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[54] VEHICULAR MOUNTED SURVEILLANCE AND RECORDING SYSTEM

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[52] **U.S. Cl.** **358/108**; 358/103; 358/125; 360/5

[58] **Field of Search** ..... 358/108, 103, 125, 310, 358/229, 245, 248; 360/5; 346/107 VP; 445/346

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Primary Examiner—Howard W. Britton
Assistant Examiner—Sherrie Hsia

[57] **ABSTRACT**

A vehicular surveillance system comprising a video recorder and monitor in a housing mounted within the passenger compartment of the vehicle to a bracket and a small camera rotatably mounted to the windshield of the vehicle. An FM microphone transmits audio signals to the vehicle's antenna whence it is carried to the recorder by a cable and added to the video images. Date and time information is superimposed on the video image on the top right of the image so as to interfere as little as possible with the image being recorded. The video recorder has a locking mechanism to prevent ejecting the video cassette by unauthorized personnel and its on/off switch is combined with the start record/stop recording function so that one button applies power to the system and starts the recording after a short delay. The housing may be removed from the vehicle for portable use in presenting recorded events as evidence and both video recorder and monitor may operate on the car battery or standard household current.

14 Claims, 3 Drawing Sheets

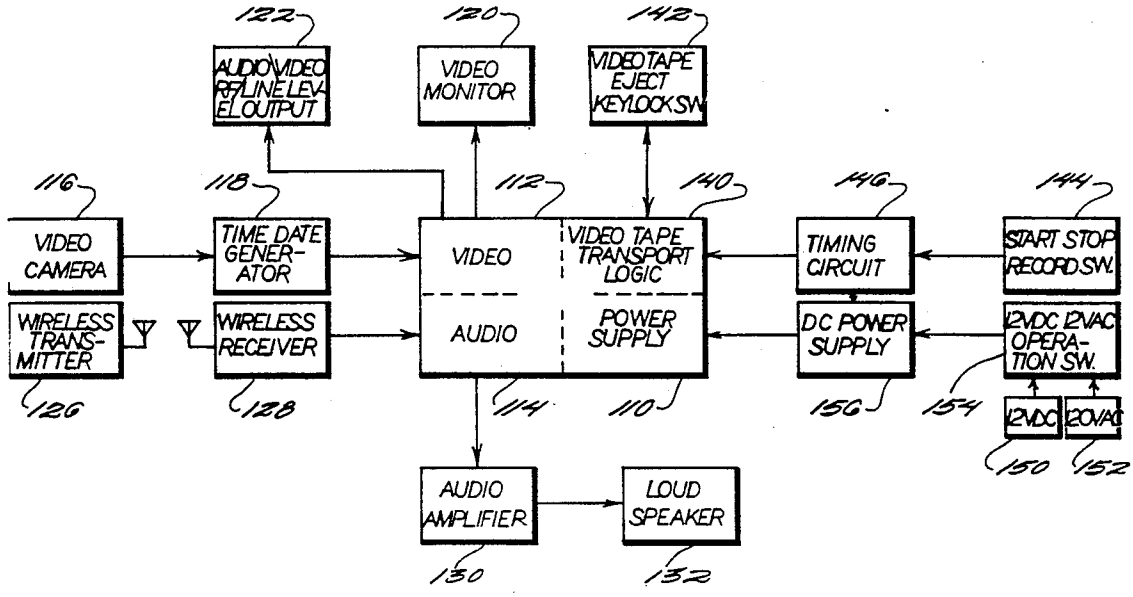
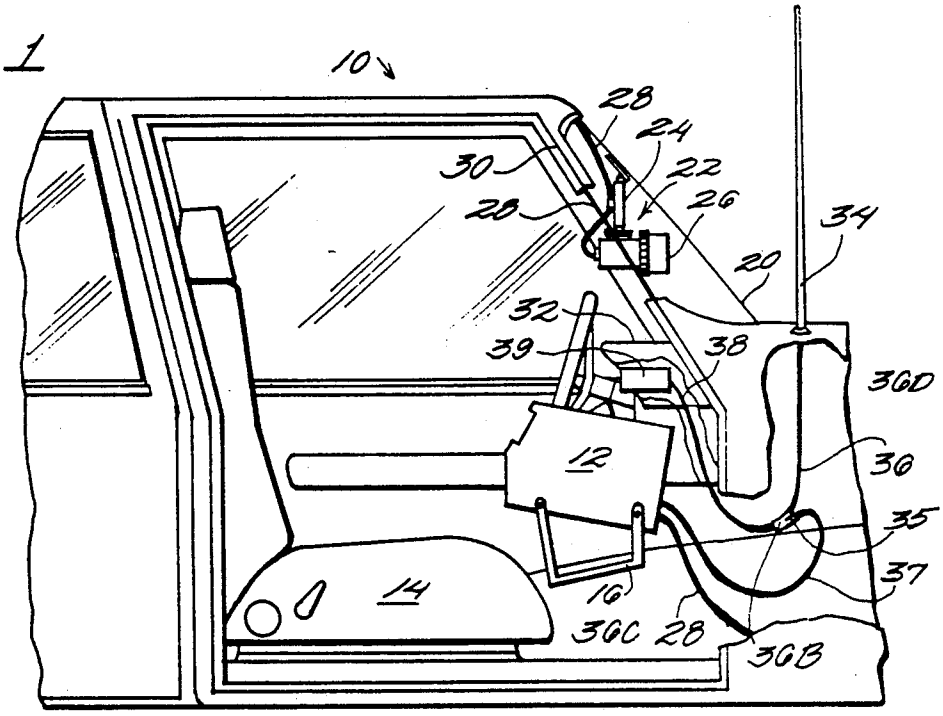


