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(54) **KEY FOB WITH VALET AND CAR LOCATOR FEATURE**

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4,673,921 A	6/1987	Saito et al.	340/539
5,519,376 A *	5/1996	Iijima	340/426
5,819,568 A *	10/1998	Christie et al.	70/395
5,855,050 A *	1/1999	Christie et al.	29/33 R
5,959,540 A *	9/1999	Walter	340/825.31
6,016,676 A *	1/2000	McConnell	70/408
6,243,022 B1 *	6/2001	Furukawa	340/825.72
6,275,141 B1 *	8/2001	Walter	340/5.64

FOREIGN PATENT DOCUMENTS

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FR	2629934	4/1988
GB	2319803	6/1998

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* cited by examiner

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Related U.S. Application Data

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(51) **Int. Cl.⁷** **E05B 19/04**

(52) **U.S. Cl.** **70/408; 70/257; 70/278.2; 70/278.3**

(58) **Field of Search** **70/408, 257, 278.3, 70/278.2, 413, 252, 456 R; 340/539**

(56) **References Cited**

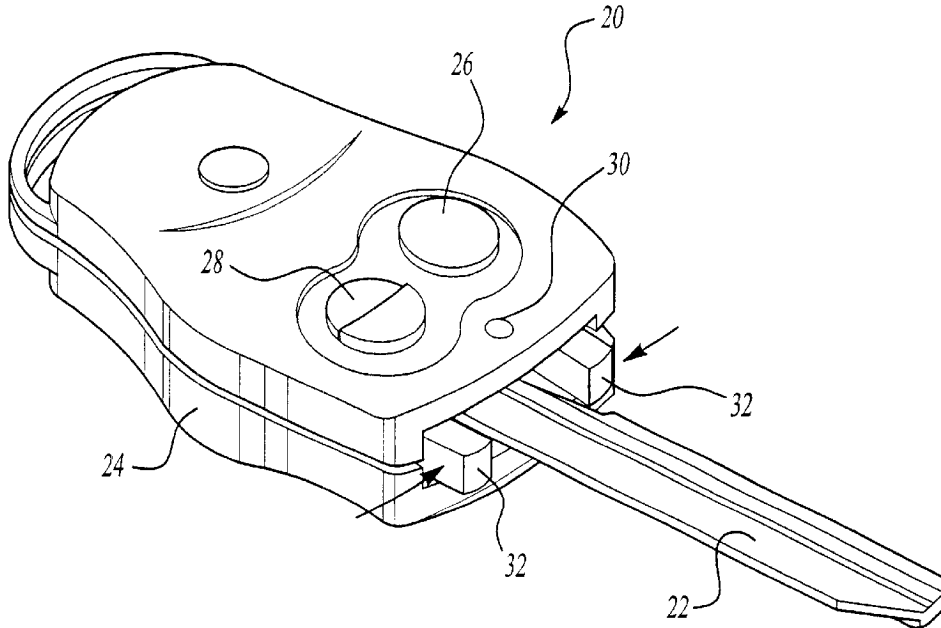
U.S. PATENT DOCUMENTS

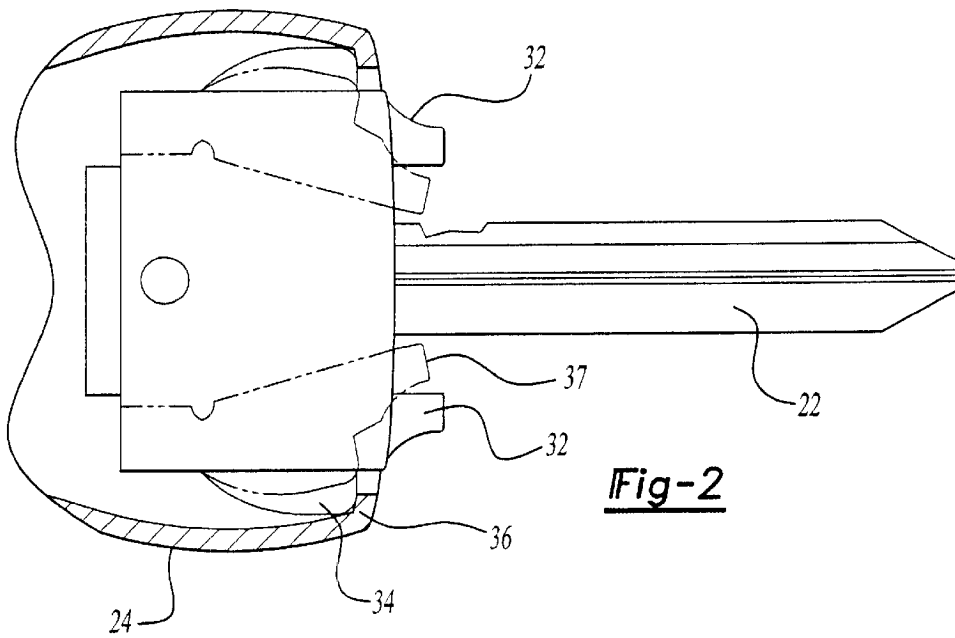
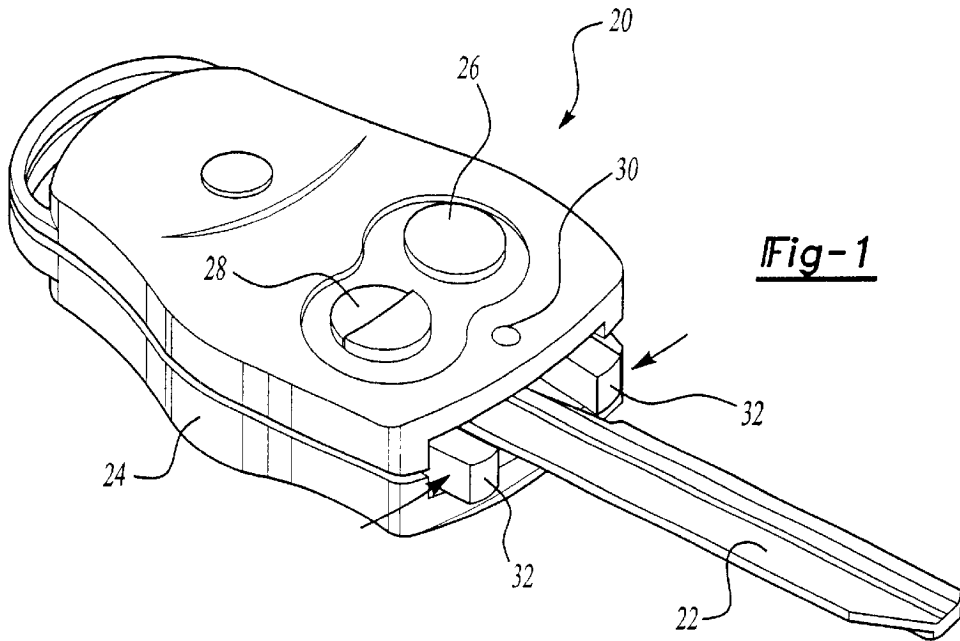
4,562,712 A	1/1986	Wolter	70/456 R
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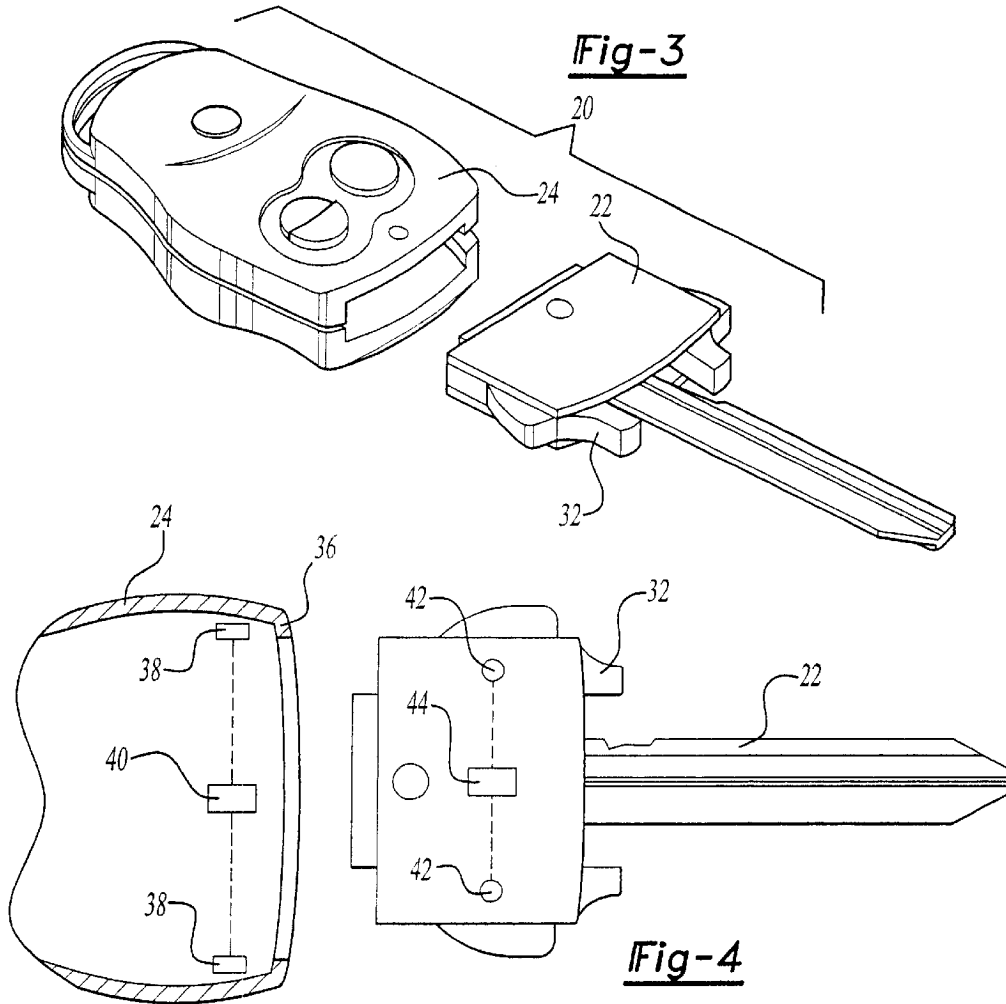
(57) **ABSTRACT**

