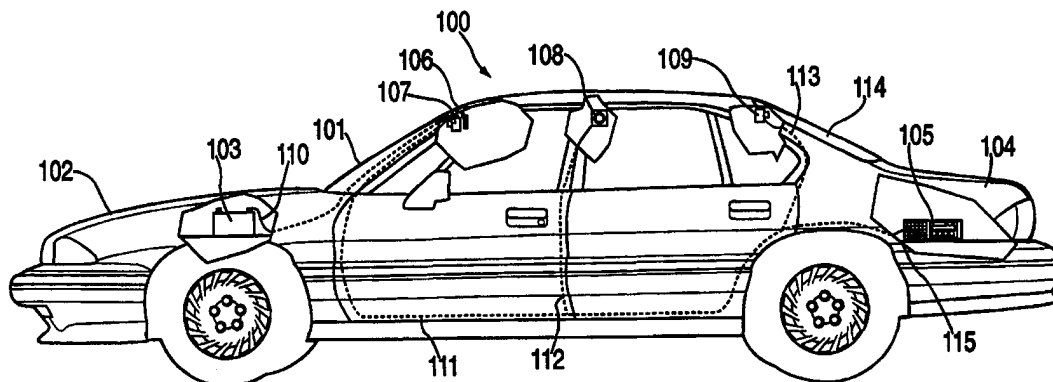




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT) -

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<p>(21) International Application Number: PCT/US98/04991</p> <p>(22) International Filing Date: 13 March 1998 (13.03.98)</p> <p>(30) Priority Data: 08/855,119 13 May 1997 (13.05.97) US</p> <p>(71)(72) Applicants and Inventors: WONG, Bill [US/US]; 135 Mimosa Drive, East Hills, NY 11576 (US). LAU, Eddie [US/US]; 746 Bonnie Drive, Baldwin Harbor, NY 11510-4521 (US).</p> <p>(74) Agent: AUFRICHTIG, Peter, D.; 5th floor, 300 East 42nd Street, New York, NY 10017 (US).</p>		<p>(81) Designated States: AM, AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LT, LU, LV, MD, MG, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TT, UA, UG, UZ, VN, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p><b>Published</b> <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p>

(54) Title: TRANSPORTATION SURVEILLANCE SYSTEM



(57) Abstract

A transportation surveillance system for a vehicle. The vehicle is capable of movement in at least a first direction. A camera or cameras (107, 108, 109) are used to record at least a portion of the field of vision of the operator in the first direction. A storage device (105) stores the visual record produced by the camera or cameras (107, 108, 109) in the storage medium (105). The cameras (107, 108, 109) and storage means (105) are operatively connected together and connected to a power source (103) so that the transportation surveillance system provides a record of the field of vision of the operator of the vehicle for review and evidentiary purposes.

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## TRANSPORTATION SURVEILLANCE SYSTEM

BACKGROUND OF THE INVENTION

The invention is generally directed to a transportation surveillance system and, in particular, to a transportation surveillance system for use in vehicles in which driver or operator error and circumstances may be recorded for later use to determine or establish fault in connection with accidents or to monitor the operator's reactions to external events and stimuli.

In many car accidents involving multiple cars there is a factual dispute between the operators and passengers of the vehicles as to the actual circumstances leading up to and causing the accident. One common example is an accident when two cars meet at an intersection and both drivers indicate that they entered the intersection on a green light. In the vast majority of these cases one of the two drivers is mistaken as traffic lights for intersecting streets, in the absence of some mechanical or electrical failure, do not provide green lights for intersecting traffic.

Generally, the two drivers and any passengers in the cars are the only witnesses to the circumstances. The factual dispute between the two drivers and witnesses has various costs both to the participants and, by extension, to the insurance companies and other drivers. Where the drivers have different versions of the situation, it is generally the question of fault to be litigated either directly between the drivers or, more

usually, between their respective insurance companies. The cost of the litigation, which can be quite substantial, often ultimately resolves on the simple question as to the state of the traffic light at the time of the accident.

