



FIG. I

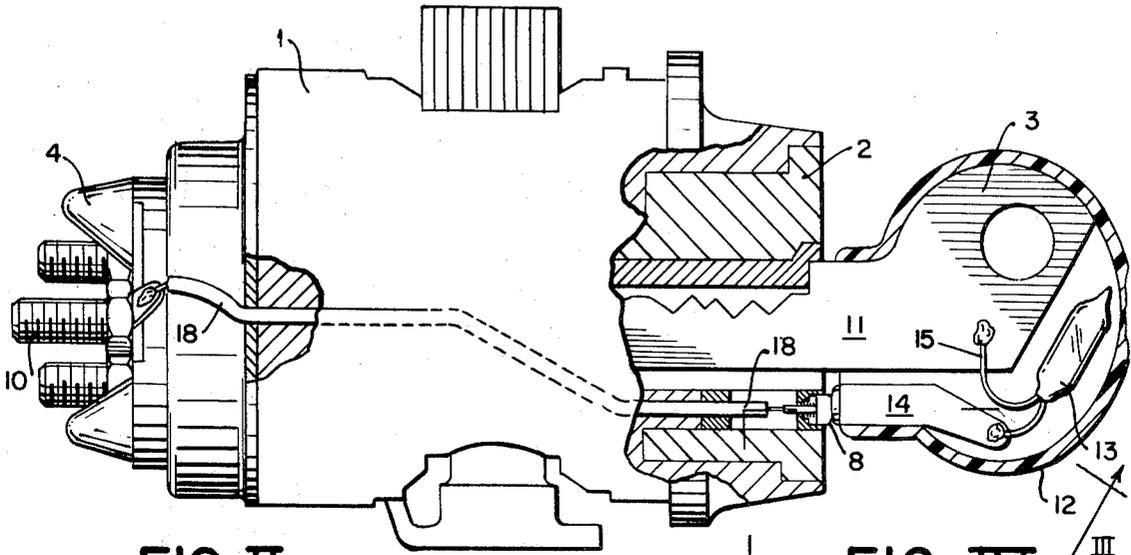


FIG. II

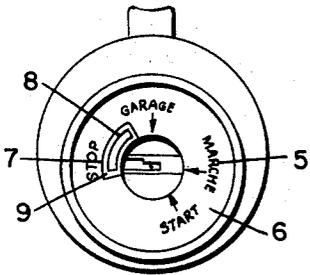


FIG. V

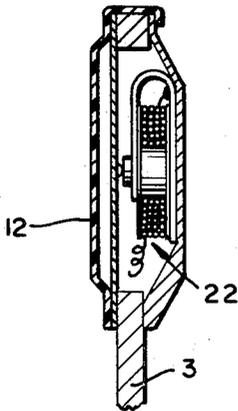


FIG. III

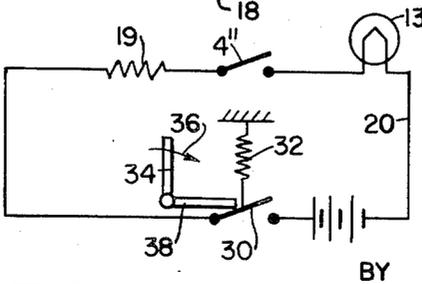
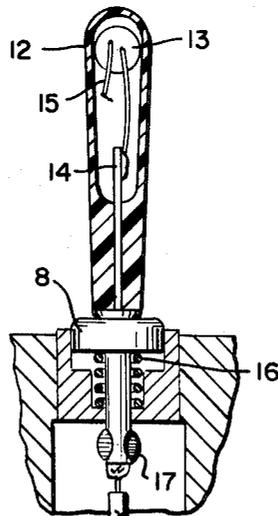


FIG. VII

FIG. IV

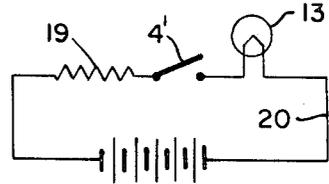
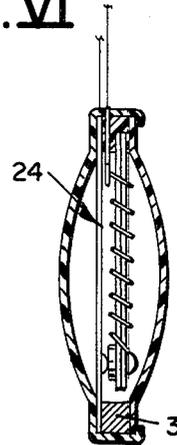


FIG. VI



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# SIGNALLING DEVICE TO PREVENT LEAVING A KEY IN A LOCK

## BACKGROUND OF THE INVENTION

The present invention relates to signalling devices.

In particular, the present invention relates to devices of this type used in connection with locks so as to prevent an operator from leaving a key in the lock.

