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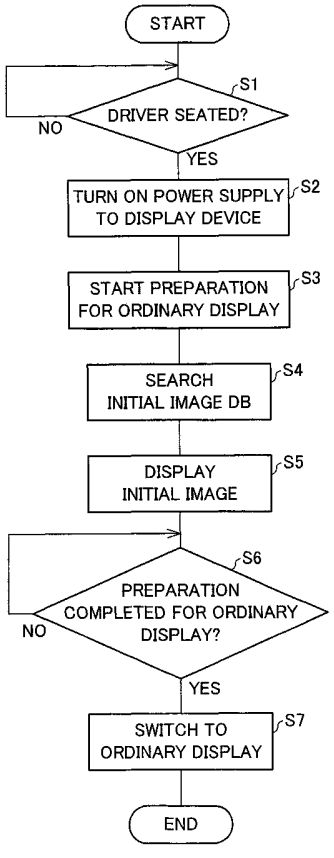

(57) Abstract: An initial image DB contains an image which will be displayed as an initial image. As the driver is seated in the driver seat, a preparation for an ordinary display is started. Simultaneously, the initial image DB is searched for the initial image. The detected initial image is displayed. The initial image is displayed until the preparation for an ordinary display completes. Upon the completion, the display is switched to the ordinary display. The invention enables a user-desired image to be displayed on a display device mounted to a vehicle immediately after startup.

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DESCRIPTION

DISPLAY DEVICE, VEHICLE, DISPLAY SYSTEM, DISPLAY COMPUTER PROGRAM, AND STORAGE MEDIUM CONTAINING SAME

TECHNICAL FIELD

The present invention relates to display devices mounted to automobiles and other types of vehicles and relates also to vehicles equipped with such a display device, display systems, display computer programs, and storage media containing the programs.

BACKGROUND ART

Onboard display devices have been very popular for some time. The device is used to display navigational information and television pictures.

An example can be found in Japanese published patent application 6-195056/1994 (Tokukaihei 6-195056; published on July 15, 1994). The patent application discloses technology to produce various displays on an onboard display device. Examples of such displays include navigational information and its operation menu, various meters,

GPS-based information, video from both external and internal sources and an operation menu for onboard AV (audio visual) equipment, audio status, images captured by camera sections, and various conditions of the vehicle. The device further doubles as a monitor for information manipulation devices.

Japanese published patent application 3-57730/1991 (Tokukaihei 3-57730; published on March 13, 1991) discloses an onboard meter display device. The device adds text and geometric patterns to a graphical (no text) display based on information from an external storage device. The device also decides display content.

Japanese published patent application 10-329627/1998 (Tokukaihei 10-329627; published on December 15, 1998) describes technology to display data from a mobile personal computer on a central cluster display device or an instrument panel display device. The central cluster display device produces a display of the status of auxiliary devices mounted to the vehicle. The instrument panel display device produces a display of the operating status of the vehicle.

Upon startup, these display devices need to load programs related to the display process and image data from which displays are produced, before a desired image is displayed. This startup process normally takes a few seconds or even longer.

For example, to display navigational information,

programs need to be loaded to run the navigation system, the current position be detected, and map information be read. These actions normally take a few seconds or more.

Conventional display devices typically display the manufacturer's logo or text saying that various information is loading, as an initial screen on the display device from a startup instruction from the user until the desired image is displayed.

However, these text and logo displays are not always attractive to the user. This is especially true when it takes long to display the desired image after the startup instruction; the user may feel offended.

DISCLOSURE OF INVENTION

To address the problems, a display device in accordance with the present invention is characterized in that it includes a display section displaying an image. The device is mounted to a vehicle. The device includes a control section replacing an initial image with a given image. The initial image is displayed on the display section from immediately after startup of the display device until the display section becomes capable of an ordinary display.

The vehicle can be any mode of transport including automobiles, motorcycles, bicycles, helicopter, aircraft, and boats and ships. The display device does not need to be fixed

to these vehicles. For example, the device may be mounted to the vehicles in such a manner that the device is attachable/detachable.

The ordinary display can be a display various contents displayed on the display device for example. Examples include gauges of the vehicle, navigational information, and television broadcast images.

According to the configuration, the control section replaces an initial image with a given image. The initial image is displayed on the display section from immediately after startup of the display device until the display section becomes capable of an ordinary display. The configuration enables a display of a user-desired image from immediately after startup until an ordinary display becomes possible, which gives a flavor to the inner and surrounding space of the vehicle.

The display device may further include an initial image storage section containing the initial image. The control section controls the initial image storage section to store an initial image which will be displayed next time the display section starts up. In the configuration, the initial image storage section stores a user-desired image. Upon next startup, the control section retrieves image from the initial image storage section for a display. The configuration enables a display of the user-desired image immediately after startup.

The display device may further include an image capture section capturing an image around the vehicle. The control section uses the image captured on the image capture section as the initial image. In this configuration, the user can instantly know what is going on around the vehicle. The configuration also enables the user to use, for example, a landscape image taken on a trip as an initial image.

The display device may further include a receiver section receiving data from another device. The control section uses an image received from the other device as the initial image. In this configuration, a user-desired image received from the other device can be used as the initial image. There are no particular limitations on the configuration of the other device transmitting an image to the display device. The other device may be a mobile phone, personal computer, or other display device with a communications function owned by the user. Alternatively, the other device may be a server containing multiple images.

The display device may further include a connecting section connecting to another device. The control section uses an image received from the other device as the initial image. According to the configuration, a user-desired image received from another device can be displayed. There are no particular limitations on the configuration of the other device connected the display device. The other device may be a digital camera

or a video camera. Alternatively, the other device may be a mobile phone, personal computer, or other device reproducing an image from a video tape, DVD, and other various storage media.

The display device may further include a read section reading data from a storage medium. The control section uses an image read from the storage medium as the initial image. In this configuration, a user-desired image can be read from the storage medium for a display as the initial image. The storage medium is not limited in any particular manner. Examples include magnetic tapes, such as video tapes and cassette tapes; magnetic discs, such as floppy (registered trademark) discs and hard disks; optical discs (magneto-optical discs), such as CD-ROMs, MOs, MDs, DVDs, and CD-Rs; memory cards, such as IC cards and optical cards; and semiconductor memories, such as mask ROMs, EPROMs, EEPROMs, and flash ROMs. The provision of the read section reading information stored on the storage medium enables the image contained in the storage medium to be used as the initial image.

The display device may further include an image storage section containing multiple images. The control section retrieves and uses any one of the multiple images contained in the image storage section as the initial image. In this configuration, a user-desired image is retrieved from the

image storage section for a display as the initial image.

The display device may be such that the control section resizes the initial image in accordance with a size of a display area of the display section. In this configuration, the displayed image fits in the size of the display area of the display section.

The display device may be such that the control section displays the initial image in a part of the display area of the display section and colors an entire remaining part of the display area. This, for example, improves the visibility of the initial image.

The display device may further include a color distribution association table containing preferred combinations of color distributions of initial images and colors in which the remaining part of the display area is entirely colored. The control section detects the color distribution of the initial image and references the color distribution association table for a color combination to determine a color in which the remaining part of the display area is entirely colored.

According to the configuration, the control section can select a suitable color in which the surrounding area of the initial image is entirely colored. The preferred combinations are not limited in any particular manner. For example, the combinations may be predetermined and they associate the

color of the initial image and the color in which its surroundings are entirely colored and which is believed to enhance the visibility of the initial image from various statistical and other data. The user may make preset his favorite color combinations.

The display device may further include a decorative image storage section containing decorative images decorating the initial image. The control section selects one of the decorative images which matches the initial image from the decorative image storage section and produces a composite image from the initial image and the selected decorative image for a display. According to the configuration, the control section can add a suitable decoration to the initial image. The decorative image is not limited in any particular manner. For example, the decorative image may be a frame around the initial image.

The display device may further include a rearrangement storage section containing a pattern according to which the display area of the display section is divided into multiple subareas. The control section produces a composite image from multiple images and the pattern contained in the rearrangement storage section for use as the initial image. According to the configuration, the initial image can be produced from multiple images arranged in a suitable manner.

The display device may be such that when the initial image has been displayed on the display section for a predetermined period after the startup of the display device, the control section switches a display on the display section to the ordinary display. According to the configuration, the control section replaces the initial image with ordinary display in a suitable manner when the predetermined period has elapsed. Therefore, for example, the display can be smoothly switched to the ordinary display without any user manipulations at all.

For example, the display device may further include a time measurement section measuring an elapsed time. The control section switches the display on the display section to the ordinary display when a preset time has elapsed after the startup of the display device.

The display device may be such that: the display section includes a liquid crystal display element; the display device further includes a temperature sensor section detecting a temperature of the liquid crystal display element; and the control section switches the display on the display section to the ordinary display when the temperature of the liquid crystal display element has reached a predetermined temperature or higher.

When the display section includes a liquid crystal panel and is used at low ambient temperatures, the liquid crystal

element may exhibit low response speed which can be insufficient for a moving picture display and fail to produce a proper display. According to the configuration, a user-desired image can be displayed until the temperature of the liquid crystal display element rises beyond the predetermined temperature and becomes capable of a suitable display.

The display device may be such that the control section controls to display the initial image in a part of the display area even after the display is switched to the ordinary display. Thus, even after the display is switched to the ordinary display, the user's favorite image can be displayed in a part of the display area.

The display device may further include a transmitter section transmitting data to another device. The control section transmits the initial image to another device. Thus, the user-desired image can be transmitted to another device. Therefore, for example, the desired image can be commonly displayed on multiple devices owned by the user.

The display device may be such that the control section cuts out a part of the initial image for a transmission to another device. The configuration enables the control section to cut out a part of the image which matches the size needed on another device and send the cutout to that device.

The display device may further include a manual input section receiving a user instruction. The control section

determines the cutout part of the initial image in accordance with a user instruction. In this configuration, the user can cut out a necessary part of the image for a transmission to another device.

The display device may be such that the control section determines the cutout part of the initial image in accordance with a size of a display area of a display section of a device to which the cutout part will be transmitted. In this configuration, a part of the initial image which matches the display size on the device to which the part will be transmitted can be cut out and transmitted.

The display device may further include a manual input section receiving a user instruction. The control section replaces the initial image in accordance with a user instruction entered through the manual input section. According to the configuration, the user can directly select a desired image. This ensures that the user-desired image is displayed.

A vehicle in accordance with the present invention is characterized in that it includes any one of the above display devices. The vehicle here refers to any mode of transport carrying people, including automobiles, motorcycles, bicycles, helicopters, aircraft, and boats and ships. The display device does not need to be fixed to these vehicles. For example, the device may be mounted to the vehicles in such a manner that

the device is attachable/detachable.

According to the configuration, the user-desired image can be displayed on the startup of the display device. This gives a suitable flavor to the inner and surrounding space of the vehicle.

The vehicle may further include an embarkation sensor section detecting an embarkation of a passenger. The control section for the display device controls the display device to start up when the embarkation sensor section has detected an embarkation of a passenger.

According to the configuration, when a passenger gets in the vehicle, the display device starts up, and the user-desired image is displayed. The passenger can see the desired image immediately after he gets into the vehicle.

The vehicle may further include: a power generation section; and a startup instruction sensor section detecting a startup instruction to the power generation section. The control section for the display device controls the display device to start up when a startup instruction to the power generation section is detected. According to the configuration, in response to a startup instruction to the power generation section in the vehicle, the display device starts up, and the user-desired image is displayed.

The vehicle may further include: a door; a lock section locking the door; and an unlock sensor section detecting an

unlock action of the lock section. The control section for the display device controls the display device to start up when an unlock action is detected.

According to the configuration, when the door is unlocked, the display device starts up, and the user-desired image is displayed.

The vehicle may further include: a power generation section; and a startup instruction sensor section detecting a startup instruction to the power generation section. The control section for the display device switches a display on the display device to the ordinary display when a startup instruction to the power generation section is detected.

According to the configuration, when a startup instruction to the power generation section is detected, the display on the display section is switched to the ordinary display. Therefore, while the vehicle is moving, the display device shows the ordinary display.

The vehicle may further include: a gear change section; and a gear change instruction sensor section detecting a manual input to the gear change section. The control section for the display device switches a display on the display device to the ordinary display when a manual input to the gear change section is detected.

According to the configuration, when there is a manual input to the gear change section, the display on the display

section is switched to the ordinary display. Therefore, while the vehicle is moving, the display device shows the ordinary display.

The vehicle may further include a status sensing section detecting status of vehicle components. The control section switches a display on the display device to the ordinary display when detection of the status of the vehicle components is completed.

According to the configuration, the user-desired image can be displayed until the detection of the status of the vehicle components completes.

To address the problems, a display system in accordance with the present invention is characterized in that it includes a display device mounted to a vehicle. The device includes: a display section displaying an image; a control section replacing an initial image with a given image, the initial image being displayed on the display section immediately after startup; and a communications section performing data communications with another device. The system also includes another device including a communications section performing data communications with the display device. The control section replaces the initial image in accordance with data from the other device.

According to the configuration, when the display device starts up, the display device can display an image sent from

another device. Thus, for example, a user-desired image is transmitted from the other device and received as the initial image. The user-desired image can be displayed.

The display system may be such that: the control section transmits to the other device an image request signal requesting a transmission of a desired image and uses the image received from the other device as the initial image; and the other device includes: a server image storage section containing multiple images; and a server control section detecting an image from the images in the server image storage section in accordance with the image request signal from the display device and transmitting the detected image to the display device.