An improved key fob and key combination allows the mechanical key to be removed from the key fob and given to a valet attendant. The key is provided with a mechanical latch which may be easily removed from the key fob. When the key is removed, secured areas on the vehicle are locked. Moreover, the vehicle has limited operation when the mechanical key is not received with the key fob. In a second feature of this invention, a locator function on the key fob provides an indication of an approximate direction to a vehicle in a parking area. The key fob relies upon RF transmissions from the vehicle to determine an approximate direction to the vehicle.

9 Claims, 3 Drawing Sheets







	FOB + KEY	KEY ONLY	FOB ONLY
DOOR	L/UN	L/UN	L/UN
TRUNK	L/UN	N/A	UNLOCK
GLOVE COMP.	N/A	N/A	LOCK
ENGINE	N/A	LIMIT RPM	N/A
IGNITION	ON/OFF	ON/OFF	N/A

Fig-5

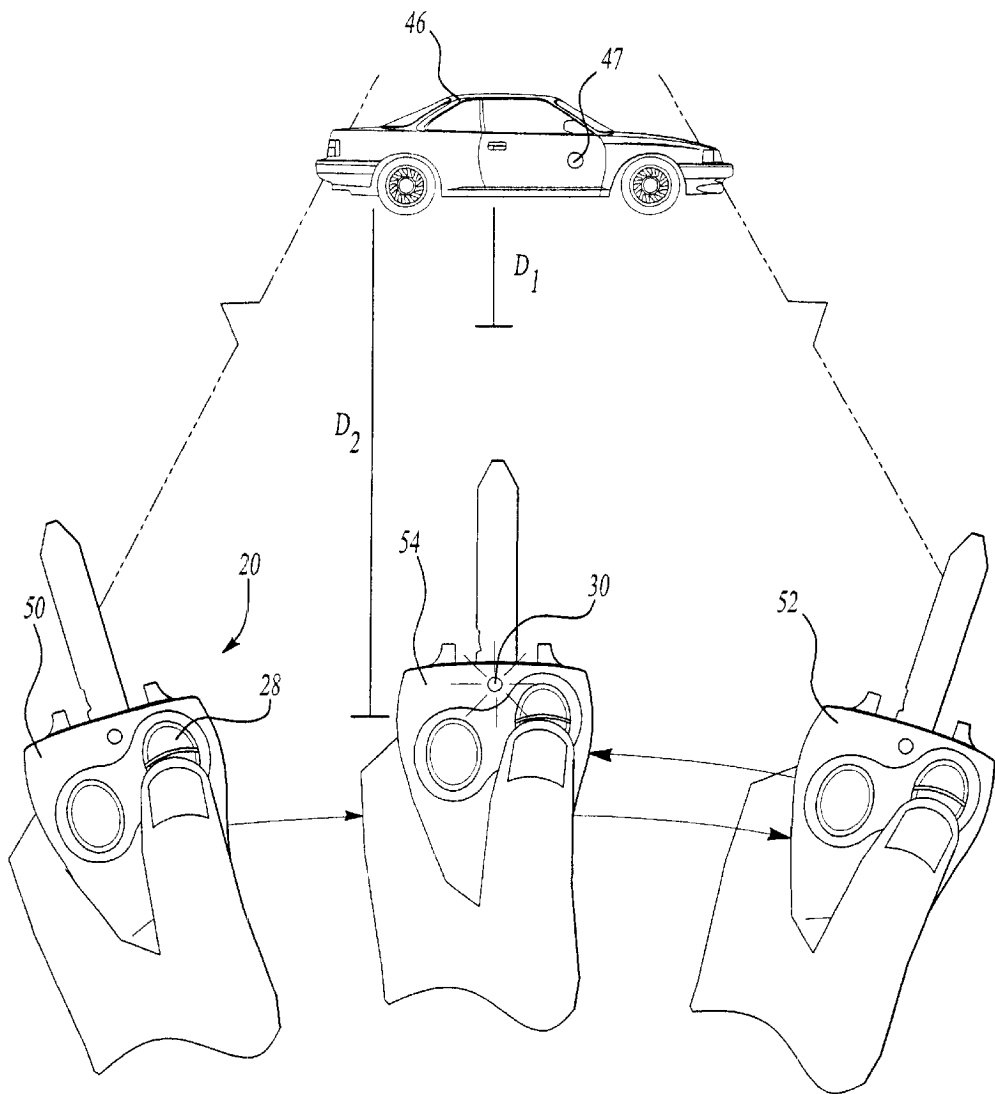


Fig-6

KEY FOB WITH VALET AND CAR LOCATOR FEATURE

This application claims benefit of Provisional Application No.60/139,237 filed Jun. 14, 1999.

BACKGROUND OF THE INVENTION

This application relates to a vehicle key fob having a detachable key for use by a valet parking attendant. Further, this invention relates to a key fob which assists an operator in locating a vehicle when parked.

Modern vehicles are typically provided with a key fob providing a number of electronic control functions. Typical key fob functions include door lock/unlock, trunk lock/unlock, and various other security controls. As more and more controls are incorporated into a vehicle key fob, certain common uses of a vehicle key become problematic. As one example, when parking at a restaurant, etc., an operator often chooses to allow a parking valet to utilize the key to park the vehicle. If the valet is allowed to have complete use of all of the key fob functions, then security of the vehicle might be compromised.

