

Oct. 23, 1962

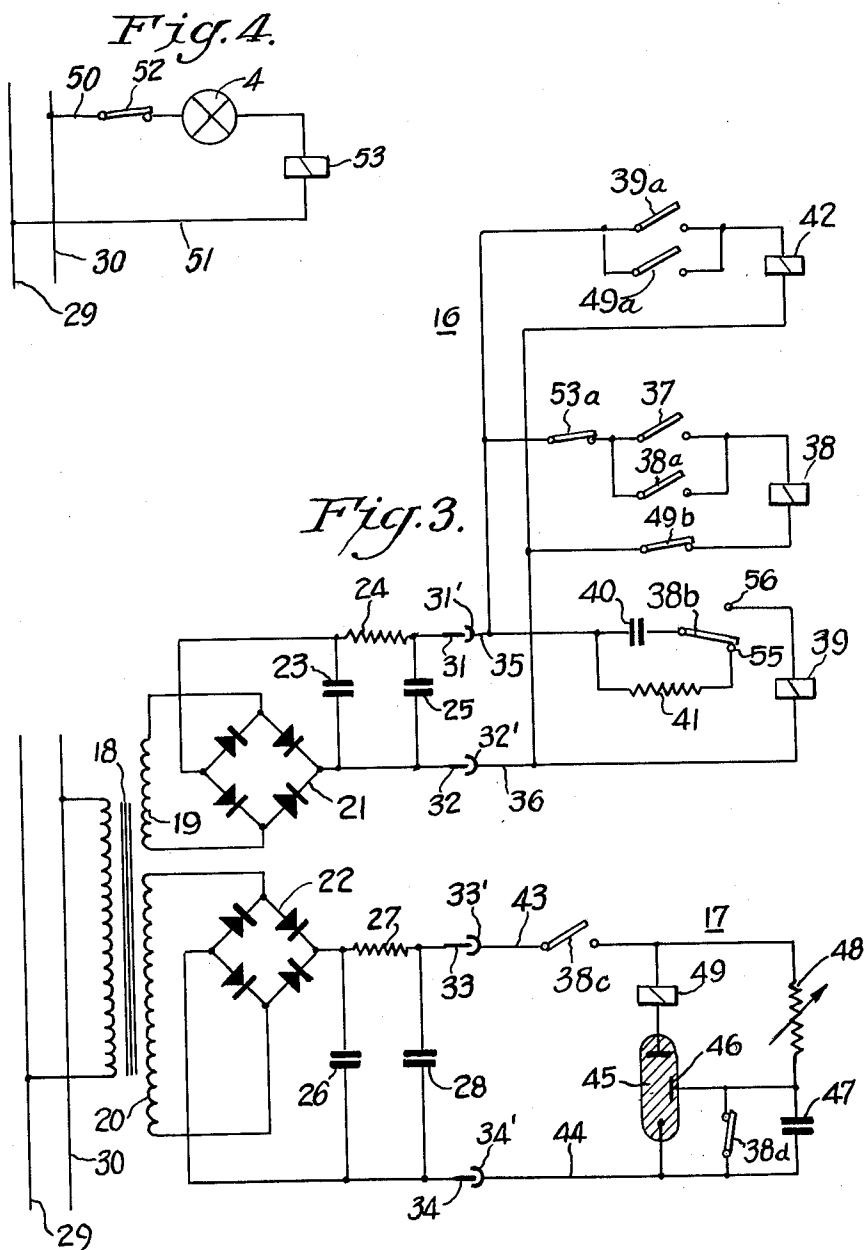
F. BIEDERMANN ETAL

3,060,434

METHOD AND APPARATUS FOR TRAFFIC SURVEILLANCE

Filed Feb. 25, 1959

3 Sheets-Sheet 2



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Fig. 5.

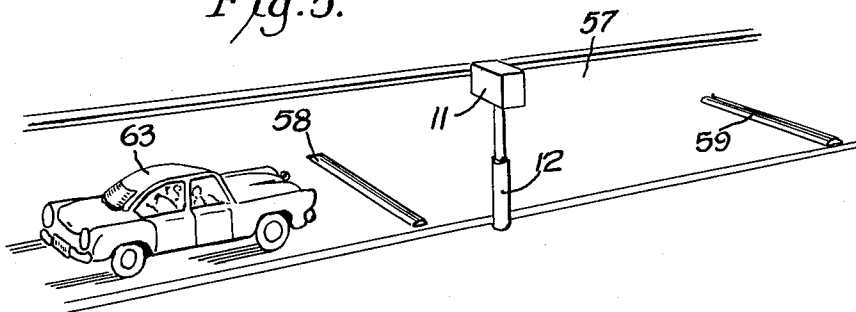
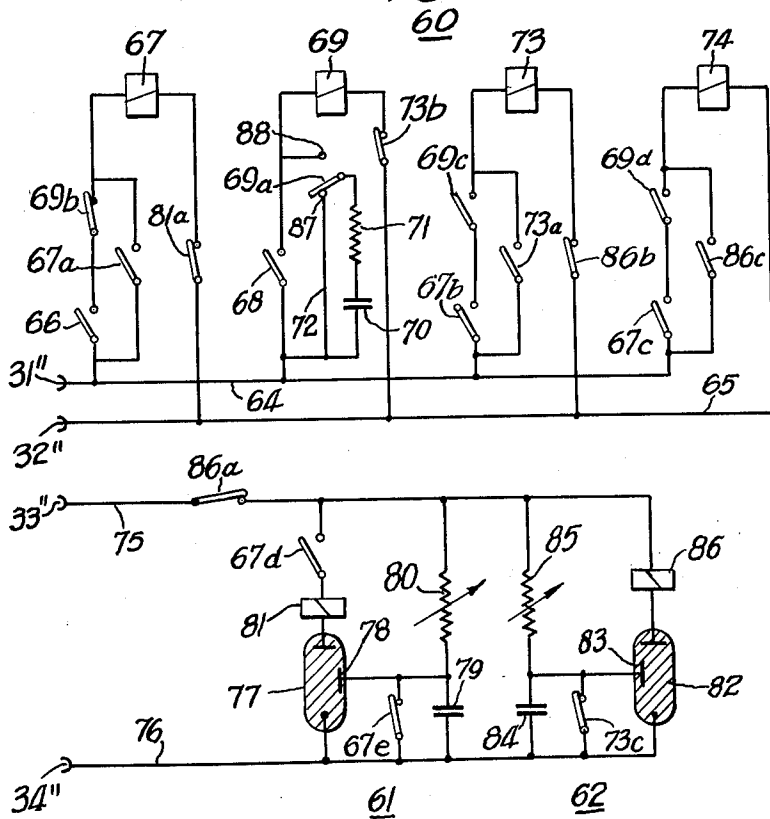