According to the configuration, the user-desired image can be obtained from the server image storage section for use as the initial image displayed on the startup of the display device. This ensures that the user-desired image is displayed on the startup of the display device.

The display system may be such that: the display device includes a manual input section receiving a user instruction input; the control section for the display section transmits to the other device a signal corresponding to a key word for a user-desired image entered through the manual input section as the image request signal; and the server control section detects an image in accordance with the key word and

transmits the detected image to the display device.

According to the configuration, an image in accordance with the key word entered by the user is detected in the server image storage section and used as the initial image displayed upon the startup of the display device.

The display system may be such that: the other device includes: a second image display section displaying an image; and a second control section controlling the second image display section to display a particular image under predetermined conditions and to replace the particular image with a given particular image; the second control section transmits the new particular image to the display device when the old particular image is replaced; and the control section for the display device uses an image in accordance with the image transmitted from the other device as the initial image.

The image displayed under predetermined conditions refers to, for example, the initial image displayed immediately after the startup of the other device, a wallpaper image always shown as the background of the display area, and an image shown when there is no input signal for a predetermined period.

According to the configuration, when the particular image is replaced, the second control section transmits a substituting particular image to the display device. The control section for the display device sets up an image in

accordance with the image received from the other device as the initial image. Therefore, the image displayed on the other device under predetermined conditions can be associated with the initial image for the display device. For example, Therefore, for example, the desired image can be commonly displayed on the onboard display device and on other devices (for example, mobile phone and personal computer) owned by the user.

The display system may be such that the other device includes: a second image display section displaying an image; and a second control section controlling the second image display section to display a particular image under predetermined conditions and to replace the particular image with a given particular image. The control section for the display section transmits a substituting initial image to the other device when the initial image is replaced. The second control section uses an image in accordance with the image transmitted from the display device as the particular image.

According to the configuration, when the initial image is replaced, the control section transmits a substituting initial image to the other device. The second control section sets up an image in accordance with the image received from the display device as the particular image. Thus, the initial image for the display device can be associated with the image displayed on the other device under predetermined

conditions.

To address the problems, a display system in accordance with the present invention is characterized in that it includes: a display device; a second display device; and a server device. The display device includes: a display section displaying an image; a control section replacing an initial image with a given image, the initial image being displayed on the display section immediately after startup; and a communications section performing data communications with another device. The second display device includes: a second image display section displaying an image; a second control section controlling the second image display section to display a particular image under predetermined conditions and to replace the particular image with a given particular image; and a second communications section performing data communications with another device. The server device includes: a server image storage section containing multiple images; a server communications section performing data communications with another device; and a server control section searching the server image storage section for an image in accordance with an image request signal received from another device. The second display device includes a second manual input section receiving a user instruction input. The second control section transmits to the server device an image request signal requesting the server device to

transmit a user-desired image as instructed through the second manual input section and sets up the image received from the server device as the particular image. The server control section transmits to the second display device and the display device the image in accordance with the image request signal transmitted from the second display device. The display control section for the display device uses the image received from the server device as the initial image.

According to the configuration, when the second display device requests the server image storage section to transmit a user-desired image, the user-desired image is transmitted to both the second display device and the display device. The second display device receives the image and sets it up as the image displayed under the predetermined conditions. The display device receives data about an identical image for use in a display of the initial image. Therefore, the user-desired image can be commonly displayed on multiple display devices.

To address the problems, a display system in accordance with the present invention is characterized in that it includes: a display device; a second display device; and a server device. The display device includes: a display section displaying an image; a control section replacing an initial image with a given image, the initial image being displayed on the display section immediately after startup; and a communications section performing data communications with another device.

The second display device includes: a second image display section displaying an image; a second control section controlling the second image display section to display a particular image under predetermined conditions and to replace the particular image with a given particular image; and a second communications section performing data communications with another device. The server device includes: a server image storage section containing multiple images; a server communications section performing data communications with another device; and a server control section searching the server image storage section for an image in accordance with an image request signal received from another device. The display device includes a manual input section receiving a user instruction input. The control section for the display device transmits to the server device an image request signal requesting the server device to transmit a user-desired image as instructed through the manual input section and sets up the image received from the server device as the initial image. The server control section transmits to the second display device and the display device the image in accordance with the image request signal received from the display device. The second control section for the second display device uses the image received from the server device as the particular image.

According to the configuration, when the display device

has requested the server image storage section to transmit a user-desired image, the user-desired image is transmitted to both the second display device and the display device. The second display device receives the image and sets it up as the image displayed under the predetermined conditions. The display device receives data about an identical image for use in a display of the initial image. Therefore, the user-desired image can be commonly displayed on multiple display devices.

The display system may be such that upon receiving the image request signal, the server control section transmits the image in accordance with the image request signal to the display device and the second display device after resizing the image in accordance with sizes of display areas of the display sections of the display devices.

According to the configuration, the server control section transmits the requested image after resizing it in accordance with the sizes of the display area of the display sections of the display device and the second display device. Therefore, each display device can display the user-desired image which suitably fits in its display area.

To address the problems, a computer program in accordance with the present invention controls a computer provided to a display device to function as a control section for the display device.

By the computer loading the program, the computer can

replace the control section, implementing the processing for the display device.

By recording the computer program on a computer-readable storage medium, the program can be readily stored and distributed. By reading the storage medium, a computer can replace the control section, implementing the processing for the display device.

The present invention, conceived to address the problems, has an objective to provide an onboard display device capable of producing an image display needed by the user immediately after startup. Other objectives involve providing a vehicle equipped with such a device, a display system, display computer program, and a storage medium containing the program.

BRIEF DESCRIPTION OF DRAWINGS

Figure 1 is a flow chart illustrating an initial image display process on a display device of in accordance with an embodiment of the present invention.

Figure 2 is a schematic block diagram illustrating the configuration of a display device in accordance with an embodiment of the present invention.

Figure 3 is a plan view illustrating an example of positions of image capture means which is part of a display device in accordance with an embodiment of the present

invention.

Figure 4 is a flow chart illustrating an initial image recording process on a display device in accordance with an embodiment of the present invention.

Figure 5 is a flow chart illustrating a change in size of an initial image on a display device in accordance with an embodiment of the present invention.

Figure 6 is a flow chart illustrating a process of producing a colored display across the entire display area except an initial image on a display device in accordance with an embodiment of the present invention.

Figure 7 is a flow chart illustrating an example of a process of continuously producing an initial image, although only in a part of the display area, on a display device in accordance with an embodiment of the present invention after the startup process proceeds as far as to the production of an ordinary display.

Figure 8 is a flow chart illustrating another example of a process of continuously producing an initial image, although only in a part of the display area, on a display device in accordance with an embodiment of the present invention after the startup process proceeds as far as to the production of an ordinary display.

Figure 9 is a flow chart illustrating a display device startup process in accordance with an IR signal as a door

unlock instruction on a display device in accordance with an embodiment of the present invention.

Figure 10 is a flow chart illustrating an example of a switching process from an initial display to an ordinary display on a display device in accordance with an embodiment of the present invention.

Figure 11 is a flow chart illustrating another example of a switching process from an initial display to an ordinary display on a display device in accordance with an embodiment of the present invention.

Figure 12 is a flow chart illustrating a further example of a switching process from an initial display to an ordinary display.

Figure 13 is a flow chart illustrating a process of directly displaying an image captured by image capture means on display means on a display device in accordance with an embodiment of the present invention. The image is not stored on initial image storage means.

Figures 14(a), 14(b) are flow charts illustrating a process of using an image obtained from a server to produce an initial image on a display device in accordance with an embodiment of the present invention. Figure 14(a) depicts the process as it is implemented on the display device. Figure 14(b) depicts the process as it is implemented on the server.

Figure 15 is a flow chart illustrating a process of laying

out a set of images in a display area to produce an initial image on a display device in accordance with an embodiment of the present invention.

Figure 16 is a flow chart illustrating a process of using an image specified as the wallpaper through another device as the initial image on a display device in accordance with an embodiment of the present invention.

Figure 17 is a flow chart illustrating a process of establishing a display system by connecting a display device in accordance with an embodiment of the present invention to a server and another display device, for example, over a network. The chart further illustrates a process of using an image stored in the server on the display devices in an associated manner.

Figure 18 is a flow chart illustrating a process of cutting out a part of an initial image on a display device in accordance with an embodiment of the present invention. The cutout is transmitted to another device for use there.

Figure 19 is a block diagram illustrating a configuration example of a server which becomes a part of a display system when connected to a display device in accordance with an embodiment of the present invention, for example, over a network.

Figure 20 is a block diagram illustrating a configuration example of a mobile phone which becomes a part of a display

system when connected to a display device in accordance with an embodiment of the present invention, for example, over a network.

Figure 21 is a cross-sectional view illustrating a configuration example of an image capture section in a display device in accordance with an embodiment of the present invention.

Figures 22(a) to 22(c) are plan views illustrating an example of positions of image capture sections which is part of a display device in accordance with an embodiment of the present invention.

BEST MODE FOR CARRYING OUT THE INVENTION

An embodiment of the present invention will be described.

Figure 2 is a block diagram schematically illustrating a configuration of a display device 1 in accordance with the present embodiment. A display device 1 is mounted to an onboard instrument panel. The device 1 displays a speedometer and other gauges, as well as various information fed from a navigation system. The display device 1 is adapted to allow a free choice of an initial image which is displayed on startup.

The vehicle to which the display device 1 is mounted has a vehicle check means, or status sensing means sensing the

status of vehicle components. Immediately after the engine is started, the means checks if there are any components that might disrupt normal driving. Items to be checked include reduced tire pressure, insufficient fuel, reduced amounts of brake oil, engine oil, and other oils, and insufficient cooling water. Results of the checks are displayed on the display device 1.

Still referring to Figure 2, the display device 1 includes an image capture section 11, a communications section 12, a display section 13, a manual input section 14, a storage-data storage section 15, an initial image DB 16, a memory section 17, a color distribution association table 18, sensors 19, and a control section 20.

The image capture section 11 captures images around the vehicle. In the present embodiment, the image capture section 11 is cameras with a wide angle lens capable of image capture within predetermined angles.

There are no particular limitations on where the image capture section 11 is mounted or how many cameras are involved. See Figure 3 for an example of its arrangement. In Figure 3, broken lines indicate widest possible image capturing angles for the cameras.

In Figure 3, the image capture section 11 is attached onto the roof as an example. The cameras sit facing the front, back, left, and right to avoid the occurrence of any blind

corners. The images captured by the Figure 3 four-camera image capture section 11 may be used, for example, for the driver to check safety around the vehicle while driving, starting, or stopping. The Figure 3 arrangement of the image capture section 11 has an advantage: the cameras, attached to the roof, rarely touch anything or become displaced while the vehicle is moving.

The communications section 12 exchange data with other devices, such as a server, a mobile phone, and a personal computer. To describe it in more detail, the communications section 12 converts data to be transmitted into suitable data for a transmission in accordance with an instruction from the control section 20. The section 12 then transmits the converted data to another device via a communication antenna 12a. The communications section 12 also converts data received from another device via the communication antenna 12a to suitable data for processing by the control section 20. These series of actions enables the display device 1, for example, to exchange an image with another device.

The display section 13 displays an image in accordance with an instruction from the control section 20. The display section 13 in accordance with the present embodiment is a liquid crystal panel (display panel built around a liquid crystal display element). The panel has a super-wide screen:

its aspect ratio, or the ratio of width to height of the display area, is 7:3. The screen is 7/3 times as wide as it is high. The section 13 is provided as an instrument panel to show a speedometer, a tachometer, a fuel gauge, and other gauges. In addition to the gauge display, the display section 13 is also capable of, for example, showing navigational information, those images captured by the image capture section 11, and those received from another device.

The manual input section 14 receives a user instruction and passes it on to the control section 20. The manual input section 14 has a set of input keys. The user can give various instructions to the control section 20 via these input keys.

The storage-data storage section 15 is built around, for example, a hard disk. The section 15 is a memory (storage means) storing, for example, the images captured by the image capture section 11 and those received from other devices.

The initial image DB (database) 16 is storage means storing initial images which are displayed on startup. It is built around, for example, a flash memory.

The memory section 17 contains a decorative image DB 17a, an image DB 17b, and a key word DB 17c. The decorative image DB 17a stores many decorative images, or component images. The decorative images are displayed around an initial image for decorative purposes. An example is an image of a

frame surrounding the initial image. The image DB 17b stores either landscape and other images or map information and associated images and data. The DB 17b also stores fixed image information (detailed later). The key word DB 17c stores key words related to those images which are wanted by the user. The key words are entered through the manual input section 14.

The color distribution association table 18 stores information based on which a color is determined. The color is used, for example, to fill the display area around an image shown on the display section 13. Details will be given later. The color distribution association table 18 is built around, for example, a hard disk.

The sensors 19 include, for example, various kinds of sensors detecting vehicle status and user instructions to the vehicle. Some of the examples are an ignition instruction sensor (startup instruction sensor means) 19a sensing the manipulation of an ignition key (startup means); a gear lever sensor (gear change instruction sensor means) 19b sensing the condition (position) of the gear lever (gear change means); an unlock sensor (unlock sensor means) 19c sensing unlocked driver seat door; a timer 19d showing the time and an elapsed time; an IR signal sensor section 19e sensing IR signal (infrared signal); a temperature sensor (temperature sensor means) 19f sensing the temperature of the display section 13;

and a seating sensor (embarkation sensor means) 19g sensing a seated driver.