Ultimately, a jury or judge must listen to the two witnesses, expert witnesses and the lawyers and make a judgment based upon the apparent veracity of the various witnesses. In practice, this procedure is unlikely to result in any reliable resolution of what actually occurred and an extremely expensive and unpredictable method. This is in part due to people's poor powers of observation, the passage of time which dulls recollections, self-interest in the position taken by each party and the desire for each party to avoid liability.

Other situations in which there are problems with the current system include situations where there is no stop light but a stop sign or yield sign affecting one of the two drivers in an accident. That driver would generally indicate that they stopped or yielded the right of way at the intersection but that the other party either was traveling at an unreasonably high rate of speed or failed to yield or stop as required.

Similarly, where a business wishes to monitor the activities of its drivers and determine whether they are safely driving without the need for or expense of placing an observer either in the company vehicle or following or monitoring the vehicle, the only alternative has been to place signs on the truck or other vehicle requesting other motorists to call a

telephone number and advise how the driver is performing. These procedures are unlikely to result in any meaningful responses except in the most severe of cases and any such reports would be highly unreliable.

Currently, certain police cars have video cameras set up to record activities from the front of the car when a policeman is going to get out of the car and wants a record of an arrest or stop and seizure. However, these systems are not generally set up to record continuously or installed so as not to interfere with the use of the vehicle.

Accordingly, there is a need for an objective, permanent record of the visual stimuli available to the operator of a vehicle to provide an evidentiary record of the facts, date and time, and circumstances occurring prior to, during and following a vehicle accident or other event. In addition, there is a need for a means to monitor the driving patterns and reactions of a driver of a vehicle in an inconspicuous fashion which would allow an observer at a remote site to review the driver's activities, either by physical removal of a storage medium for later review or by direct transmission to a remote site.

#### SUMMARY OF THE INVENTION

The invention is generally directed to a transportation surveillance system for a vehicle in which the vehicle is capable of movement in at least a first direction and has a means for visually recording at least a portion of the

field of vision of an operator of the vehicle in the first direction, along with a means for storing the visual record produced by the means for visually recording in a storage medium and means for operatively connecting the visual recording means and storage means to each other and to a power source, whereby the transportation surveillance system provides a record of the field of vision of the operator of the vehicle for review and evidentiary purposes.

A further object of the invention is to provide an improved transportation surveillance system which is capable of recording the visual stimuli available to the operator leading up to, during and following an accident.

Still another object of the invention is to provide an improved transportation surveillance system in which a video camera is placed unobtrusively near the front windshield of the car to record the driver's observations for later replay and evidentiary purposes.

Yet a further object of the invention is to provide an improved transportation surveillance system in which a series of cameras including at least a forward mounted and back mounted camera are implemented with wide angle lenses to record the field of view of the driver for later use.

Still another object of the invention is to provide an improved transportation surveillance system including a series of cameras linked to a storage recording medium for permanently or semi-permanently recording the input from the

video cameras to create a historical record of the operation of the vehicle and the surrounding environment.

Still yet a further object of the invention is to provide an improved transportation surveillance system in which a permanent record of the environment surrounding a vehicle is available in at least the direction of movement and, perhaps, in the other directions so that allocation of fault in connection with a mishap or dispute between various competing stories may be definitively established without the need for litigation.

Still a further object of the invention is to provide an improved transportation surveillance system in which the environment surrounding a vehicle is captured by one or more video cameras and the output of the video cameras are mixed into a recording equipment with extended capacity to provide a permanent or semi-permanent medium for recording such information.

Yet still another object of the invention is to provide an improved transportation surveillance system in which one or more video cameras provide a record of the visual environment of the vehicle to observe the operation of the vehicle, even in the absence of operator input.

Still other objects and advantages of the invention will, in part, be obvious and will, in part, be apparent from the specification.

The invention accordingly comprises the features of construction, combinations of elements and arrangements of parts which will be exemplified in the construction as hereinafter set forth, and the scope of the invention will be indicated in the Claims.