Fig. 6



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3,060,434

METHOD AND APPARATUS FOR TRAFFIC
SURVEILLANCE

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Filed Feb. 25, 1959, Ser. No. 795,436

Claims priority, application Germany Mar. 4, 1958
17 Claims. (Cl. 346—107)

This invention relates to a method and apparatus for the surveillance of traffic incorporating a device for automatically detecting vehicles which violate traffic regulations, and more particularly, relates to such a method and apparatus which makes a photographic record of any vehicles which violate traffic regulations.

In accordance with this invention, it is proposed to automatically photograph several times at successive predetermined intervals of time, those vehicles which violate traffic regulations after it has been determined that their manner of driving is in violation of regulations.

A watching device is proposed for carrying out the process in accordance with this invention which incorporates a photographic camera, a device for automatically releasing the shutter of this camera when it detects any vehicle which violates traffic regulations, and additional means for effecting a repetition of the shutter release after a definite interval of time. The means for repeating the shutter release preferably includes an electronic time switch which is actuated by the device which detects any vehicles which drive in a manner violating traffic regulations.

A device made in accordance with this invention is particularly useful for making a multiple photographic record of any vehicles which do not pay attention to a "Stop" signal. When a device made in accordance with this invention is used in conjunction with a traffic light, it is placed in readiness for operation when the red "Stop" signal light is switched on; or it can be placed into operative readiness during the period of operation of the yellow "Caution" light which precedes the illumination of the red "Stop" signal light.

A device made in accordance with this invention can also serve to make a multiple photographic record of any vehicles which travel upon a forbidden zone of the road, for example, in violation of a "No Passing" regulation; or it can be used to detect vehicles which exceed the speed limit.

In accordance with a further characteristic of this invention, a relay is provided which is energized through a contactor which is actuated by a vehicle which drives in violation of traffic regulations. This relay effects first the release of a camera shutter and, secondly, the actuation of an electronic time switch which effects the second release of the camera shutter. In conjunction with the surveillance of the speed of vehicles, two contactors which are successively triggered by a vehicle, which travels at a speed in excess of the speed limit, respectively energize relays which control a switch in the circuit of a solenoid in the camera actuating device and a switch in the circuit of another relay which energizes the electronic time switch which effects the second release of the camera shutter. This time switch controls another switch which is incorporated in the camera actuating solenoid circuit.

Also in accordance with this invention, means are provided for preventing the control component from being actuated by other vehicles during the time interval that a series of pictures of a vehicle which has violated a traffic regulation is being taken.

In accordance with a further characteristic of this pres-

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ent invention, the time interval between successive pictures being taken of a vehicle which has violated traffic regulations can be adjusted. Also, the contactors which are triggered by vehicles being watched are preferably actuated by contact base plates which are mounted upon or within the road being watched.

Further, in accordance with this invention, the photographic camera of the watching device is mounted together with the electronic control and timing devices in a housing mounted adjacent the road being watched.

Still further, in accordance with this invention, the camera, a flash apparatus which might optionally be utilized, electronic control and timing devices, and in a particular instance, a power supply, are mounted in a conveniently detachable manner within the aforementioned housing or casing. Additional devices may also be installed within the housing for indicating the date, time of day, and in a given instance, also the speed of the vehicle violating traffic regulations; and their information can be reflected into the field of view of the photographic camera.

This invention is highly advantageous because the multiple photographic record of a vehicle which violates traffic regulations can be thoroughly studied by means of the exposed film stored in the camera of the watching device. Furthermore, the approximate speed of a vehicle violating traffic regulations can be determined from the different positions of the vehicle in the successive pictures which are taken at definite intervals of time. It can be determined, for example, whether the violating vehicle has crossed the intersection against a red light at a high or low speed. Furthermore, the license or registration plate of the violating vehicle is, in most instances, clearly photographed even if it was covered in the first picture by other traffic elements, for example, pedestrians standing within or crossing the intersection.

