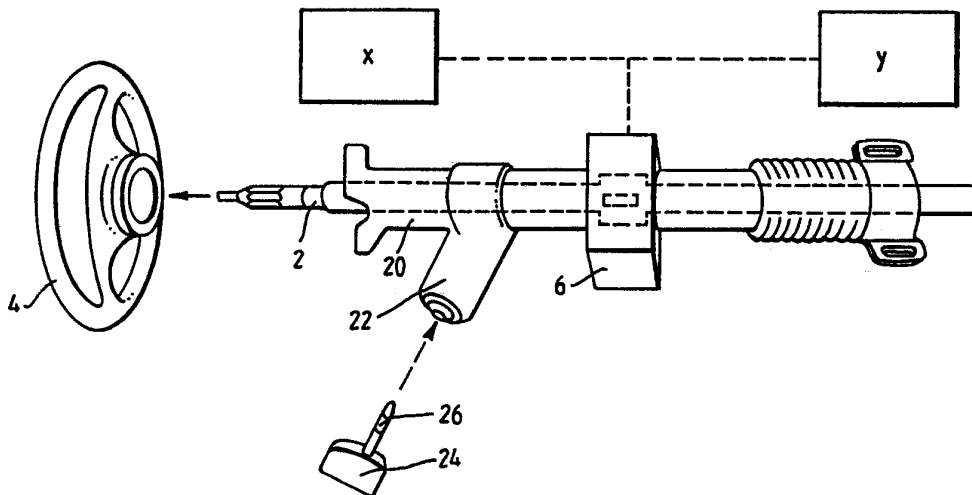




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(54) Title: SECURITY DEVICE



(57) Abstract

A security device primarily for preventing theft of motor vehicles comprises a rigid metal housing (6) containing a component (10), such as the steering column lock of a vehicle, movable between operative and inoperative modes, a first electronic circuit, conveniently in the form of a first microchip, within the housing (6) for causing movement of the component (10) between its operative and inoperative modes, a receptor socket (22) remote from the housing (6) and electronically interconnected with the first electronic circuit, and an intelligent coded key (24) incorporating a second electronic circuit, conveniently in the form of second microchip, insertion of the key (24) into the receptor socket (22), resulting in the transmission of coded signals between the first and second circuits, reception by the first circuit of an approved signal from the second circuit resulting in the component (10) being moved from its inoperative mode to its operative mode.

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SECURITY DEVICEBACKGROUND OF THE INVENTION

This invention relates to security devices and has particular though not exclusive application to such devices for preventing the theft of motor vehicles.

The theft of cars is a major problem worldwide. Apart from the inconvenience caused to the owner of the vehicle, there is a significant cost element associated with the involvement of insurance companies and the police.

Numerous attempts have been made to combat car theft the majority of which comprise the installation of alarm systems. However most of these alarm systems require installation by someone with a knowledge of car electrics, and are therefore quite expensive, while those that are easily fitted by the owner can usually be easily removed by a potential thief.

Wheel clamps are now available but these are extremely bulky and inconvenient, while there have been improvements in the steering locks fitted by the car manufacturers, but most of these can still be defeated by a serious thief.

The major problem with steering locks is that the key is mechanically connected to the locking mechanism. No matter how secure the key/lock mechanism is, once the barrel has been removed or broken off, the steering lock is readily accessible for operation by a pair of pliers or a screwdriver, while the car engine can be started by simply short-circuiting a pair of wires.

SUMMARY OF THE INVENTION

It would be desirable to be able to provide a security

device less vulnerable than heretofore, and in particular a security device of this type particularly suited to mounting on a motor vehicle to make the theft of the vehicle more of a problem than heretofore.

According to the present invention there is provided a security device comprising a rigid housing containing a component having inoperative and operative modes, said housing further containing a first electronic circuit associated with said component and operable to switch said component between its inoperative and operative modes, a receptor socket for location remotely from the housing and electronically interconnected with said first circuit, and a key incorporating a second electronic circuit and adapted for insertion into said receptor socket, the arrangement being such that, on insertion of the key into the receptor socket, coded signals are transmitted between the first and second circuits whereby, on reception by the first circuit of an approved signal from the second circuit, the component is switched from its inoperative mode to its operative mode.

