



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

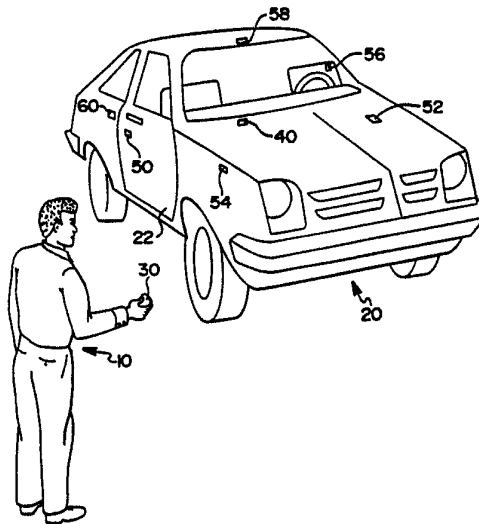
(51) International Patent Classification 5 : <b>E05B 49/00</b>	<b>A1</b>	(11) International Publication Number: <b>WO 92/02702</b> (43) International Publication Date: 20 February 1992 (20.02.92)
---	-----------	---

(21) International Application Number: PCT/US91/05612

(22) International Filing Date: 7 August 1991 (07.08.91)

(30) Priority data:  
564,413 8 August 1990 (08.08.90) US(71) Applicant: TRW INC. [US/US]; 1900 Richmond Road,  
Cleveland, OH 44124 (US).(72) Inventors: LAMBROPOULOS, George, P. ; 970 Anita  
Avenue, Grosse Point Woods, MI 48236 (US). KONA,  
Carl ; 31508 Waltham, Birmingham, MI 48009 (US).(74) Agent: GREENLEE, David, A.; P.O. Box 4516, Troy, MI  
48099 (US).(81) Designated States: AT (European patent), AU, BE (Euro-  
pean patent), BR, CA, CH (European patent), DE (Eu-  
ropean patent), DK (European patent), ES (European  
patent), FR (European patent), GB (European patent),  
GR (European patent), IT (European patent), JP, KR,  
LU (European patent), NL (European patent), SE (Eu-  
ropean patent).**Published***With international search report.**Before the expiration of the time limit for amending the  
claims and to be republished in the event of the receipt of  
amendments.*

(54) Title: REMOTE PROGRAMMING OF VEHICLE FUNCTIONS



## (57) Abstract

A remote control vehicle door locking system has a transmitter (30) for transmitting two-part signals of binary bits each containing a security code and a different function code. A receiver (40) is mounted in a vehicle (20) and is operative to generate control signals for effecting primary door locking and unlocking functions and for enabling and disabling at least one secondary function, such as a security system (60). The receiver (40) comprises a memory for storing a security code of binary bits, and a comparator for comparing the security code of a received signal with the stored security code to generate a control signal for effecting the indicated primary door locking function upon detecting a security code match. The receiver (40) is operable to initiate field programming time periods, during which it generates a secondary control signal for disabling the secondary function upon receipt of a predetermined sequence of signals from a transmitter (30). The secondary function is enabled by receipt of a signal during a subsequent field programming period.

**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	ES	Spain	MG	Madagascar
AU	Australia	FI	Finland	ML	Mali
BB	Barbados	FR	France	MN	Mongolia
BE	Belgium	GA	Gabon	MR	Mauritania
BF	Burkina Faso	GB	United Kingdom	MW	Malawi
BG	Bulgaria	GN	Guinea	NL	Netherlands
BJ	Benin	GR	Greece	NO	Norway
BR	Brazil	HU	Hungary	PL	Poland
CA	Canada	IT	Italy	RO	Romania
CF	Central African Republic	JP	Japan	SD	Sudan
CG	Congo	KP	Democratic People's Republic of Korea	SE	Sweden
CH	Switzerland	KR	Republic of Korea	SN	Senegal
CI	Côte d'Ivoire	LI	Liechtenstein	SU <sup>+</sup>	Soviet Union
CM	Cameroon	LK	Sri Lanka	TD	Chad
CS	Czechoslovakia	LU	Luxembourg	TG	Togo
DE	Germany	MC	Monaco	US	United States of America
DK	Denmark				

<sup>+</sup> It is not yet known for which States of the former Soviet Union any designation of the Soviet Union has effect.