Novel features and advantages of the present invention will become apparent to one skilled in the art from a reading of the following description in conjunction with the accompanying drawings wherein similar reference characters refer to similar parts and in which:

FIG. 1 is a perspective view of an intersection at which a traffic light and a traffic watching device which is an embodiment of this invention is installed;

FIG. 2 is a front view in elevation of a portion of the traffic observing device shown in FIG. 1;

FIG. 3 is a schematic diagram of the electrical portion of the observing device shown in FIG. 1;

FIG. 4 is a schematic diagram of the circuit of the signal lamp of the traffic light shown in FIG. 1;

FIG. 5 is a perspective view of a section of road at which a device for the surveillance of a maximum speed limit is installed; and

FIG. 6 is a schematic diagram of the circuit of the switching device shown in FIG. 5.

FIG. 1 schematically represents a traffic intersection 1. At the side of road 2 entering intersection 1 is positioned a column 3 upon which is mounted a traffic light which incorporates in the conventional manner a red "Stop" signal lamp 4, a yellow "Caution" signal lamp 5, and a green "Go" signal lamp 6.

This surveillance or observation device acting in conjunction with the signal lights and which is described more fully in the following, detects and makes a record of any vehicles which drive through intersection 1 coming from street 2 in violation of a red "Stop" light.

This traffic observing device incorporates, for example, a contacting base plate 7 which is mounted upon or within the right lane of street 2, an automatically operated camera 8 whose shutter is, for example, electromagnetically released, an electronic flash device 9 operating in

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synchronism with camera 8, and an electrical control apparatus mounted within a casing 10. Camera 8, flash device 9, and casing 10 incorporating the electrical switching device are, for example, mounted within a common housing 11 in a manner permitting convenient installation and removal. Housing 11 is secured upon column or post 12 which is disposed several feet in front of signal lamp post 3. As shown in FIG. 2, a window 14 is mounted in the front wall 13 of housing 11 facing signal lamps 4-6 behind which is arranged objective lens of camera 8, and an additional window 15 is provided in front wall 13 behind which flash apparatus 9 is mounted. The angle of view of the lens of camera 8 and the illumination angle of the reflector of flash device 9 are great enough to respectively cover and illuminate the portion of the road at and behind contact base plate 7. Signal lamps 4-6 accordingly lie in the field of view of camera 8 and are recorded on the film when the shutter is released.

The electrical control or switching device which is mounted within casing 10, which is, for example, slidably arranged in the housing 11 like a drawer, is shown in detail in FIG. 3; and it consists in the most part of a control component 16 and an electronic time switch 17 which are connected through respective D.C. power supply circuits to a common transformer 18 and alternating current lines 29 and 30 through respective secondary windings 19 and 20. These power supplies include rectifiers 21 and 22 which are, for example, full-wave rectifiers or rectifier bridges and band-pass filters incorporating elements 23, 24, 25, 26, 27, and 28. Control component 16 and time switch 17 are connected to the aforementioned power supply apparatus preferably through plug connections 31, 31'; 32, 32'; 33, 33'; and 34, 34'.

The first relay solenoid 38 of control component 16 is connected to terminals 31' and 32' through connections 35 and 36 through a contactor 37 which is actuated by contact base plate 7. Relay solenoid 38 in turn actuates contactor 38a which is connected in parallel with contactor 37. The various relay solenoids are hereinafter referred to as merely relays for brevity of presentation. Furthermore, the various contactors which are controlled by particular solenoids are designated by the same reference numeral as this solenoid followed by an identifying letter suffix.

A second relay 39 in control component 16 can be connected to lines 35 and 36 through a double-throw contactor 38b which is actuated by first relay 38. A capacitor 40 is connected in series with contactor 38b, and a resistor 41 can be connected to capacitor 40 in one position of double-throw switch 38b.

Relay 39 actuates contactor 39a which connects solenoid 42 across lines 35 and 36. Solenoid 42, for example, controls a known type of device (not shown) for releasing the camera shutter as well as cocking it and advancing the film of the photographic camera to place it in readiness for the next exposure. Such a device is, for example, described in U.S. Letters Patent 2,393,534.

Electronic time switch 17 is connected through lines 43 and 44 with terminal plugs 33' and 34' and incorporates in a conventional manner a thyatron 45 having a grid 46 connected with a timing capacitor 47. Timing capacitor 47 is connected in series with a resistor 48 which is preferably of the variable type. Contactor 38c which is connected in the circuit of timing switch 17 and contactor 38d which is connected in parallel with timing capacitor 47 are controlled by relay 38 of switching component 16. Relay 49 connected in the anode circuit of thyatron 45 controls contactors 49a and 49b which are respectively connected to shutter release solenoid 42 in parallel with contactor 39a and in the circuit of first relay 38 of control component 16.

As is shown in FIG. 4, a further relay 53 is connected to alternating current lines 30 and 29 through conductor 50, contactor 52 and conductor 51. Relay 53 controls

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contactor 53a which is connected in the circuit of first relay 38 of control component 16. Contactor 52, shown in FIG. 4, is actuated by the device which controls the on and off switching of red signal lamp 4.

The method of operation of the apparatus shown in FIGS. 1, 3 and 4 is described in detail in the following.

When red signal lamp 4 is not energized and contactor 52 is accordingly open, relay 53 is also de-energized and its contactor 53a is also open. The other contactors of control component 16 and timing device 17 are in the positions which are shown in FIG. 3. Control component 16 and timing device 17 are accordingly not actuated if a vehicle should drive over contact base plate 7 and close contactor 37 and no photographic record of this vehicle is accordingly made.

During the time that access from street 2 across intersection 1 is prohibited, contactor 52 is closed, red signal light 4 is lit and relay 53 is energized. During this red phase of operation, contactor 53a is maintained closed by relay 53. However, relay 38 and other parts of control devices 16 and 17 still are de-energized until the following events occur.