#### BRIEF DESCRIPTION OF THE DRAWINGS

For a fuller understanding of the invention, reference is had to the following descriptions taken in connection with the accompanying drawings, in which:

Fig. 1 is a partially cut away side elevational view of an automobile including a transportation surveillance system constructed in accordance with a preferred embodiment of the invention;

Fig. 2 is a partially schematic exploded view of a transportation surveillance system constructed in accordance with another preferred embodiment of the invention;

Fig. 3 is a front elevational view of a driver through the front windshield of a car incorporating a transportation surveillance system constructed in accordance with a preferred embodiment of the invention;

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Reference is made to Fig. 1 wherein a car, generally indicated as 100, is shown with various cut out portions to highlight the transportation surveillance system constructed in accordance with a preferred embodiment of the invention. Car 100 includes a hood 102 under which a battery 103 is found. In



addition, a trunk 104 at the rear of the car 100 includes a video recorder or other storage device 105 for storing the signals from a video camera. A rear view mirror 106 is found attached at or near to dashboard 101 on the inside of car 100. A small wide-angle video camera 107 is secured in place between the rear view mirror 106 and the dashboard 101. Similarly, a camera 108 is mounted facing toward the driver's left facing outwards on the left side of the car (driver's side in the United States). Similarly, a video camera (not shown) is similarly situated on the right side of the car to record outwardly through the side windows. A further video camera 109 is rear facing and is positioned adjacent to rear windshield 114, and generally can be placed near or attached to a rear brake light (not shown). Cameras 107, 108 and 109, as well as video recording storage device 105 are provided with electrical power from battery 103, either directly or through a fuse arrangement using electrical connecting wires 110, 111, 112, 113 and 115. In addition, the video signals from cameras 107, 108 and 109 are connected to inputs in recording device 105 through wires 111, 112, 113 and 115. The connections are shown in a schematic fashion but in practice would likely include separate power leads and signal leads in accordance with standard video and power technology. Similar connections would exist for the video camera on the right side of the car 100 not shown in Fig. 1.

In a preferred embodiment, each of the input signals from the cameras would be received by the recording device 105 which would store the inputs as a composite image of many cameras on a single screen. For example, as is often done conventionally in connection with security cameras at various locations, the video playback of the composite video would show the screens split into four quadrants, each of which has the view of one of the cameras. Depending upon the needs of a situation or preferences, the camera in the front may occupy a greater area of the screen than the other inputs based upon the relatively greater importance of this view.

In a preferred embodiment of the invention, the cameras 107, 108 and 109 are wired to the car's battery so that, upon the car ignition being turned on, the video recording system is enabled. Similarly, the video cassette recorder or other storage medium 105 stored in trunk 104 is likewise enabled and turned on as the car is started. In addition, a switch (not shown) may be added to allow the user to turn on the recording system even if the ignition is not turned on. However, in this case the system would be a drain on the car's battery over an extended period. A supplemental or back-up battery system can be used which may be a replaceable system. More preferably, the system would recharge using the car's electrical system.

Similarly, there may also be a kill switch which, in certain circumstances, might allow the system to be turned off during the operation of the vehicle. Generally, this is not

desirable for several reasons. First, in the event that the system is turned off and not turned back on, it might not record during a necessary time. Also, to the extent that the system is intended to monitor the operator's activities, it would not be desirable to allow the system to be turned off.

A large portion of the cost of automobile insurance is related to the costs of investigation and litigation relating to accidents affecting cars. The presence of a recording system of the type described above in a insured person's vehicle operating at all times would enable the insurance company to more objectively evaluate the potential liability of its insured and/or other parties so that these matters could be resolved without the need for in-depth investigation or litigation. Insurance companies could offer their insureds substantial discounts on their insurance policies in the event that the transportation surveillance system constructed in accordance with the invention are installed in their vehicles and maintained in operating order so that, upon a claim being presented, the claim would be accompanied by the relevant video tape or other storage medium. A date and time stamp should preferably be installed so that the tape's evidentiary value is increased.