Fig. 1



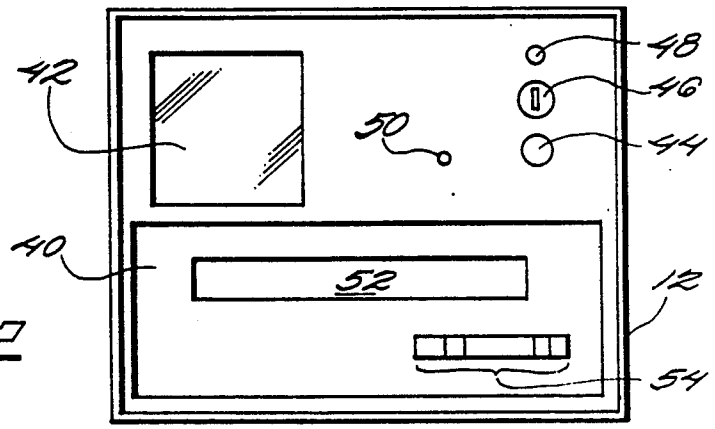


Fig. 2

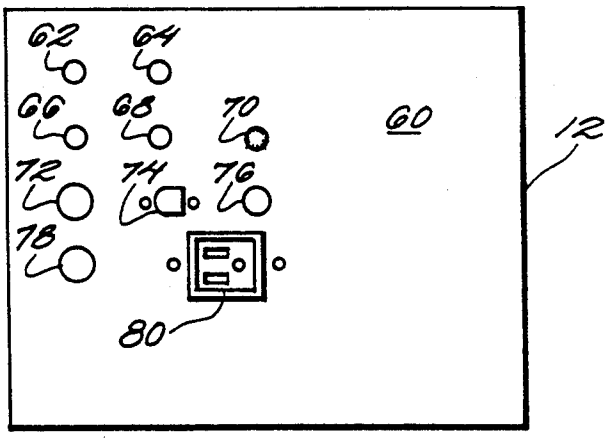


Fig. 3

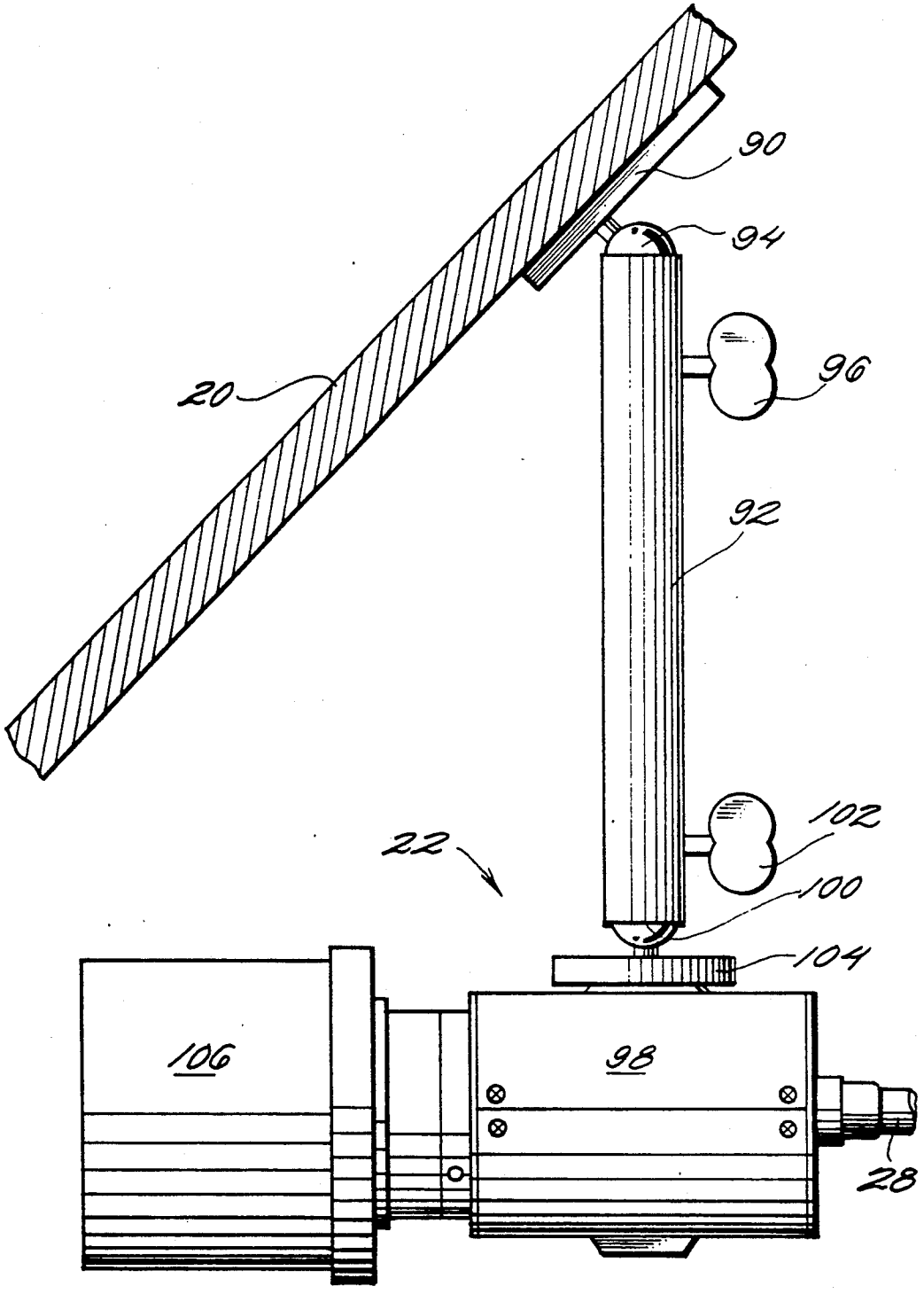


Fig 4

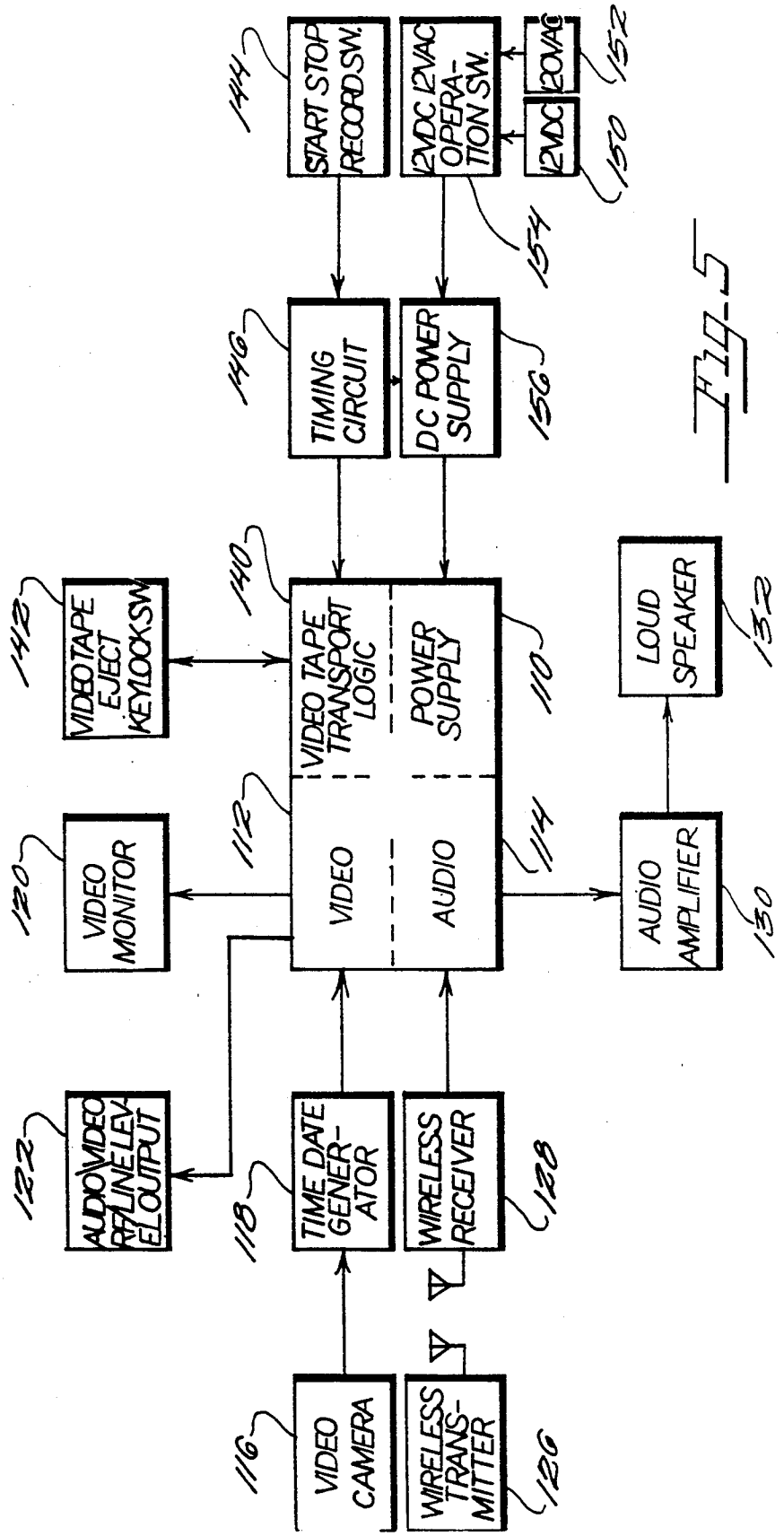

VIDEO CAMERA
116
WIRELESS TRANS-MITTER
126
TIME DATE GENER-ATOR
118
WIRELESS RECEIVER
128
AUDIO/VIDEO RF/LINE LEVEL OUTPUT
122
VIDEO MONITOR
120
VIDEO
112
AUDIO
114
VIDEO TAPE TRANSPORT LOGIC
POWER SUPPLY
110
140
VIDEO TAPE EJECT KEYLOCK SW.
142
AUDIO AMPLIFIER
130
LOUD SPEAKER
132
TIMING CIRCUIT
146
DC POWER SUPPLY
150
START STOP RECORD SW.
144
12VDC 12VAC OPERA-TION SW.
154
12VDC
150
12VAC
152

FIG. 5

VEHICULAR MOUNTED SURVEILLANCE AND RECORDING SYSTEM

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to vehicular-based surveillance systems. More particularly, the present invention relates to video and audio recording of events by a vehicular-based surveillance system.