If a vehicle drives into intersection 1 from street 2 against a lit red light 4, it closes contactor 37 when it drives over contact base plate 7. This energizes relay 38 through closed contactor 53a and maintains it closed through contactor 38a which it itself controls. Accordingly, even when contactor 37 opens, after contact base plate 7 is released, for example, by a spring (not shown) relay 38 is maintained energized through contactor 38a. Relay 38 also moves double-throw switch 38b from contact 55 to contact 56 to charge capacitor 40 through relay 39. Relay 39 is accordingly energized for a short time which momentarily closes contactor 39a which in turn momentarily energizes camera solenoid 42 which releases the shutter of photographic camera 8. This makes a first photographic record or picture of violating vehicle 54. As previously mentioned, solenoid 42 also actuates the resetting of the shutter and advances the film of camera 8 to place it in condition for taking another picture.

Contactor 38c of electronic timing switch 17 is closed by the previously mentioned energization of relay 38, and contactor 38d is opened to permit timing capacitor 47 to charge through resistor 48. When the capacitor voltage reaches a predetermined value, thyatron 45 fires and energizes relay 49. This closes contactor 49a, and photographic camera 8 is thereby actuated by solenoid 42 for the second time. At the same time, contactor 49b is opened which de-energizes relay 38. This consequently returns contactors 38a, b, c, and d to their original starting condition which is shown in FIG. 3; thereby the conducting phase of thyatron 45 is terminated and capacitors 40 and 47 are discharged.

This opens contactor 49a associated with solenoid 42 and closes contactor 49b associated with relay 38. This places electrical control devices 16 and 17 once more in their starting conditions ready for their next cycle of actuation.

Resistor 48 may be varied to adjust the operating period of timing switch 17 to accordingly set the time interval between the time of taking the first picture, which occurs when the vehicle drives over contact base plate 7, and the second picture, which is taken when timing switch 17 is triggered to, for example, approximately one second. The closing of contactor 53a and therewith the placing of control devices 16 and 17 in operative readiness can, in a modification of the illustrated example, occur during the yellow signal light, for example, which precedes the red signal light phase instead of during the period of illumination of red lamp 4. This may occur either simultaneously with the illumination of yellow lamp 5 or during the course of illumination of yellow lamp 5 by means of a time switch device which is triggered by the switching on of yellow lamp 5. This time switch is adjusted, for example, to close contactor 53a after $\frac{2}{3}$ of

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the time of illumination of yellow lamp 5 has been spent.

In this case, contactor 53a also opens, for example, when red signal lamp 4 is switched off which may occur together with the switching off of yellow lamp 5 at the end of the yellow "Caution" phase preceding the green "Go" phase.

This principle of multiple photographic recording of vehicles traveling in a manner violating traffic regulations can also be used for the observation of other traffic regulations, for example, the surveillance of a center line in the road which must not be crossed. For this purpose, the device represented in FIGS. 1-3 may also be used if the traffic light incorporating signal lamps 4, 5 and 6 and contactor 53a are eliminated and contact base plate 7 is disposed along the centerline of the road.

The apparatus of FIGS. 1-3 modified in such manner can also be utilized for observing a "No Passing" zone. In this case, contact base plate 7 is moved over into the portion of the road which is not permitted to be used by on-coming traffic, and it is constructed and arranged in a manner to permit it to actuate contactor 37 only when it is driven over by a vehicle moving in a predetermined one of the two directions. In the case of observing no-passing zones for trucks only, a contact base plate is used, for example, which actuates control devices 16 and 17 only when a predetermined minimum axle pressure is applied to it. These contact base plates whose operation depends upon pressure, of course, do not have to be constructed to operate dependent upon direction of movement if they are used on turnpikes and other divided roads upon which traffic does not move in two directions.

The multiple photographic recording principle can also be utilized for watching that a certain maximum speed limit is observed. A device suitable for this purpose is shown in FIG. 5. It includes two contact base plates 58 and 59 which are arranged at a predetermined distance from each other within or upon road 57 and it also includes a housing 11 which is mounted alongside road 57 upon a post 12 and within which are arranged in a manner similar to that shown in FIG. 2 photographic camera 8, flash apparatus 9, and a casing 10 incorporating an electrical control or switching device.

This control device is described in FIG. 6 and includes a control component 60 and two electronic timing switches 61 and 62. Timing switch 62 provides a means for repeating the shutter release of the camera after it is first triggered as is later described in detail. Control component 60 is connected with a direct current source through connecting terminals 31" and 32", and electronic timing switches 61 and 62 are connected to a direct current source through terminals 33" and 34". These terminals or plugs are, for example, respectively connectable to terminals or plugs 31, 32, 33 and 34 of the power supply shown in FIG. 3 which includes a transformer, rectifiers and band-pass filters.

Control component 60 includes a first relay 67 which is connectable to terminals 31" and 32" to provide a flow of direct current thereto. For this purpose, relay 67 is connectable to lines 64 and 65 through contactor 66 which is actuated by the first contact base plate 58 and through normally closed contactors 69b and 81a. Relay 67 when energized actuates contactor 67a which is connected in parallel with contactors 66 and 69b for maintaining relay 67 energized even after contactor 66 is opened after vehicle 63 has passed contact plate 58.