**REMOTE PROGRAMMING OF VEHICLE FUNCTIONS****FIELD OF THE INVENTION**

5

This invention relates generally to remotely-controlled vehicle locking systems and, more particularly, to the use of such a system to program the function of electrically-controlled vehicle functions.

10

**BACKGROUND OF THE INVENTION**

Electrically-controlled vehicle door and trunk locking/unlocking (door lock) systems have become increasingly popular. To enhance their performance, many types of keyless entry systems have been provided for these door lock systems. In one widely-used system of this type, a hard-wired numeric keypad, usually comprising five input keys, is provided on the vehicle door. Manipulation of the keys input a security code to lock/unlock the vehicle's doors and/or trunk. Operation of this system requires memorization of a security code and maintaining the secrecy of the security code.

25

An improvement on this type of keyless entry system is a remote control system which utilizes a hand-held transmitter that emits an infra-red beam to a vehicle-mounted receiver to effect locking and unlocking of the doors and/or trunk. In these systems, a security code is programmed into both receiver and transmitter. This eliminates the necessity of memorizing a security code or keeping it secret. Such a system has limited utility since it requires a clear, straight line (line-of-sight) path between transmitter and receiver to function. A remote control of this type is shown in U.S. Patent No. 4,573,046 to Pinnow.

30

35

An improvement on this remote system utilizes a hand-held transmitter which emits a radio frequency signal to a vehicle-mounted receiver for effecting the lock/unlock functions. To function, a transmitter need only be within range of the receiver. A drawback of this type system is that transmitter and receiver must be matched.

An improvement on this is a system disclosed in U.S. Patent No. 4,881,148 to Lambropoulos et al and owned by the assignee hereof. This system features the ability to change and add security codes so that a receiver may be field programmed to operate with any transmitter, each of which has a unique security code.

Keyless entry systems have been developed which provide for remotely controlling vehicle functions other than door locking/unlocking. For example, a remote control system described in U.S. Patent No. 4,893,240 to Karkouti provides for the remote initiation of the gas pumping, engine starting, heater actuation, air conditioning initiation, and defroster start-up by depressing an appropriate function key on the transmitter keypad.

Keypad-type keyless entry systems which are currently available feature the ability to manipulate the keys in a predetermined sequence, after a master code is entered, to disable an automatic door lock (ADL) function. Normally this ADL automatically locks/unlocks the vehicle doors upon actuation of the ignition switch to on/off position. The keypad manipulation requires memorization of another key sequence.

It would be desirable to provide a remote control type of keyless entry system that features the expanded capability of controlling other electrically-operated vehicle functions.

5

#### SUMMARY OF THE INVENTION

10

In accordance with one aspect of this invention, a remote control system has a transmitter with means for transmitting two-part signals of binary bits each containing a security code and a different function code. A receiver is mounted to a support structure and is operative to generate control signals for effecting at least two primary functions and affecting operation of at least one secondary function. The receiver comprises a memory for storing a security code of binary bits, and a comparator for comparing the security code of a received signal with said stored security code to generate a control signal for effecting the indicated primary function upon detecting a security code match. Field programming means are provided on the receiver to initiate field programming time periods; the receiver is operable during a field programming period to generate a control signal for affecting operation of a secondary function upon receipt of a predetermined sequence of signals.

20  
25  
30

In accordance with another aspect of this invention, a remote control vehicle door locking system has a transmitter with means for transmitting two-part signals of binary bits each containing a security code and a different function code. A receiver is mounted in a vehicle and is operative to

35

generate control signals for effecting primary door locking and unlocking functions and for enabling and disabling operation of at least one secondary function. The receiver comprises a memory for storing a security code of binary bits, and a comparator for comparing the security code of a received signal with said stored security code to generate a control signal for effecting the indicated primary function upon detecting a security code match. Field programming means are provided on the receiver to initiate field programming time periods, during which a secondary control signal is generated to disable operation of a secondary vehicle function upon receipt of a predetermined sequence of signals from the transmitter. The secondary function may be enabled during a subsequent field programming period upon receipt of a signal.

The receiver may also include means for maintaining the disabled operational status of a secondary function upon restoration of power to the receiver following a power failure.