The control section 20 is a CPU (central processing unit) handling all data processing, control, and judgement in the display device 1. The control section 20 contains a display control section 20a controlling the display state of the display section 13; a storage-data obtain section 20b obtaining an image from the storage-data storage section 15; and a data obtain section 20c obtaining various data from the initial image DB 16, the memory section 17, and the color distribution association table 18.

The control section 20 measures, through the temperature sensor 19f, the temperature of the liquid crystal element which is part of the liquid crystal panel being used as the display section 13. On the basis of the temperature measurement, the section 20 detects the time it takes for the response speed of the liquid crystal panel to reach a suitable value for use. To describe it in more detail, in a memory section (not shown) of the control section 20 are there recorded in advance the required temperature for the liquid crystal panel (display section 13) to give a predetermined response speed; the quantity of heat given per unit time from the backlight (not shown) to the liquid crystal panel; and the thermal capacitance of the liquid crystal panel. The control section 20 calculates the time it takes for the response speed

of the liquid crystal panel to reach a suitable value for use, from the temperature of the liquid crystal panel as measured through the temperature sensor 19f and the information recorded in the memory section. Heating means other than the backlight may be provided to heat the display section 13. When this is the case, the memory section contains in advance the quantity of heat given per unit time from the backlight and the heating means and the thermal capacitance of the liquid crystal panel. The section 20 calculates the time it takes for the response speed of the liquid crystal panel to reach a suitable value for use, based on the recorded information.

Now, a process will be described for the initial image setting and display on the display device 1. Figure 1 is a flow chart illustrating an initial image display process by the display device 1.

As in the figure, the control section 20 monitors if the driver is in the driver seat, through the seating sensor 19g (S1). The seating sensor 19g is provided beneath the cover sheet of the driver seat. The sensor 19g detects the driver seated in the driver seat by detecting a load exerted onto the driver seat.

Upon the detection of the seated driver (Yes in S1), the control section 20 turns on a power supply to the display device (S2). The power supply is a primary power supply for

the display device 1 which turns the display section 13, the image capture section 11, etc. into an operation state. Electric power driving display device 1 is fed from an engine startup battery of the vehicle to which the display device 1 is mounted. In the display device 1, when the power supply (primary power supply) is off, the battery still provides electric power so that, for example, the sensors 19 can detect various information, the communications section 12 can receive incoming information, the manual input section 14 can receive a user command to turn on the power supply, and the control section 20 can process these kinds of information.

If the driver has not been seated (No in S1), the control section 20 continues to monitor if the driver is in the driver seat.

Next, the control section 20 starts a preparatory process for an ordinary display. Concretely, in the process, computer programs are obtained which will display a speedometer and other gauges, navigational information, vehicle check results, etc. Various data, etc. are also obtained which are needed for the display of these objects (S3). The display device 1 includes a memory means (not shown) containing computer programs executed by the control section 20 to perform various processes. The control section 20 reads out the programs from the memory means to perform the processes. The control section 20 has storage means (not shown) storing

programs to implement various processes. The section 20 reads out the programs from the storage means to execute various processes. The control section 20 has position sensor means (not shown) based on the GPS or global positioning system. The section 20 collects information on the current position needed for a navigational display through the position sensor means.

In parallel with the execution of the startup process for the system, the control section 20 searches the initial image DB 16 for an initial image and retrieves the image (S4). The initial image DB 16 stores in advance initial images which will be displayed on startup. Storing an initial image in the initial image DB 16 will be detailed later.

The control section 20 displays the initial image retrieved from the initial image DB 16 on the display section 13 (S5).

Next, the control section 20 determines whether the preparation for an ordinary display has completed (S6). Concretely, the section 20 determines whether the obtaining has completed of the computer programs which will display a speedometer and other gauges, navigational information, vehicle check results, etc. and of the various data, etc. which is needed for the display of these objects. The section 20 also determines whether the temperature of the display section 13 has reached a value at which a predetermined response speed

is available.

If the preparation for an ordinary display has not completed yet, the section 20 continues to reproduce the initial screen on the display section 13, while standing by until the preparation completes.

On the other hand, if the preparation for an ordinary display has completed, the control section 20 switches the display on the display section 13 from the initial screen to an ordinary screen (S7). Concretely, the section 20 terminates the initial image display to show a speedometer and other gauges, navigational information, vehicle check results, etc. The control section 20 thus ends the initial image display process.

Now, a process will be described for storing images which will be displayed as initial images in the initial image DB 16.

Figure 4 is a flow chart illustrating an example of a process for storing an image captured by the image capture section 11 in the initial image DB 16 as an initial image.

First, the control section 20 captures an image of the surroundings on the image capture section 11 in accordance with an image capture instruction from the user (S11). The captured image is temporarily saved in a RAM (temporary storage means) (not shown).

Next, the control section 20 determines whether the

captured image is to be used as an initial image (S12). The determination is made in accordance with an instruction entered by the user through the manual input section 14.

If the captured image is not to be used as an initial image (No in S12), the control section 20 transfers the captured image from the RAM to the storage-data storage section 15 (S13), thereby ending the process.

On the other hand, if the captured image has been selected as an initial image (Yes in S12), the control section 20 resizes the captured image so that it fits in the display area of the display section 13 (S14).

The control section 20 then stores the resized image in the initial image DB 16 (S15), thereby ending the process. When a new image is stored in the initial image DB 16 in S15, the old initial image may be either erased from the initial image DB 16 or transferred to the storage-data storage section 15.

As discussed in here, the display device 1 in accordance with the present embodiment reproduces the initial image from the initial image DB 16 and shows it on the display section 13 starting immediately after the startup (turn-on of the power supply) of the display device 1 until the preparatory process for an ordinary display completes at which moment the display switches to an ordinary display. Concretely, in the preparatory process, computer programs are obtained which

will display a speedometer and other gauges, navigational information, vehicle check results, etc. Various data, etc. are also obtained which are needed for the display of these objects.

This display of the user-desired image on the display section 13 until an ordinary display becomes possible gives a flavor to the inner space of the vehicle.

In the display device 1, the initial image DB 16 contains in it user's favorite images captured through the image capture section 11. This enables the user to use, for example, a landscape image taken on a previous car trip as an initial image. If the image capture section 11 includes a camera with a wide angle lens or an omnidirectional camera, the user can take, for example, a wide landscape image on a trip. Reproducing such a landscape image on a super-wide screen having a display area with a 7:3 aspect ratio as in the present embodiment provides a vivid, highly real display, which adds an extra flavor to the inner space of the vehicle. The present embodiment assumes a super-wide screen having a display area with an aspect ratio of 7:3. The embodiment is however not limited to this ratio.

An image may be resized to fit in the display area of the display section 13 before being stored in the initial image DB 16 as an initial image. Alternatively, the image may be stored without undergoing resizing. Such an image can be resized

when reproduced on the section 13. The image be resized at a uniform ratio across the entire image or at different ratios for the width and height.

Figure 5 is a flow chart illustrating a process for reproducing an initial image in an initial image DB 16 after resizing.

As described in the figure, the control section 20 monitors if the driver has been seated in the driver seat, through the seating sensor 19g (S21).

Upon the detection of the seated driver (Yes in S21), the control section 20 turns on a power supply to the display device (S22). If the driver has not been seated (No in S21), the control section 20 continues to monitor if the driver has been seated.

Next, the control section 20 starts a preparatory process for an ordinary display. Concretely, in the process, computer programs are obtained which will display a speedometer and other gauges, navigational information, vehicle check results, etc. Various data, etc. are also obtained which are needed for the display of these objects (S23).

In parallel with the execution of this preparatory process for an ordinary display, the control section 20 searches the initial image DB 16 for an initial image (S24).

The control section 20 then retrieves an initial image from the initial image DB 16 (S25) and detects an image size

for that initial image (S26).

Further, the control section 20 calculates an image resizing amount (new image size) so that the initial image fits in the display area of the display section 13 (S27). The initial image DB 16 may hold, for example, initial images with an aspect ratio of 3:4 captured on a mobile phone and those with an aspect ratio of 5:4 which is the ordinary screen size of the personal computer. Both of these aspect ratios are changed to 7:3 which is the aspect ratio of the display area of the display section 13. Alternatively, if the initial image has 1280 pixels by 1024 pixels (equivalent to the personal computer display screen) or 1224 pixels by 1632 pixels (equivalent to the mobile phone display screen) for example, the section 20 may calculate the image resizing amount so that the horizontal and vertical pixel counts of the initial image match the horizontal and vertical pixel counts on the display section 13.

The control section 20 then resizes the initial image based on the calculated image resizing amount (S28).

The control section 20 reproduces the resized initial image on the display section 13 (S29). Then, steps similar to S6 and its subsequent steps in Figure 1 are performed before ending the process.

This resizing of the initial image retrieved from the initial image DB 16 before its reproduction on the display section 13 enables efficient use of the display area of the

display section 13 in displaying the initial image even when, for example, the initial image in the initial image DB 16 dose not match the display area of the display section 13 in size.

The description so far has assumed that the initial image is resized to fit in the display area of the display section 13. Alternatively, the initial image may be resized to exactly fill up the entire display area. Also, the initial image may be resized to appear only in a part of the display area.

The initial image in the initial image DB 16 may be displayed without resizing even when the initial image dose not match the display area of the display section 13 in size. When this is the case, for example, either a part of the initial image may not appear on the display section 13 or no image may appear on a part of the display area (blank area).

For example, if the initial image in the initial image DB 16 has a different aspect ratio from that of the display area of the display section 13, the initial image may be displayed without changing the aspect ratio. A part of the display area may appear blank, showing no image.

The blank area may display a background color or background image. For example, the blank area may be entirely colored or display a background image (monotone image, geometric pattern, etc.) which would not adversely affect visual recognition of the initial image. Alternatively, the control section 20 may decide on the background color or the

color of the background image based on the color distribution of the initial image.

A composite image of an initial image and a frame image may be displayed. Frame images matched with initial image sizes are stored in the decorative image DB 17a in advance.

A composite initial/frame image may be displayed along with the entire blank area being colored in the color decided on by the control section 20 in accordance with the color distribution of the initial image. Figure 6 is a flow chart illustrating a process to realize this. The processing up to the retrieval of the initial image from the initial image DB 16 and the detection of the image size is identical to the processing performed in S21 to S26 in Figure 5. The processing is not depicted from Figure 6.

After the retrieval of the initial image and the detection of the image size of the initial image, the control section 20 calculates the color distribution of the initial image (S41).

Next, the control section 20 determines a color in which the blank area will be entirely colored in accordance with the calculated color distribution of the initial image (S42). To describe it in more detail, the most frequently used color is extracted from the calculated color distribution. A color (or colors) suited to the extracted color is determined by searching the color distribution association table 18. The entire blank area will be colored in that color. Here, suppose

that the color distribution association table 18 contains combinations of the most frequently used colors in the initial images (color distribution of the initial images) and the colors, suited to those colors, in which the entire image will be colored. For example, the latter colors background colors of the same hue as the most frequently used colors in the initial images and enhance the visibility of the initial images or do not adversely affect the visibility of the initial images. If no color combination is recorded for the most frequently used color in the initial image for example, a combination may be identified to determine a color which is suited to the second most frequently used color. The blank area may be entirely colored in that color. Alternatively, the blank area may be entirely colored in a predetermined color (for example, black).

Next, the control section 20 calculates an image resizing amount for the initial image (S43). Here, for example, it would be sufficient if the image resizing amount is calculated so that the initial image can fit either horizontally or vertically in the display area. The aspect ratio of the initial image does not have to be changed.

The control section 20 resizes the initial image based on the calculated image resizing amount (S44).

Next, the control section 20 produces an image to fill the area where the initial image does not appear (blank area). The section 20 then produces a composite image of this image and

the initial image (S45).

Next, the control section 20 detects a frame image (associated frame image) which matches the image size/aspect ratio of the initial image (S46). Here, suppose that the decorative image DB 17a contains in advance many frame images for each image size (and/or each aspect ratio). The control section 20 retrieves one of the frame images which is suited to the aspect ratio of the initial image which will be displayed. The color distribution association table 18, etc. may contain in advance combinations of the initial images, the colors in which the entire blank area will be colored, and the colors of the frame images suitable to them. The control section 20 can then decide the color of the frame image.

Next, the control section 20 calculates a frame image resizing amount based on the image resizing amount for the initial image calculated in S43 (S47). The frame image is resized based on the calculated frame image resizing amount (S48).

The composite image of the initial image and the image filling the entire blank area is further combined with this resized frame image (S49) and reproduced on the display section 13 (S50). Thereafter, steps similar to S6 and its subsequent steps in Figure 1 are performed.

These coloring of the entire blank area and/or addition of a frame image to the initial image makes the initial image

appear better blended with the surroundings and improves the visibility of the initial image, for example.

Figure 6 demonstrates such a calculation of the image resizing amount that the initial image can fit either horizontally or vertically in the display area with the aspect ratio of the initial image being preserved. Alternatives are also possible. An example is such a calculation of the image resizing amount that the initial image can be surrounded by a blank area on all the four sides. Another is to calculate the image resizing amount so that the initial image can be part of a predetermined layout.