The system would provide most of the benefits of the four camera system with a single camera arrangement as shown schematically in Fig. 2 constructed in accordance with another preferred embodiment of the invention. The transportation

surveillance system includes a camera 201 secured to a windshield (not shown), with a suction cup support mechanism 202 of the type often used in connection with radar detecting equipment. A video recording unit 203, which would preferably be stored in the trunk, and electrical power provided by the car battery 204, through fuse box 205, provides power to the camera 201 and video cassette recorder 203, through power cables 206 and 207, respectively. The signal from video camera 201 would be transmitted to video cassette recorder 203 through a signal cable 208. A tape 209 would be present in video cassette recorder 203.

In a currently preferred embodiment, the video cassette recorder would be located in the trunk of the car, with the wiring installed in a fashion so that it does not interfere with the use of the operation of the vehicle or the passenger's comfort. Recent advances in video recording technology have made these units ever smaller, which would allow the unit to be placed somewhere within the passenger compartment of the car, such as: the glove compartment; between the front seats; in the center arm rests between the front seats of the car; built into the dashboard of the car; in one of the doors or seat structures; or other suitable location. However, because the unit requires no intervention by the user, an out of the way location, such as a trunk, is preferred.

While the video recorder 203 is shown schematically as having a single tape, to increase the recording time of the

system a dual tape system can be utilized. This also enables there to be continuous recording. In a single tape system the system must deal with the time necessary to rewind a video tape from the end to the beginning. During this period there would be no permanent record of the conditions visible from the car. This can be dealt with in several ways. One way would be to immediately rewind the tape to the beginning following the car being turned off so that only in the event that there is a trip of a duration exceeding six or eight hours, depending upon the tape utilized, would the end of tape problem occur. Alternatively, a warning signal, such as a sound based system could be transmitted to the driver advising them that the end of the tape was imminent and that the driver should either put in a new tape or stop the vehicle for several minutes so that the tape can rewind. Obviously, in the event of an incident requiring recorded events, the tape or other medium should be removed from the recording device so that it may be preserved for evidence. In a preferred embodiment, the cameras or video recording device would place a time and date stamped on the video image at all times so that the record would be of greater evidentiary value.

In the dual tape system, where the video cassette recorder 203 has provision for two tapes there is no gap problem because when the first tape reaches the end of its run, the second tape begins to record the events going on and the first tape can then rewind. While the continuous recording has the

effect of recording over previously taped events, the date and time markings will allow easy identification of the relevant tapes and the materials which are taped over will be from a substantial time in the past. Thus, in the event that there is a situation which requires the evidentiary use of the tapes, they would be removed well before the relevant portions are recorded over.

In the vast majority of cases in which an accident occurs, the liability could be ascertained from merely the view out of the front windshield of the car, revealing the view available to the driver. Even where the car containing the transportation surveillance system is rear-ended, the visual record would reflect whether there was any erratic driving on the part of the car, such as an immediate stop or other erratic maneuver immediately before the accident which might shift liability from the traditional liability of the trailing car, impacting the car from the rear.

Reference is next made to Fig. 3 in which a video surveillance unit, constructed in accordance with a preferred embodiment of the invention is depicted. Like elements represent like reference numerals. Fig. 3 shows a windshield 101, rear view mirror 106 and camera 107 from the driver's perspective. The driver would be sitting behind steering wheel 301, along with radio controls 302, glove box 303 and dashboard 304. As noted in Fig. 3, the camera 107 is relatively unobtrusive and would not interfere materially with the driver's

field of view. In a preferred embodiment, the camera 107 would have a wide angle lens and can be attached either to the front windshield by a suction cup or attached either permanently or removably to the rear view mirror 106. In the event that it is attached to the rear view mirror, it can be attached with mating hook and pad connection members or may be bolted in place around the stem connecting the rear view mirror to either the roof of windshield 101 of the car. Generally, the wires connecting camera 107 to the battery and the video cassette recorder can be hidden so as to avoid interfering with the driver's view. The wires can be either bound around the outside of windshield 101 or extended through the ceiling panels of the car to the side of the car.