2. Discussion of Background

Vehicular surveillance by video camera can augment police activities. A properly made video recording of an arrest and the circumstances preceding the arrest can add considerably to the credibility of the arresting officer's courtroom testimony as to the existence of probable cause for the arrest.

Vehicular-based surveillance systems for producing a recording of arrests are known. A description of the use of video cameras for documenting the arrest of traffic offenders in Creve Coeur, Mo., can be found in an Oct. 17, 1971 issue of Parade Magazine, for example. See also the system of Peterson described in U.S. Pat. No. 4,789,904. Others have developed systems for use by a motorist to provide his or her own record of events and for other private purposes, such as for providing proof of insurance claims. See the devices of Conte in U.S. Pat. No. 4,281,354 and of Michetti in U.S. Pat. No. 4,843,463.

Several considerations are important in the design of vehicular mounted surveillance systems. Since such systems are usually installed after purchase of the vehicles, it is important that the surveillance equipment be easily accommodated within the vehicle and not interfere with driving or interior features of the vehicle. The system needs to be compact, not only to minimize its space requirements but to be discrete and unobtrusive. The Peterson system, for example, uses a vault in the trunk. However, police carry a substantial amount of gear in the trunks of police cars. Furthermore, changing a tape requires stopping the vehicle and opening the trunk and vault. The surveillance system needs to be easy to use but flexible and practical enough to meet a variety of situations. Most importantly, the quality of evidence it presents will depend on how well its components function individually and as a unit and its ease of operation.

SUMMARY OF THE INVENTION

According to its major aspects, the present invention is a surveillance system for use in a vehicle. The surveillance system includes an auto-iris, video camera attached to the windshield of a car and sending video images to a video recorder within the passenger compartment. The recorder is located with a small monitor in a housing releasibly attached to a bracket attached to the floor of the vehicle by the driver's seat. A key-operated interlock on the recorder prevents the unauthorized removal of video cassettes from the recorder. As the video images are received from the camera, the date and time are superimposed in the upper right of the recorded images by a date and time generator. A frequency modulated, wireless microphone transmitter, worn preferably by the vehicle driver transmits sounds to the vehicle's antenna, which in turn are carried by cabling to the video recorder and incorporated with the video images on the cassette. A single switch turns the system on and activates the recorder. The recorder and monitor are adapted to be powered by the car battery or, alternatively, household current and can drive a television for showing the video cassette on a larger screen. Additionally, the system can be started remotely.

A feature of the present invention is the monitor and video recorder combined in a single housing in the passenger compartment of the vehicle. The passenger compartment is usually at a comfortable temperature year round so there is no need for a special climate controlled vault in, say, a trunk-located recorder. The housing with monitor and recorder is small and relatively light in weight so it occupies little space and can be carried easily. The driver can verify by viewing the monitor that the camera is aimed correctly to pick up the video images and can adjust the camera angle horizontally and vertically to make corrections as needed, but may turn the monitor off when not needed while allowing the recorder to continue to run. Furthermore, the housing can be removed from its bracket and for use in showing a video cassette recording of an arrest away from the vehicle when no appropriate recorder is available, such as in a rural magistrate's office. The system can be powered from the car battery or from standard household current and can drive a television with a full size screen for viewing of the video cassette by a large audience, such as a jury.

Another feature of the present invention is the superimposing of the date and time on the top right portion of the recorded image. Not only is the date and time information important as part of the recorded event, but the positioning of the information is also important. In its most common use, a police car equipped with the present surveillance system will be following a car that is speeding or being driven erratically. The police car will stop the vehicle from behind with the camera trained on the license plate at the bottom center of the recorded image and on the left side of the car, the side that the officer approaches. The top right is usually, then, the least important part of the image being recorded and the appropriate place for the date and time to be superimposed.

Yet another feature of the present invention is the use of the car's standard antenna to receive frequency modulated transmissions from the microphone. No special antenna is required. Therefore installation of the system is simplified and absence of a special antenna makes the system less conspicuous.

