

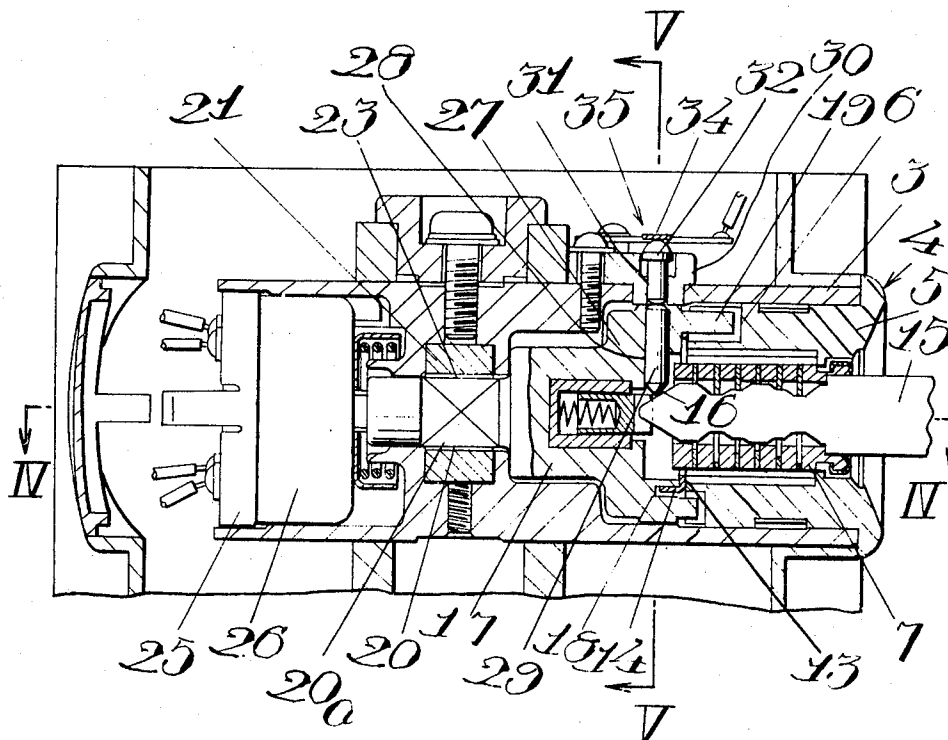
[72] Inventor **Masakazu Hukuta**
Ama-gun, Aichi Prefecture, Japan
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 [73] Assignee **Kabushiki Kaisha Tokai Rika Denki**
Seisakusho
Nishibiwajima-cho, Nishikasugai-gun,
Aichi Prefecture, Japan
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 [33] **Japan**
 [31] **43/7261**
Continuation of application Ser. No.
794,532, Jan. 28, 1969, now abandoned.
This application Aug. 25, 1970, Ser. No.
66,863

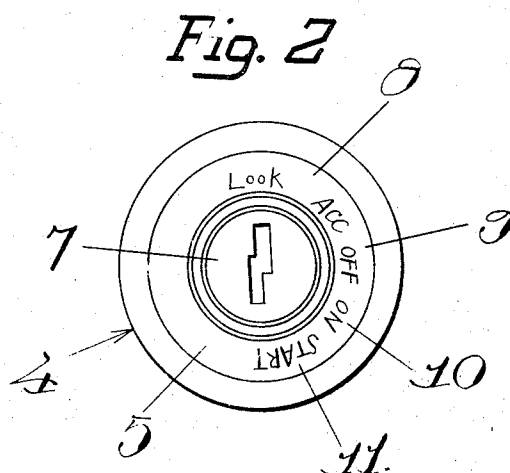
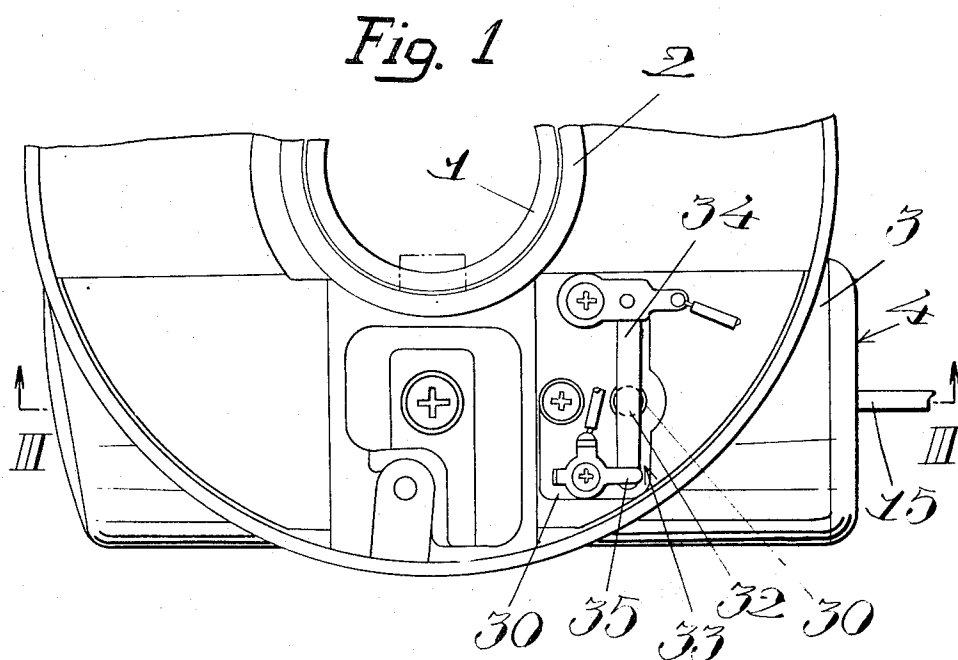
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Primary Examiner—Herman J. Hohausner
Attorney—McGlew and Toren

