Nov. 26, 1963 A. W. NEAVILLE 3,112,004

REMOTE CONTROL SYSTEM FOR AUTOMOTIVE VEHICLES

Filed April 5, 1961

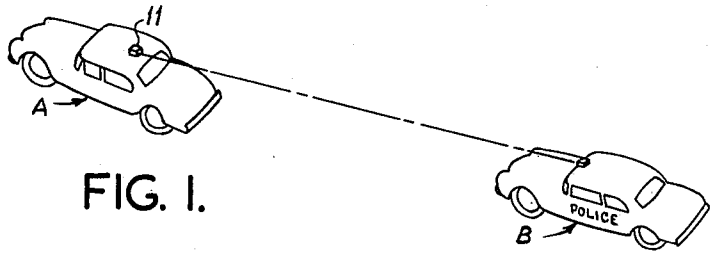

FIG. 1.

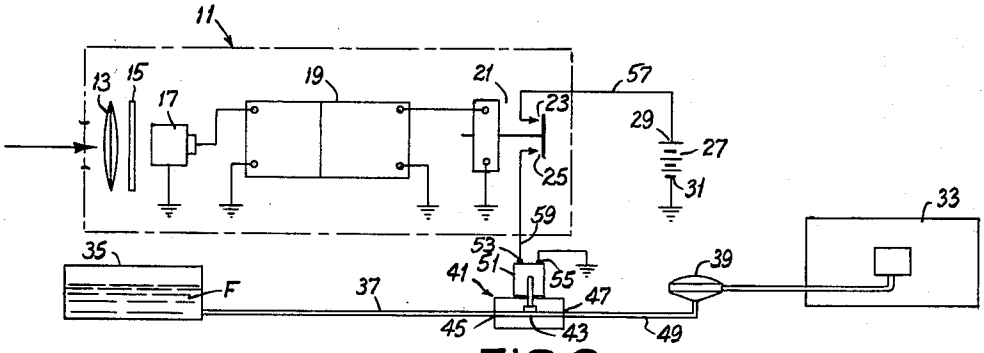

FIG. 2.

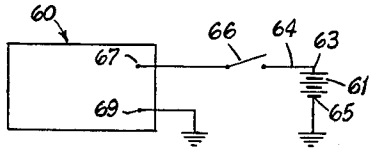

FIG. 3.

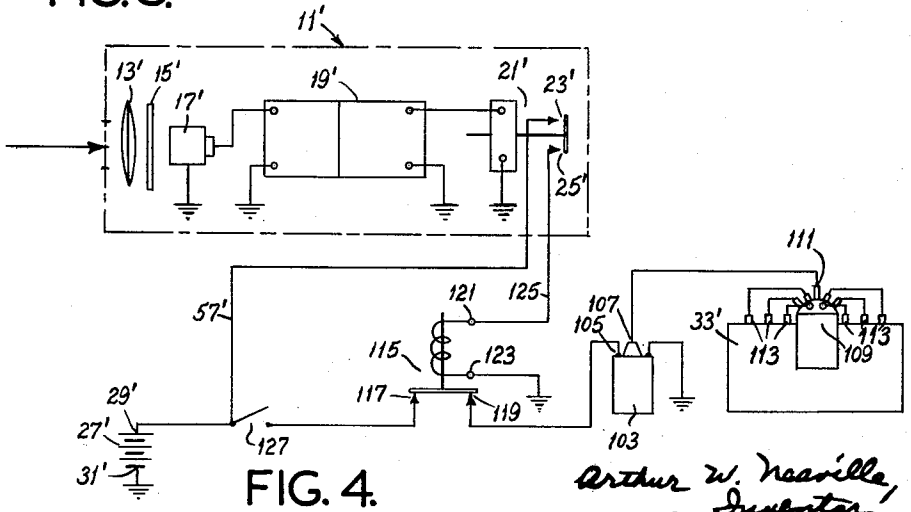

FIG. 4.

Arthur W. Neaville,
Inventor.
Koenig, Pope, Senniger and Powers,
Attorneys.