The description so far has assumed that when a preparation for an ordinary display is completed after an initial image is displayed, the display is switched to the ordinary display with the initial image being no longer displayed. Alternatives are also possible. For example, after switching to an ordinary display screen, the initial image may still be displayed on a part of the display screen. The initial screen may be continuously displayed, for example, in a navigation window where navigational information is shown, after switching to the ordinary display. The initial image may be displayed in a navigation window of a navigational display area (for example, the left half of the display area) while a speedometer and other gauges are being shown in a part of the display area (for example, the right half of the display

area). In this case, the navigation window will be used like a "photo frame."

This process will be now described in reference to Figure 7 which is a flow chart illustrating the flow of the process for displaying an initial image in a navigation window after the display is switched to an ordinary display.

As shown in the figure, the control section 20 determines whether to end the initial display (S51), that is, whether the display device 1 is ready to switch to an ordinary display.

If the initial display is not ended, (No in S51), that is, if the display device 1 is not ready to switch to an ordinary display, the initial screen is continuously displayed.

In contrast, if the display device 1 is ready to produce an initial display (Yes in S51), that is, if the display device 1 is ready to switch to an ordinary display, the control section 20 determines whether the initial screen will be shown in a navigation window (S52). Through the manual input section 14, the user can specify in advance whether to display the initial image in a navigation window after switching to an ordinary display. Alternatively, it may be determined in accordance with a detection result of a startup of the navigation system by the control section 20.

If no initial image is to be displayed in the navigation window (No in S52), the control section 20 produces an

ordinary display in the navigation window, that is, a navigational information display (S53), thereby ending the process.

In contrast, if an initial image is to be displayed in the navigation window (Yes in S52), the control section 20 detects data about the display area, that is, the navigation window (S54). The control section 20 then further detects the size of the display area in that data about the navigation window (S55).

Next, the control section 20 detects the size of the initial image prior to the switching to an ordinary display (S56). From this size of the initial image prior to switching to an ordinary display and the size of the display area, the section 20 calculates an image resizing amount for the initial image (S57).

The section then resizes the initial image based on the calculated image resizing amount (S58), before displaying the initial image in the navigation window (S59).

Thereafter, the control section 20 determines whether to end the initial image display in the navigation window (S60). The initial image display may be ended, replaced by a navigational information display, when for example there is a user instruction to the navigation system.

if the initial image display is not to be ended (No in S60), the control section 20 continuously displays the initial image

in the navigation window.

In contrast, if the initial image display is to be ended (Yes in S60), the control section 20 ends the initial image display to produce an ordinary display in the navigation window, thereby ending the process.

The description so far has assumed that the navigation window shows navigational information as the ordinary display. Alternatives are also possible. Examples include television broadcasts, images reproduced from a video tape or DVD, and those captured on the image capture section 11.

To display these images in display areas (display windows) other than the navigation window, after switching to an ordinary display, the initial image may be displayed not only in the navigation window, but in the display windows.

The entire navigational display area (for example, the entire left half of the display area) may be used to display the initial image. For example, a speedometer and other gauges may be displayed in either the left or right half of the display area (for example, near the driver or the right half of the display area). The initial image is continuously displayed in the rest of the area after switching to an ordinary display.

Figure 8 is a flow chart illustrating an example of the foregoing process. In the illustrated process example, the display area of the display section 13 can be divided into two areas: a navigational display area for a display of navigational

information and the like and a meter display area for a display of a speedometer and other gauges. Let us assume that the user can specify design in an ordinary display (instrument panel design), such as the sizes of the areas, as he likes.

As shown in the figure, the control section 20 determines whether to end the initial display (S61). If the initial display is not to be ended (No in S61),that is, if the display device 1 is not ready to switch to an ordinary display, the control section 20 continuously reproduces the initial screen.

In contrast, if the initial display is to be ended (Yes in S61), that is, if the display device 1 is ready to switch to an ordinary display, the control section 20 determines whether to display the initial screen in the navigational display area (S62). Through the manual input section 14, the user can specify in advance whether to display the initial image in the navigational display area after switching to an ordinary display.

If no initial image is to be displayed in the navigational display area (No in S62), the control section 20 produces an ordinary display, that is, a navigational information and other displays, in the navigational display area (S63), thereby ending the process.

In contrast, if an initial image is to be displayed in the

navigational display area (Yes in S62), the control section 20 detects a design (instrument panel design) for the ordinary display (S64). Further, the control section 20 detects the size of the navigational display area (divisional area) (S65).

Next, the control section 20 calculates an image resizing amount for the initial image based on the detected size of the navigational display area (S66). The section 20 then resizes the initial image based on the calculated image resizing amount (S67).

Next, the control section 20 produces a composite instrument panel design based on the resized initial image (S68). That is, the section 20 produces a composite image (instrument panel design) of the resized initial image and an image to be displayed in the meter display area. The composite image will be displayed on the display section 13.

The control section 20 then displays the instrument panel design on the display section 13 (S69).

Thereafter, the control section 20 determines whether to end the initial image display in the navigational display area (S70). The determination may be made in accordance with, for example, a user instruction.

If the initial image display is not to be ended (No in S70), the control section 20 continues to execute S68 and its succeeding steps.

In contrast, if the initial image display is to be ended

(Yes in S70), the control section 20 ends the initial image display in the navigational display area and produces an ordinary display in the navigational display area, thereby ending the process.

This display of the initial image in a part of the display area (for example, the navigational display area or a navigation window therein) after the display is switched to an ordinary display enables the display section 13 to display a user-desired image when an ordinary display is being produced, which gives a flavor to the inner space of the vehicle.

The description in reference to Figures 7, 8 has assumed that the gauges, etc. are displayed in the right half of the display area, whereas the navigation window, etc. are displayed in the left half of the display area. Alternatives are also possible. For example, the display section 13 of the present embodiment has a landscape-type display area with an aspect ratio of 7:3. A left-hand part of the display area equivalent to the 4:3 aspect ratio may be designated as the navigational display area including the navigation window, etc, with the remaining part of the display area (equivalent to the 3:3 aspect ratio) near the driver being used to display a speedometer and other gauges.

Figures 7, 8 have assumed that the initial image is displayed in the navigational display area, not in the meter

display area. Alternatives are also possible. For example, the initial image may be displayed in the display area for gauges after switching to an ordinary display, but before the vehicle starts moving (for example, while the user is entering destination, route, and other settings to the navigation system).

The Figure 1 example assumed that the power supply to the display device 1 is turned on when the driver is seated in the driver seat. Alternatives are also possible. For example, S1 in Figure 1 may be modified so that the power supply to the display device 1 can be turned on when the ignition instruction sensor 19a has detected an ignition instruction from the user (engine [power generation means] startup instruction). The ignition instruction sensor 19a has been assumed to detect an manipulation of the ignition key. Alternatives are also possible. For example, the senor 19a may detect instruction through a "remote control engine starter" which transmits an engine startup instruction signal over a wireless IR (infrared) channel.

Alternatively, S1 in Figure 1 may be modified so that the power supply to the display device 1 can be turned on when the unlock sensor 19c has detected an opening of a lock (locking means) on the driver seat door. The unlock sensor 19c may detect an insertion of an unlock key into a key cylinder of a door as the unlocking of the door. The sensor

19c may alternatively detect an unlocking operation, or a rotation of an inserted key. In a further alternative, the sensor 19c may detect an unlock instruction from a "keyless entry system" which transmits a wireless door unlock instruction signal.

For example, S1 in Figure 1 may be replaced by the following steps as shown in Figure 9. The control section 20 first determines whether the IR signal sensor section 19e has received an IR signal (S71). The IR signal may be sent from a terminal device dedicated for the transmission of an unlock instruction or from an information terminal device, such as a mobile phone or a PHS (personal handyphone system, registered trademark).

If no IR signal has been received (No in S71), the section 20 continuously monitors the IR signal sensor section 19e for a reception of an IR signal. If an IR signal has been received, the control section 20 determines whether the IR signal contains a door unlock instruction (S72).

If the received IR signal contains no door unlock instruction (No in S72), the control section 20 continues the process at S71 and its succeeding steps. If the received IR signal contains a door unlock instruction (Yes in S72), the control section 20 continues the process at S2 and its succeeding steps.

The Figure 1 example assumed that the initial image

display (initial display) is ended when a preparation for an ordinary display is completed. The preparation is regarded as complete when computer programs are obtained which will display a speedometer and other gauges, navigational information, vehicle check results, etc., and various data, etc. are also obtained which are needed for the display of these objects. The initial display may be ended at other timings.

For example, the initial display may be ended to switch to an ordinary display when the user has operated the gear lever. Figure 10 illustrates the flow of this process.

As the initial screen display (initial display) is started (S81), the control section 20 checks the position of the gear lever through the gear lever sensor 19b (S82) and determines whether the gear lever is in "P" (parking) (S83).

If the gear lever is in P (Yes in S83), the control section 20 continues the process at S82 and its succeeding steps. Specifically, the section 20 monitors if the gear lever has been shifted into a position other than "P" (for example, "D" or drive, "N" or neutral, or "R" or reverse).

In contrast, if the gear lever is not in "P" (No in S83), the control section 20 ends the initial display to switch to the ordinary display (S84), thereby ending the process.

The initial display may be ended when a predetermined time has elapsed after the start of the initial display. Figure 11 shows an example case of the process.

As the initial screen display (initial display) starts (S91), the control section 20 starts up a time control mode, starting time measurement on the timer 19d (S92).

The control section 20 also detects a setting for the duration of the initial display (S93). This duration setting may be made in advance by the user as he likes, or may have a particular predetermined value.

The control section 20 determines whether the time measurement on the timer 19d after the start of the initial display has reached the duration setting, that is, whether the specified duration has ended (elapsed) (S94).

If the duration setting has not been reached (No in S94), the control section 20 allows continuous time measurement on the continuously timer 19d while monitoring the time measurement to see if the duration setting has been reached.

In contrast, if the elapsed time after the start of the initial display as measured on the timer 19d has reached the duration setting (Yes in S94), the control section 20 ends the initial display to switch to an ordinary display (S95), thereby ending the process.

The timing to end the initial display may be determined by the control section 20 determining the gear lever position and the elapsed time after the start of the initial display. Figure 12 is a flow chart illustrating an example of the process.

In the illustrated example, as the initial screen display (initial display) starts (S101), the control section 20 starts up a time control mode, starting time measurement on the timer 19d (S102).

The control section 20 also detects a setting for the duration of the initial display (S103). This duration setting may be made in advance by the user as he likes, or may have a particular predetermined value.

the control section 20 determines whether the time measurement on the timer 19d after the start of the initial display has reached the duration setting, that is, whether the specified duration has ended (elapsed) (S104).

If the duration setting has not been reached (No in S104), the control section 20 allows continuous time measurement on the continuously timer 19d while monitoring the time measurement to see if the duration setting has been reached.

In contrast, if the elapsed time after the start of the initial display as measured on the timer 19d has reached the duration setting (Yes in S104), the control section 20 checks the gear lever position through the gear lever sensor 19b (S105) to determine whether the gear lever is in "P (parking)" (S106).

If the gear lever position is in "P" (Yes in S106), the control section 20 continues the process at S105 and its succeeding steps. Specifically, the section 20 monitors if the

gear lever has been shifted into a position other than "P" (for example, "D" or drive, "N" or neutral, "R" or reverse).

In contrast, if the gear lever is not in "P" (No in S106), the control section 20 ends the initial display to switch to the ordinary display (S107), thereby ending the process.

In the Figure 12 example, the initial display is ended when the duration setting has been reached after the start of the initial display and the gear lever is in a position other than "P." Alternatives are also possible. For example, the initial display may be ended when either the duration setting has been reached after the start of the initial display or the gear lever has been shifted into a position other than "P."

As an another example, the initial display may be ended when there is detected a user instruction or when the brake is released, regardless of the time elapsed after the start of the initial display or the gear lever position.

The initial display may alternatively ended when the temperature of the display section 13 as detected by the temperature sensor 19f has reached a predetermined value. The control section 20 may calculate, from results of temperature detections of the display section 13 by the temperature sensor 19f, a time which will be taken by the display section 13 to reach a predetermined temperature due to heat from a backlight or other heating means. The timing to end the initial display is then determined based on the

calculated time. Along with the initial image in a part of the display area may be displayed the time taken by the section 13 to reach the predetermined temperature, the temperature as detected by the temperature sensor 19f, an image indicating that the temperature of the display section 13 is less than or equal to the predetermined temperature, etc.

These methods of deciding on the timing to end the initial display may be used in suitable combinations.

The display device 1 may deal with not only still image, but video, as the initial image. When the display section 13 is a liquid crystal panel and used at low ambient temperatures (for example, below freezing point), the liquid crystal panel may exhibit insufficient display speed (response speed); it is preferable to use a still image as the initial image. Text data may be displayed as the initial image.

The display device 1 has been assumed to reproduce an initial image upon startup from the data stored in the initial image DB 16. Alternatives are also possible. For example, an image captured on the image capture section 11 may be directly displayed on the display section 13, without first being stored in the initial image DB 16. Figure 13 shows an example of such a process.

First, under the control of the control section 20, the image capture section 11 captures an image of the surroundings in accordance with an image capture

instruction from the user (S111).

Next, the control section 20 determines whether the captured image will be used as an initial image (S112). The determination may be made in accordance with an instruction from the user entered through the manual input section 14 or based on preset information.

If the captured image is not to be used as an initial image (No in S112), the control section 20 stores the captured image in the storage-data storage section 15 (S113), thereby ending the process.

In contrast, if the captured image has been selected for use as an initial image (Yes in S112), the control section 20 resizes the captured image according to the size of the display area of the display section 13 (S114).