Still another feature of the present invention is the combination on/off switch and the start recording/stop recording switch. One button sends power to the system and starts the recording so that operation is simplified. A built-in timing circuit sequences power and record initiation so that the system begins recording only a few seconds after the power flows to it.

These and other features and advantages of the present invention will be apparent to those skilled in the art of vehicular-based surveillance systems from a review of the following detailed description of a preferred embodiment and the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a cut away, side view, of a portion of a vehicle with a preferred embodiment of the present invention shown therein;

FIG. 2 is a front view of the housing of the present invention;

FIG. 3 is a rear view of the housing of the present invention;

FIG. 4 is a detailed view of the camera of the present invention; and

FIG. 5 is a block diagram of a surveillance system according to the present invention.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

Now referring to FIG. 1, the present invention is shown in the front of the passenger compartment **11** of a motor vehicle **10**. Vehicle **10** is partially cut away for clarity and shows a housing **12** positioned between the driver's seat **14** and the front passenger seat (not shown) and preferably angled toward driver's seat **14**. Housing **12** is detachably mounted to a floor bracket **16** so that housing **12** may be detached and removed from vehicle **10** with relative ease. Preferably a padlock (not shown) prevents housing **12** from being removed by unauthorized personnel.

To the inside of a windshield **20**, approximately centered and towards the top of windshield **20** is a camera **22** mounted on a bracket **24** having a lens **26** and a cable **28**. Through cable **28** is carried video images from camera **22** to housing **12**. Cable **28** preferably is run across the top of windshield **20**, down through the frame **30** of window **20**, behind and under the dashboard **32** of vehicle **10** to housing **12**. An existing, standard car antenna **34** is attached to an antenna splitter **35** with a cable **36**. A second cable **37** connects antenna splitter **35** to housing **12**. A third cable **38** connects antenna splitter **35** to car radio **39**. Antenna **34** can receive signals for radio **39** or direct them to housing **12**.

In FIG. 2 is shown a preferred embodiment of the front of housing **12** which has a video recorder **40** and a monitor **42**, and a combination ON/OFF button **44** for both switching the power on and off and the recorder on and off, a monitor ON/OFF button **48** and a POWER ON light emitting diode (LED) **50** to indicate that power is on although monitor **42** might be off. An information storage unit such as a video cassette is inserted in the front of video recorder **40** in a slot **52**. Preferably video recorder **40** records on 8 millimeter cassettes or smaller information storage units rather than larger storage units such as VHS or BETA in order to reduce the space required for the recorder. Video recorder **40** is otherwise a standard recorder that pulls in the cassette and drops it into position for recording or playing and has a standard set of controls **54** of a standard video recorder including an eject button, pause, rewind, and so on. As with other video recorders, a remote control unit (not shown) may be provided to operate the recorder at a distance, which can prove useful when an officer has left the vehicle, is still in the range of the remote control unit and desires to activate the recorder. Also, in a court room, where housing **12** has been brought, an attorney can conveniently activate and deactivate recorder **40** remotely.

A lock **46**, preferably operated by a key **58**, normally removed from housing but illustrated in lock **46**, is provided to prevent removal of the video cassette from recorder **40**. Lock **46** disables the operation of the eject button of recorder **40**.

Monitor **42** is also preferably small in order to take up as little space as necessary, preferably having a screen somewhat larger than approximately 2 inches (5 centimeters) but less than approximately 9 inches (23 centimeters), and most preferably approximately 4 inches (10 centimeters) for ease in viewing by the driver who is sitting next to housing **12** but would have difficulty seeing images while driving if monitor **42** were too small.

FIG. 3 shows the back **60** of housing **12** with various connections including connections for video output **62**, audio output **64**, camera input **66** from camera cable **28**, antenna input **68** from antenna cable **37**, audio volume control **70**, DC voltage input connection **72** from the battery of vehicle **10**, connection **74** for DC power to camera **22** through camera cable **28**, a radio frequency output jack **76** for connection to the antenna of a standard television, a fuse **78**, and a connection **80** for standard AC power.