ABSTRACT: An antitheft lock device of an automotive vehicle ignition switch system comprises a member mounted for sliding movement radially of the rotor of a cylinder-type ignition lock, the member being moved radially outwardly by insertion of the key into the rotor until the radially outer end of the member is flush with the circumferential surface of the rotor. A cylindrical housing embraces the cylinder lock, and a switch control element is slidable in a radial slot in this housing and its radially inner end projects into the radial slot mounting the sliding member, when the key is withdrawn from the lock. In its radially inner position, the switch control element allows opening of an alarm switch. When the key is inserted into the lock, the sliding member is moved radially outwardly and the switch control element is displaced radially outwardly to close the alarm switch. The alarm switch is cooperable with another switch, such as the door-operated switch, so that, if the driver opens the door to leave the car without withdrawing the key from the ignition switch, an alarm is energized. This alarm may be a lamp, a buzzer, or a similar device.

[54] **ANTITHEFT LOCK DEVICE OF AN IGNITION**
SWITCH SYSTEM IN AN AUTOMOBILE
2 Claims, 7 Drawing Figs.
 [52] U.S. Cl..... 200/42,
 200/61.66
 [51] Int. Cl..... H01h 27/00
 [50] Field of Search..... 200/42, 44,
 61.66; 340/63, 64, 274; 180/114