Next, the control section 20 determines whether the power supply to the display device 1 is on (S115). If the power supply to the display device 1 is not on (No in S114), the section 20 stands by until the power supply of the display device 1 is turned on. In this case, for example, the resized image may be temporarily stored in a RAM (not shown).

In contrast, if the power supply to the display device 1 is on (Yes in S114), the control section 20 displays the resized image on the display section 13 (S116), thereby ending the process.

Images used as the initial image are not limited to those

captured by the image capture section 11. For example, those stored in, for example, the image DB 16 may be used as the initial image. Alternatively, the display device 1 may be equipped with reproduction means retrieving information from a storage medium; an image retrieved from the storage medium is used as the initial image. Alternatively, an interface (connect means; not shown) may be provided for connection to a reproduction device which reads a storage medium; an image retrieved from the device may be used as the initial image. Examples of the storage medium include magnetic tapes, such as video tapes and cassette tapes; magnetic discs, such as floppy (registered trademark) discs and hard disks; optical discs (magneto-optical discs), such as CD-ROMs, MOs, MDs, DVDs, and CD-Rs; memory cards, such as IC cards and optical cards; and semiconductor memories, such as mask ROMs, EPROMs, EEPROMs, and flash ROMs. Alternatively, an interface (connect means; not shown) may be provided for connection, for example, to an image capture device, such as a digital camera or a video camera; a television broadcast receiver; or a player, such as a video player or a DVD player; an image retrieved from these devices is used as the initial image.

Alternatively, an image received from another communications device over the communications section 12 may be used as the initial image. In other words, the display

device 1 may provide a part of a display system when connected to another device over a communications channel.

For example, an image may be downloaded for use from a server 100 (details will be given later) located at a site connectable to the display device 1 over a network (Intranet, the Internet, etc.). An example of such a process will be now described in reference to Figures 14(a), 14(b).

Figure 14(a) is a flow chart illustrating a process in the display device 1. Figure 14(b) is a flow chart illustrating a process in the server 100. In the Figure 14(a) and Figure 14(b) examples, the server 100, connected to the display device 1 over a network, already contains an image which fits in size to the display area of the display section 13. The display device 1 contains predetermined key words which match the type of favorite images of the user. Every time the display device 1 starts up, an image which match these key words is automatically sent from the server 100. In this configuration, the user does not know what the initial image will be like that will be displayed on the display device 1. One of images prepared in the site which matches the key words contained in the display device 1 will be displayed. Further, if the image sent from the server 100 is to be used as the initial image also upon next and following startups (if the initial image is to be fixed), the display device 1 allows a setting on the period, in terms of the number of days, in which the

image will be continuously used as the initial image.

Figure 19 is a block diagram illustrating a configuration example of the server 100 connected to the display device 1. The illustrated server 100 contains a communications section 101, a control section (control means) 102, a storage section 103, a RAM 104, an operating section 105, and a display section 106.

The communications section 101 acts as a communications interface for the server 100. Through the communications section 101, the server 100 carries out data communications with a mobile phone, a personal computer, the display device 1, etc. over the Internet, mobile phone, and other networks.

Through the operating section 105, the administrator of the server 100 can enter instructions when he services/manages the server 100. The operating section 105 is arranged from, for example, a keyboard and a pointing device, such as a mouse. The display section 106 is a display means where the administrator of the server 100 can observe processing in the server 100 when he services/manages the server 100.

The control section 102 plays the central role in controlling all actions of the server 100.

The storage section 103 contains various data and computer programs for use by the control section 102 and is

arranged from, for example, a hard disk. The storage section 103 includes, among others, an image DB (database) 103a containing various images, a similar image DB 103b containing the same images as those in the image DB but in various different sizes, and an IP address storage section 103c containing the IP addresses of mobile phones, the display device 1, and other communications terminals connected to the server. Throughout the specification and claims, the "similar" image refers to the mathematical sense of the term, not the more general sense of "being alike."

The RAM 104 is a primary memory section for use by the control section 102. The RAM 104 temporarily stores data communicated through the communications section 101. The control section 102 loads control programs from the storage section 103 to the RAM 104 as an operating memory where the section 102 executes the programs.

Referring to Figure 14(a), as the power supply to the display device 1 is turned on (S121), the control section 20 starts a preparatory process for an ordinary display. Concretely, in the process, computer programs are obtained which will display a speedometer and other gauges, navigational information, vehicle check results, etc. Various data, etc. are also obtained which are needed for the display of these objects (S122).

Next, the control section 20 searches the key word DB

17c for a key word (S123). The key word DB 17c is adapted to contain key words in advance, depicting favorite images, which are entered by the user through the manual input section 14.

The control section 20 determines whether the key word DB 17c contains a key word (S124).

If the key word DB 17c contains a key word (Yes in S124), the control section 20 retrieves the key word from the key word DB 17c (S125).

In contrast, if the key word DB 17c contains no key word (No in S124), the control section 20 uses a predetermined key word (S126). The section 20 may, for example, select the "latest image" to request the latest image from the server, "random" to request a randomly selected image, or a "popular image" to request the image most frequently downloaded from the server 100.

The control section 20 connects the display device 1 to the server 100 on the network through the communications section 12 and the communication antenna 12a, to transmit the key word (image request signal) which is either retrieved from the key word DB 17c (S125) or predetermined (S126) to the server 100 (S127).

Now reference is made to Figure 14(b). In the server 100, upon receiving the key word from the display device 1 (S138), the control section 102 finds an image which matches the

received key word in the image DB 103a (S139). If two or more images match the key word, the latest one of the matched images for example is detected.

Next, the control section 102 transmits the detected image to the display device 1 (S140), thereby ending the process. The IP address of the display device 1 may be contained in the IP address storage section 103c in advance or transmitted from the display device 1 to the server 100 along with the key word.

Then, in the display section 1, the control section 20 receives the image transmitted from the server 100 (S128). The received image is stored in the storage-data storage section 15 (S129).

Next, the control section 20 determines whether the image DB 17b contains fixed image information (S130). The fixed image information is information by which a particular image used by the user as the fixed initial image (fixed image) is identified. The information is inclusive of the date when the initial image is fixed (fixing date) and the number of days for which the initial image is to be fixed (number of fixing days). This information is entered by the user through the manual input section 14. Figure 14(a) assumes that the number of days for which the initial image is to fixed is specified. Alternatives are also possible. The duration for which the initial image is to be fixed may be specified in terms of hours,

weeks, or months. The last day to fix the initial image may be specified.

If the image DB 17b contains fixed image information (Yes in S130), the control section 20 retrieves the fixing date from the image DB 17b (S131) and the number of fixing days (S132). The section 20 then determines whether the initial image fixing period has ended at this point in time (S133).

If the fixing period has not ended (No in S133), the control section 20 updates the initial image DB 16 with the fixed image (S134) by replacing the initial image stored therein.

In contrast, if the fixing period has ended (Yes in S133) or if the image DB 17b contains no fixed image information in S130 (No in S130), the control section 20 detects the latest one of the images contained in the storage-data storage section 15 (the one with the latest "last saved" time) (S135). The initial image DB 16 is then updated with the detected, latest image (S136).

The control section 20 displays the initial image selected in S134 or S136 on the display section 13 (S137). Thereafter, steps similar to S6 and its subsequent steps in Figure 1 are performed before ending the process.

The description so far has assumed that the presence/absence of the fixed image information is determined after the image is received from the server 100

based on a key word. Alternatives are also possible. The presence/absence of the fixed image information may be determined first; only when the image is not to be fixed, the key word may be transmitted to the server 100.

The description so far has assumed that the fixed image is contained in the storage-data storage section. Alternatives are also possible. The fixed image may be downloaded from the server 100 upon startup.

Figures 14(a), 14(b) depict a display system in which the display device 1 connects to the server 100 over a network. Alternatives are also possible. For example, the device 1 may directly communicate with a personal computer, a mobile phone with an image display means, and like information processing devices through the communications section 12 and the communication antenna 12a. Another example is to adapt the device 1 so that it can connect to a personal computer, a mobile phone, and like information processing devices via a communications cable coupled to an interface (connect means; not shown) for communications.

The system enables, for example, the user to access the display device 1 from his PC (personal computer) server for a transmission of an image to the display device 1, so that the display device 1 can use the transmitted image as the initial image. It is also possible to access a personal computer, a mobile phone, or like information processing devices from the

display device 1 to select and download favorite images.

To download images from a server, a personal computer, etc. to the display device 1 over a network as an example, the download instruction may be made by the user, for example, through the manual input section 14 of the display device 1 or through another information processing device over a network.

Supposing that images are transmitted/received between the display device 1 and a personal computer, a mobile phone, or other like devices, chances are that the display section 13 of the display device 1 differs from the display means on the other device in image size. The image used as the initial image may be rearranged to address this problem.

For example, images captured on mobile phones or similar devices with a built-in camera are generally small in images size. Accordingly, multiple copies of such an image may be rearranged to produce a display in the display area as the initial image. Figure 15 is a flow chart illustrating an example of selection of an initial image in such a process.

First, upon receiving an image from another device (S141), the control section 20 detects the latest one of the received images (S142). If there is only one incoming image, the image is used as the latest image. The section 20 then detects the file names of the received images (S143).

Next, the control section 20 determines whether any of

the detected file names contains a number preceded by a hyphen (S144). If there are no file names containing such a number (No in S144), the control section 20 selects the latest image detected in S142 as the initial image (S145). The latest image may be resized according to the display area of the display section 13 upon its selection as the initial image (not illustrated in Figure 15).

In contrast, if any of the file names has a number preceded by a hyphen (file with a hyphenated number) (Yes in S144), the control section 20 detects the number of files with a hyphenated number (S146). The section 20 also detects the size of the image in each file with a hyphenated number (S147).

The control section 20 detects a suitable rearrangement pattern according to the detected number of the files and the sizes of the images in those files (S148). The image DB (rearrangement storage means) 17b contains in advance the number of the files and the image sizes in association with suited rearrangement patterns. That is, the image DB 17b contains in advance many division patterns (rearrangement patterns) with subareas varying in the count and size. The display area of the display section 13 will be divided into those subareas according to the pattern.

Next, the control section 20 calculates an image resizing amount for an image in a file with a hyphenated number from

the detected rearrangement size (S149). The section 20 resizes the image based on the calculated image resizing amount (S150). The control section 20 rearranges copies of the resized image and the rearrangement pattern detected in S148 to produce a composite initial image (S151).

Thereafter, the control section 20 determines whether the power supply to the display device 1 is on (S152). If the power supply to the display device 1 is not on, the section 20 stands by until the power supply is turned on. In contrast, if the power supply to the display device 1 is on, the section 20 displays the initial image selected in S145 or S151 on the display section 13 (S153), thereby ending the process.

This configuration enables, for example, the display section 13 to rearrange images captured on a mobile phone with a built-in camera (for example, sequential or panoramic photos) for a display. For example, on the mobile phone, one can view an image (photo) at a time due to the limited display screen size. With the configuration, one can view two or more images at a time on the section 13. Especially, the display device 1 in accordance with the present embodiment, equipped with a super-wide screen with an aspect ratio of 7:3, can display images with the 3:4 aspect ratio captured, for example, on a mobile phone with a built-in camera side by side in a horizontal row.

The description so far assumed that images are captured

on a mobile phone with a built-in camera. Alternatives are also possible. Images may be captured on the image capture section 11. Also, images may be transferred from a personal computer or a server, captured on a digital camera, fed from a storage medium or over a communications cable, or otherwise imported from other sources.

The image used as the initial image does not need to be specified on the display device 1. For example, the display device 1 and an information processing device connected to the device 1 via the communications section 12 or an interface (not shown) may be configured to provide a display system. The configuration enables the image used as the initial image on the display device 1 to be selected, for example, on the information processing device.

For example, a mobile phone with an image display function or a personal computer shows a particular image when a set of predetermined conditions are met: e.g. an initial image shown on startup, a wallpaper image shown as the background, and an image shown when the user makes no inputs for a predetermined period (screen saver). The mobile phone or personal computer may be set up to, when any of these images are changed, automatically transmit the new image from the mobile phone or personal computer to the display device 1. The new image is used as the initial image on the display device 1.

Figure 16 is a flow chart illustrating an example of the initial image display process on the display device 1 in such a display system. In Figure 16, the display system is configured from the user's mobile phone and the display device 1. Figure 20 is a block diagram illustrating, as an example, the configuration of the mobile phone 200 which is part of the display system.

The illustrated mobile phone 200 contains an image capture section 201, a manual input section 202, a communications section 203, a display section 204,a memory section 205, and a control section 206.

The manual input section 202 receives user instructions for a transfer to the control section 206. The section 202 is arranged from, for example, a set of input keys. The image capture section 201 is a camera capturing images in response to user instructions. The display section 204 is display means presenting various information in the form of text and images. The section 204 is arranged from, for example, a liquid crystal display panel. The memory section 205 contains various data, computer programs, etc. for use by the control section 102. The memory section 205 is divided into a wallpaper image memory section 205a containing wallpaper images and an IP address memory section 205b containing the IP addresses of destination devices. The control section 206 plays the central role in controlling all actions of the

mobile phone 200.

The control section 206 in the mobile phone 200 is set up to, when wallpaper images are changed, automatically transmit the new wallpaper image to the display device 1. In Figure 16, upon receiving the new wallpaper image, the display device 1 selects the image as the initial image. The display device 1 has an IP address which is stored in advance in the IP address memory section 205b in the mobile phone 200.

