means 8 to 14, see FIG. 4, movable in apertures 16, 17 of core sleeve 6, FIG. 2, the dimensions of these being such that the plungers can be mounted even when core piece 7 is in core sleeve 6.

At the rear end of the core piece 7, this piece has a smaller co-axial extension 18, flattened at 19, 20 as is best shown in FIGS. 1 and 7. The flattened portion of this piece extends through matching portions of a disc 22, FIG. 1, which is rigidly connected with core sleeve 6 to rotationally couple this sleeve with core 7 while allowing relative axial motion.

According to the invention, key hole 23 at the front end of sleeve 6 has a recess 24, inside this sleeve, FIG. 1. The inner walls of this recess provide room and limitation for a set, particularly a pair, of lock-controlling form bodies or rollers, shown as cylinders 25, 26. When the key is being inserted or withdrawn, these bodies roll along walls 27 in recess 24 and on top surfaces 28 of core 7, compare FIGS. 1 and 4. Some of the surfaces, facing one another, are inclined to enforce axial and transverse rolling of the rollers. As shown in FIG. 6, the rollers have plain rounded ends but it will be understood that they also can have spherical end enlargements; as already noted, they can be non-symmetrical particularly to the vertical center line in FIG. 6; they can also use sliding surfaces and be formed as wedges or the like. In each case, they constitute key-engaging form bodies movable relative to the key and the key-surrounding structures.

The shoulder 31 of core piece 7 surrounding extension 18, FIG. 1, has pressure spring 32 acting on it and reacting against disc 22 to bias core piece 7 forwardly against form bodies 25, 26. Flattened part 33 of extension 18 of core 7, FIG. 7, fits into switch drum 34, FIGS. 1 and 7, and is firmly connected therewith by pin 35.

As further shown in FIGS. 4, 5 and 7, drum 3 has lugs 36, 37 on its end facing the switch drum. These lugs are in positive engagement with recesses 38, 39 of switch drum 34 when the unit, after removal of the key, is in anti-theft position.

Drum 34 on its head surface 56 opposite the latch bar has stop member 40 thereon which engages recess

41 of cylinder housing 3. Drum 34 has shaft 42 extending through latch bar 33 and positively engages a rotatable part of an ignition switch, not shown, but well known by itself.

Referring mainly to FIGS. 4 and 5, bar 43 has transverse extension 44 which has lateral slidable engagement with surface 45 on switch drum 34. This extension contains pin 46, pressed upwardly by spring 47. The locking bar with its extension is biased toward locking position by spring 48, as is known to the art. Also, of course, a variety of similar lock bar arrangements can be used. It will be understood that the "upward" direction mentioned and illustrated here, normally is "forward" in the actual orientation of the lock device, in a car.

OPERATION

After removal of the key the unit is in locking position of bar 43, FIG. 1.

In order to unlock the device, key 49 is introduced into key hole 23 of core sleeve 6. It encounters cylinders 25 and 26 which lie in recess 24 of sleeve 6 where they are laterally confined and have correspondingly limited mobility. The key shifts them into sleeve 6 where the enlargement of recess 24 at 50 and 51 (FIG. 4) together with the wedge action of the key tip allows the rollers to yield laterally corresponding with thickness of the key. Thereupon, core 7 is axially moved against the pressure of spring 32 by the two rollers which engage its front face 28. The key slides between the rollers into key channel 15 of core 7, up to the key stopping abutment, and, if it has the proper profile, operates plungers 8 to 14 to operate the lock. Rollers 25 and 26, in contact with the side surfaces of the key, come to rest at 50 to 53 in sleeve 6 and at 54, 55 on core 7 (FIG. 9), whereby they fix the core in rearwardly pushed position. Switch drum 34, rigidly connected with core 7, at its flattened part 33, is also shifted and its contact surface 45 slides along extension 44 of bar 43, FIG. 5. In this process it causes its rear surface 57 to shift pin 46, against the pressure of spring 47, into extension 44 of bar 43, FIG. 4. Thereupon, recesses 38 and 39 provided in switch drum 34 (FIG. 10) no longer surround and limit lugs 36, 37 of cylinder lock drum 3 so that switch drum 34 no longer is locked against rotation. In addition (FIG. 3) stop 40 on head surface 36 of switching drum 34 is removed from recess 41 of lock drum 3.