In a preferred application of the invention, the security device is incorporated in the steering column of a vehicle.

In such an application the security device comprises a rigid housing secured in the vehicle with the steering column thereof extending through said housing, a locking bolt contained within said housing and movable into and out of engagement with the steering column into a locking position and a release position to prevent and permit rotation of the

steering column respectively, a first electronic circuit contained within said housing and operable to move the locking bolt between its locking position and its release position, a receptor socket preferably located on the steering column and electronically interconnected with said first electronic circuit, and a key for location in said receptor socket, said key incorporating a second electronic circuit whereby, on insertion of the key into the receptor socket, coded signals are transmitted between the first and second circuits, receipt by the first circuit of an approved signal from the second circuit resulting in movement of the locking bolt from its locking position to its release position.

Preferably the locking bolt is resiliently urged towards its locking position, the housing including an electric motor which, on receipt of the approved signal by the first electronic circuit, is actuated by said first electronic circuit to drive the locking bolt into its release position.

Conveniently the security device includes a source of power connected to the first electronic circuit and to the the receptor socket, insertion of the key into said socket completing the second electronic circuit in said key.

In one embodiment of the invention, the first electronic circuit is connected to one or more auxiliary pieces of equipment within the vehicle whereby, on reception of the approved signal from the second circuit, said auxiliary pieces of equipment are either actuated or made available for actuation.

Preferably the housing comprises a steel casing bolted or otherwise secured to a bulkhead of the vehicle.

Conveniently, on disconnection of the power supply from the first electronic circuit, and with the component in its operative mode, said component remains in its operative mode.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 shows a security device according to the invention applied to the steering column of a motor vehicle,

Figs. 2a, 2b and 2c are transverse sections through the housing and steering column of the device of Fig. 1 showing the locking bolt in its released position, its lock position prior to engagement with the associated recess in the steering column, and its engaged locking position respectively,

Fig. 3 is an end view in the direction of arrow 'A' in Fig. 2a of the components within the housing, and

Fig. 4 is a front view in the direction of arrow 'B' in Fig. 2a of the components within the housing.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to Fig. 1 of the drawings there is shown a conventional steering column assembly to which the security device of the invention has been fitted, the assembly including a rotatable column 2 to the upper end of which is secured a steering wheel 4.

A rigid steel, box-like housing 6 is securely bolted or otherwise attached to a bulkhead of the vehicle with the steering column 2 extending through the housing 6, said column 2 incorporating a recess or slot 8 therein into and

out of which can be moved a locking bolt 10 as will be detailed below. The housing 6 may be secured within the vehicle other than to a bulkhead, providing the attachment is secure and the steering column 2 extends therethrough.

More particularly, the locking bolt 10 is mounted within a carrier 12 contained within the housing 6, the bolt 10 being resiliently urged by a coiled compression spring 14 to a normal position in which the nose end of the bolt 10 projects from the carrier 12 as seen in Fig. 2a.

The carrier 12 can be driven towards and away from the steering column 2 in the direction of arrow 'M' in Fig. 2a by means of a servo-assisted electric motor 16 also contained within the housing 2. The motor 14 drives a rotatable gear wheel 18 which engages with a corresponding rack 20 on the carrier 12 whereby appropriate controlled rotary movement of the gear wheel 18 is translated into linear movement of the carrier 12.

Fig. 2a shows the steering column 2 in its unlocked condition permitting rotation thereof, the carrier 12 being in its fully displaced position remote from the steering column whereby the nose end of the bolt 10 is displaced from the slot 8 in the steering column.

Fig. 2b shows the carrier member 12 having been driven by the motor 16 into an operative position adjacent the steering column with the bolt 10 engaging the outer surface of the column 2 and with the spring 14 compressed.

Subsequent turning of the steering column 2 into the position shown in Fig. 2c in which the slot 8 is axially

aligned with the bolt 10 results in the nose end of the bolt 10 entering the slot 8 under the influence of the spring 14 and whereby the steering column is effectively locked.