A second relay 69 is also connectable to D.C. lines 64 and 65 through contactor 68 which is actuated by the second contact base plate 59. Relay 69 actuates double-throw contactor 69a to connect capacitor 70 and resistor 71 in parallel with contactor 68 to connect relay 69 through them to line 64 when contactor 69a is moved into electrical contact with terminal 88. In the de-energized condition shown in FIG. 6, contactor 69a is in

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electrical contact with terminal 87 which short-circuits capacitor 70 and resistor 71 through line 72 to line 64. Relay 69 opens contactor 69b which is connected in parallel with contactor 67a and in series with contactor 66.

Furthermore, a third relay 73 is connectable to lines 64 and 65 through contactor 67b which is actuated by the first relay 67 and through contactor 69c which is closed by the second relay 69. Contactors 67b and 69c are connected in series with each other and both are in parallel with contactor 73a which is actuated by relay 73 to maintain it energized when either of contactors 67b and 69c are allowed to open. Relay 73 also actuates contactor 73b which is arranged in the energizing circuit for relay 69. Finally, solenoid 74 is connectable to conductors 64 and 65 through contactor 67c actuated by relay 67 and contactor 69d which is actuated by relay 69. Solenoid 74, similar to solenoid 42 in FIG. 3, actuates release and cocking of the shutter of camera 8 and automatic advance of its film.

Electronic timing switches 61 and 62 are connectable to terminals 33" and 34" through common lines 75 and 76, and they respectively include thyratrons 77 and 82, timing capacitors 79 and 84 connected to the thyatron grids 78 and 83, and variable resistors 80 and 85 connected in series with capacitors 79 and 84.

Relay 81 connected to the anode of thyatron 77 of timing switch 61 actuates contactor 81a which is connected in series with relay 67 of control component 60. Conversely, relay 67 controls contactor 67d connected in series with the anode of thyatron 77, and it also actuates contactor 67e connected in parallel with timing capacitor 79 of timing switch 61.

In contrast, relay 86 connected to the anode of thyatron 82 of timing switch 62 actuates contactor 86a connected within common power line 75 for both timing switches 61 and 62. Relay 86 also actuates contactor 86b connected in series with relay 73 and contactor 86c connected in parallel with contactors 67c and 69d associated with camera solenoid 74 of control component 60.

The switching period of timing switch 61 is adjusted through a corresponding setting of resistor 80 exactly to the time required for a vehicle 63 to travel between contact base plates 58 and 59 along road 57 when it is proceeding at the maximum permitted rate of speed. The switching period of timing switch 62 is, for example, adjusted to approximately one second.

The apparatus shown in FIGS. 5 and 6 operates to cause the operating cycle of timing switch 61 to be initiated when vehicle 63 drives over first contact base plate 58. If vehicle 63 should be proceeding at a speed above the maximum speed limit, it triggers the shutter of camera 8 to take a first photographic recording of itself when it passes over second contact base plate 59. At this time, it also initiates the cycle of operation of timing switch 62 which effects the second photographic recording after approximately one second. The following discussion describes in detail the mode of operation of the apparatus shown in FIGS. 5 and 6.

When vehicle 63 passes over base plate 58, contactor 66 is thereby closed for a short period of time. This energizes relay 67 which closes contactors 67a, b, c, and d and opens contactor 67e. The closing of contactor 67a maintains relay 66 energized even after contactor 66 is allowed to open after vehicle 63 has passed contactor plate 58. The closing of contactor 67d and the opening of contactor 67e initiates the cycle of operation of timing switch 61, thereby permitting capacitor 79 to start to charge.

If the speed of vehicle 63 is in excess of the maximum permitted rate of speed so that the road distance between contact base plates 58 and 59 is traversed in a shorter period of time than the cycle of operation of timing switch 61, contact base plate 59 is actuated before thyatron 77

fires. Contactor 68 is closed when the vehicle drives over plate 59 which energizes relay 69. This actuates double-throw contactor 69a to move from terminal 87 to terminal 88 thereby opening contactor 69b associated with relay 67 and closing contactors 69c and 69d respectively associated with relay 73 and camera solenoid 74. Since, at this time, in an instance of violation of the speed limit, contactors 67b and 67c are still closed, relay 73 and solenoid 74 are respectively energized. Solenoid 74, when energized, releases the shutter of camera 8 for the first time and recocks it after taking the picture as well as advancing the film forward by a single frame. Contactors 69c and 69d are only during a short period closed because contactor 68 opens as soon as vehicle 63 moves off plate 58 and current flows through the alternate path through capacitor 70 and contactor 69a only during the short period of charging of said capacitor but solenoid 74 is maintained energized long enough to accomplish its function. Furthermore, relay 73 maintains itself energized even after contact plate 59 is released through its contactor 73a connected in parallel with contactors 67b and 69c.

When relay 73, as previously mentioned, was energized, contactor 73b was opened which de-energized relay 69 thereby returning contactors 69a, b, c, and d to their original condition, and de-energizing camera solenoid 74.

At the same time that contact base plate 59 is depressed and relay 73 accordingly energized, contactor 73c connected to the grid 83 of thyatron 82 is opened to switch on timing switch 62 and permit capacitor 84 to start to charge.

Before the cycle of operations of timing switch 62 has expired, capacitor 79 of timing switch 61 charges enough to fire thyatron 77. This energizes relay 81 which opens contactor 81a which de-energizes relay 67. Contactors 67a, b, c, and d are thereby opened and contactor 67e is closed which returns timing switch 61 to its original condition.