Referring to Figure 16, in response to the change of the wallpaper images (S160), the control section 206 in the mobile phone 200 sends the new image and a setup signal from the mobile phone 200 to the display device 1 (S161), thereby ending the process on the mobile phone 200. In the display device 1, the control section 20 will replace the current initial image with the new image for a display on the display device 1 in accordance with the setup signal.

The display device 1 receives the image and setup signal from the mobile phone 200 on the communication antenna 12a (S162).

Upon receiving the image and signal, the control section 20 detects an image in the received data (S163) and detects the size of the detected image (S164). The control section 20 then calculates an image resizing amount in accordance with the size of the display area of the display section 13 (S165)

and resizes the image (S166) to set up the image as the initial image. That is, the section 20 updates the initial image DB 16, replacing the current initial image with a new one.

The control section 20 determines whether the power supply to the display device 1 is on (S167). If the power supply to the display device 1 is not on, the section 20 stands by until the power supply is turned on.

In contrast, if the power supply to the display device 1 is on, the control section 20 displays the resized initial image on the display section 13 (S168), thereby ending the process.

The display device 1 may be connected to a server and a mobile phone, a personal computer, or a like information processing device over a network, etc. to form a display system. The configuration enables images on the server which are identical but differs in size to be displayed on the devices in the display system in an associated manner.

For example, the server contains images in various sizes so that they fit in the display screens of a mobile phone, a personal computer, and the display area of the display section 13 of the display device 1. When wallpapers on the mobile phone or personal computer are changed, the current initial image on the display device 1 is replaced by the image which is identical to the new wallpaper image on the mobile phone or personal computer, but differs in size so that the new image fits in the display area of the display device 1.

Figure 17 illustrates an example of an initial image display process on the display device 1 in the display system. The display system is arranged from the display device 1, the server 100, and the mobile phone 200.

First, the control section 206 in the mobile phone 200 connects the mobile phone 200 to over a network, etc. to the server 100 in accordance with a user instruction through the manual input section 202 (S170). Upon being connected to the mobile phone 200 (S171), the control section 102 in the server 100 sends a copy of the images on the server 100 to the mobile phone 200 (S172).

The images are sequentially displayed on the display section 204 of the mobile phone 200 so that the user can browse the images on the server 100 (S173). Then, through the manual input section 202, the user selects a desired image from the presented images and specify which image to be downloaded (S174). The control section 206 of the mobile phone 200 transmits a signal identifying an image to be downloaded (image request signal) to the server 100 in accordance with a user instruction.

Upon receiving from the mobile phone 200 the signal identifying the image to be downloaded, the control section 102 of the server 100 searches the image DB 103a for an image corresponding to that signal (S175). The section 102 then transmits the detected image to the mobile phone 200

(S176).

Upon receiving the image through the communications section 203 from the server 100 (S177), the control section 206 of the mobile phone 200 sets up the received image as the wallpaper image (S178). After the wallpaper image setup, the control section 206 transmits a wallpaper image setup signal to the server 100 (S179). The signal indicates the updating of the wallpaper image and identifies the new wallpaper image.

Upon receiving the wallpaper image setup signal through the communications section 101 from the mobile phone 200 (S180), the control section 102 of the server 100 searches the similar image DB 103b for a similar image (S181). The similar image is identical to the updated wallpaper image on the mobile phone 200 but has a size in accordance with the display area of the display device 1. The section 102 transmits the detected similar image and a signal to the display device 1 (S182). In response to the signal, the control section 20 of the display device 1 will replace the current initial image with this similar image.

The display device 1 receives the similar image and the signal through the communication antenna 12a (S183). Upon the receipt, the control section 20 detects the image from the received signal (S184) and replaces the current initial image (S185). That is, the section 20 updates the initial image DB 16 so that it contains a new initial image.

The control section 20 then determines whether the power supply to the display device 1 is on (S186). If the power supply to the display device 1 is not on, the section 20 stands by until the power supply is turned on.

In contrast, if the power supply to the display device 1 is on, the control section 20 displays the resized initial image on the display section 13 (S187), thereby ending the process.

With the display system which is configured from the display device 1 connected to a server, a mobile phone, a personal computer, etc., the user can manage the initial image and wallpaper image on his mobile phone and personal computer, as well as the initial image on the display device 1 in an associated manner. The user can manage the images shown on these devices by a simple method.

The examples illustrated in Figures 16, 17 have been described assuming that the initial image on the display device 1 is updated in accordance with the wallpaper image on the mobile phone 200. Alternatives are also possible. For example, the wallpaper image on the mobile phone 200 may be changed in accordance with the initial image setting on the display device 1. For example, when initial images on the display device 1 are changed, the control section 20 transmits the new initial image to the mobile phone 200. The new initial image is received by the mobile phone 200 and set up as the wallpaper image there by the control section 206. Another

possible configuration is the display device 1 transmitting a signal requesting the user's desired image from the server 100 (image request signal). The control section 102 of the server 100 transmits an image corresponding to that signal to both the display device 1 and the mobile phone 200. The control section 20 of the display device 1 sets up the transmitted image as the initial image. The control section 206 of the mobile phone 200 sets up the transmitted image as the wallpaper image.

A part of the initial image on the display device 1 may be cut out for a transmission to the mobile phone, the personal computer, etc. Figure 18 is a flow chart illustrating an example of this process.

In the Figure 18 process, first of all, the control section 20 makes initial image settings by any one of the foregoing methods (S191).

Next, the control section 20 determines whether to transmit the initial image to another device (S192). The determination is made, for example, in accordance with a user input through the manual input section 14. If the initial image is not to be transmitted to another device (No in S192), the control section 20 ends the process here.

In contrast, if the initial image is to be transmitted to another device (Yes in S192), the control section 20 activates an image retrieval interface (not shown) (S193). This image

retrieval interface receives user instructions about which part of the image shown on the display section 13 should be cut out for a transmission to another device. For example, the user may enter instructions specifying the cut-out part through the manual input section 14 or by pressing the display screen of a touch panel.

Next, the control section 20 receives information on the transmission destination from the user (S194). That is, the user operates the manual input section 14 to select a destination terminal device.

Next, the control section 20 detects the display size of the display screen on the destination terminal device (S195). The display size of the destination terminal device is assumed to be stored in advance in the memory section 17. Alternatives are also possible. For example, the user may enter the display size through the manual input section 1.

Next, the control section 20 displays a rectangle display (cutout rectangle) on the display section 13 in accordance with the detected display size (S196). The user then selects a cutout area (extracted area) for the image through the image retrieval interface (S197). For example, the user selects a cutout area having the aspect ratio detected in S195 by specifying one of the four corners of the rectangle display and then the opposite corner.

Next, the control section 20 cuts out the selected cutout

area of the image (S198). That is, the section extracts the image data for the selected cutout area.

Further, the control section 20 resizes the cutout area in accordance with the display size detected in S195 (S199) for a transmission to the destination terminal device (S200), thereby ending the process.

Figure 18 assumes that the initial image is partly cut out for a transmission to another device. The initial image may be however an image captured on the image capture section 11. When this is the case, for example, a landscape image taken on a trip may be set up as the initial image on the display device 1. The image also may be partly cut out for use as, for example, the wallpaper or the initial image display on startup on another device (for example, the mobile phone, personal computer, and other peripherals owned by the user).

Only the desired part of the initial image may be cut out for a transmission. The user can transmit a suitable image in accordance with the display area of another device.

In the display device 1, the seating sensor 19g was assumed to detect a driver seated in the driver seat through a change in load exerted on the driver seat. The seating sensor 19g may be configured another way. For example, the sensor 19a may be an infrared sensor or an ultrasound sensor which detects a seated driver. Alternatively, the vehicle may be equipped with a camera surveying its interior. A seated driver

may be detected based on the image captured on that camera.

The seating sensor 19g was assumed to detect a driver seated in the driver seat. Alternatives are also possible. The sensor 19g may detect an embarkation of a passenger (for example, in the driver seat, front passenger seat, or rear passenger seat).

In the display device 1, the camera was assumed to have a wide angle lens capable of simultaneous image capturing within predetermined angles. Alternatives are also possible. For example, an omnidirectional camera may be used which is capable of omnidirectional image capturing. "Omnidirectional" refers to a 360° view around an axis substantially perpendicular to the ground surface. When this is the case, the camera may be capable of instantly capturing an omnidirectional image or producing an omnidirectional image by continuously changing its orientation.

Figure 21 is a plan view illustrating an configuration example of the image capture section 11. As shown in the figure, the image capture section 11 is arranged from a camera section 31, a convex-surface mirror 32, a casing 33, and a cover member 34 which is part of the casing 33.

The casing 33 has a substantially cylindrical shape. A predetermined, round stretch of the side wall of the casing 33 is made of a transparent cover member 34. Inside the casing

33 is the convex-surface mirror 32 as a reflection mirror. The mirror 32 is disposed to match the vertical position of the cover member 34. The convex-surface mirror 32 has a surface that is derived by rotating a predetermined convex line around a predetermined axis (i.e., optical axis or vertical axis of the casing 33). The convex line may be, for example, an arc, hyperbolic curve, or a parabola. The convex-surface mirror 32 is oriented to project downward. External light coming in through the cover member 34 is reflected downward by the mirror 32.

Inside the casing 33 is the camera section 31 as an image capture device. The section 31 is located right under the convex-surface mirror 32 and is made of a CCD or CMOS (complementary metal-oxide semiconductor) image sensor. The camera section 31 receives external light directed by the convex-surface mirror 32 and produces an electric signal output corresponding to the incident light. Thus, owning to the convex-surface mirror 32 which is a reflection mirror with a convex surface, the Figure 21 configuration is capable of capturing a horizontally omnidirectional, that is, 360° image of the surroundings.

The image capture section 11 needs to be able to capture an image at least in one direction. The section 11 is not limited to a camera with a wide angle lens or to an omnidirectional camera; it may be a camera with a standard

lens. The image capturing direction of the camera does not need to be fixed; it may be variable. A desired image capturing direction may be selectable in accordance with user instructions. When this is the case, it is preferable to provide an input section where user instructions are entered.

The image capture section 11 may be an infrared camera. Also, there may be provided lighting means to illuminate target objects (range) for the image capture section 11. In these configurations, proper images can be taken at night.

The image capture section 11 may be normally sheltered, for example, inside the vehicle and comes out of the vehicle only when capturing an image.

There are no particular limitations on where the image capture section 11 is mounted or how many cameras are involved. Figure 3 is a mere example. Other examples are shown in Figures 22(a) to 22(c).

In the Figure 22(a) layout example, the image capture section 11 is made up of four cameras covering at least the front, rear, left, and right of the vehicle. One of the cameras is positioned on a corner of the vehicle near the front passenger seat to capture images to the front. Another one is positioned on the same corner to capture images to the front passenger seat side of the vehicle. Another one is positioned on a corner near the driver seat to capture images to the driver seat side of the vehicle. The last one is positioned on a

rear corner to the back of the driver seat to capture images to the rear.

Compared to the image capture section 11 in Figure 22(a), the image capture section 11 in the Figure 22(b) layout example involves additional cameras to capture more detailed omnidirectional images. Specifically, one of the additional cameras is positioned on a corner near the front passenger seat to capture images to the front of the vehicle near the front passenger seat. The other one is positioned on a corner near the driver seat to capture images to the front. This layout involves a set of three or more cameras working together to cover the front of the vehicle, eliminating blind corners.

In the Figure 22(c) example, a camera is positioned on a corner near the front passenger seat to capture images to the front. Another one is positioned on the same corner to capture images to the front passenger seat side of the vehicle. Another one is positioned on a corner near the driver seat to capture images to the front near the driver seat. The last one is positioned on a rear corner to the back of the driver seat to capture images to the rear of the vehicle. This layout certainly prevents any part of the vehicle from causing blind corners.

In the display device 1, the communications section 12 was assumed to carry out wireless communications through the communication antenna 12a. Alternatives are also

possible. For example, a communications interface (communications means; not shown) may be provided to communicate over a cable, etc. connected to the communications interface. Also, there may be provided write means writing data on a storage medium and/or read means reading data on the storage medium, so that data can be communicated with other devices using a storage medium. The write means and/or read means may be built into the display device 1 or provided separately from the display device 1, but connected to the display device 1 through an interface, etc. (not shown). Examples of the storage medium include magnetic tapes, such as video tapes and cassette tapes; magnetic discs, such as floppy (registered trademark) discs and hard disks; optical discs (magneto-optical discs), such as CD-ROMs, MOs, MDs, DVDs, and CD-Rs; memory cards, such as IC cards and optical cards; and semiconductor memories, such as mask ROMs, EPROMs, EEPROMs, and flash ROMs.

The display device 1 was assumed to involve the display section 13 built around a liquid crystal panel having a super-wide screen with an aspect ratio of 7:3. Alternatives are also possible. For example, the display section 13 may be conventional display means with the 4:3 aspect ratio used in many onboard navigation devices and television broadcast display devices.

The display section 13 of the present embodiment has an aspect ratio of 7:3. If a part of its display area which has the same 4:3 aspect ratio as conventional display devices is occupied for a purpose, the section 13 is left with a square 3:3 part of the display area. When used as an instrument panel, the display section 13 can show a speedometer and other gauges in that square part of the display area. For example, the speedometer is typically circular for its high visibility. If the remaining part of the display area is wider than it is high, the shorter side of the aspect ratio is efficiently used to display a large speedometer. Therefore, the speedometer has good visibility and provides a high level of safety.