Unlocking of the steering column 2 is achieved by appropriate powering of the motor 16 to withdraw the carrier 12 and the bolt 10 from the position shown in Fig. 2c to that shown in Fig. 2a.

This control of the motor 16 is achieved using the following system.

Also contained within the rigid housing 6 is an integrated electronic control circuit in the form of a master microchip, a power lead from the vehicle battery feeding said circuit.

It is to be emphasised that the housing 6 effectively comprises a security safe whereby access to any of the components within the housing 6 is prevented.

Mounted on a conventional fixed sleeve 20 surrounding the steering column 2, adjacent the steering wheel 4, is a receptor socket 22 electronically interconnected with the control circuit in the housing 6 either by hard-wiring or otherwise.

The system further includes an intelligent electronic key 24 for location within the receptor socket 22, the key incorporating an integrated circuit in the form of a single microchip adapted to transmit a predetermined coded signal.

In the illustrated arrangement, the key includes a cylindrical plug portion 26 and the socket 22 is of hollow cylindrical shape to receive said plug portion 26 in the

manner of a phono plug and socket combination. However the electronic key may be of, for example, credit card shape and the socket of corresponding slit shape, while other electronic information carriers may be used.

On insertion of the key 24 into the socket 22, power is established to the microchip within the key 24 and the predetermined coded signal is transmitted thereby to be received at the control circuit within the housing 6.

The master microchip in said control circuit is programmed to recognise a particular coded signal so that, when mutual recognition between the circuits of the key 24 and the housing 6 occurs, the circuit within the housing 6 actuates associated electrical equipment, in this case the servo-assisted electric motor 16 whereby the bolt 10 is withdrawn from its locking position of Fig. 2c to its unlocked position of Fig. 2a.

The control circuit within the housing 6 may also be connected to auxiliary equipment indicated by the boxes 'X' and 'Y' in Fig. 1, such as vehicle stereo equipment, the engine management system of the vehicle, a car telephone or other internal communication equipment, a lockable valuables compartment, supplementary burglar alarms and the like. All such auxiliary equipment would be provided with a slave microchip programmed with the same code as the key 24. Thus, on receipt of the approved signal by the control circuit within the housing 6 from the key 24, the auxiliary equipment will either be actuated or made available for actuation.

Thus it will be appreciated that the location of the

steering column locking mechanism within a rigid housing or safe to which access is desired prevents any direct tampering with the locking mechanism itself, while movement of the locking mechanism is totally under electronic control and requires the use of an intelligent, specifically-coded key.

The circuitry of the security device of the invention is so arranged that, on insertion of the key 24 into the receptor socket 22, the circuitry compares the codes of the signals being transmitted and, if the correct key is being used, the locking mechanism is released and the auxiliary equipment is operated.

If, upon insertion of the correct key, the friction upon the locking bolt 10 as a result of its engagement with the steering column 2 as in Fig. 2**b** is in excess of a predetermined value, an overload protection circuit is actuated to prevent damage to the motor 16, the circuitry being such as to keep attempting to unlock the mechanism every second or so until the friction is reduced to an acceptable level.

On removal of the key 24 from the socket 22, the bolt 10 would be moved to its locking position of Fig. 2**c** and the auxiliary equipment would cease to function.

Conveniently the circuitry includes a lockout function such that, if a potential thief inserted a key 24 into the receptor socket 22 and connected the key to a computer with a view to breaking the code by running a series of different combinations to the key, the circuitry would lockout for a predetermined time, typically 5 to 10 seconds, between each

combination. This would hinder the potential thief sufficiently to make an attempt to break the code futile.

The circuitry is preferably designed such that, in the event of a malfunction, the locking mechanism would remain disengaged from the steering column as long as the key was inserted in the socket.

If there is a power failure or any other malfunction, the locking mechanism will remain in its existing mode.

If anyone tampers with any electrical wiring feeding into or out of the housing 6, the circuitry is protected against de-activation due to reversing polarity, overloading, cutting of wires and the like.