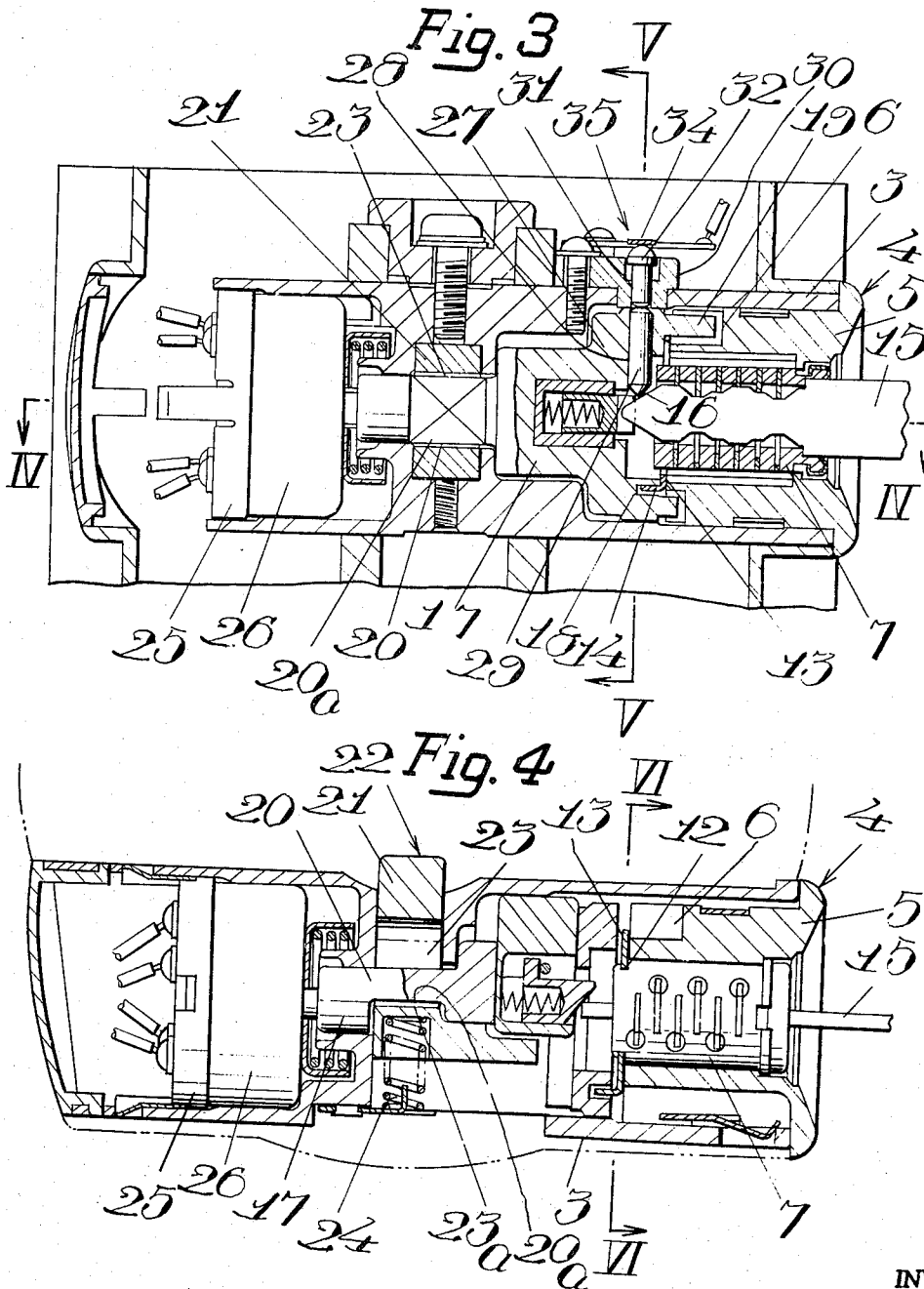
INVENTOR

MASAKAZU HUKUTA

BY

McGraw-Hill

ATTORNEYS



INVENTOR

MASAKAZU HUKUTA

BY *McGraw + Toren*

ATTORNEYS

Fig. 5

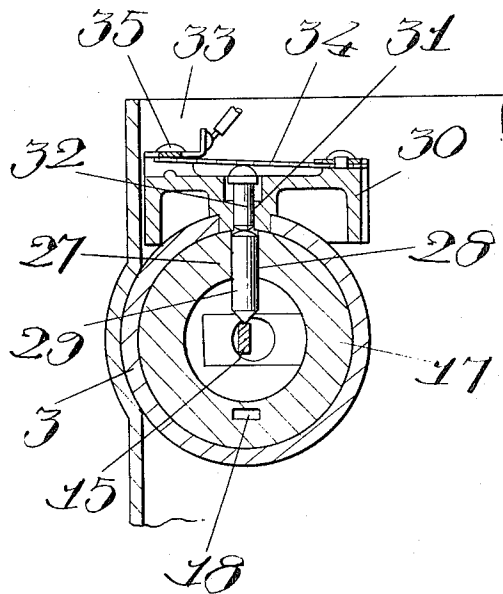


Fig. 6

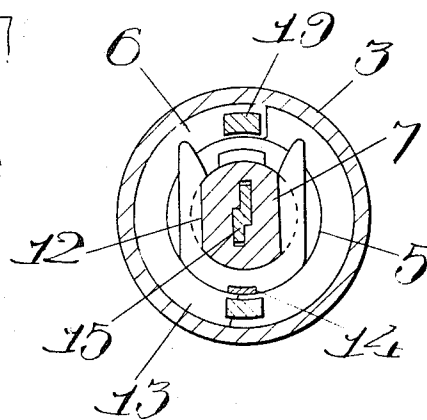
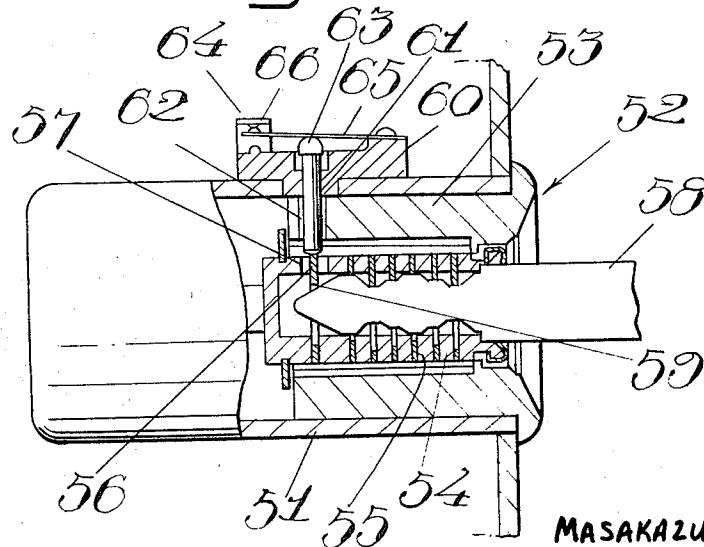


Fig. 7



INVENTOR

MASAKAZU HUKUTA

BY *McGraw + Horen*

ATTORNEYS

ANTITHEFT LOCK DEVICE OF AN IGNITION SWITCH SYSTEM IN AN AUTOMOBILE

This is a continuation of application Ser. No. 794,532 filed Jan. 28, 1969, now abandoned.

The present invention relates to an antitheft lock device in an automobile, more particularly to an alarm device in an ignition switch system which can remind a driver to remove a key from the ignition switch, when he leaves a car.

In the conventional ignition switch system, of which ON or OFF action is controlled by the rotor of the lock of the cylinder type rotated by a key inserted therein, insertion or withdrawal of the key is permitted only in a certain angular position of the rotor. The key is also used for the door lock and the trunk of the automotive vehicle, such as an automobile. If the driver leaves the car with the key inserted in the lock, it invites theft of the car, or articles in the trunk, which will cause another crime.

An object of the present invention is to provide an antitheft lock device of an automotive vehicle ignition switch system comprising a sliding member having an outer end pushed into flush relation with the circumferential surface of a lock bolt for a steering shaft by a key inserted into a rotor or a rotary member rotating with said rotor. A switch control element is provided inside a stationary member circumferentially embracing the rotor. This switch control element normally has its radially inner end engaged in