A VEHICLE SAFETY APPARATUS

A vehicle safety apparatus (1, 2) comprises an electronic sign (11), a registration plate support (21) covering the sign (11), a controller (2), and a mechanism (30) to, in response to an event, move the registration plate support (21) in a direction away from the sign (11) and up or down to expose the sign (11) and leave a registration plate (P) on the registration plate support (21) visible. The mechanism (30) has a rotating link (17, 18) at each lateral end of the registration plate support (21). The sign (11) is adapted to display any of a number of options and the controller (2) provides a default option. An in-car controller (2) regularly polls the sign (11) and in absence of a response it generates a tampering output alarm.
A Vehicle Safety Apparatus

Introduction

The invention relates to vehicle and occupant safety.

It is known to provide an apparatus for displaying a message such as a distress message. Examples are described in US5031347 and US4091553, GB2271012, and GB2121225. In the latter two approaches a warning sign is revealed when a registration plate pivots down or slides down.

The invention is directed towards providing an improved safety apparatus for conveying information in emergency situations.

Summary of the Invention

According to the invention, there is provided a vehicle safety apparatus comprising:

a sign;

a registration plate support covering the sign;

a controller, and

a mechanism to, in response to an event, move the registration plate support in a direction away from the sign and up or down to expose the sign and leave a registration plate on the registration plate support visible.

In one embodiment, the mechanism has a rotating link at each lateral end of the registration plate support.

In one embodiment, the sign is an electronic sign having a control circuit and a power supply.

In one embodiment, the power supply is independent.

In one embodiment, the sign comprises LEDs.

In one embodiment, the sign is adapted to display any of a number of options.
In one embodiment, the controller chooses a display option in response to a user input.

In one embodiment, the controller provides a default option.

In one embodiment, the controller comprises a radiation receiver and is adapted to respond to a remotely-transmitted signal to activate the warning sign.

In one embodiment, the receiver operates according to a mobile network protocol such as GSM.

In one embodiment, the apparatus comprises means to detect tampering with the sign, and the controller is adapted to provide an alarm output.

In one embodiment, the alarm output includes sending a message via a mobile network to a designated mobile device.

In one embodiment, the controller is adapted to communicate wirelessly with the sign to detect tampering.

In one embodiment, the controller is adapted to poll the sign and to generate a tampering event if a response is not received to a pre-set number of polls.

In one embodiment, the controller comprises a positioning system and is adapted to transmit a mobile network signal if position of the vehicle deviates from a set route or region.

In one embodiment, the drive mechanism comprises an axle to which are connected a plurality of support arms for the registration plate support, rotation of the axle causing rotation of the support arms.

In one embodiment, the drive mechanism comprises a twisted axle, a carriage running on the axle, and a drive to cause sliding movement of the carriage which translates into rotation of the bar.

In one embodiment, the carriage is driven by a motor driving a spindle on which the carriage is driven.
In one embodiment, the sign and the registration plate support comprise snap-fitting features for retaining the support in a default position enclosing the sign.

Detailed Description of the Invention

The invention will be more clearly understood from the following description of some embodiments thereof, given by way of example only with reference to the accompanying drawings in which:

Fig. 1 is a general view of context of the invention, showing a safety apparatus installed in a car;

Fig. 2 is a perspective view of a sign unit of the apparatus, and Fig. 3 is a side view showing it in the process of opening;

Figs. 4 and 5 are perspective views showing a drive mechanism for the sign unit; and

Fig. 6 is a block diagram of the apparatus.

Referring to Fig. 1 a vehicle safety apparatus comprises a sign unit 1 mounted at the location of a registration plate on a car, and a controller 2 located internally. The controller 2 communicates via a mobile network 3 with mobile devices 4.

Referring to Figs. 2 to 4 the sign unit 1 comprises an electronic display 10 having an LED display element array 11 of LEDs 26 driven by a drive circuit 25 within a housing 12. The housing 12 includes two lateral spring-loaded plungers 13.

A front part 20 of the sign unit 1 comprises a housing 21 with side walls 22 including apertures 23. The housing 21 is configured to neatly enclose the electronic display 10 when the housing 21 is retracted. In the event of an emergency, the controller 2 causes arms 17 and 18 to rotate to push the housing 21 off the warning sign 10, with disengagement of the snap-fitted plungers 13 from the apertures 23.

Hence, the conventional registration plate P is movable to a lower position to reveal the electronic display 11. At this position, the conventional registration plate P is at a position which
is lower than the display 11 and also forward of it. Hence, the conventional registration plate P is in a position beyond a car bumper for example or other moulding or other protruding bodywork. The opening mechanism thus ensures effective visibility of the electronic display 11 even if the location of the registration plate P is immediately above or below a bumper or in a recessed part of the bodywork.

The housings 12 and 21 comprise an all-weather two part enclosure; consisting of a fixed back plate and movable front cover 21, the design of which facilitates the covert nature. The housing 12 contains the display drive circuit 25 and a drive mechanism 30 and assists the mounting of the apparatus to a vehicle in a similar manner as a conventional number plate. The front cover 21 is appropriate for the mounting of the vehicle's license number plate and is inconspicuous. The sign unit 1 is powered by the vehicle's batteries, or it may include its own independent power source.