United States Patent Office 3,112,004 Patented Nov. 26, 1963

3,112,004
REMOTE CONTROL SYSTEM FOR AUTOMOTIVE VEHICLES

Arthur W. Neaville, 912 S. Rock Hill Road, Webster Groves 19, Mo.

Filed Apr. 5, 1961, Ser. No. 101,001
5 Claims. (Cl. 180—82)

This invention relates to remote control systems, and more particularly to such systems for engine-driven vehicles where the controlling intelligence is transmitted by means of infrared carrier waves.

Among the several objects of this invention may be noted the provision of a remote control system in which a vehicle may be selectively stopped by an operator at a position remote from the vehicle by wireless means; the provision of a remote control system of the class described which employs an infrared carrier and in which the receiver component thereof is insensitive to infrared signals which are not modulated in accordance with a preselected pattern; the provision of a remote control system in which a remote vehicle engine can be stopped notwithstanding that the desire of the operator of said controlled vehicle may be to the contrary; the provision of such a remote system in which the vehicle engine may be restarted after a predetermined delay after stopping it; and the provision of methods for selectively disabling a motor vehicle from a remote position. Other objects and features will be in part apparent and in part pointed out hereinafter.

The invention accordingly comprises the constructions and methods hereinafter described, the scope of the invention being indicated in the following claims.

In the accompanying drawings, in which several of various possible embodiments of the invention are illustrated,

FIG. 1 is a perspective view of two vehicles equipped with the remote control system of the present invention;

FIG. 2 is a block diagram of the receiver portion of the control system shown in FIG. 1;

FIG. 3 is a block diagram of the transmitting portion of the remote control system shown in FIG. 1; and

FIG. 4 is a block diagram of one portion of another embodiment of the present invention.

Corresponding reference characters indicate corresponding parts throughout the several views of the drawings.

It has become increasingly apparent within the past few years that a reliable and economical system for selectively stopping or halting moving vehicles from a remote position would be a highly desirable and beneficial traffic and law enforcement tool. In accordance with the present invention such a system has been developed which permits an authorized person or agency to halt any moving vehicle (even contrary to the wishes of the driver thereof) which is equipped with a component portion of the remote control system disclosed herein. Thus a police officer equipped with a transmitting portion component of the present invention and located at a fixed position near a highway or in another vehicle moving along a road can selectively halt another vehicle equipped with the receiver portion and associated components of the present invention.

Referring now more particularly to the drawings which

illustrate preferred embodiments of the present invention, reference character A designates a controlled vehicle and B designates a controlling vehicle, each of which is conventionally constructed and operated except that they are modified as described below to include components of the remote control system of this invention.

Securely mounted on the vehicle A and directed generally rearwardly, is an infrared receiver 11. This receiver 11 includes a focusing lens 13, an optical filter 15 for purposes of eliminating visible light, a detecting cell 17, a tuned amplifier 19, and a relay 21 having a set of normally open contacts 23, 25. As can be seen in FIG. 2, the filter 15 is interposed between the lens 13 and the cell 17 which in turn is directly coupled electrically to the amplifier 19. The coil of relay 21 is electrically connected to the output terminals of amplifier 19. Thus, when an electromagnetic radiation signal in the infrared spectrum, which is modulated or coded in a preselected pattern or at a frequency which matches that to which amplifier 19 is tuned, is received and detected by receiver 11, relay 21 is actuated by the output of said amplifier, and the contacts 23, 25 will close. It should be noted here that the particular manner in which the individual components of the receiver 11 are mounted therein has no direct bearing on this invention, and accordingly said components are described only so far as required to show their operation in the present invention in combination with other units.

The vehicle A is also conventionally provided with a battery 27 having a positive terminal 29 and a chassis-grounded terminal 31. Operatively mounted in the vehicle A is an engine 33 to which fuel F from a fuel tank 35 is fed through a fuel line 37 by a fuel pump 39. Interposed between fuel tank 35 and the fuel pump 39 is a normally open, electrically closable fuel valve 41 which provides a passage 43 between an inlet port 45, which is directly coupled to the fuel line 37, and an outlet port 47 which is directly coupled to a second length of fuel line 49, which in turn is connected to fuel pump 39. The valve 41 integrally includes an electrically operated means 51, such as a solenoid valve, for blocking the passage 43 upon the applying of a voltage across a pair of terminals 53, 55. Preferably valve 41 includes a time delay mechanism, such as a dash pot, which reopens the valve in a predetermined time period after it is electrically de-energized. However, any customary solenoid-operated valve without a time delay mechanism may be employed at 41 provided, of course, that it is designed to interrupt the flow of fuel to engine 33 upon energization by the voltage of battery 27.