Preferably, the receiver includes means for maintaining the disabled operational status of a secondary function upon restoration of power to the receiver following a power failure.

These and further features of the invention will become more readily apparent upon reference to the following detailed description and the annexed drawings, in which:

#### DRAWING DESCRIPTION

Fig. 1 is a perspective sketch of a vehicle and operator utilizing a remote control system utilizing a receiver according to this invention;

5 Fig.2 is a plan view of a transmitter which is manipulated to effect functioning of a receiver in accordance with this invention; and

10 Fig. 3 is a side view of the transmitter.

#### DETAILED DESCRIPTION OF THE INVENTION

15 The entire disclosure of U.S. Patent 4,881,148 to Lambropoulos et al is hereby incorporated by reference.

20 Referring now to Fig. 1, a vehicle operator 10 is shown approaching an automobile 20 which has been previously locked. The operator is manipulating a hand-held transmitter 30 to communicate with a vehicle-mounted receiver 40 to unlock the vehicle doors (one of which 22 is shown) and/or trunk lid (not shown), as will be later described.

25 The transmitter and receiver preferably utilize radio frequency signals having a nominal frequency of 310 MHz, as described in the aforementioned Lambropoulos patent. Referring additionally to Figs. 2 and 3, transmitter includes a door "unlock" button 32, a door "lock" button 34, and a "trunk" unlock button 36 mounted in a plastic case 38. The transmitter 30 preferably contains circuitry as described in the Lambropoulos patent for transmitting two-part signals containing a security code portion and a function code portion corresponding to the function desired to be accomplished. As described in the Lambropoulos patent, the signal preferably

30

35

contains a so-called "wake-up" portion, but in any event, contains the security and function code portions.

5 Receiver 40 includes a signal detector, a comparator and a memory (denoted as 60, 80 and 100, respectively, in the Lambropoulos patent). Thus, actuation of button 32 will cause the receiver 40 to effect unlocking of the doors 22 of the vehicle 20.  
10 Similarly, actuation of button 34 will effect locking of the doors, and actuation of button 36 will effect unlocking of the vehicle trunk. The operation of the receiver 40 to accomplish the above functions is fully disclosed in the Lambropoulos patent.

15

This invention utilizes the transmitter buttons 32 - 36 to accomplish not only the primary vehicle functions described above, but also one or more secondary functions, as will now be described.

20

Referring again to Fig. 1, Vehicle 20 is schematically illustrated as being provided with a number of electrically-controlled "secondary" functions, as follows:

25

	<u>Function</u>	<u>Reference</u>
	automatic door locking	50
	horn chirp & horn activation	52
30	ignition inhibit	54
	automatic seat position	56
	illuminated entry	58
	security system	60

35 These secondary functions are normally programmed into the vehicle's electronic system to function upon



occurrence of a condition. This operation is well-known and forms no part of this invention.

Automatic door locking (50) normally occurs a set  
5 period of time, such as 30 seconds, after the ignition  
key is removed. A horn chirp (52) may be provided  
upon vehicle locking to indicate this status. The  
horn may also be activated if vehicle security, as  
detected by security system 60, is breached. The  
10 security system may also include provision to inhibit  
ignition operation (54). Repositioning of the  
driver's seat (56) upon unlocking of the vehicle and  
automatic actuation of entry illumination (58) may  
also occur upon vehicle unlocking.

15  
Although these functions are conveniences for  
some vehicle operators, some operators and certain  
circumstances render their operation undesirable or  
inconvenient. For example, automatic door locking may  
20 be a hindrance in a parking lot; it may be desirable  
to deactivate operation of the entire security system  
or portions thereof when the vehicle is being  
repaired. It would be desirable for a driver other  
than the one for whom the seat is pre-set to  
25 deactivate operation of the automatic seat  
repositioning function. An operator may wish to  
disable operation of the automatic entry illumination  
to enable operation at night without drawing attention  
to this operation. The horn chirp may be a nuisance  
30 for an operator who does not wish to wake up his  
neighbors.