Although the key 24 is preferably self-supporting, in that there are no batteries in it to go flat, power for the circuitry therein being obtained from contacts within the socket 22, the key may incorporate a battery.

The vehicle may incorporate an auxiliary alarm including sensors within the vehicle to determine the presence of an intruder, and a siren for sounding on intrusion. The alarm would be interconnected with the circuitry within the housing 6 in such a manner that, on entering the vehicle, the intruder would activate the sensors which would send a signal to the circuitry within the housing 6. This circuitry would immediately send a signal to the siren, and, if, within a given period of say 5 seconds, the correct coded key 24 is not inserted into the socket 22, the siren would sound. The siren would be a totally self-contained unit with its own power source and fitted under the dash or any other

inaccessible place.

Although described in relation to the control of a locking bolt of a vehicle steering system, the invention has numerous other applications where a component or equipment within a rigid housing is to be moved between two different modes or conditions.

Whatever the application, the security device can be installed extremely quickly and at relatively low cost whilst at the same time providing a virtually thief-proof system.

CLAIMS

1. A security device comprising a rigid housing (6) containing a component (10) having inoperative and operative modes, said housing (6) further containing a first electronic circuit associated with said component (10) and operable to switch said component (10) between its inoperative and operative modes, a receptor socket (22) for location remotely from the housing (6) and electronically interconnected with said first circuit, and a key (24) incorporating a second electronic circuit and adapted for insertion into said receptor socket (22), the arrangement being such that, on insertion of the key (24) into the receptor socket (22), coded signals are transmitted between the first and second circuits whereby, on reception by the first circuit of an approved signal from the second circuit, the component (10) is switched from its inoperative mode to its operative mode.

2. A security device as claimed in claim 1 for the steering column of a vehicle, the device comprising a rigid housing (6) secured in the vehicle with the steering column (2) extending through said housing (6), a locking bolt (10) contained within said housing (6) and movable into and out of engagement with the steering column (2) into a locking position and a release position to prevent and permit rotation of the steering column (2) respectively, a first electronic circuit contained within said housing (6) and operable to move the locking bolt (10) between its locking position and its release position, a receptor socket (22)

electronically interconnected with said first electronic circuit, and a key (24) for location in said receptor socket (22), said key (24) incorporating a second electronic circuit whereby, on insertion of the key (24) into the receptor socket (22), coded signals are transmitted between the first and second circuits, receipt by the first circuit of an approved signal from the second circuit resulting in movement of the locking bolt (10) from its locking position to its release position.

3. A security device as claimed in claim 2 in which the locking bolt (10) is resiliently urged towards its locking position, the housing (6) including an electric motor (16) which, on receipt of the approved signal by the first electronic circuit, is actuated by said first electronic circuit to drive the locking bolt (10) into its release position.