In the preferred embodiment camera 106 is a mini-video camera which could be approximately half the size of a person's palm, or approximately 4 in. x 2 in. x 1 in., with a wide angle lens having a fixed focus to obtain as broad a view of the front of the car as possible. In practice, the view should be at least as broad as that available to the driver of the car through the front windshield. In a preferred embodiment the storage device 105 is a VCR, either a single tape or dual tape arrangement, in which the machine is configured only to record, as in security surveillance systems. A sun shade may be added to the camera to cut down on glare.

The transportation surveillance system can also be used when the car is off and the driver needs, for example, to

stay in the car and can record the approaches to the car for security purposes.

As noted above, in the preferred embodiment, the preferred storage medium is a video cassette recorder. However, the video cassette recorder suffers from relatively limited storage capacity. Other, larger storage capacity devices, such as writable CD ROM technology, computer memory systems of various sorts, including hard drives, optical disks of various sorts and the like may be utilized to extend the recording capacity of the device. In addition, the video signals may be compressed or otherwise modified so as to extend the recording capacity.

The system may also have a battery back-up, which may likewise be placed in the trunk or other portion of the car which does not have substantial interference with use so that, in the event of a problem with the car's battery connection, power is not lost to the system. In the event that a user wishes to bring the recording system into a new car, such as a rental car, the system may be battery powered. Alternatively, in this scenario, the power may be accomplished through a connector jack inserted into the car's cigarette lighter.

The video camera may be placed in the grill or front of the car, although this creates the need for greater protection of the camera. The camera must then be protected against contact with flying stones or debris and collision damage which might interfere with the utility of the system.



Also, the video camera and recording system are preferably adapted for low light situations so that at night the light of the headlights is sufficient to obtain a clear picture. Finally, the camera may operate in various desired bands of the light spectrum, producing a black and white image or a color image.

The car may be configured with one, two or even four video cameras configured to record the views available to the driver as the car moves through traffic. The transportation surveillance system is equally appropriate for use in connection with other forms of transportation, such as buses, trucks, subways, railroads, boats and planes.

In addition to the storage of the visual information, it may also be transmitted, either by antenna, satellite uplink or other means directly to a remote station for review, either on a live or intermittent basis. This would be applicable in connection with a trucking company or similar entity which might wish to monitor the activities and/or location of its trucks.

Accordingly, an improved transportation surveillance system, in which the visual field presented to the operator of the vehicle is recorded for later use so that an objective determination of events relating to the use of the vehicle can be achieved.

It will thus be seen that the objects set forth above, among those made apparent in the preceding description, are

efficiently obtained and, since certain changes may be made in the above constructions without departing from the spirit and 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.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention, herein described and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

C L A I M S

WHAT IS CLAIMED IS:

1. A transportation surveillance system for a vehicle, comprising:

a vehicle, capable of movement in at least a first direction;

camera means for visually recording at least a portion of the field of vision of an operator in the first direction;

storage means for storing the visual recording produced by the camera means in a storage medium;

coupling means for operatively connecting the camera means to the storage means; and

power means for providing power to the camera means and the storage means;

whereby the transportation surveillance system provides a record of the field of vision of the operator of the vehicle for review and evidentiary purposes.

2. The transportation surveillance system of Claim 1 wherein the camera means is coupled to the inside of the vehicle.

3. The transportation surveillance system of Claim 2 wherein the camera means includes at least one camera located proximate a front windshield of the vehicle.

4. The transportation surveillance system of Claim 2 wherein the camera means includes at least two cameras, one of which faces in the first direction and a second camera that faces in a direction other than the first direction.

5. The transportation surveillance system of Claim 1 further comprising identification means, coupled to the camera means and the storage means for adding a time stamp to the visual recording.

6. The transportation surveillance system of Claim 1 wherein the storage means includes a single tape video recorder.

7. The transportation surveillance system of Claim 1 wherein the storage means includes a dual tape video recorder.

8. The transportation surveillance system of Claim 1 wherein the power means includes the vehicle's internal power system.

9. The transportation surveillance system of Claim 1 wherein the camera means includes four cameras and the storage means stores the visual recording of all of the four cameras in a split screen format.

10. The transportation surveillance system of Claim 1 wherein the camera means includes at least one camera secured to the back of a rearview mirror of the vehicle.