Many other reasons exist for selectively  
disabling operation of these and other convenience  
functions. Once disabled, it is desirable to be able  
35 to re-establish, or enable, their operation once  
again. It is possible, of course, to provide for  
hardware changes to selectively disabling and enabling

operation of these functions. However, such actions are beyond the ability or desire of most vehicle operators. This invention provides for utilization of the remote lock system to enable vehicle operators to easily and selectively disable and enable operation of these secondary vehicle convenience functions.

This disabling/enabling occurs during the field programming of receiver 30, as detailed in the Lambropoulos patent with reference to the Figs. 3, 3A, 3B and 3C therein. As described therein, a receiver grounding switch 86 is closed to initiate a field programming period, during which additional or different security codes can be programmed into the receiver from different transmitters.

Operation of the receiver circuitry is explained with reference to the Lambropoulos Fig. 2, which shows use of multiple 24-bit registers. This invention adds another register of, for example, 8 bits, to accomplish the selective disabling and enabling operation of the secondary convenience functions in the following manner.

For example, if it is desired to disable the vehicle's automatic door lock function, the following steps must be followed:

- 1) Turn on the ignition;
- 2) The receiver grounding switch (Lambropoulos 86, Fig. 2) is closed to initiate the field programming period;
- 3) Next, any of buttons 32, 34 or 36 are actuated to store the security code of transmitter 30 in all receiver registers, as fully explained in the Lambropoulos patent; the door locks will cycle as a feedback.

4) Another transmitter may then be similarly operated to store its security code in receiver 40.

To disable the automatic door lock function 50,

5) Either transmitter is operated to actuate the buttons in a predetermined sequence, such as 32-34-36, 32-34-36, 32-34-36, whereupon the receiver will generate a signal to disable the automatic door lock function.

10

Operation of other secondary convenience functions may similarly be disabled during this same field programming period as follows:

6) To disable the horn chirp 52, actuate another button sequence, such as 32-36, 32-36, 32-36;

7) Optionally, to further disable, say, the automatic seat position 56, manipulate the buttons in sequence, such as 32-34, 32-34, 32-34.

20

Of course any sequence can be chosen for disabling operation of any selected function, and a sequence could be structured to disarm combinations of functions, in a manner that will be apparent to those skilled.

25

To enable, or reactivate, operation of the disabled functions, any number of methods can be used. In the embodiment of this invention disclosed herein, the procedure used is to simply repeat steps 1-3 above and operation of all disabled functions will be enabled. Of course other procedures could be utilized and are contemplated within the scope of this invention.

30

35

An advantage of utilizing the remote control disclosed in the Lambropoulos patent is that, should

vehicle battery power fail, the receiver will "remember" the security codes and the disabled functions. Thus, upon repowering of the vehicle, it will be unnecessary to reprogram the receiver to

5

disable operation of the functions desired.

We claim:

1. For use in a remote control system  
5 having a transmitter with means for transmitting two-  
part signals of binary bits each containing a security  
code and a different function code; a receiver for  
mounting to a support structure and operative to  
generate control signals for effecting at least two  
10 primary functions and affecting operation of at least  
one secondary function, comprising a memory for  
storing a security code of binary bits, and a  
comparator for comparing the security code of a  
received signal with said stored security code to  
15 generate a control signal for effecting the indicated  
primary function upon detecting a security code match;  
field programming means on the receiver operable to  
initiate field programming time periods, the receiver  
being operable during a field programming period to  
20 generate a control signal for affecting operation of  
a secondary function upon receipt of a predetermined  
sequence of signals.

2. For use in a remote control vehicle door  
25 locking system having a transmitter with means for  
transmitting two-part signals of binary bits each  
containing a security code and a different function  
code; a receiver for mounting in a vehicle and  
operative to generate control signals for effecting  
30 primary door locking and unlocking functions and for  
enabling and disabling operation of at least one  
secondary function, comprising a memory for storing a  
security code of binary bits, and a comparator for  
comparing the security code of a received signal with  
35 said stored security code to generate a control signal  
for effecting the indicated primary function upon  
detecting a security code match; field programming

means on the receiver operable to initiate field programming time periods, the receiver being operable during a field programming period to generate a secondary control signal for disabling operation of a secondary function upon receipt of a predetermined sequence of signals, and for enabling operation of the secondary function during receipt of a signal during a subsequent field programming period.