In the making of the electrical connections required in the vehicle A, the positive terminal 29 of the battery 27 is connected to contact 23 of the relay 21 through a conductor 57. Contact 25 of the relay 21 is connected to the terminal 53 of the valve 41 through a conductor 59, and terminal 55 of said valve is chassis-grounded to the vehicle A in a manner similar to the terminal 31 of the battery 27 to complete the circuit.

The transmitting portion 60 of the remote control system is shown in FIG. 3 as comprising an infrared transmitter which is preferably mounted on the top of a second vehicle B, so that it may be adjustably directed or controlled manually by an operator from within vehicle B to direct its modulated coded collimated infrared radia-

tion beam as desired. It will be understood that this transmitter **60** may be positioned at a fixed location such as a rise near a highway commanding a line-of-sight path to vehicles such as B traveling thereover. Power from a conventional vehicular battery **61** is supplied from a hot terminal **63** via a wire **64** and a manually operable switch **66** to one power terminal **67** of transmitter **60**. The electrical circuit for transmitter **60** is completed via the chassis of vehicle B between a chassis-grounded battery terminal **65** and a second power input terminal **69**.

In operation, the tuned amplifier **19** of the receiver **11** and the transmitter **60** are adjusted to receive and transmit respectively compatible coded signals. The vehicles A and B may then be operated independently until such time as the operator of the vehicle B desires that the vehicle A be halted whereupon the operator of the vehicle B actuates the switch **66**, causing energization of transmitter **60** and directing the collimated beam of coded infrared radiation at the receiver **11** on the vehicle A. As the beam of infrared energy strikes the receiver **11**, the lens **13** causes the beam to be focused on the cell **17** through the filter **15** which removes random visible light. The cell **17** supplies the input of the amplifier **19** with the properly coded signal and the relay **21** is actuated by the output of the amplifier **19**. Upon such actuation, the contacts **23**, **25** close and electrical power from the battery **27** is applied to the electrically operated valve **41**. When so energized valve **41** interrupts the flow of fuel to engine **33** and stops vehicle A. The time delayed reopening of valve **41** will permit the valve to reopen and pass fuel to engine **33** after a predetermined time period. The impingement of infrared radiation upon lens **13**, other than that modulated in accordance with the preselected pattern, will not actuate valve **41**. Thus, random infrared radiation will not effect operation of the receiver to halt the vehicle.

Referring now in more detail to FIG. 4, a second embodiment of my invention is shown wherein coded infrared transmissions are used to accomplish the deactivation of the ignition system of a vehicle A', thereby causing the loss of its motive power.

In similar fashion to the vehicle A, the vehicle A' includes a receiver **11'** integrally provided with a focusing lens **13'**, an optical filter **15'**, an infrared detecting cell **17'**, a tuned amplifier **19'**, and a relay **21'** which includes a set of normally open contacts **23'**, **25'**, said parts being identical in description, installation and operation to the correspondingly numbered parts in the vehicle A. In addition, the vehicle A' includes a battery **27'** having a positive terminal **29'** and a chassis-grounded terminal **31'**; a conductor cable **57'** directly connects the positive terminal **29'** to the open contact **23'** of the relay **21'**.

Vehicle A' is powered by an internal combustion engine **33'** having a conventional ignition system which includes a spark coil **103** having an input terminal **105**, an output terminal **107**, and a distributor **109** which sequentially connects the output of the spark coil **103** through an input terminal **111** to the various spark plugs **113**.

Mounted on the vehicle A' is a relay **115** including a pair of normally closed contacts **117**, **119**, which remain closed until the switch **115** is actuated by applying a voltage across a pair of control terminals **121**, **123**. Preferably, though not necessarily, the switch **115** includes an automatic time delay resetting mechanism.