the radially extending slot or bore receiving the sliding member and, when the switch control element is in this position, the contacts of an alarm switch mounted on the stationary member are in an OFF position. The contacts are placed in an ON position by radially outward movement of the sliding member upon insertion of a key into the ignition switch. Thereby, the alarm switch is maintained closed when the key is left in the ignition switch and operates, in cooperation with a second switch which is closed responsive to actions of the driver in leaving the vehicle, to energize an alarm system warning the driver that the key remains in the ignition switch.

For an understanding of the principles of the invention, reference is made to the following description of typical embodiments thereof as illustrated in the accompanying drawings:

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a plan view of an ignition switch system combined with a lock means for a steering shaft;

FIG. 2 is a side view of FIG. 1;

FIG. 3 is a cross-sectional view taken along the line III—III of FIG. 1;

FIG. 4 is a cross-sectional view taken along the line IV—IV of FIG. 3;

FIG. 5 is a longitudinal sectional side view taken along the line V—V of FIG. 3;

FIG. 6 is a longitudinal sectional side view taken along the line VI—VI of FIG. 4; and

FIG. 7 is a side elevational view partly in section of another embodiment.

Referring to FIGS. 1 through 6 showing an embodiment of an antitheft lock device of the present invention in an ignition switch system combined with a lock bolt for a steering shaft, numeral 1 is a steering shaft, which is circumferentially embraced by a stationary sleeve 2. A housing 3 is provided tangentially of the stationary sleeve 2 and extends transversely of the vehicle body.