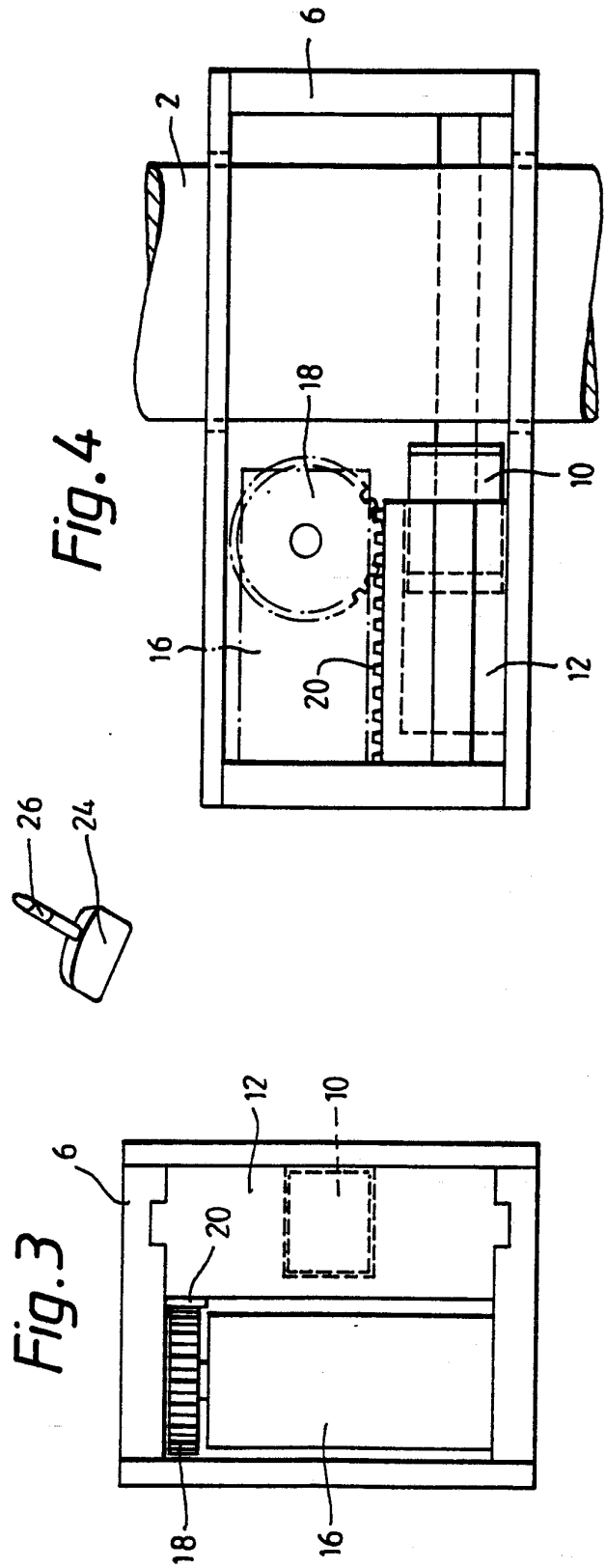
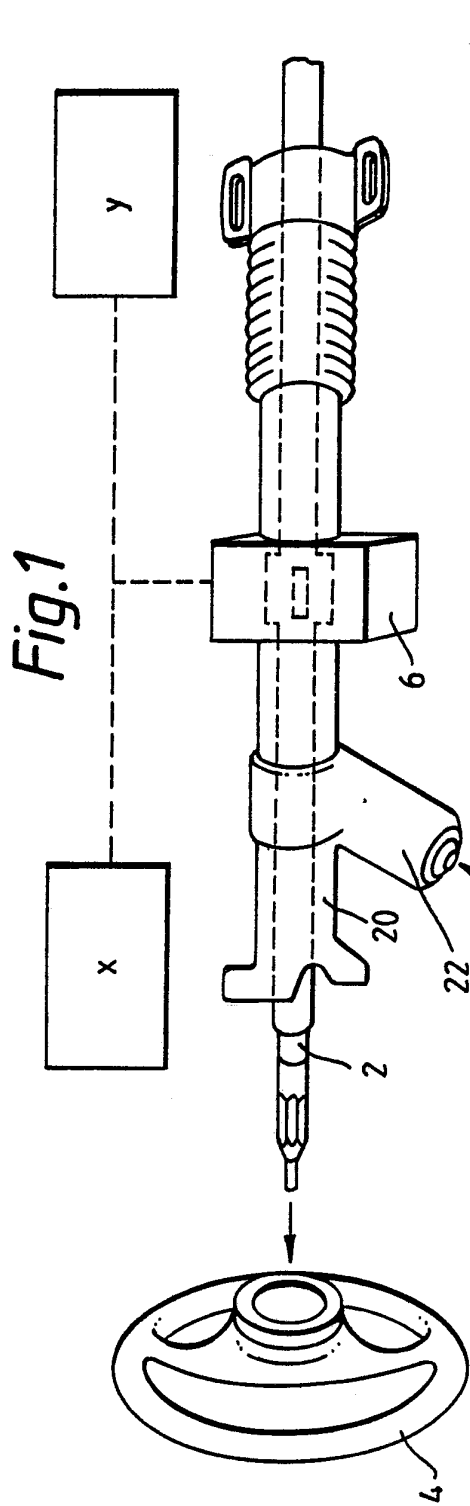
4. A security device as claimed in claim 2 and including a source of power connected to the first electronic circuit and to the receptor socket (22), insertion of the key (24) into said socket (22) completing the second electronic circuit in said key (24).