FIG. 4 shows camera **22** in more detain than shown in FIG. 1, and its attachment to windshield **20**. A base **90** is attached by gluing or other attaching means to windshield **20**. Base **90** is connected to a camera-holding stem **92** by a pivoting joint **94** such as a ball and socket as shown. Although pivoting, it is important to be able secure stem **92** to base **90** rigidly by a tightening means such as a first wing nut **96**.

A similar pivotable attachment connects the other end of stem **92** to camera **22**, which attachment includes a ball joint **100** and a second wing nut **102** for tightening. A knurled wheel **104** allows panning of camera **22** in a horizontal plane. Camera **22** comprises a small, solid state, preferably charge coupled device **98** able to secure an image at low light and preferably rated at half lux or lower, and an automatically controlled iris lens **106** so that the amount of light entering camera **22** can be automatically adjusted for correct exposure. Cable **28** is connected to camera **22** and to camera input **66** and connection **74** on the back of housing **12**.

FIG. 5 is a block diagram showing the relation of the various components of the surveillance system of the present invention. The center of the system is the video recorder **110** which includes a video component **112** and an audio component **114** each receiving input from separate sources and combining them to produce a video and audio recording on an information storage unit, preferably an 8 millimeter cassette, which cassette is not part of the present invention. The video image is generated by video camera **116** and sent to a date time generator **118**. Date/time generator **118** superimposes the data and time in digital format on the top right portion of the received image so as to interfere as little as possible with the information contained in the image. The image would normally contain a view of license plate and the a stopped vehicle, the activity of the officer as he approaches the vehicle on the left, and any testing of the individual's condition (reflexes, ability to walk, etc.) which would usually be done on the left side of the stopped vehicle. Regardless of any rewinding, pausing, erasing, rerecording or other editing, date/time generator **118** would place the date and time on the image as it is recorded so that the sequence of images could be seen in the recording and any images not in sequence detected. The purpose of date/time generator **118** is to add both useful information and credibility to the recorded images.

Video output is to monitor **120** or alternatively to an audio/video radio frequency line level output **122** for connection to a standard television antenna if it is desired to show the video cassette on a standard television having a larger screen.

The input to the audio component **114** comes from a frequency modulated, wireless transmitter **126**, preferably a small microphone clippable to a collar or shirt pocket, transmitting to a wireless receiver **128**, preferably antenna **34** of vehicle **10** which is connected by cable **36** to antenna splitter **35** to cable **37** (FIGS. **1** and **3**). The output of audio component **114** is to an audio amplifier **130** and thence to a loudspeaker **132**, both of which are located in housing **12**.

Video recorder **42** has video tape transport logic component **140** for winding the cassette spools and moving the cassette into and out of position. The cassette eject function of transport logic **140** is enabled or disabled by the position of lock **56** through video tape eject keylock switch **142**.

On the right of FIG. **5** is the combination of power on/power off and start recording/stop recording switch **144** which feeds into a timing circuit **146**. Timing circuit **146** controls the startup of the surveillance system by sequentially supplying 12 volts to the system, then switching on the power to the system and then, after a fraction of a second, switching on the recorder. The appropriate delays can be achieved using relays or high voltage, open collector output transistor circuits to pull the input to ground when activated. In turning the surveillance system off, the order of events is simply reversed but with a slightly longer delay, preferably approximately a second or longer, to rewind the video tape into the cassette, which can be achieved, for example, using a relay capable of holding an electromagnetic field a short time after power is switched off. Combining the power on/off control with the start/stop recording control into one button makes activating the surveillance system easier and quicker, which may be especially important in emergencies or at night; providing timing circuit **146** assures that the components go on and off in correct sequence and with the appropriate delay between each event.

Power is supplied by either a 12 volt DC source **150** such as the car battery or from a 120 volt AC source **152** such as ordinary household current selected by a voltage operation switch **154** and fed into a DC power supply **156** which regulates the input source of power selected. Although automobile battery power would be preferred for normal use of the present system, the flexibility of operating the system from normal household current is highly desirable since housing **12** can be removed from bracket **16** and carried into a magistrate's court, for example, to show a recording on an 8 millimeter videotape.