Various attempts have been made to limit the number of controls available to a valet. However, each of these attempts have been unduly complex. It would be desirable to provide a simple key and key fob combination wherein the valet is allowed use of the key for driving and parking a vehicle, but not allowed access to all of the security functions on the key fob.

One other problem with modern vehicles is locating the vehicle in large parking areas. Often, an operator will spend a good deal of time attempting to locate a vehicle in a large parking lot. One known way of locating a vehicle uses a key fob. The user presses the lock button on the key fob. The lock button actuates a sound, provided the key fob is within a predetermined distance of the vehicle. When the sound is made, the operator can look in the direction of the sound and hopefully find the vehicle. However, this method does require the operator to be within a short distance of the vehicle and thus does not address the problem of finding a vehicle in a very large parking area.

SUMMARY OF THE INVENTION

In one feature of this invention, a key is held in its key fob by a retention feature, and specifically latches. The key easily and quickly snaps into the key fob, and is easily removed by actuation of the latches. Thus, the operator can remove the key from the key fob, and can provide the key to the valet parking attendant.

Moreover, the key by itself preferably has fewer controls for security applications than does the key fob. As an example, while the key fob may have door unlock/lock functions and trunk lock/unlock functions, the key may be solely a mechanical key which can be utilized for mechanically opening a door and then starting the vehicle, but which has no control function. Alternatively, the key may have a single button for locking/unlocking the doors, but does not provide access to the trunk.

In a preferred feature of this invention, the key fob is provided with a sensor which senses when the key has been removed. When the key is removed, the sensor sends a signal to a control, and the control preferably moves the vehicle into a "valet" mode. In the valet mode, the trunk is preferably locked, and preferably not allowed to open from the mechanical key. Similarly, the glove compartment is

locked and not allowed to open by the mechanical key. Thus, the valet is not allowed access to secured areas in the vehicle. Further, other controls such as limiting the RPMs on the engine may also be actuated by the key fob when the key has been removed.

In a further separate feature of this invention, the combined key and key fob have a vehicle locator function. The key fob is provided with both a transmitter and receiver, as is commonly known. The transmitter transmits a signal to the vehicle, and a vehicle will send back an answering signal for identification purposes. The vehicle based receivers can make an estimate of distance based upon the strength of the signal received from the key fob.

In a disclosed embodiment of this invention, a receiver on a vehicle receives a signal from a key fob, and makes a determination of whether the particular key is inside or outside of a predetermined distance. If the particular key is close to the vehicle and inside the predetermined distance then the receiver on the vehicle interprets the signal to be a control signal from the key. As an example, the key fob may have its door unlock key actuated, and if it is within a predetermined distance, then the control will unlock the vehicle doors. However, if the signal is outside of the distance, then the vehicle receiver will interpret the signal as being a car locator request. In car locator mode, the vehicle sends a signal back to the key fob which will provide the key fob with an indication of the approximate direction to the vehicle. In one preferred method, the key fob is swept through an angular range while holding a button, such as the door unlock button actuated. The signal from the key fob is received by the vehicle for which the operator is searching. The vehicle receiver determines that the signal is from a key fob outside the predetermined distance, and thus determines that the key fob is in a "locator" mode. A signal is sent back to the key fob. As the key fob is swept through the angular range, a receiver on the key fob receives the signal from the vehicle. The signal received at the fob will be of varying strength as the key fob receiver is pointed away from and directly toward the vehicle. After a first sweep through the range is complete, the key is returned through the same range. The control has previously stored the approximate peak signal value from the vehicle received by the key fob. On the second sweep back, when this same peak signal is approached, a signal on the key fob is actuated to allow the operator to identify the approximate direction of the vehicle. Alternatively, once the key fob and vehicle are in the locator mode, the vehicle can sense the strength of the signal as the key fob moves through the sweep. The vehicle can then identify a peak, and when that peak is again sensed, send a directional signal to the key fob. When the key fob receives the signal, it can then actuate the locator device. The signal can be light, sound, vibration, etc.