As soon as capacitor 84 of timing switch 62 is charged to the potential required to fire thyatron 82, it conducts through relay 86 which is maintained energized during the period of conduction of thyatron 82. This closes switch 86c to momentarily energize camera solenoid 74 for the second time. This makes the second photographic record of violating vehicle 63.

When relay 86 is energized, it also opens contactor 86b which de-energizes relay 73 thereby opening contactor 73a and closing contactors 73b (relay 69) and 73c (thyatron 82). Furthermore, contactor 86a is opened which interrupts the flow of current through the thyatron 82. Relay 86 accordingly is immediately de-energized which returns contactors 86a, b, and c to their original condition which is shown in FIG. 6.

At this time, the entire control apparatus including components 60, 61 and 62 is returned to its original condition.

Since contactor 73b in series with relay 69 is opened by relay 73 when a vehicle passes over plates 58 and 59 at a rate of speed which exceeds the speed limit, this guarantees that relay 69 cannot be energized by a second vehicle driving in the same or in the opposite direction as the violating vehicle because relay 73 remains energized until the second photographic recording of the violating vehicle is accomplished. This prevents errors in photographing caused by following vehicles.

Also, no release of the camera shutter occurs when a vehicle driving in the opposite direction passes over contact base plate 59 before base plate 58 because contactor 69b is opened when contact base plate 59 is traversed which prevents relay 67 from being energized even when contactor 66 is closed by this vehicle passing over contact base plate 58.

Capacitor 70, which is connected in parallel with contactor 68 after base plate 59 is traversed, provides a momentary current flow through resistor 71, contactor 75

69a and terminal 88 which causes solenoid 69 to remain energized a short time after contactor 68 is opened. This insures that relay 73 which has a certain response delay has enough time to energize contactor 73a which insures that it always maintains itself energized thereafter. Furthermore, solenoid 74 is always maintained energized long enough to permit its armature which actuates camera 8 to complete its required path of travel.

If the speed of vehicle 63 when driving along the road between base plates 58 and 59 does not exceed the maximum speed specified by the adjustment of resistor 80, contactors 66 and 68 are closed by their respective contact base plates when relays 67 and 69 are energized. However, relay 73 and solenoid 74 are not energized because the cycle of operation of timing switch 61 has already expired before base plate 59 is depressed; and, therefore, contactors 67b and 67c respectively associated with relay 73 and solenoid 74 have already been opened by the firing of thyatron 77 by the time that contactors 69c and 69d are closed when contact plate 59 is depressed. In this case, camera 8 is, therefore, not released.

By adjustment of resistor 48, of the embodiment shown in FIGS. 1-4 and resistor 85 of the embodiment shown in FIGS. 5 and 6, it is possible to vary the time interval of approximately one second between the successive photographic recordings or pictures of a vehicle which violates traffic regulations.

It is, of course, within the scope of this invention to photographically record violating vehicles not only twice, but any number of times at predetermined time intervals. For this purpose, additional electronic timing switches are required which would be released either by relays 38 or 39 of FIG. 3 or relays 73 or 86 of FIG. 6. These timing switches would control additional contactors which would be disposed in the circuits of solenoids 42 or 74, namely, in parallel with contactors 49a and 86c.

Other timing switch devices may be utilized instead of the electronic timing switches 17, 61 and 62, for example, timing switches incorporating servomechanisms.

Control apparatus 16, 17, 60, 61, and 62 could be connected to dry cells or storage batteries mounted in housing 11 instead of being connected to a D.C. power supply which is connected to A.C. lines through a transformer, rectifiers, and filters.

The apparatus shown in FIGS. 5 and 6 can also be used for guarding "Stop Signs" which are placed in intersections which cannot be surveyed at a glance by motorists. In this instance, through a corresponding adjustment of variable resistor 80, the switching period of timing switch 61 is adjusted to the minimum time interval which is required to come to a full stop and start between contact base plates 58 and 59.

Devices for indicating the date, time and, in a given instance, the speed of a vehicle violating traffic regulations, can also be mounted within housing 11. These devices can be constructed and arranged to reflect their indications into the field of view of the photographic camera to permit the date, time and possibly also the speed of the vehicle to be simultaneously recorded upon the film when the picture of the violating vehicle is being taken.

What is claimed is:

1. An apparatus for automatically detecting and photographing any vehicles which are being driven in a manner violating traffic regulations comprising a photographic camera including a shutter-operating means, an electrical control device for detecting vehicles which violate traffic regulations, said electrical control device being connected with said shutter-operating means for effecting the release of said shutter when the passage of a vehicle traveling in violation of traffic regulations is detected to provide a first photograph of the violating vehicle, a timing means connected with said electrical control device and with said shutter-operating means for effecting a repetition of said shutter release at a definite time interval after said first

mentioned release to provide a second photograph of said vehicle a definite time interval after said first photograph; an inactivating means in said electrical control device which prevents it from being actuated by a following vehicle after it has effected the first release of said shutter, a reactivating means in said electrical control device, and said timing means being connected to operate said reactivating means when it effects said second photograph whereby said electrical control device is restored to its initial condition for detecting a violating vehicle.

2. An apparatus as set forth in claim 1 wherein said means for repetition of said shutter release includes an electronic time switch.

3. An apparatus as set forth in claim 1 wherein said electrical control device includes a switch which is constructed and arranged to be actuated by a vehicle which violates traffic regulations, a switch-controlled relay solenoid being connected in an electrical circuit with said switch to permit its energization to be controlled thereby, said timing means including a time switch, said switch-controlled relay solenoid being operatively associated with contactor means and with shutter control means associated with said camera shutter-operating means for releasing said shutter to take a first photograph of said violating vehicle and for actuating said time switch, and said time switch being connected in an electric circuit with said shutter control means for actuating the second release of said shutter to take said second photograph of said vehicle.