In use, a police officer driving vehicle **10** could have recorder **40** operating continuously with the monitor **42** turned on or off (FIGS. **1** and **2**) or could switch recorder **40** on by pressing ON/OFF button **44** when needed to record an unusual event. If camera **22** were not directed properly, horizontal adjustments can be made by turning knurled wheel **104** (FIG. **4**). Camera **22** can be easily positioned in a generally appropriate attitude by loosening first and second wing nuts **96** and **102** and pivoting camera **22** into a desired position with respect to windshield **20**, then tightening wing nuts **96** and **102** until camera **22** remains securely in place but can be moved vertically, if necessary. It has been found best to initially aim camera **22** so that the center of the hood of vehicle **10** is at the bottom center of the image on monitor **42**. A simple check of the monitor with monitor ON button **48** pressed will indicate whether the image is being recorded properly and if camera **22** is aimed properly.

It will be apparent from the foregoing description that many changes can be made in the preferred embodiment without departing from the spirit and scope of the invention, which is defined by the following claims.

What is claimed is:

1. In a vehicle having a passenger compartment and a standard radio antenna, said vehicle having a source of electrical power, a surveillance system comprising:
- camera means for obtaining motion picture images, said camera means attached to said vehicle;
- a bracket attached to said vehicle within said passenger compartment;
- a housing releasably attached to said bracket;
- means for recording said images onto removable information storage units within said housing;
- means for monitoring said images as said images are being recorded or monitoring said information storage units, said monitoring means located within said housing; and
- a switch carried by said housing and in electrical communication with said source of power, said switch activating said monitoring means, said camera means and said recording means, said switch activating said recording means after said switch activates monitoring and said camera means are activated.

2. The system as recited in claim **1**, further comprising means for superimposing date and time information on said images so that said date and time information will appear in the upper right corner of said image.

3. The system as recited in claim **1**, further comprising means for preventing said information storage units from being removed from said housing.

4. The system as recited in claim **1**, further comprising:
- means for transmitting an audio signal to said radio antenna; and
- means for imposing said audio signal received by said radio antenna onto said information storage units to correspond with said images.

5. The system as recited in claim **1**, further comprising:
- means for superimposing date and time information on said image;
- means for imposing an audio signal onto said information storage units to correspond with said images.

6. The system as recited in claim **1**, further comprising:
- means for preventing said information storage units from being removed from said housing; and
- means for superimposing date and time information on said images.

7. In a vehicle having a passenger compartment and a standard radio antenna and a source of electrical power, a surveillance system comprising:
- camera means for obtaining motion picture images, said camera means attached to said vehicle;
- a bracket attached to said vehicle within said passenger compartment;
- a housing releasably attached to said bracket;
- means for recording said images onto removable information storage units within said housing;
- means for monitoring said images as said images are being recorded or monitoring said information storage units, said monitoring means located within said housing;

means for preventing said information storage units from being removed from said housing;

means for transmitting an audio signal to said radio antenna;

means for carrying said audio signals received by said radio antenna and imposing said audio signal onto said information storage units to correspond with said images;

means for superimposing date and time information on said image so that said date and time information will appear in the upper right corner of said image; and

switching means for applying said electrical power to said system and activating said camera means, said monitoring means and said recording means, said switching means having circuitry means for delaying activation of said recording means until after said electrical power source is applied to said camera means and said monitoring means.

8. The system as recited in claim **7**, wherein said camera means further comprises a camera having a lens with an iris responding automatically to changes in the amount of ambient light.

9. The system as recited in claim **7**, wherein said camera means further comprises a camera rated at half lux or lower.

10. The system as recited in claim **8**, wherein said camera means further comprises a camera rated at half lux or lower.

11. The system as recited in claim **7**, wherein said monitoring means further comprises a switch so that said monitor may be turned off when said recording means is recording.

12. The system as recited in claim **7**, wherein said monitoring and said recording means is operated off a source of household current.

13. The system as recited in claim **7**, wherein said recording means is a video recorder having a means for ejecting said information storing units and said preventing means inhibits said ejecting means from ejecting said information storing units from said housing.

14. The system as recited in claim **7**, wherein said switching means having circuitry means for delaying activation of said recording means until after said electrical power source is applied to said system.

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