11. A transportation surveillance system for a vehicle, comprising:

a vehicle, capable of movement in at least a first direction, having windows on four sides, including the first direction, the direction opposite the first direction and two directions perpendicular to the first direction, said directions being referred to as the front, back and sides, respectively;

camera means, secured proximate the front window for visually recording at least a portion of the field of vision of an operator of the vehicle moving in the first direction;

storage means for storing the visual recording produced by the camera means in a storage medium;

coupling means for operatively connecting the camera means to the storage means; and

power means for providing power to the camera means and the storage means;

whereby the transportation surveillance system provides a record of a field of vision of the operator of the vehicle for review and evidentiary purposes.

12. The transportation surveillance system of Claim 11 wherein the vehicle includes a rearview mirror proximate the

front window of the vehicle and the camera means is secured to the rearview mirror facing the front window.

13. The transportation surveillance system of Claim 11 wherein the camera means includes at least two video cameras, one of which records at least a portion of the field of vision of an operator in the first direction and a second camera records at least a portion of the field of vision of an operator in a second direction, either perpendicular to or behind the field of vision of the operator in the first direction.

14. The transportation surveillance system of Claim 11 wherein the camera means includes four video cameras, each of which visually records a field of vision through one of the front window, back window and two side windows, whereby a substantially complete view of the surroundings of the vehicle are obtained.

15. The transportation surveillance system of Claim 14 wherein the storage means stores the inputs from the camera means as a split screen which simultaneously shows the visual recordings in each of the four directions.

16. The transportation surveillance system of Claim 11 wherein the coupling means includes power and data connecting

lines between the camera means, power means and the storage means.

17. The transportation surveillance system of Claim 11 wherein the power means includes the vehicle's internal power source.

18. The transportation surveillance system of Claim 11 further including switch means, coupled to the vehicle so that the transportation surveillance system is enabled when the vehicle is started.

19. The transportation surveillance system of Claim 1 wherein the storage means includes a digital memory source.

20. The transportation surveillance system of Claim 11 further comprising transmitting means for transmitting the stored visual recording produced by the camera means to a remote location.