These and other features of the present invention can be best understood from the following specification and drawings, the following of which is a brief description.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a view of a key fob combination according to the present invention.

FIG. 2 is a cross-sectional view.

FIG. 3 shows the separate key fob and key.

FIG. 4 shows a key fob and removed key.

FIG. 5 is a table showing the function of the components of the present invention.

FIG. 6 shows the key fob in a locator mode.

DETAILED DESCRIPTION OF A PREFERRED
EMBODIMENT

A key fob and key combination **20** is illustrated in FIG. 1 having a mechanical key portion **22** in a fob portion **24**. As known, fob portion **24** incorporates buttons **26** and **28** which perform functions such as door lock/unlock and trunk lock/unlock. Further, a light **30** is incorporated into the key fob **24** to provide a locator function which will be described below. Alternatively, the signal can be vibration, sound, etc. The mechanical key **22** is provided with a pair of spring biased latches **32** which hold the mechanical key portion **22** within the fob **24**.

As shown in FIG. 2, a portion **34** of the latches **32** is received within a ledge **36** of the fob **24**. Portions **34** thus locks the mechanical key **22** within the fob **24**. Latches can be flexed to a position **37** where they allow removal of the key. Although a particular mechanical latch arrangement is illustrated, it should be understood that other simply removable mechanical locks can be utilized to hold the mechanical key within the key fob portion.

As shown in FIG. 3, when the operator is delivering his vehicle to a valet, then the latches **32** are simply moved to remove the mechanical key portion **22** from the fob **24**. As is clear, key **22** can be given to the valet with the operator retaining fob **24**.

As shown schematically in FIG. 4, sensors **38** are associated with the areas of the ledges **36** in the fob **24**, and can sense when the mechanical key **22** has been removed. Sensors **38** communicate with a control **40** to provide an indication that the mechanical key **22** has been removed, and that the key fob **20** is in valet mode.

Similar sensors **42** are shown associated with the latches **32** and communicate with a switch **44**. It should be understood that while this invention does disclose a switch **44** on the mechanical key **22**, the invention can also be utilized with pure mechanical key **22** that will only provide mechanical functions to the valet.

When the sensors **38** indicate to the control **40** that the mechanical key **22** has been removed, then the key fob **24** is actuated to provide additional security at the vehicle, and to limit access to certain areas in the vehicle for the valet. As an example, the trunk and glove compartment may be automatically locked. The locks are preferably made such that they cannot be overridden by the mechanical key **22**. Moreover, other controls such as an engine limit on RPM may be actuated by the control **40**. The controls necessary to achieve the above are within the skill of a worker in this art. It is the application of such controls to this system which is inventive here.

The switch **44** may be utilized to lock and unlock the doors of the vehicle. Further, it may be that the sensors **42** will communicate with the control **44** and the switch, such that when the mechanical key **22** is used by the valet to start the vehicle, the above limit on RPM will be set by the key. Further, other types of controls such as a limited number of starts without the key **22** being reinserted into the fob **24** may also be incorporated into the key only function. Various of these features are illustrated in the FIG. 5 table.

Thus, the removable key serves to provide additional security to a vehicle when the vehicle has been delivered to a valet parking attendant.

FIG. 6 shows a further feature of this invention, wherein the fob and key **20** is providing a locator function. As shown, the fob and key combination **20** is outside of the distance **D1** from a vehicle **46**. The vehicle **46** is provided with a

transmitter/receiver **47** for transmitting and receiving RF signals. As shown, the fob **20** is a distance **D2** from the receiver **47**. As known, the fob is typically provided with a transmitter/receiver to send and receive RF signals to and from the transmitter/receiver **47** on the vehicle **46**. In the locator mode, one of the switches (here **28**) on the fob **24** is actuated. In one embodiment, the door open button **28** is actuated. The fob **22** is moved through an angular range, between points **50** and **52**. Through this angular range, at some point, the key fob is pointing directly at the receiver **47**.