It is well established that the best of locks, ignition switches, switch-keys, and the like, will be of no avail if the user forgets to remove the key from the lock. As a result, it is highly desirable to be able to direct the attention of the operator to the fact that he has not yet carried out all of the manipulations necessary to protect his property, as when the operator forgets to remove a key from a lock.

## SUMMARY OF THE INVENTION

It is accordingly a primary object of the present invention to provide a device which will reliably signal to the operator the fact that a key has not been removed from a lock.

In particular, it is an object of the invention to provide a signal of this type which can be visible, audible, or vibratory so as to be felt by the operator.

In particular, it is an object of the present invention to provide a structure which will produce such a signal when the key has in the lock a position corresponding to that where the key should be removed from the lock. Thus, in the case of a vehicle ignition switch, the signal should be provided when the contact is open or in any position of the switch selected by the operator when the engine of the vehicle is stopped, as when the vehicle is in a parking or garaged position.

It is thus one of the more particular objects of the invention to provide a construction of this type which is particularly suited for use in connection with vehicles.

In accordance with the invention, the signalling device includes a key and a lock which can be moved to a number of different positions by the key. In at least one of these positions an electromechanical means which coacts with the key and locks provides a signal indicating that the key has not been removed from the lock. This signal may be either a visible signal, an audible signal, or a vibratory signal which can be felt by the fingers of the operator when the operator engages the key.

## BRIEF DESCRIPTION OF DRAWINGS

The invention is illustrated by way of example in the accompanying drawings which form part of this application and in which:

FIG. I is a partly sectional, partly schematic side elevation of an ignition switch of a vehicle shown with a key therein and having the signalling device of the invention;

FIG. II is an end view of the structure of FIG. I without the key illustrating the indicia which is located at the outer end face of the lock;

FIG. III is a sectional, fragmentary view of the outer end of the lock, key, and signalling structure with part of the electrical structure which coacts therewith this view being taken generally along the lines III-III in FIG. I;

FIG. IV is a wiring diagram;

FIG. V is a fragmentary transverse section similar to FIG. III but showing a different embodiment;

FIG. VI is a transverse fragmentary section illustration similar to FIG. III but showing still another embodiment; and  
FIG. VII is a schematic illustration of a further embodiment.

## DESCRIPTION OF PREFERRED EMBODIMENTS

Referring now to the drawings, FIG. I shows a vehicle ignition switch 1. This ignition switch has a lock 2 capable of being displaced between its several positions by a key 3. The lock operates a switch 4 which provides for distribution of the current according to a predetermined program as is generally known in the art of ignition systems; the well-known circuits

providing for such a program are not illustrated herein but will readily be remembered upon inspection of FIG. II. In the particular case illustrated rotary movement of the key will successively establish closing of the ignition circuit, closing of the circuit for starting the engine, or opening of the latter circuits.

Accordingly and as may be seen from FIG. II, the lock has, among its different positions, the position 5 for ignition, the position 6 for starting, and the position 7 for stopping or opening the circuits. In addition, as generally shown at 4' in FIG. IV, the lock also has (FIGS. I and III) an electrical-switching or -contacting system for giving indication with regard to presence or absence of the key in the lock. In this system, an electrically conductive spring-pressed pin 8, shiftable within an insulated guide 9, is electrically connected with a positive terminal 10 shown in FIG. I. The shank 11 of the key 3 is grounded.

The outer end of the key which extends beyond the lock, is situated within an elastic enclosure made partially or entirely of a transparent plastic 12 and forming in its interior a chamber for accommodating a lamp 13. Thus, as may be seen from FIG. 1, the outer portion of the key forms part of the circle which is enclosed within the entire circular space defined by the enclosure 12 so that the part of this latter space which is not occupied by the outer end of the key forms a free space defining the chamber in which the lamp 13 is accommodated. Since this enclosure 12 is partly or entirely transparent the light of the lamp 13 will be visible through the wall of the enclosure 12.

An elongated electrically conductive member 14 is situated within the enclosure 12 and has an outer exposed free end directed toward the lock for directly engaging the spring-pressed contact or pin 8. One of the terminals of the filament of the lamp 13 is electrically connected with the member 14 so that through the latter the lamp 13 is connected to the contact 8. The other terminal of the lamp is connected by a conductor 15 directly with the key 3 which has its shank 11 grounded, as pointed out above, when the key is inserted into the lock 1, so that in this way this other terminal of the lamp 13 is grounded. As may be seen from FIG. III a spring 16 urges the contact 8 outwardly, and this outward movement is limited by a stop 17 which engages a suitable shoulder of the fitting which guides the contact 8 and which carries the spring 16. The conductor 18 which is connected to the contact 8 at one end has its opposite end connected to the positive terminal 10 of the ignition switch 4.