The sign unit 1 is activated upon:

- the driver pressing an emergency button, and/or
- a sensor detecting a condition or event, and/or
- the driver remotely activating it by for example SMS.

Referring to Figs. 4 and 5, the drive mechanism 30 includes a twisted bar lead screw 31 at each end of which there is an arm 17 extending at right angles. There is a carriage 32 on the twisted lead screw 31. A motor 33 is connected to the carriage 32 by a threaded spindle 34. Rotation of the motor output spindle 34 causes the carriage 32 to slide, thus causing the bar 31 to rotate because it is skewed. This diagram does not include the arms 18, which merely perform a stabilising function, providing additional robustness and reliability.

Instead of the twisted bar arrangement the drive may comprise a motor driving a gear which in turn rotates an axle supporting the arms 17. Alternatively, a motor may directly rotate the axle. In all of these embodiments there is robustness and consistency in operation because a single axle causes both arms to rotate. This avoids a situation where one arm rotates but the other doesn't sue to a fault, something which might cause additional damage.

Referring to Fig. 6 at a block diagram level the apparatus comprises the sign unit 1, the controller 2, a keyfob 40, and the controller 2 links with the mobile network 3 and secure radio links with the keyfob 40 and the sign unit 1.
The in-car controller 2 has a microcontroller with a GSM and GPS interlace and a secure radio link to the display unit 1 and the keyfob 40. It communicates with the display unit 1 on a frequent basis and hence recognises if the display unit 1 is missing (communication breakdown), in the latter case a text message is sent immediately. The keyfob 40, the in-car controller 2 and the display unit 1 are coded, so that the display unit 1 is worthless to a thief without having the matching keyfob. The display unit 1 is powered from the car battery, as is the in-car controller 2. Additionally, the in-car controller 2 has a small internal battery that will power it for a certain amount of time in case the car battery is disconnected. Also, in this case a text message is sent immediately.

The sign unit 1 circuit 25 communicates with the in-car controller 2 using an RF protocol which is a proprietary encrypted rolling code protocol. According to this protocol no code is sent twice during the useful lifetime of the unit. It may be modified to a challenge-response authentication system. A missing response from the display unit 1 signals tampering.

The controller 2 is linked with an immobiliser unit by a normally closed relay contact that can be wired into the car's engine electrical circuit.

The mechanism 30 may be activated either by the remote fob 40 or in response to a mobile SMS message. Once activated, the motor 33 rotates the spindle 34 to cause the carriage 32 to slide and hence rotate the 5mm twisted bar lead screw 31 that runs to the ends of the unit 1 where they are connected to the guiding arms 17. This moves the registration surround 21 as shown in Figs. 2 and 3 with the plate P in an outward and downward direction as shown by the arrow A in Fig. 3. This action avoids contact with any obstruction that may be in place, such as a bumper or boot lid.

In other embodiments, the drive mechanism moves the plate outward and upward instead of outward and downward as illustrated.

The controller 2 is fitted inside the vehicle at any position the owner desires. By not fitting in one standard position it will take time for a perpetrator to find the unit and will most likely deter them from attempting to take the vehicle.

Once the vehicle is started the global positioning system within the controller 2 starts to track vehicle movement. Should the vehicle lose a tracking signal it will automatically send an SMS to
the designated recipient alerting them that the position has been iosi. the owner know
that the vehicle has been taken and also its last known position at the time the signal was lost.
The owner can then send an SMS to the controller 2 which will do two things - firstly it will
activate the sign unit 1 to display a message in LED lights stating the vehicle is stolen and
tracked; and secondly the controller 2 will immobilise the vehicle once it becomes stationary for
sixty seconds. Once this has happened, it will then send an SMS telling the owner that it is
immobilised and also the location of the vehicle. The owner can then inform the authorities and
have the vehicle recovered.

If a person tries to remove the sign unit 1 from the vehicle the unit 1 will not respond to any of
the polling pulses that the controller 2 sends. The controller 2 will then send a message to the
vehicle's immobiliser which will in turn immobilise the vehicle. Thus, even if the perpetrator has
the key for the vehicle, it will not start, it will simultaneously send an SMS to a pre-
programmed recipient to inform them of attempted tampering. The owner can only restart the
vehicle by sending an SMS to the controller 2 to deactivate the vehicle's immobilised state.

In any embodiment, the apparatus may have an independent power supply, which may be solar-
powered. Its control circuit may be linked only with a driver control device in the vehicle, and it
may have an RF interface for remote activation. The content of the message may be one of a
number of available messages, and the user may select one at activation. There may for example
be a distress message, or an emergency services message such as doctor or unmarked police car
signage. Where there are multiple potential messages there may be a default one.