3. The receiver of claim 2, including means for maintaining the disabled operational status of a secondary function upon restoration of power to the receiver following a power failure.

4. For use in a remote control system having a transmitter with means for transmitting two-part signals of binary bits each containing a security code and a different function code; a receiver for mounting in a vehicle and operative to generate control signals for effecting at least two primary functions and for enabling and disabling operation of a plurality of secondary functions, comprising a memory for storing a security code of binary bits, and a comparator for comparing the security code of a received signal with said stored security code to generate a control signal for effecting the indicated primary function upon detecting a security code match; field programming means on the receiver operable to initiate field programming time periods, the receiver being operable during a field programming period to generate a plurality of secondary control signals for disabling operation of a plurality of secondary functions upon receipt a plurality of different predetermined sequences of signals, and for enabling operation of all disabled secondary functions upon receipt of a signal during a subsequent field programming period.

5. The receiver of claim 4, including means for maintaining the disabled operational status of a secondary function upon restoration of power to the receiver following a power failure.

5

6. For use in a remote control system having a transmitter with means for transmitting two-part signals of binary bits each containing a security code and a different function code; a receiver for mounting to a support structure and operative to generate control signals for effecting at least two primary functions and affecting operation of at least one secondary function, comprising a memory for storing a security code of binary bits, and a comparator for comparing the security code of a received signal with said stored security code to generate a control signal for effecting the indicated primary function upon detecting a security code match; field programming means on the receiver operable to initiate field programming time periods, means for replacing the security code stored in the receiver memory by the security code of a signal received from a transmitter during the field programming period, the receiver being operable during the field programming period to generate a secondary control signal for affecting operation of a secondary function upon receipt a predetermined sequence of signals.

10

15

20

25

7. For use in a remote control system having a transmitter with means for transmitting two-part signals of binary bits each containing a security code and a different function code; a receiver for mounting in a vehicle and operative to generate control signals for effecting at least two primary functions and affecting operation of a plurality of secondary functions, comprising a memory for storing a security code of binary bits, and a comparator for comparing

30

35

the security code of a received signal with said stored security code to generate a control signal for effecting the indicated primary function upon detecting a security code match; field programming means on the receiver operable to initiate field programming time periods, means for replacing the security code stored in the receiver memory by the security code of a signal received from a transmitter during any field programming period, the receiver being operable during the field programming period to generate a secondary control signal for affecting operation of a secondary function upon receipt a predetermined sequence of signals.

5  
10  
15  
20  
25  
30

8. The remote control of claim 7, wherein the receiver is operable during the field programming period to generate a plurality of secondary control signals for disabling operation of a plurality of secondary functions upon receipt a plurality of different predetermined sequences of signals, and for enabling operation of all disabled secondary functions upon receipt of a signal during a subsequent field programming period.

35

9. The receiver of claim 8, including means for maintaining the disabled operational status of a secondary function upon restoration of power to the receiver following a power failure.

40

10. A remote control system including a transmitter having means for transmitting two-part signals of binary bits each containing a security code and a different function code; a receiver for mounting in a vehicle and operative to generate control signals for effecting at least two primary functions and affecting operation of at least one secondary