Receiver **47** receives the RF signal from the fob **24**. As is known, the signal sent by the fob is coded in some way and is recognized by the receiver **47** as being associated with the particular vehicle **46**. If receiver **47** and associated controls on the vehicle determine that the RF signal is from outside the predetermined distance **D1**, then the transmitter/receiver **47** moves into the locator mode. In the locator mode, the transmitter **47** sends an RF signal outwardly for a predetermined period of time. During this predetermined period of time, the key fob **20** is moved through the angular movement between points **50** and **52**. During this movement the control **40** will be receiving the RF signal from the receiver **47**, and looking for a peak on that signal. Once the particular angular movement has been completed, the operator may reverse the direction and move the key fob back through the same angular direction. The control **40** again reads the signal from the transmitter **47**. When the same peak is read, the light **30** is actuated such as shown at point **54**. Alternatively, sound or vibration actuation may be utilized. However, when the operator sees the signal **30**, the operator knows that the key is pointing in the direction of the vehicle. Thus, the operator can begin heading in the proper direction for finding the vehicle.

As an alternative, once the vehicle **46** recognizes that it is in locator mode, it can sense the strength of the signal during a sweep through the angular movement between points **50** and **52**. When it next sees the peak, it can assume the fob is then pointed in the direction of the vehicle. A signal can then be sent to the fob indicating to the fob that the vehicle is in that direction.

While the locator function is shown being incorporated into a key fob, it should be understood that other hand held devices could be utilized to perform this method. Thus, hand held telephones, or even stand alone locators could be developed utilizing the above discussed techniques.

Although a preferred embodiment of this invention has been disclosed, a worker in this art would recognize that certain modifications would come within the scope of this invention. For that reason, the following claims should be studied to determine the true scope and content of this invention.

What is claimed is:

1. A combined key and key fob comprising:

a mechanical key;

a key fob body including electronic switches for sending RF signals to a vehicle to actuate components on the vehicle; and

a mechanical attachment feature on said mechanical key for allowing said mechanical key to be removed from said key fob body, said attachment feature including at least one latch on one of said mechanical key, said latch being biased into an opening on one of said mechanical key and said key fob, said latch being biased to a relaxed position at which it will be received within an opening on the other of said mechanical and said key

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fob, and said latch being movable away from said bias position in said opening by manually moving said latch to a release position such that said mechanical key can be removed from said key fob body.

2. A combination as set forth in claim 1, wherein said latch is on said mechanical key which is biased into an opening on said key fob body and said latch being biased back outwardly of said opening when said mechanical key is to be removed from said key fob body.

3. A combination as recited in claim 2, wherein said key fob body has a sensor to sense when said mechanical key has been removed from said key fob body, and said sensor communicating with a control on said key fob body to send a signal to a vehicle associated with said key fob body that said mechanical key has been removed.

4. A combination as recited in claim 3, wherein said signal actuates security systems on the vehicle.

5. A combination as recited in claim 4, wherein said signal locks secured areas on the vehicle.

6. A combination as recited in claim 5, wherein said secured areas include the trunk and the glove compartment.

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7. A combination as recited in claim 1, wherein a control associated with one of said key fob body and said mechanical key limits the operation of an engine associated with the vehicle when the mechanical key is removed from the key fob body.

8. A combination as recited in claim 1, wherein there are a pair of opposed latch members on two lateral sides of said mechanical key, said two lateral latch members being biased laterally outwardly to said locking position, and being manually movable laterally inwardly to said the least position.

9. A combination as recited in claim 8, wherein said latches are inserted along with a portion of said key into a central opening in said key fob body, said central opening having a laterally inwardly extending ledge spaced to define said opening and catch said latch members when said latch members are in said locked position.

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