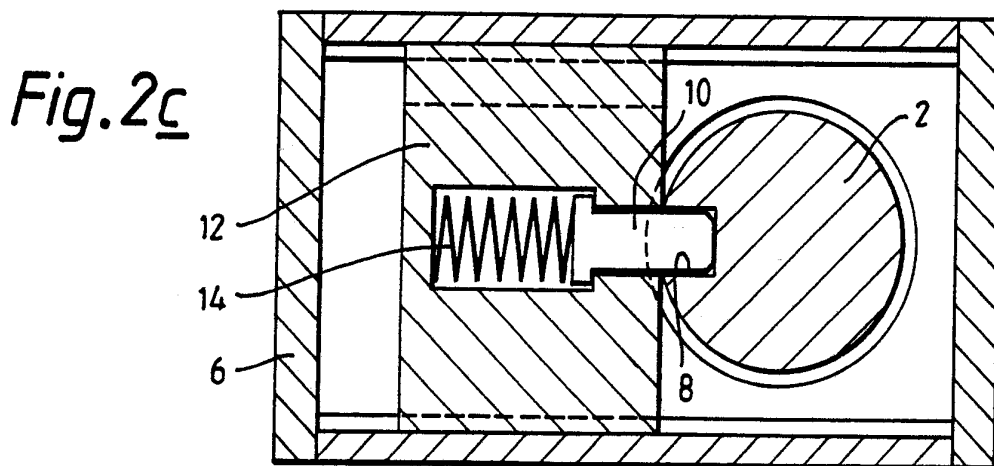
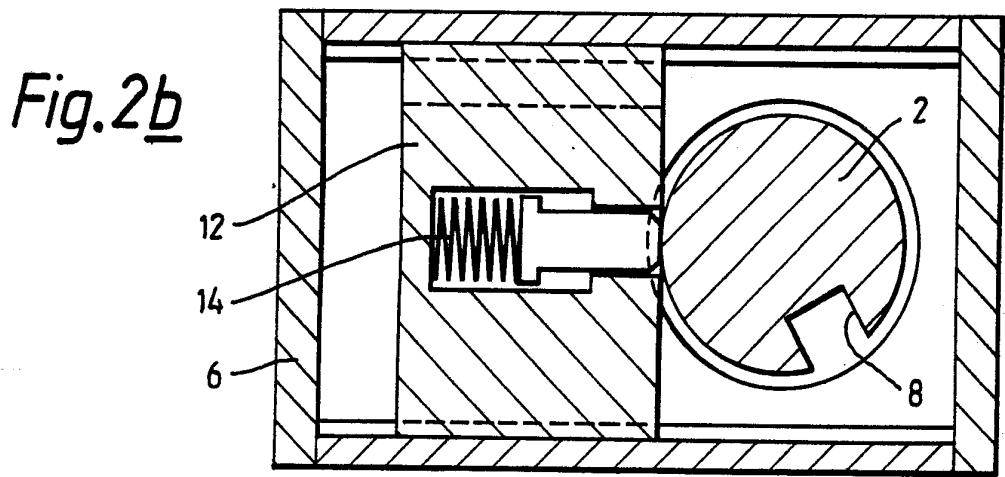
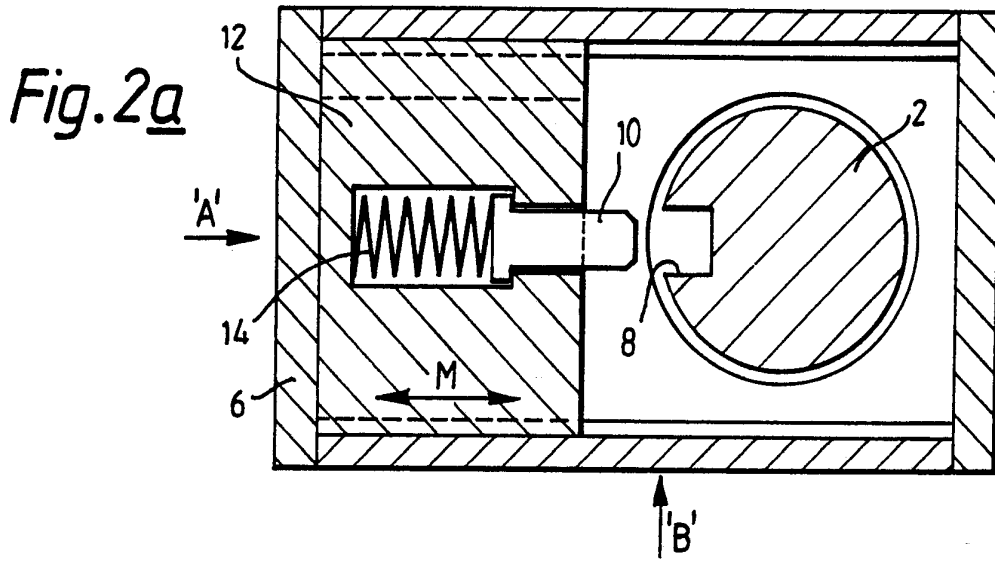
5. A security device as claimed in claim 2 in which the first electronic circuit is connected to one or more auxiliary pieces of equipment (X,Y) within the vehicle whereby, on reception of the approved signal from the second circuit, said auxiliary pieces of equipment (X,Y) are either actuated or made available for actuation.