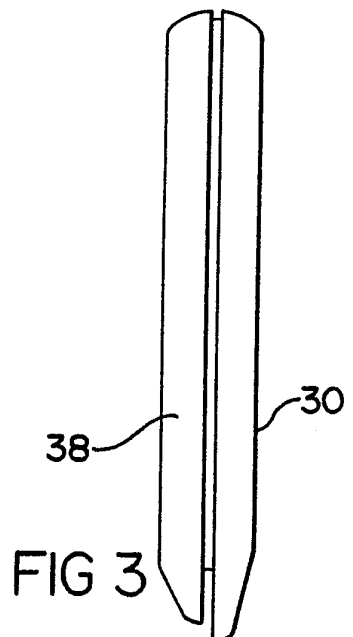
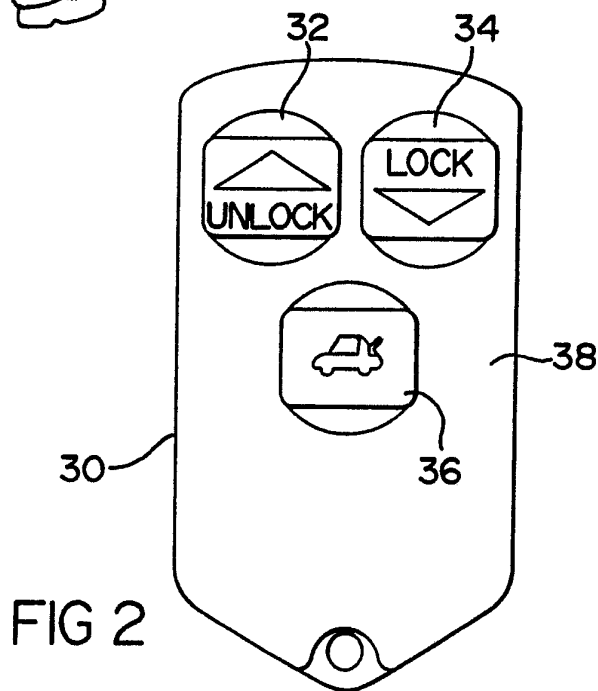
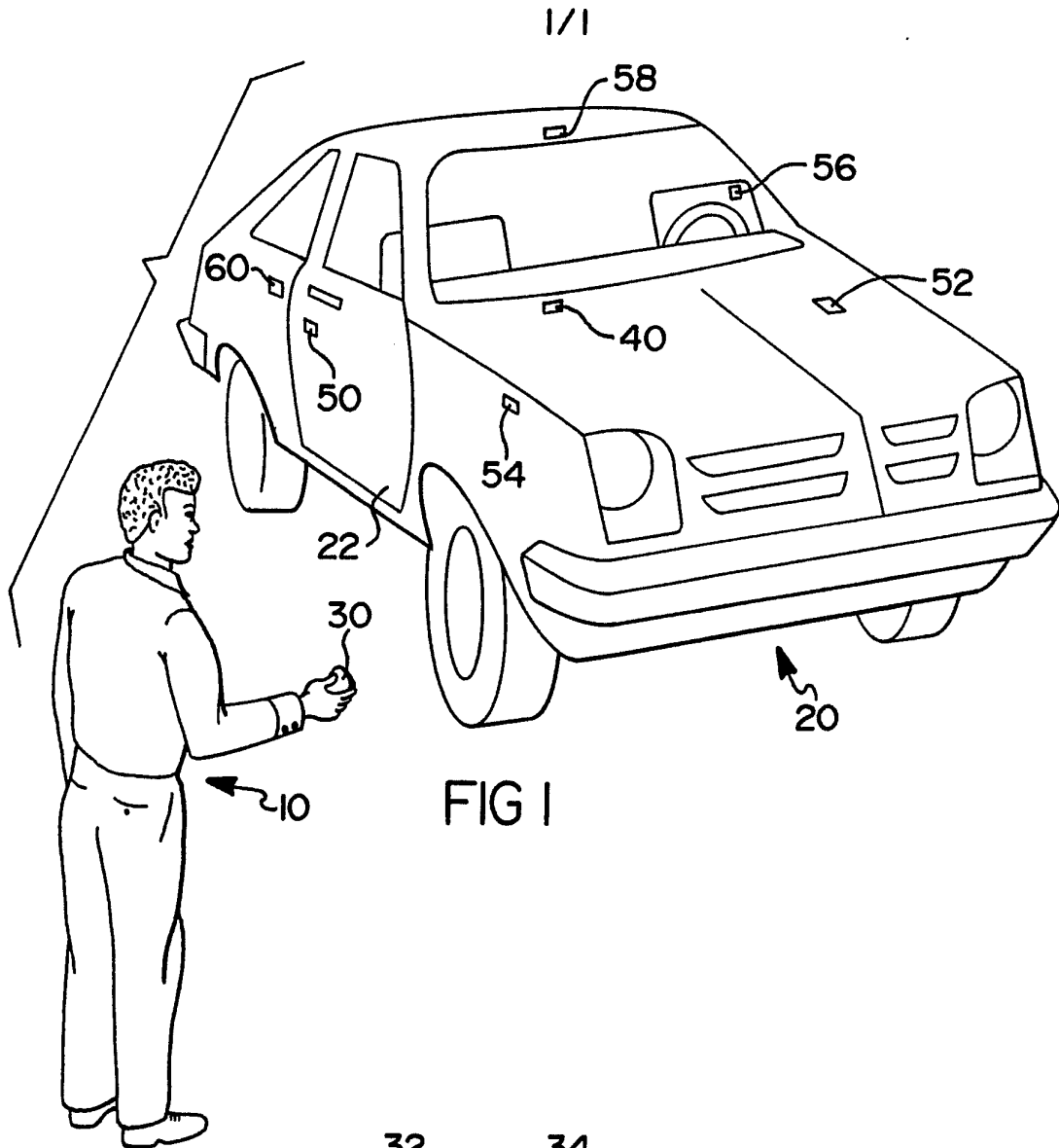