Recent navigation devices involve a display device with an aspect ratio of 15:9. The display section 13 may have such an aspect ratio.

The section 13 may have a display area with an aspect ratio greater than 7:3 (the width is more than 7/3 times the height). For example, the display section 13 may have an aspect ratio of 24:9 or more if the display section 13 is to show an image displayed on display means with the 15:9 aspect ratio along with gauges. Likewise, a television broadcast format specifies a 16:9 aspect ratio. If such a television image is to shown alongside gauges on the display section 13, the display section 13 may have an aspect ratio of

25:9 or more. The aspect ratio has no particular upper limit as long as the length of the shorter side of the display area is more than or equal to a predetermined value and the resolution is more than or equal to a predetermined value.

The display area of the display section 13 does not need to be a rectangle. For example, the area may be elliptic or circular. The display surface of the display section 13 may be a plane or curved.

The display section 13 in accordance with the present embodiment is assumed to be capable of simultaneously showing a speedometer, a tachometer, a fuel gauge, and other gauges, as well as captured images and navigational information. Alternatives are also possible. For example, there may be provided individual display sections, one for gauges and the other for captured images, maps and related information, etc. In other words, the display section 13 in accordance with the present embodiment may be an instrument panel dedicated to the display of a speedometer, a tachometer, a fuel gauge, and other gauges. Alternatively, the section 13 shows no gauges, but is dedicated to the display of captured images, television, navigational information, etc.

In the present embodiment, the display section 13 is a liquid crystal panel. Alternatives are also possible. For example, the section 13 may be an organic EL (electroluminescence) panel, a plasma display device panel, a

CRT (cathode ray tube), etc.

If the display section 13 is to show a speedometer and other gauges, there may be provided an emergency display device. For example, when the display section 13 is a liquid crystal panel, the display section 13 may break down or have a reaction speed (response speed) below a preferred practical level due to low temperature. However, the speedometer, etc. must still be properly displayed for safety reasons. Accordingly, for example, there may be provided an emergency display device built around a transparent EL panel, etc. (not shown). The emergency display device can display a speedometer, etc. for improved safety in driving when the display section 13 has broken down or is malfunctioning.

When a speedometer and other gauges are displayed, the initial image may be continuously displayed as the background after the display of gauges are started. When this is the case, for example, the visibility of gauges may fall if luminance is far higher in the background than in the display area for the gauges. To avoid this from happening, settings may be made to make luminance in the background equal to or lower than luminance in the display area for the gauges. For example, if luminance in background has increased beyond luminance in the display area for the gauges, the background luminance may be reduced below the gauge display luminance. Alternatively, the background luminance

may be restricted to a threshold or lower, to prevent the background luminance from increasing beyond the predetermined threshold.

The manual input section 14 in accordance with the present embodiment is made of a set of input keys. Alternatives are also possible. For example, the display section 13 may double as the manual input section 14. This is a "touch panel" type of display section. The display section 13 displays items, allowing driver inputs. The driver touches where a desired item is shown in the display area to given instructions to the control section 20. Alternatively, the manual input section 14 may be a mouse or a joystick-type of manipulation device. An audio system may also be used together with other types of manual input sections. If there is provided a system in which the angles, etc. of a door mirror (fender mirror) can be electrically adjustable, this manipulate means may also be used. Alternatively the section 14 may involve a "remote control" made up of manual input/transmission means for infrared, radio frequency, or other wireless communications of instructional information entered by the user and receive means for receiving the transmitted information.

In the present embodiment, the initial image DB 16 is a flash memory. However, this is by no means intended to be limiting the initial image DB 16. However, to quickly display

the initial image immediately after the startup of the display device 1, the DB 16 is preferably storage means with a high data read rate like the flash memory.

In the present embodiment, the storage-data storage section 15, the memory section 17, and the color distribution association table 18 are provided on a hard disk. Alternatives are also possible. For example, images may be stored in advance for later retrieval in magnetic tapes, such as video tapes and cassette tapes; magnetic discs, such as floppy (registered trademark) discs and hard disks; optical discs (magneto-optical discs), such as CD-ROMs, MOs, MDs, DVDs, and CD-Rs; memory cards, such as IC cards and optical cards; and semiconductor memories, such as mask ROMs, EPROMs, EEPROMs, and flash ROMs.

In the present embodiment, the power supply to the display device 1 is an engine startup battery. Alternatives are also possible. A separate power supply means may be provided for the display device 1. For example, the power supply may be a battery or rechargeable battery.

In the present embodiment, the user enters an instruction to turn on the power supply to the display device 1 through the manual input section 14. Alternatives are also possible. For example, the vehicle to which the display device 1 is mounted may be provided with means detecting a turn-on action of the ignition key, so that the power supply to the

display device 1 is turned on when a turn-on action of the ignition key is detected. Alternatively, for example, the power supply to the display device 1 may be turned on when the driver seat door is opened/closed, the door is unlocked, or the door is opened/closed.

The vehicle to which the display device 1 is mounted has been assumed to have system check functions. With these functions, immediately after the engine is started, the vehicle checks if there are any components that might disrupt normal driving. Items to be checked include reduced tire pressure, insufficient fuel, reduced amounts of brake oil, engine oil, and other oils, and insufficient cooling water. Other items may be checked: for example, the remaining amounts of the brake pads; the remaining amounts of tire grooves; the tension on the timing belt and other belts; the cleanness of the air filters, oil elements, and other filters; and the working conditions of the head lights, blinkers, brake lamps, and other lamps. There may be provided a function to notify the driver of his car's maintenance information. For example, records may be made about the date when engine oil, oil elements, and other expendable components were changed last time, the traveling distance accumulated up to that date, etc. so that the time from the last change and the traveling distance covered during that period may be detected upon engine startup.

The display device 1 has been assumed to be mounted to a vehicle. The vehicle in accordance with the present embodiment is not limited to automobiles, but also encompasses motorcycles and bicycles. The display device 1 may be mounted not only to vehicles, but also to any mode of transport carrying people, including helicopters, aircraft, and boats and ships. The display device 1 does not need to be fixed to these vehicles. For example, the device 1 may be mounted to the vehicles in such a manner that the device 1 is attachable/detachable.

The display device 1 in accordance with the present embodiment is used, for example, as an onboard liquid crystal instrument panel. Upon startup, the device (instrument panel) 1 can display an image thereon. The image is stored in the vehicle in advance, downloaded over communication lines, or transferred from another terminal.

Generally, many captured images have a resolution and size which are not suitable for instrument panels. Accordingly, the control section 20 in the display device 1 may automatically modify the image in size, resolution, and visibility so that it is suited to the instrument panel. The image is displayed after such modifications.

In the present embodiment, all processing in the display device 1, the server 100, the mobile phone 200 are done respectively under the control of the control section 20, the

control section 102, and the control section 206. However, alternatives are also possible. A computer program for the processing may be stored on a storage medium. An information processing device, capable of reading the program out, can replace the control sections 20, 102, 206.

In this configuration, the computing unit (CPU, MPU, etc.) of the information processing device reads out and executes the program stored on the storage medium. Therefore, it can be said that the program per se is a realization of the processing.

The information processing device is a general computer (workstation, personal computer, etc.) or a extension board or unit attached to a computer.

The computer program is program code (executable program, intermediate code program, source program) of software realizing the processing. The computer program may be used alone or in combination with another computer program (e.g., OS). The computer program may be retrieved from a storage medium, temporarily stored in a memory (e.g. RAM) in the device, and thereafter retrieved again for execution.

The storage medium containing the program may be readily separable from the information processing device or fixed (attached) to the device. The medium may be a peripheral connecting to the device.

Examples of the storage medium include magnetic tapes, such as video tapes and cassette tapes; magnetic discs, such as floppy (registered trademark) discs and hard disks; optical discs (magneto-optical discs), such as CD-ROMs, MOs, MDs, DVDs, and CD-Rs; memory cards, such as IC cards and optical cards; and semiconductor memories, such as mask ROMs, EPROMs, EEPROMs, and flash ROMs.

The storage medium may be capable of connecting to the information processing device over a network (Intranet/Internet, etc.). When this is the case, the information processing device downloads the program over the network. In other words, the program may be obtained via a transmission medium (which stores the program in a flowing manner) for a network (either wired or wireless), etc. The computer program performing the download is preferably stored in the device (or in the transmitter/receiver) in advance.

According to the present invention, user-desired images can be displayed on the instrument panel when the display of gauges is not necessary, like when the vehicle is not moving. Images drawn by the user, etc., not those given in advance, can be displayed. Thus, the user can add his favorite flavor to the inner space of the vehicle.

According to the present invention, images which were not produced for an instrument panel may be automatically

modified for an instrument panel display. Those images can also be displayed on other terminals. The user can manage the images displayed on peripherals in an associated manner. Since the instrument panel has a wide screen, several images or a large quantity of information can be viewed in a single display.

The invention being thus described, it will be obvious that the same way may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention, and all such modifications as would be obvious to one skilled in the art are intended to be included within the scope of the following claims.

INDUSTRIAL APPLICABILITY

The display device in accordance with the present invention can be mounted to any mode of transport: for example, automobiles, motorcycles, bicycles, helicopter, aircraft, and boats and ships.

The display system in accordance with the present invention can be arranged by connecting the display device in accordance with the present invention to, for example, a server, a mobile phone, a personal computer, or any other device capable of data communications.

CLAIMS

1. A display device including a display section displaying an image, the device being mounted to a vehicle,

the device comprising a control section replacing an initial image with a given image, the initial image being displayed on the display section from immediately after startup of the display device until the display section becomes capable of an ordinary display.

2. The display device as set forth in claim 1, further comprising an initial image storage section containing the initial image,

wherein the control section controls the initial image storage section to store an initial image which will be displayed next time the display section starts up.

3. The display device as set forth in claim 1, further comprising an image capture section capturing an image around the vehicle,

wherein the control section uses the image captured on the image capture section as the initial image.

4. The display device as set forth in claim 1, further comprising a receiver section receiving data from another

device,

wherein the control section uses an image received from the other device as the initial image.

5. The display device as set forth in claim 1, further comprising a connecting section connecting to another device,

wherein the control section uses an image received from the other device as the initial image.

6. The display device as set forth in claim 1, further comprising a read section reading data from a storage medium,

wherein the control section uses an image read from the storage medium as the initial image.

7. The display device as set forth in claim 1, further comprising an image storage section containing multiple images,

wherein the control section retrieves and uses any one of the multiple images contained in the image storage section as the initial image.

8. The display device as set forth in claim 1, wherein the control section resizes the initial image in accordance with a size of a display area of the display section.

9. The display device as set forth in claim 1, wherein the control section displays the initial image in a part of the display area of the display section and colors an entire remaining part of the display area.

10. The display device as set forth in claim 9, further comprising a color distribution association table containing preferred combinations of color distributions of initial images and colors in which the remaining part of the display area is entirely colored,

wherein the control section detects the color distribution of the initial image and references the color distribution association table for a color combination to determine a color in which the remaining part of the display area is entirely colored.

11. The display device as set forth in claim 1, further comprising a decorative image storage section containing decorative images decorating the initial image,

wherein the control section selects one of the decorative images which matches the initial image from the decorative image storage section and produces a composite image from the initial image and the selected decorative image for a display.

12. The display device as set forth in claim 1, further comprising a rearrangement storage section containing a pattern according to which the display area of the display section is divided into multiple subareas,

wherein the control section produces a composite image from multiple images and the pattern contained in the rearrangement storage section for use as the initial image.

13. The display device as set forth in claim 1, wherein when the initial image has been displayed on the display section for a predetermined period after the startup of the display device, the control section switches a display on the display section to the ordinary display.

14.. The display device as set forth in claim 13, further comprising a time measurement section measuring an elapsed time,

wherein the control section switches the display on the display section to the ordinary display when a preset time has elapsed after the startup of the display device.

15. The display device as set forth in claim 13, wherein:

the display section includes a liquid crystal display element;

the display device further comprises a temperature sensor section detecting a temperature of the liquid crystal display element; and

the control section switches the display on the display section to the ordinary display when the temperature of the liquid crystal display element has reached a predetermined temperature or higher.

16. The display device as set forth in claim 13, wherein the control section controls to display the initial image in a part of the display area even after the display is switched to the ordinary display.

17. The display device as set forth in claim 1, further comprising a transmitter section transmitting data to another device,

wherein the control section transmits the initial image to another device.

18. The display device as set forth in claim 17, wherein the control section cuts out a part of the initial image for a transmission to another device.

19. The display device as set forth in claim 18, further comprising a manual input section receiving a user

instruction,

wherein the control section determines the cutout part of the initial image in accordance with a user instruction.

20. The display device as set forth in claim 18, wherein the control section determines the cutout part of the initial image in accordance with a size of a display area of a display section of a device to which the cutout part will be transmitted.

21. The display device as set forth in claim 1, further comprising a manual input section receiving a user instruction,

wherein the control section replaces the initial image in accordance with a user instruction entered through the manual input section.

22. A vehicle, comprising a display device including a display section displaying an image, the device being mounted to the vehicle,

the device comprising a control section replacing an initial image with a given image, the initial image being displayed on the display section from immediately after startup of the display device until the display section becomes capable of an ordinary display.

23. The vehicle as set forth in claim 22, further comprising an embarkation sensor section detecting an embarkation of a passenger,

wherein the control section for the display device controls the display device to start up when the embarkation sensor section has detected an embarkation of a passenger.