6. A security device as claimed in claim 2 in which the

housing (6) comprises a steel casing bolted or otherwise secured to a bulkhead of the vehicle.

7. A security device as claimed in claim 2 in which a source of power is connected to the first electronic circuit in such a manner that, with the component in its operative mode and on disconnection of the power source from the first electronic circuit, the component remains in its operative mode.

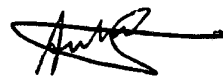




INTERNATIONAL SEARCH REPORT

PCT/GB 92/00439

International Application No

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶		
According to International Patent Classification (IPC) or to both National Classification and IPC		
Int.Cl. 5 B6R25/02; E05B49/00		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁷		
Classification System	Classification Symbols	
Int.Cl. 5	B6R ; E05B	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸		
III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹		
Category ¹⁰	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claims No. ¹³
X	GB,A,2 226 593 (IVAN ANASTASOVSKI) 4 July 1990 see page 9, line 1 - page 10, line 14 see page 10, line 32 - page 11, line 8 see figures ---	1
Y	FR,A,2 487 274 (ANTIVOLS SIMPLEX) 29 January 1982 see page 1, line 30 - page 2, line 21 see page 3, line 19 - line 26 see page 4, line 1 - page 6, line 16 see page 7, line 7 - line 11 see figures ---	1-5,7
Y	DE,A,3 306 863 (DAIMLER-BENZ AG) 6 September 1984 see page 7, line 27 - page 8, line 22 see page 9, line 9 - page 10, line 10 see page 12, line 1 - line 5 see figures ---	1-3,5,7
	-/-	
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IV. CERTIFICATION		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
05 JUNE 1992	17. 06. 92	
International Searching Authority	Signature of Authorized Officer	
EUROPEAN PATENT OFFICE	AREAL CALAMA A. 	

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		Relevant to Claim No.
Category °	Citation of Document, with indication, where appropriate, of the relevant passages	
Y	DE,C,3 318 415 (HÜLSBECK & FÜRST GMBH & CO.KG) 23 August 1984 see column 6, line 36 - column 7, line 2 see column 8, line 40 - line 57 see figures 1-3,8 ---	1,2,4

**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO. GB 9200439
SA 57479**

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB-A-2226593	04-07-90	None	
FR-A-2487274	29-01-82	None	
DE-A-3306863	06-09-84	None	
DE-C-3318415	23-08-84	None	