function, wherein the receiver includes a memory for storing security codes of binary bits, and a comparator for comparing the security code of a received signal with the security code stored in each register to generate a control signal for effecting a primary function upon detecting a security code match; field programming means on the receiver operable to initiate field programming time periods, means for replacing the security code stored in the receiver memory by the security code of a signal received from a first transmitter during any field programming period, and replacing the just-stored code in the second and any subsequent registers by the security code portion of a signal received from a different transmitter only during the same field programming period, the receiver being operable during the field programming period to generate a secondary control signal for affecting operation of a secondary function upon receipt a predetermined sequence of signals.

11. The remote control of claim 10, wherein the receiver memory includes a plurality of sequential registers, and the field programming means is capable of causing replacement of the security code in the sequentially next and in each sequentially subsequent register with the security code portion of a signal received from another different transmitter only during that same field programming period, so that each of the plurality of registers may contain a different unique security code.

12. The remote control of claim 11, wherein the receiver is operable during a field programming period to generate a plurality of secondary control signals for disabling operation of a plurality of secondary functions upon receipt a plurality of different predetermined sequences of signals, and for enabling

operation of all disabled secondary functions upon receipt of a signal during a subsequent field programming period.



INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 91/05612

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)<sup>6</sup>

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl. 5 E05B49/00

II. FIELDS SEARCHED

Minimum Documentation Searched<sup>7</sup>

Classification System	Classification Symbols
Int.Cl. 5	E05B

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched<sup>8</sup>

III. DOCUMENTS CONSIDERED TO BE RELEVANT<sup>9</sup>

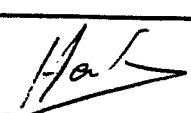
Category <sup>10</sup>	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
X	WO,A,9 008 242 (BMW) 26 July 1990 see page 8, line 3 - page 10, line 18; figures 1,2	1,2,4,8
A	--- EP,A,0 139 059 (CARTER,STRACCIA) 2 May 1985  see page 4, line 3 - page 13, line 21; figures 1-3	1,2,4, 6-8,10, 12
A	--- FR,A,2 494 534 (SWF-SPEZIALFABRIK FÜR AUTOZUBEHÖR GUSTAV RAU) 21 May 1982 see page 7, line 5 - page 9, line 23; figures 2,3	1,2,4, 6-8
	--- -/--	

<sup>10</sup> Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search <b>22 NOVEMBER 1991</b>	Date of Mailing of this International Search Report <b>23. 12. 91</b>
International Searching Authority <b>EUROPEAN PATENT OFFICE</b>	Signature of Authorized Officer <b>HERBELET J. C.</b> 

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category °	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
A	US,A,4 881 148 (LAMBROPOULOS) 14 November 1989 cited in the application see column 8, line 60 - column 12, line 6; figures 1,1A,2  ---	1,2,6,7, 11

**ANNEX TO THE INTERNATIONAL SEARCH REPORT  
ON INTERNATIONAL PATENT APPLICATION NO. US 9105612  
SA 51296**

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on  
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information. 22/11/91

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO-A-9008242	26-07-90	DE-A- 3900494	12-07-90
		EP-A- 0452346	23-10-91
-----			
EP-A-0139059	02-05-85	None	
-----			
FR-A-2494534	21-05-82	DE-A- 3043605	08-07-82
		JP-A- 57121796	29-07-82
-----			
US-A-4881148	14-11-89	EP-A- 0292217	23-11-88
		JP-A- 63308171	15-12-88
-----			