A cylindrical-type lock 4 is conformingly fitted in housing 3, and includes a rotor 7 rotatable in a stationary sleeve 5. As seen in FIG. 2, rotor 7 may be turned, from a position 8, in which the steering shaft 1 is locked, clockwise through 90° to an OFF position 9, and may be further rotated clockwise, through 35°, to an ON position 10 of the ignition switch. The rotor may be turned further clockwise, through 35°, to an ON position 11 of a starter switch. Insertion or withdrawal of a key 15 is permitted only in a specific angular position range of the

rotor, in relation to lock position 8, but not at any other angular position thereof. The rotor 7 has an internal end projecting from an internal end of the stationary sleeve 5 and provided with opposite circumferential slots 12, each of which is normal to the axis of the rotor, and into which a stopper or engaging plate 13, having an inwardly projected portion 14, is fitted. Numeral 17 is lock bolt for controlling the steering shaft, which is fitted rotatably in the housing, the inward portion of the cylinder type lock 4. The lock bolt 17 has an end portion provided in a slot 18 with which the projection 14 of the plate 13 is engaged, and has a projection 19 serving as a stop and engage in an arcuate slot 6 formed in the inner end of stationary sleeve 5, and serving to limit conjoint rotation of rotor 7 and lock bolt 17. Thereby, lock bolt 17 rotates with rotor 7 only in the angular range from lock position 8 to ON position 11 of the steering shaft 1. Lock bolt 17 is provided with a semicylindrical neck portion 20 with the other semicylindrical portion cut out. A lock element 21, having a horseshoe-shaped opening 23 corresponding to the neck portion 20 of the lock bolt 17, is mounted for movement radially of the housing 3. Lock element 21 seats a spring 24 serving to bias lock element 21 in a projecting direction, that is, upwardly in FIG. 4. When the rotor 7 and the lock bolt 17 are turned to the lock position 8 to oppose flat portion 20a of the neck portion 20 to a bottom portion 23a of the horseshoe-shaped opening 23, the lock element 21 is moved outwardly by the spring 24, as shown in FIG. 4, until bottom portion 23a contacts with the flat portion 20a of the neck portion 20, and an outer end portion 22 of the lock element 21 is projected from lock element 21 is pushed radially inwardly of housing 3 to exert a force against neck portion 20 when steering shaft 1 occupies a position other than the lock position.

At the innermost portion of housing 3, there is mounted a switch element 25, the movable portion 26 of which is connected with lock bolt 17. Switch element 25 operates to close an ignition circuit when the rotor 7 is turned to the ON position 10, and to close the ignition circuit and an electric circuit of the starter, when the rotor is at the start or ON position 11.

In the above-described embodiment of the present invention, bolt 17 has, at a portion contacting with the inner end of the rotor 7, a central opening into which the key is insertable. In a peripheral wall 27 of the lock bolt 17, and correspondingly to a tapered portion 16 of the key 15, there is formed a radial slot 28. Into said slot or bore 28 is fitted a pin-like sliding member 29, which has a radially inner conical end normally located centrally of the rotor 7. Sliding member 29 is engaged at the conical end thereof by tapered portion 16 of the key 15 when the latter is inserted, to move outwardly until an outer end thereof is flush with the circumferential surface of the wall portion 27. Numeral 30 is a base plate, for mounting an alarm switch means 33, which is fixed on the housing 3 correspondingly to the outer end of the sliding member 29, and which has a portion fitted inside the housing 3. The base plate 30 is provided with a slot or bore 31 in registering alignment with the slot 28 and terminating outwardly in a diametrically enlarged slot or bore. Into slot 31, there is slidably fitted a control element 32 consisting of a round head pin. Numeral 34 is a movable contact of the alarm switch means 33, which has one end fixed on the base plate 31 and other end extending over the control element 32. Outwardly of movable contact 32, and engageable therewith is mounted a fixed contact 35.

Referring to operation of the alarm switch means 33, when the key 15 is inserted into the rotor 7 at the lock position 8, the control element 32 is moved outwardly by the outer end of the sliding member 29 pushed outwardly by the tapered portion 16 of the key 15, and pushes the movable contact 34 to contact with the fixed contact 35, thereby turning the alarm switch means 33 to the ON position. When the rotor 7 is turned by the key 15 to the ON position 10 or 11, the inner end of control element 32 is displaced from the outer end of sliding member 29 to engage the circumferential surface of lock bolt 17, thereby maintaining the alarm switch means 33

in the ON position. When the key 15 is withdrawn from the cylinder type of lock in the lock position 8, the sliding member 29 moves inwardly in slot 28 and simultaneously, the control element 32 moves inwardly to engage its inner end in the slot 28. Thereby the movable contact 34 moves downwardly to turn the alarm switch 33 to the OFF position. Thereby, so long as key 15 remains inserted in the ignition switch, alarm switch 33 is maintained in the ON position.