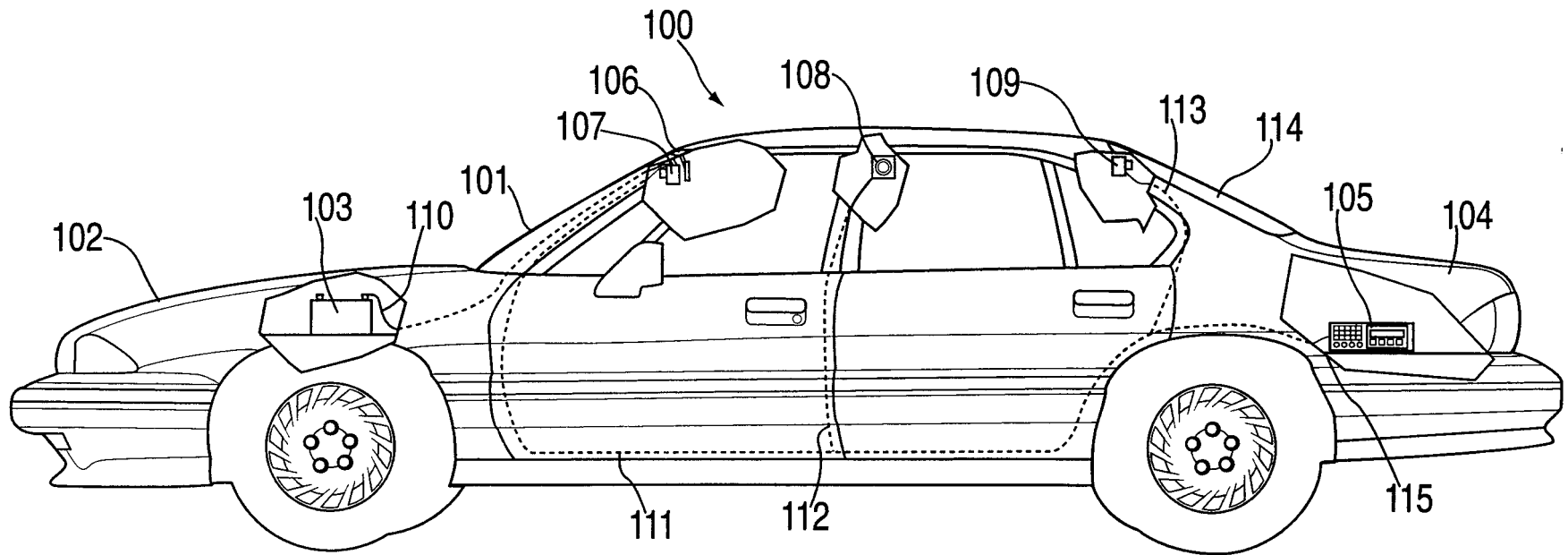


FIG. 1



2/3

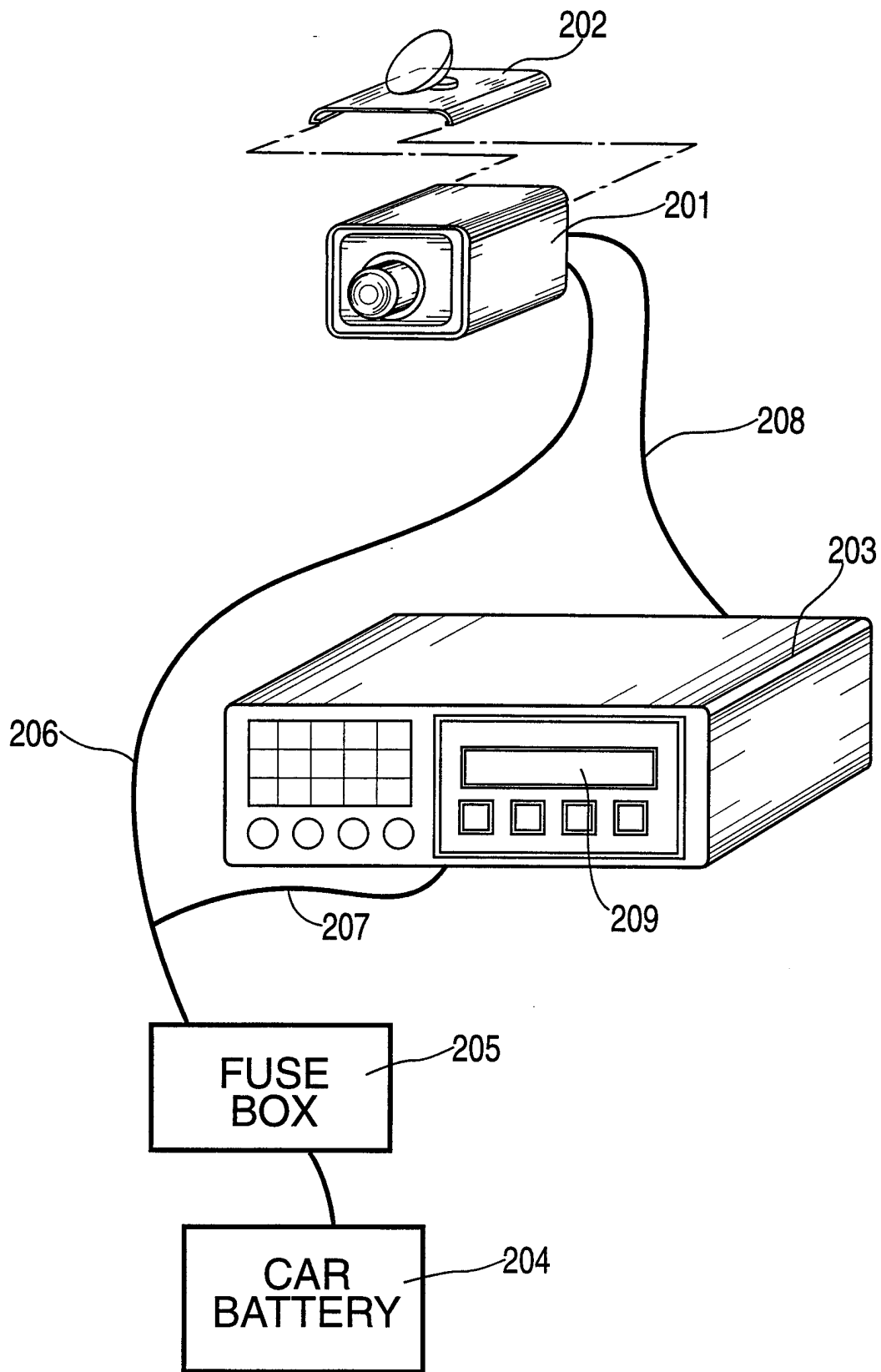


FIG. 2

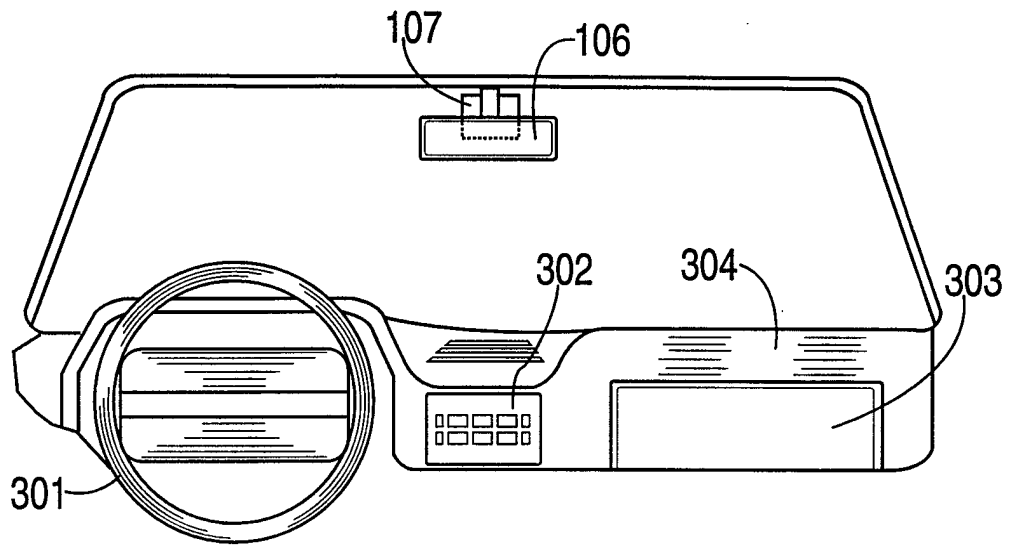


FIG. 3

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US98/04991**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(6) : H04N 7/18; G08B 23/00  
 US CL : 348/143, 148, 149; 340/500; 359/402; 360/5; 386/46  
 According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 348/46, 143, 148, 149; 340/500; 386/46; 359/402; 360/5

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

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

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**


Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X ---	US 5,570,127 A (Schmidt) 29 October 1996, col. 2, lines 45-59	1-8, 10-14, 16-18/ 9, 15, 19-20
Y, P	US 5,689,442 A (Swanson et al) 18 November 1997 col. 2, lines 17-23, col. 11, lines 48-54, col. 12, lines 5-15	
Y, P	US 5,677,979 A (Squicciarini et al.) 14 October 1997, col. 2, lines 7-67, col. 3, lines 1-43	9, 15, 19-20
Y	US 5,144,661 A (Shamosh et al.) 01 September 1992, col. 1, lines 49-68, col. 2, lines 1-42	9, 15, 19-20
Y	US 5,111,289 A (Lucas et al.) 05 May 1992, col. 1, lines 50-68, col. 2, lines 1-62	9, 15, 19-20

 Further documents are listed in the continuation of Box C.
  See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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Date of the actual completion of the international search  
01 JUNE 1998Date of mailing of the international search report  
**09 SEP 1998**

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INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US98/04991

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4,949,186 A (Peterson) 14 August 1990, col. 1, lines 55-68, col. 2, lines 1-3	9, 15, 19-20