FIG. IV schematically illustrates how the lamp 13 is located in the electrical circuit 20 which includes the switch 4 to open and close the circuit of the lamp 13 and which may, if desired, include a resistor 19 which in certain installations may be required.

FIG. V 28 shows, according to a variation of the invention, in a transverse section through the outer end of the key similar to that of FIG. III, an arrangement where instead of a lamp which provides a visual signal there is a sound-producing device 22 of miniaturized construction located in the interior of the enclosure 12 for providing an audible signal when the circuit is closed.

According to another embodiment of the invention illustrated schematically in FIG. VI there is an electrically operable device 24 which provides a small vibration, this device being in the form of a small vibrator which will transmit its vibrations to the fingers of the operator making it necessary for the operator to remove the key in order to eliminate the disagreeable sensation resulting from the vibrations.

When using the structure of the invention the key will initially be introduced into the lock. When, as a result, switch 4' is closed and the lamp 13 is illuminated, or when the signalling devices of FIGS. 5 and 6 operate, an indication is given in this way to the operator that the key has been introduced into the lock through a distance sufficient to permit the key now to be rotated so as to operate the lock. When the key moves beyond the spring-pressed contact 8, the lamp, the audible signal, or the vibrations will terminate. The rotary movement of the key

can be continued in a normal manner. Upon return of the key to its initial position the signal is again produced by the electromechanical means of the invention at the position of the key which corresponds to the opening of the ignition circuit. Now the key is in a position to be withdrawn.

It is also possible to connect the end of the conductor 18, not to the terminal 10, but instead to an independent additional terminal situated at the base of the switch. This latter additional terminal is itself connected, by any suitable conductor, to one of the contacts of a switch which is operated by a door of the vehicle, such as the door beside the driver, in such a way that this latter switch closes when the door opens. The other contact of the door control switch is connected to the battery.

Thus, referring to FIG. VII, it will be seen that the circuit shown in FIG. IV and described above has been amplified to include a switch 30 normally maintained in an open position by a spring 32. A schematically illustrated door 34 of the vehicle is swung in the direction of the arrow 36 when opened, this being the door which is situated beside the driver of the vehicle. The door 34 carries an extension 38 which acts on the switch 30 to close the latter when the door 34 is opened. Thus, if, with this construction, the door is opened while the key is still in the ignition switch, the signal 13 will be energized to warn the operator of this fact.

Therefore, with this construction a signal, such as a blinking or steady light or a buzzing sound or the like will be provided whenever two conditions are simultaneously fulfilled, namely, leaving of the key in the ignition switch after the ignition is turned off, and opening of the vehicle door. In this way also the operator will be warned to remove the key from the lock when he opens the door to leave the vehicle.

In any event, with all of the embodiments of the invention, the signal is terminated upon removal of the key.

I claim:

1. A signalling assembly, particularly for an ignition switch,

comprising: a lock having a plurality of positions; a key coacting with said lock to displace the latter between said positions; an enclosure carried by said key, in an outer portion thereof, situated outwardly beyond said lock; electrical-signalling means in said enclosure; and means in said lock for actuating said signalling means in at least one of the positions of the lock, for warning the operator that the key has not been removed from the lock.

2. The combination of claim 1 and wherein said electrical-signalling means is constructed and arranged to provide a vibratory sensation to the fingers of the operator during handling of the key.

3. The combination of claim 1 and wherein said electrical-signalling means is constructed and adapted to provide an audible signal.

4. The combination of claim 1 and wherein said enclosure is at least partially transparent and said electrical-signalling means is adapted to provide a visible signal.

5. The combination of claim 4 and wherein said electrical-signalling means includes a lamp and an electrical circuit for the lamp, also extending into the lock, and means for closing said circuit when the key places the lock in said one position.

6. The combination of claim 5 and wherein the electrical-signalling means includes a conductive member forming part of the circuit of said lamp, substantially located in the walls of said enclosure but having a free end directed toward said lock, said lock having a spring-pressed, insulated contact member, which is engaged by said conductive member at said end thereof when the lock coacts with the key and is in said one position.

7. The combination of claim 6 wherein the key has a metallic conductive component which is grounded through the lock when the key is in the lock.

8. The combination of claim 7 wherein said conductive component of the key extends into said enclosure.

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