It will be appreciated that the invention provides a covert warning device hidden within the
backing support of a vehicle license number plate, and when activated remotely reveals an
illuminated information display. Its purpose is to inform, summon attention, seek assistance or
command other road users through the use of illuminated alpha-numeric text, symbols, visual
and audible alerts by the manual activation of an electro-mechanical system to flip down the
vehicle's number plate to reveal a pre-configured text alert message while keeping the number
plate visible at all times.

hi use, the electronic display 11 would remain hidden behind a vehicle's number plate. When
activated by the vehicle's occupant or remotely utilizing a wireless device, the device's front
cover will fall down to reveal an illuminated text message which is readable at up to 10 meters
both night and day, while the vehicle's number plate remains visible at all times. The trigger
device may be a wireless key fob type device, a hidden panic switch, or a manual pull. The message will be one of a selection of pre-programmed messages chosen by the user.

Possible uses include:

5  - Incapacitated or disabled driver seeking assistance;
7   - Solitary drivers awaiting breakdown assistance;
9   - Police, customs, or security vehicles commanding a road user to take a specific action;
11  - High situations with reduced vehicle mobility, or reduced speed due to a fault, heavy or awkward load, or being towed;
13  - Farm animal or machinery management on public roads;
15  - Road event safety management, informing road users of hazards ahead;
17  - Driver training and testing;
19  - Stolen vehicle or driver under attack.

In one embodiment the cover is moved by an electric motor through a hinge or pivot at the lower outer corner of the cover. The cover may also be rotated by means of an electrical solenoid or a pneumatic actuator. It should be noted that this embodiment is best suited to a situation where minimum horizontal displacement of the cover is required.

In one embodiment, the cover 21 is moved by an electric motor through a rack and pinion or other geared mechanism and is guided in its trajectory by a profiled groove (linear cam). The cover may also be moved by means of an electric solenoid or pneumatic actuator.

There may be a spring to assist the closing action of the cover 21 and to help achieve a secure default state of the device.

There may be a sprung locking device to secure the cover in the closed position. This lock is released by electric solenoid or other means immediately prior to uncovering the display.

There may be an electric solenoid, which secures the cover in the closed position. This lock is released immediately prior to uncovering the display.

The invention is not limited to the embodiments described but may be varied in construction and detail.
Claims

1. A vehicle safety apparatus (1, 2) comprising:
   a sign (11);
   a registration plate support (21) covering the sign (11);
   a controller (2), and
   a mechanism (30) to, in response to an event, move the registration plate support (21) in a direction away from the sign (11) and up or down to expose the sign (11) and leave a registration plate (P) on the registration plate support (21) visible.

2. A safety apparatus as claimed in claim 1, wherein the mechanism (30) has a rotating link (17, 18) at each lateral end of the registration plate support (21).

3. A safety apparatus as claimed in any preceding claim, wherein the sign (11) is an electronic sign having a control circuit and a power supply.

4. A safety apparatus as claimed in claim 3, wherein the power supply is independent.

5. A safety apparatus as claimed in claims 3 or 4, wherein the sign (11) comprises LEDs.

6. A safety apparatus as claimed in any preceding claim, wherein the sign (11) is adapted to display any of a number of options.

7. A safety apparatus as claimed in claim 6, wherein the controller (2) chooses a display option in response to a user instruction.

8. A safety apparatus as claimed in claims 6 or 7, wherein the controller (2) provides a default option.

9. A safety apparatus as claimed in any preceding claim, wherein the controller (2) comprises a radiation receiver and is adapted to respond to a remotely-transmitted signal to activate the warning sign.

10. A safety apparatus as claimed in claim 9, wherein the receiver operates according to a mobile network protocol such as GSM.
11. A safety apparatus as claimed in any preceding claim, wherein the apparatus comprises means to detect tampering with the sign (11), and the controller is adapted to provide an alarm output.

12. A safety apparatus as claimed in claim 11, wherein the alarm output includes sending a message via a mobile network to a designated mobile device.

13. A safety apparatus as claimed in claim 11, wherein the controller is adapted to communicate wirelessly with the sign to detect tampering.

14. A safety apparatus as claimed in claim 13, wherein the controller (2) is adapted to poll the sign (11) and to generate a tampering event if a response is not received to a pre-set number of polls.

15. A safety apparatus as claimed in any preceding claim, wherein the controller comprises a positioning system and is adapted to transmit a mobile network signal if position of the vehicle deviates from a set route or region.

16. A safety apparatus as claimed in any preceding claim, wherein the drive mechanism comprises an axle to which are connected a plurality of support arms for the registration plate support, rotation of the axle causing rotation of the support arms.

17. A safety apparatus as claimed in claim 16, wherein the drive mechanism comprises a twisted axle, a carriage running on the axle, and a drive to cause sliding movement of the carriage which translates into rotation of the bar.

18. A safety apparatus as claimed in claim 16, wherein the carriage is driven by a motor driving a spindle on which the carriage is driven.

19. A safety apparatus as claimed in any preceding claim, wherein the sign and the registration plate support comprise snap-fitting features (13, 23) for retaining the support in a default position enclosing the sign (11)
Fig. 6
A. CLASSIFICATION OF SUBJECT MATTER

INV. B60Q1/52
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B60Q G09F G08B B60R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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[ ] Further documents are listed in the continuation of Box C

X See patent family annex

**Special categories of cited documents**

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Date of the actual completion of the international search

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26/10/2010

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