4. An apparatus as set forth in claim 1 wherein said inactivating means comprises a capacitor and a double-throw switch which connects said capacitor in and out of the circuit of said electrical control device, the output from said capacitor being connected to said shutter-operating means to cause the charging current pulse in said capacitor to actuate the taking of said first photograph, relay means connected to operate said double-throw switch in one direction for maintaining said capacitor in said circuit after said vehicle has been detected to prevent another current pulse from flowing through it, and additional relay means in said timing means connected to operate said double-throw switch in the opposite direction for causing it to disconnect said capacitor from said electrical control device when said second photograph is taken to restore it to its initial condition in which a charging current pulse can be formed in it.

5. An apparatus as set forth in claim 1 wherein said inactivating means includes a normally-closed relay operated switch connected in the energizing circuit of said electrical control device, said normally-closed relay operated switch being energized to open when a first violating vehicle is detected to prevent subsequent actuation of said electrical control device by a following vehicle, and timing switch being connected to de-energize said normally-closed relay-operated switch for causing it to close when said second photograph is taken whereby said electrical control device is restored to its condition for detecting a following violating vehicle.

6. An apparatus as set forth in claim 1 wherein a relay for activating said electrical control device is connected with the signal lamp of a traffic light for causing it to be energized when said signal lamp is glowing, a vehicle-operated switch being disposed in the path of a vehicle driving past said traffic light, and said vehicle-operated switch being connected in series with a switch in said electrical control device actuated by said relay connected to said signal lamp for conditioning said electrical control device to photograph said vehicle when it passes a glowing signal lamp.

7. An apparatus as set forth in claim 6 wherein said signal lamp is a red signal lamp.

8. An apparatus as set forth in claim 6 wherein said signal lamp is a yellow signal lamp.

9. An apparatus as set forth in claim 1 wherein vehicle-operated switch means are positioned in the roadway for

actuation by a violating vehicle, and said vehicle-operated switch means separate a permissive portion of the roadway from a nonpermissive portion.

10. An apparatus as set forth in claim 9 wherein said vehicle-operated switch means includes a pair of switches in the roadway which actuates said electrical control device, said electrical control device including a pair of time switches, and the first of said time switches being connected in the circuit to the second vehicle-operated switch for inactivating it when the period of said first time switch expires whereby said electrical control device is only actuated when a vehicle contacts said vehicle operated switches in less than said period of said first time switch.

11. An apparatus as set forth in claim 9 wherein said electrical control device includes a pair of switches constructed and arranged to be successively actuated by vehicles driving along a road, said switches each being respectively connected in the circuits of switch-controlled relay solenoids, said timing means including a time switch, said switch-controlled relay solenoids being each operatively associated with contactors which are connected with control means operatively associated with said camera shutter-operating means for effecting the first release of said shutter and which are connected in the circuit of time switch relay solenoid means which is operatively associated with contactor means connected in the circuit of said time switch for actuating said time switch, and said time switch being connected with said shutter control means for effecting a repetition of said shutter release a predetermined interval after said first release of said shutter.

12. An apparatus as set forth in claim 11 wherein a shutter relay solenoid for operating said shutter control is connected to said time switch, said shutter relay solenoid being operatively associated with a shutter contactor in the circuit of said shutter control means, and said shutter contactor being connected in parallel with said contactor means operatively associated with said relay solenoids actuated by said switch means.

13. An apparatus as set forth in claim 11 wherein said electrical control device and said time switch are constructed and arranged to prevent said electrical control device from being actuated by other vehicles during the period in which successive photographs are being taken of a particular vehicle violating traffic regulations.

14. An apparatus for automatically detecting and photographing any vehicles which are being driven in a manner violating traffic regulations comprising a photographic camera including a shutter-operating means, an electrical control device for detecting vehicles which violate traffic regulations, said electrical control device being connected with said shutter-operating means for effecting the release of said shutter when the passage of a vehicle traveling in violation of traffic regulation is detected to provide a first photograph of the violating vehicle, a timing means connected with said electrical control device and with said shutter-operating means for effecting a repetition of said shutter release at a definite time interval after said first mentioned release to provide a second photograph of said vehicle a definite time interval after said first photograph, said means for repetition of said shutter release including an electronic time switch, said electrical control device including a switch which is constructed and arranged to be actuated by a vehicle which violates traffic regulations, a switch-controlled relay solenoid being connected in an electrical circuit with said switch to permit its energization to be controlled thereby, said switch-controlled relay solenoid being operatively associated with contactor means and with shutter control means associated with said camera shutter-operating means for releasing said shutter to take a first photograph of said violating vehicle and for actuating said electronic time switch, said electronic time switch being connected in an electric circuit with said shutter control means for actu-

ating the second release of said shutter to take said second photograph of said vehicle, a connector being connected in parallel with said switch actuated by said vehicle, said contactor being actuated by said switch-controlled relay solenoid for maintaining said switch-controlled relay solenoid energized after said vehicle passes over said switch, said electronic time switch being connected to a time-controlled relay solenoid which is operatively associated with a contactor connected in the energizing circuit of said switch-controlled relay solenoid, and said electronic time switch energizing said time-controlled contactor for de-energizing said switch controlled relay solenoid when the period of operation of said electronic time switch has terminated.