The electrical connections in the vehicle A' are as follows: contact **25'** of the relay **21'** is directly connected by a conductor **125** to control terminal **121** of the switch **115**; control terminal **123** of the switch **115** is chassis-grounded; the input terminal **105** of the spark coil **103** is connected to the positive terminal **29'** of the battery **27'** through the contacts **117** and **119** of relay **115** and an ignition switch **127**. The output terminal **107** is connected to the input terminal **111** of the distributor **109**.

When the operator of the vehicle B desires to stop

vehicle A' transmitter **60** is placed in operation by actuation of the switch **66** and the beam is directed at the receiver **11'**. Said beam then is focused on the cell **17'** by the lens **13'** and filtered by the filter **15'**. The amplifier **19'** having previously been tuned to accept the particular coded signal from the cell **17'** then supplies actuating power to the relay **21'** which in turn causes the closing of the contacts **23'**, **25'**. The closing of the contacts **23'**, **25'** applies the battery potential across control terminals **121**, **123**, of relay **115** to actuate it. Thereupon the normally closed contacts **117**, **119**, are opened and the spark coil **103** is deenergized thereby electrically disabling engine **33'**. If relay **115** is of the time delay type even momentary reception of a coded transmission will disable vehicle A' for an appreciable period of time and after the preselected delay the contacts of relay **115** will automatically reclose and permit restarting of vehicle A'.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As various changes could be made in the above constructions and methods without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. A remote control system for an automotive vehicle having an engine with an ignition circuit and a liquid fuel supply system, an infrared radiation receiver mounted on said vehicle adapted to supply an electrical output signal only upon reception of an infrared signal modulated in accordance with a preselected pattern, an infrared transmitter located at a position remote from said receiver for selectively transmitting an infrared signal beam modulated in accordance with said preselected pattern, means responsive to said output signal connected to the vehicle engine for disabling it upon reception of said radiation signal modulated in said preselected pattern, and delay means associated with said disabling means for automatically deactuating said disabling means after a predetermined delay whereby the vehicle can be stopped by transmitting such a modulated radiation signal to said receiver, and the vehicle engine may be restarted after said predetermined delay.

2. A remote control system as set forth in claim 1 in which the disabling means comprises an electrical relay having a set of electrical contacts series-connected in the ignition circuit for opening said ignition circuit.

3. A remote control system as set forth in claim 1 in which the disabling means includes an electrically actuated solenoid valve connected in said fuel system for interrupting the flow of fuel to the engine.

4. A remote control system for an automotive vehicle having an engine with a liquid fuel supply system, said remote control system comprising an infrared radiation receiver mounted on said vehicle adapted to supply an electrical output signal only upon reception of an infrared signal modulated in accordance with a preselected pattern, an infrared transmitter located at a position remote from said receiver and adapted to selectively transmit an infrared signal modulated in accordance with said preselected pattern, an electrically actuated solenoid valve connected in said fuel supply system for interrupting, in response to an output signal supplied by said receiver, the flow of liquid fuel to said engine whereby the engine of said vehicle can be disabled by the transmitting of an infrared signal from said transmitter, and delay means associated with said electrically actuated solenoid valve for automatically deactuating said solenoid valve after a predetermined delay after actuation thereof, whereby liquid fuel is permitted to flow to said engine after said predetermined delay.

5. A remote control system for an automotive vehicle

having an engine with a liquid fuel supply system comprising a receiver mounted on said vehicle adapted to supply an electrical output signal only upon reception of a signal modulated in accordance with a preselected pattern, a transmitter located at a position remote from said receiver and adapted to selectively transmit a signal modulated in accordance with said preselected pattern, an electrically actuated solenoid valve connected in said fuel supply system for interrupting, in response to an output signal supplied by said receiver, the flow of liquid fuel to said engine whereby the engine of said vehicle may be disabled by the transmitting of a signal from said transmitter, and delay means associated with said electrically actuated interrupting valve adapted to automatically deactuate said interrupting valve after a predetermined delay after actuation thereof whereby liquid fuel is permitted to flow to said engine after said predetermined delay.

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