As the lock then is turned by key 49, lugs 36, 37 of drum 3 slide along the nearby head surface 56 of switch drum 34 which extends from recesses 38 and 39, and additionally secure this drum in its shifted position. Stop 40, lying on lug 36, comes to lie on lug 37 of drum 3 and thereby limits the rotation of the lock, in the starting position. Surface 45 of switch drum 34, (FIG. 5) engages attachment 34 of the locking bar and shifts the latter into unlocked position (FIG. 11). In this process, pin 46 slides along surface 57 of switch drum 34 and is shifted by its spring 47 into the upper, full portion of the switch drum as is indicated in FIG. 11. Incident to these operations, the conventional ignition switch provided in receptacle 1 and not shown herein is operated by the switching drum as is known to the art.

In order to establish stop or lock position, the above-described operation is reversed. Pin 46 comes to rest at

the upper part of the switch drum as shown in FIGS. 3 and 10. Thus, it holds bar 43 in non-locking position. In order to bring this bar into locking position, rollers 25, 26 must be shifted back into their initial position in core 7, under the effect of spring 36. This is possible only when key 49 has been fully removed from its channel 23, as shown in FIG. 1. The switch drum 34 firmly connected with the core 7 thereby also reaches its initial position. Pin 46 reaches the flattened and open part 58 of the switch drum. Thereby bar 43 is liberated and spring 48 shifts the same into locking position as also shown in FIG. 1. Lugs 36 and 37 on lock drum 3 slide into recesses 38 and 39 in the head of the switching drum; stop 40 of head surface 56 of the switch drum comes to rest at lug 36 and is then received in recess 41 of cylinder housing 3 as shown in FIG. 3.

The invention improves former devices mainly in that it no longer requires that either the tip of the key or its unprofiled narrow side must establish readiness for locking, or introduce the transition from unlocked to locking position. Nor does the key require special recesses for such purposes. It is only necessary to have a key as known from simpler units. It has been made to utilize large area portions of the key for introducing readiness for locking and actual lock release, and the surface load on the key connected with these operations has been kept low. Similarly low is the load on the cylinders or other form bodies which lie against the broad sides of the key and against corresponding surfaces in the core and core sleeve.

A further advantage is that no additional springs, spring actuated plungers, plates, pins, bars, links or levers are needed for transmission of motion to the locked portion which provides the readiness for locking. All engagements are very positive, providing excellent safety against inadvertent locking, for example by impact vibrations. Even strong periodic vibrations or accelerations when starting or braking fail to cause undesirable operation. Still another advantage is that when the key has been removed from the key hole the cylinders or form bodies close the key hole, thereby also providing desirable protection against dust and humidity.

What is claimed is:

1. In a lock and anti-theft device mainly for an automobile structure such as the steering wheel, wherein a bolt can be engaged with and disengaged from said structure by different rotations of a drum, under the control of lock core means for shifting the drum into rotatable and non-rotatable positions, and the further control of lock core sleeve means for locking and unlocking the lock core means, the improvement which comprises:

a system of rollers disposed between said lock core and core sleeve means and capable of shifting motions both along and across the axis of said means but biased toward motions converging on said axis, while capable of motions diverging from said axis with the help of a key for the lock; and

a system of bearing surface means for said rollers, on said lock core and core sleeve means, cooperable with said rollers so that upon and only upon certain of said motions followed by key removal, said core sleeve, rollers and lock core hold said drum in readiness to rotate so as to engage the bolt with the structure.

2. Apparatus according to claim 1, wherein one of the elements including the lock core means, core sleeve means and drum in one position thereof interferes with motion of the bolt into engagement with said structure.

3. Apparatus according to claim 2, wherein said drum is the element which interferes as described.

4. Apparatus according to claim 1, wherein the lock has recess areas adapted to receive and guide said rollers and said shifting motions thereof, with tolerances only allowing slidable insertion of the key between the rollers.

5. Apparatus according to claim 4, wherein said recess portion has surfaces oblique to the lock axis to guide the rollers, and has surfaces transverse to said axis to provide said holding of the drum in readiness to rotate so as to engage the bolt with said structure.

6. Apparatus according to claim 1, wherein said lock core means and core sleeve means comprise a two-part structure wherein the core is rotatable and axially shiftable in the sleeve.

7. Apparatus according to claim 1 having a lock housing which surrounds the lock core means, core sleeve means and drum, the drum and housing structures having, respectively, lock means and recess means, engageable with one another to prevent rotation of the lock core means in a predetermined position of the rollers.

8. Apparatus according to claim 7, wherein said structures adjacent said lugs and recesses have abutment surfaces adapted for mutual sliding motion.

9. Apparatus according to claim 1, wherein the system of rollers comprises a pair of cylinders.

10. Apparatus according to claim 9, wherein each of said cylinders has spherically shaped end portions.

11. Apparatus according to claim 10, wherein each of said end portions is a spherical surface not wider than the cylinder but having a radius longer than the radius of the cylinder.

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