15. An apparatus for automatically detecting and photographing any vehicles which are being driven in a manner violating traffic regulations comprising a photographic camera including a shutter-operating means, an electrical control device for detecting vehicles which violate traffic regulations, said electrical control device being connected with said shutter-operating means for effecting the release of said shutter when the passage of a vehicle traveling in violation of traffic regulations is detected to provide a first photograph of the violating vehicle, a timing means connected with said electrical control device and with said shutter-operating means for effecting a repetition of said shutter release at a definite time interval after said first mentioned release to provide a second photograph of said vehicle a definite time interval after said first photograph, said electrical control device being constructed and arranged for taking a series of pictures of any vehicles which exceed the maximum speed limit, said electrical control device including a pair of switches constructed and arranged to be successively actuated by vehicles driving along a road, said switches each being respectively connected in the circuits of switch-controlled relay solenoids, said switch-controlled relay solenoids being each operatively associated with contactors which are connected with control means operatively associated with said camera shutter-operating means for effecting the first release of said shutter and which are connected in the circuit of time switch relay solenoid means which is operatively associated with contactor means connected in the circuit of said electronic time switch for actuating said electronic time switch, said electronic time switch being connected with said shutter control means for effecting a repetition of said shutter release a predetermined interval after said first release of said shutter, said first switch-controlled relay actuated by the first switch disposed in the path of said vehicle being operatively associated with a contactor by-passing said first switch for maintaining said first switch-controlled relay solenoid energized after said vehicle passes over said first switch, a portion of said electronic time switch incorporating contactors operatively associated with said first switch for initiating its operating cycle when said first switch is actuated, and a time-controlled relay solenoid being connected to a portion of said electronic time switch and being operatively associated with a normally closed contactor in the circuit of said first switch-controlled relay solenoid for de-energizing said first switch-controlled relay solenoid during the period of operation of said portion of said electronic time switch.

16. An apparatus for automatically detecting and photographing any vehicles which are being driven in a manner violating traffic regulations comprising a photographic camera including a shutter-operating means, an electrical control device for detecting vehicles which violate traffic regulations, said electrical control device being connected with said shutter-operating means for effecting the release of said shutter when the passage of a vehicle traveling in violation of traffic regulations is detected to provide a first photograph of the violating vehicle, a timing means connected with said electrical control device and with said shutter-operating means for effecting a repetition of said shutter release at a definite time interval after

said first mentioned release to provide a second photograph of said vehicle a definite time interval after said first photograph, said electrical control device being constructed and arranged for taking a series of pictures of any vehicles which exceed the maximum speed limit, said electrical control device including a pair of switches constructed and arranged to be successively actuated by vehicles driving along a road, said switches each being respectively connected in the circuits of switch-controlled relay solenoids, said switch-controlled relay solenoids being each operatively associated with contactors which are connected with control means operatively associated with said camera shutter-operating means for effecting the first release of said shutter and which are connected in the circuit of time switch relay solenoid means which is operatively associated with contactor means connected in the circuit of said electronic time switch for actuating said electronic time switch, said electronic time switch being connected with said shutter control means for effecting a repetition of said shutter release a predetermined interval after said first release of said shutter, said time switch relay solenoid controlling said electronic time switch being operatively associated with a normally closed contactor in the circuit of the second switch-controlled relay solenoid which is actuated by the passage of said vehicle for de-energizing said second switch-controlled relay solenoid, said time switch relay solenoid being operatively associated with a by-pass contactor which parallels said contactors in the circuit of said time switch relay solenoid which are operatively associated with said first and second switch-controlled relay solenoids, a portion of said electronic time switch incorporating a resetting relay solenoid which is operatively associated with a contactor in the circuit of said time switch relay solenoid, and said portion of said electronic time switch being arranged to open said contactor in the circuit of said time switch relay solenoid for de-energizing it during the cycle of operation of said portion of said electronic time switch.

17. An apparatus for automatically detecting and photographing any vehicles which are being driven in a manner violating traffic regulations comprising a photographic camera including a shutter-operating means, an electrical control device for detecting vehicles which violate traffic regulations, said electrical control device being connected with said shutter-operating means for effecting the release of said shutter when the passage of a vehicle traveling in violation of traffic regulations is detected to provide a first photograph of the violating vehicle, a timing means connected with said electrical control device and with said shutter-operating means for effecting a repetition of said shutter release at a definite time interval after said first mentioned release to provide a second photograph of said vehicle a definite time interval after said first photograph, said electrical control device being constructed and arranged for taking a series of pictures of any vehicles which exceed the maximum speed limit, said electrical control device including a pair of switches constructed and arranged to be successively actuated by vehicles driving along a road, said switches each being respectively connected in the circuits of switch-controlled relay solenoids, said switch-controlled relay solenoids being each operatively associated with contactors which are connected with control means operatively associated with said camera shutter-operating means for effecting the first release of said shutter and which are connected in the circuit of time switch relay solenoid means which is operatively associated with contactor means connected in the circuit of said electronic time switch for actuating said electronic time switch, said electronic time switch being connected with said shutter control means for effecting a repetition of said shutter release a predetermined interval after said first release of said shutter, said second switch-controlled relay solenoid being operatively associated with a contactor in a circuit which by-passes said second switch, a capacitor being connected in said by-

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passing circuit, and said second switch-controlled relay solenoid actuating said contactor in said by-passing circuit to connect said capacitor in the energizing circuit of said second switch-controlled relay solenoid to provide a momentary flow of current to said switch-controlled relay solenoid. 5

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