In FIG. 7, showing another embodiment of the present invention, numeral 51 is a cylindrical housing, into an open end of which a cylinder-type lock 52 is fixedly inserted. The cylinder-type lock 52 consists of a stationary sleeve 53 and a rotor 54 fitted rotatably. Rotor 54 is connected, at its end, with a movable portion of a switch means controlling ON or OFF action of an ignition circuit and a starter circuit, and is rotatable in a specific angular range in relation to the OFF position and ON position of these electric circuits. Insertion or withdrawal of a key 58 is permitted only in the OFF position, by suitable mechanism, well known to the art, and therefore not illustrated in detail.

The rotor 54 is provided at an inner portion with a slot or bore having a diametrically enlarged portion 57 and accommodating a sliding member 56, which is slidably pushed outwardly by a tapered portion 59 of the key, until an end portion is flush with circumferential surface of the rotor 54, like the other plates or pins 55 of the rotor. In alignment with the diametrically enlarged slot 57 in the OFF position, there is mounted, on the external circumferential surface of housing 51, a baseplate 60 for mounting an alarm switch 64. The baseplate 60 has a portion fitted inside the housing and provided with a slot or bore 61 in registering alignment with the diametrically enlarged slot 57 through the intermediary of a slot or bore 62 formed within the stationary sleeve 53. In the slots 61 and 62, a roundhead pin 63, serving as a control member for a contact, is slidably fitted. Numeral 65 is a movable contact, which has one end fixed on the base plate 60 and other end extending over the control member 63. A fixed contact 66 is mounted above movable contact 63 and is engageable therewith.

In this embodiment, the sliding member 56 moves inwardly upon withdrawal of the key 58, and simultaneously the control member 63 is moved downwardly to engage its inner end in the diametrically enlarged slot 57, whereby the movable contact 65 is disengaged from the fixed contact 66, resulting in turning the alarm switch OFF. The operation is otherwise similar to that of the embodiment previously described.

In the electric circuit of an alarm lamp and buzzer, in which the alarm switch means 33 or 64 is incorporated, a second switch means is arranged in series, so that the electric circuit is closed, to sound the alarm, whenever the car door is opened with the key left inserted.

As is clear from the description relating to the above two embodiments, the antitheft lock device of the present invention has an advantage that, when the key is inserted in the rotor of the cylinder-type lock of the ignition switch system, the sliding member, with pressure of the key, is pushed forcibly to operate the control member, so that the alarm switch is turned to the ON position, and the alarm switch is maintained in the ON position, so long as the key is not withdrawn. Thus, the antitheft lock device operates to remind a driver that the key has been left in the ignition switch, and thus helps to prevent a car from being stolen or contents being stolen from the car.

What is claimed is:

1. An antitheft lock device for an automotive vehicle ignition switch system of the type including a cylinder-type lock having a lock cylinder, said lock device comprising, in combination, a cylindrical lock bolt separate from said cylinder but coaxial and rotatable with said cylinder; a lock element controlled by said lock bolt; said lock bolt being formed with a first radial passage; a sliding element mounted for radial movement in said first radial passage and having an inner end engageable with the inner end of a key inserted into said cylinder; said sliding member being movable radially inwardly in said first radial passage when the key is withdrawn from said cylinder and, when a key is inserted into said cylinder, being movable radially outwardly in said first radial passage until its outer end is substantially flush with the circumferential surface of said lock bolt; a housing adjacent said cylinder-type lock, and formed with a second passage extending radially of said lock bolt and centered in a diametric plane of said lock bolt including said first radial passage; a switch control element slidably movable radially in said second radial passage and being positioned out of engagement with said lock bolt and cylinder during conjoint rotation of said lock bolt and cylinder to provide free rotation of said lock bolt and cylinder responsive to insertion of a key into said cylinder; said switch control element being movable radially inwardly to engage into said first radial passage responsive to radial inward movement of said sliding member when a key is withdrawn from said cylinder in a selected position of said cylinder-type lock; and an alarm switch closed by said control element in the radially outer position thereof and opened by said control element upon movement of the inner end of said control element into said first radial passage.

2. An antitheft lock device, as claimed in claim 1, including an alarm-energizing circuit controlled by said alarm switch and including a second switch means closed responsive to actions of a driver in leaving the automotive vehicle; whereby, if the driver leaves the automotive vehicle with a key inserted in said cylinder-type lock, said alarm is energized.

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