24. The vehicle as set forth in claim 22, further comprising:

a power generation section; and

a startup instruction sensor section detecting a startup instruction to the power generation section,

wherein the control section for the display device controls the display device to start up when a startup instruction to the power generation section is detected.

25. The vehicle as set forth in claim 22, further comprising:

a door;

a lock section locking the door; and

an unlock sensor section detecting an unlock action of the lock section,

wherein the control section for the display device controls the display device to start up when an unlock action is detected.

26. The vehicle as set forth in claim 22, further comprising:

a power generation section; and

a startup instruction sensor section detecting a startup instruction to the power generation section,

wherein the control section for the display device switches a display on the display device to the ordinary display when a startup instruction to the power generation section is detected.

27. The vehicle as set forth in claim 22, further comprising:

a gear change section; and

a gear change instruction sensor section detecting a manual input to the gear change section,

wherein the control section for the display device switches a display on the display device to the ordinary display when a manual input to the gear change section is detected.

28. The vehicle as set forth in claim 22, further comprising a status sensing section detecting status of vehicle components,

wherein the control section switches a display on the display device to the ordinary display when detection of the status of the vehicle components is completed.

29. A display system, comprising:

a display device mounted to a vehicle, the device

including: a display section displaying an image; a control section replacing an initial image with a given image, the initial image being displayed on the display section immediately after startup; and a communications section performing data communications with another device, and

another device including a communications section performing data communications with the display device,

wherein the control section replaces the initial image in accordance with data from the other device.

30. The display system as set forth in claim 29, wherein:

the control section transmits to the other device an image request signal requesting a transmission of a desired image and uses the image received from the other device as the initial image; and

the other device includes: a server image storage section containing multiple images; and a server control section detecting an image from the images in the server image storage section in accordance with the image request signal from the display device and transmitting the detected image to the display device.

31. The display system as set forth in claim 30, wherein:

the display device includes a manual input section receiving a user instruction input;

the control section for the display section transmits to the other device a signal corresponding to a key word for a user-desired image entered through the manual input section as the image request signal; and

the server control section detects an image in accordance with the key word and transmits the detected image to the display device.

32. The display system as set forth in claim 29, wherein:

the other device includes: a second image display section displaying an image; and a second control section controlling the second image display section to display a particular image under predetermined conditions and to replace the particular image with a given particular image;

the second control section transmits the new particular image to the display device when the old particular image is replaced; and

the control section for the display device uses an image in accordance with the image transmitted from the other device as the initial image.

33. The display system as set forth in claim 29, wherein:

the other device includes: a second image display section displaying an image; and a second control section controlling the second image display section to display a

particular image under predetermined conditions and to replace the particular image with a given particular image;

the control section for the display section transmits a substituting initial image to the other device when the initial image is replaced; and

the second control section uses an image in accordance with the image transmitted from the display device as the particular image.

34. A display system, comprising: a display device; a second display device; and a server device,

the display device including: a display section displaying an image; a control section replacing an initial image with a given image, the initial image being displayed on the display section immediately after startup; and a communications section performing data communications with another device,

the second display device including: a second image display section displaying an image; a second control section controlling the second image display section to display a particular image under predetermined conditions and to replace the particular image with a given particular image; and a second communications section performing data communications with another device,

the server device including: a server image storage section containing multiple images; a server communications

section performing data communications with another device; and a server control section searching the server image storage section for an image in accordance with an image request signal received from another device,

wherein:

the second display device includes a second manual input section receiving a user instruction input;

the second control section transmits to the server device an image request signal requesting the server device to transmit a user-desired image as instructed through the second manual input section and sets up the image received from the server device as the particular image;

the server control section transmits to the second display device and the display device the image in accordance with the image request signal transmitted from the second display device; and

the display control section for the display device uses the image received from the server device as the initial image.

35. A display system, comprising: a display device; a second display device; and a server device,

the display device including: a display section displaying an image; a control section replacing an initial image with a given image, the initial image being displayed on the display section immediately after startup; and a communications

section performing data communications with another device,

the second display device including: a second image display section displaying an image; a second control section controlling the second image display section to display a particular image under predetermined conditions and to replace the particular image with a given particular image; and a second communications section performing data communications with another device,

the server device including: a server image storage section containing multiple images; a server communications section performing data communications with another device; and a server control section searching the server image storage section for an image in accordance with an image request signal received from another device,

wherein:

the display device includes a manual input section receiving a user instruction input;

the control section for the display device transmits to the server device an image request signal requesting the server device to transmit a user-desired image as instructed through the manual input section and sets up the image received from the server device as the initial image;

the server control section transmits to the second display device and the display device the image in accordance with the image request signal received from the display

device; and

the second control section for the second display device uses the image received from the server device as the particular image.

36. The display system as set forth in either one of claims 34 and 35, wherein upon receiving the image request signal, the server control section transmits the image in accordance with the image request signal to the display device and the second display device after resizing the image in accordance with sizes of display areas of the display sections of the display devices.

37. A computer program controlling a computer to function as a control section,

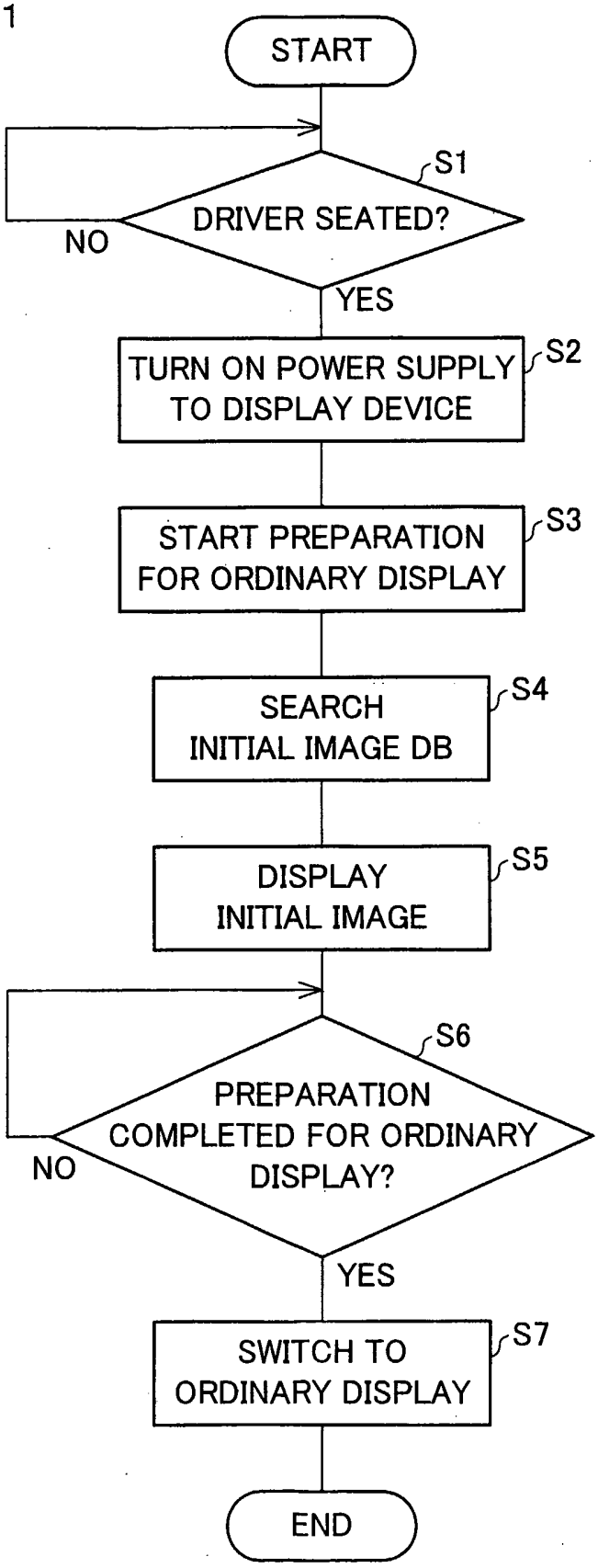
the computer being provided to a display device including a display section displaying an image, the device being mounted to a vehicle,

the control section replacing an initial image with a given image, the initial image being displayed on the display section from immediately after startup of the display device until the display section becomes capable of an ordinary display.

38. A computer-readable storage medium containing the

computer program as set forth in claim 37.

FIG. 1


START
S1
DRIVER SEATED?
NO
YES
TURN ON POWER SUPPLY TO DISPLAY DEVICE
S2
START PREPARATION FOR ORDINARY DISPLAY
S3
SEARCH INITIAL IMAGE DB
S4
DISPLAY INITIAL IMAGE
S5
S6
PREPARATION COMPLETED FOR ORDINARY DISPLAY?
NO
YES
SWITCH TO ORDINARY DISPLAY
S7
END

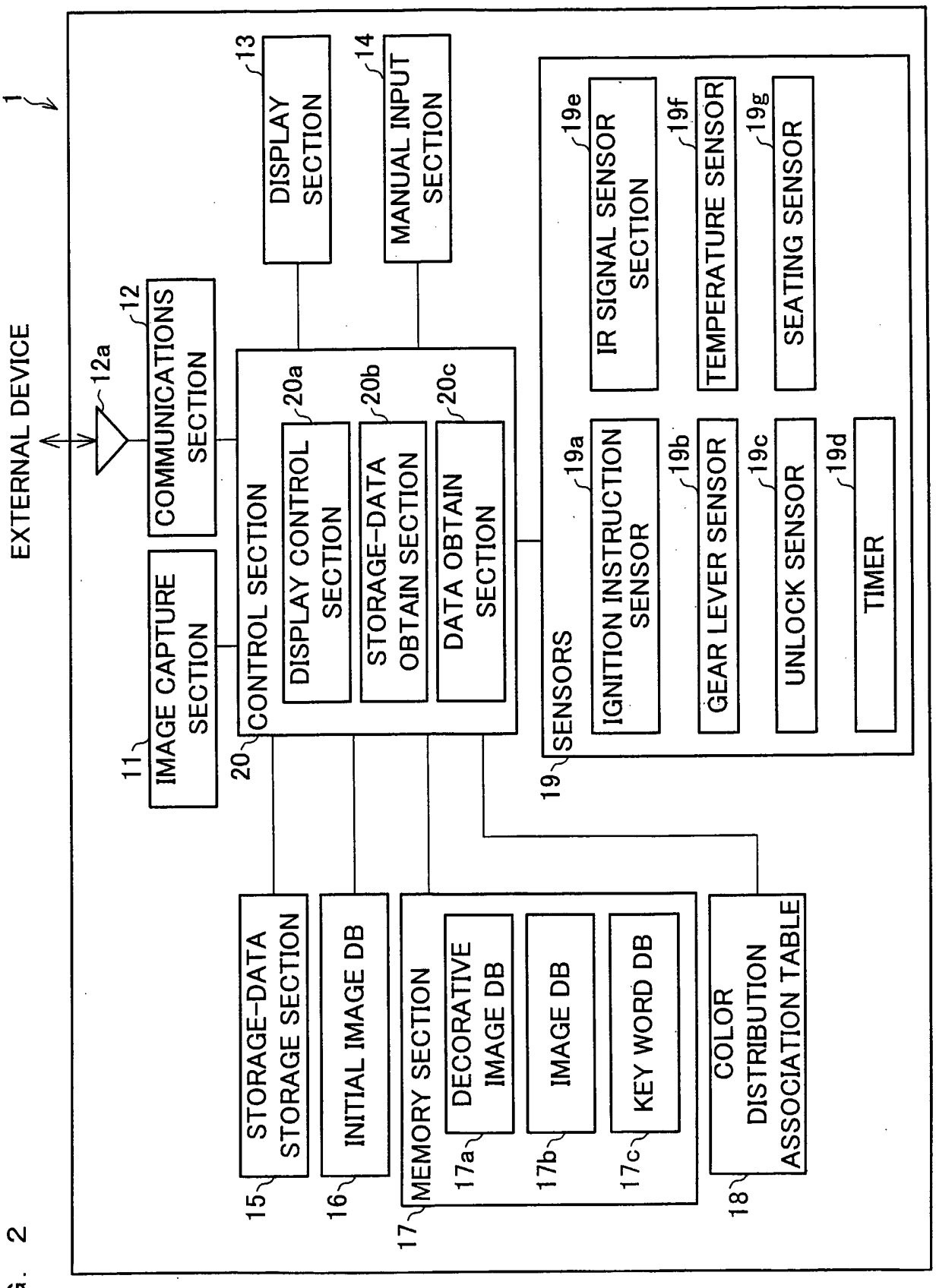

1
EXTERNAL DEVICE
12a
12
COMMUNICATIONS SECTION
13
DISPLAY SECTION
14
MANUAL INPUT SECTION
11
IMAGE CAPTURE SECTION
20
CONTROL SECTION
20a
DISPLAY CONTROL SECTION
20b
STORAGE-DATA OBTAIN SECTION
20c
DATA OBTAIN SECTION
19
SENSORS
19a
IGNITION INSTRUCTION SENSOR
19b
GEAR LEVER SENSOR
19c
UNLOCK SENSOR
19d
TIMER
19e
IR SIGNAL SENSOR SECTION
19f
TEMPERATURE SENSOR
19g
SEATING SENSOR
15
STORAGE-DATA STORAGE SECTION
16
INITIAL IMAGE DB
17
MEMORY SECTION
17a
DECORATIVE IMAGE DB
17b
IMAGE DB
17c
KEY WORD DB
18
COLOR DISTRIBUTION ASSOCIATION TABLE

FIG. 2

FIG. 3

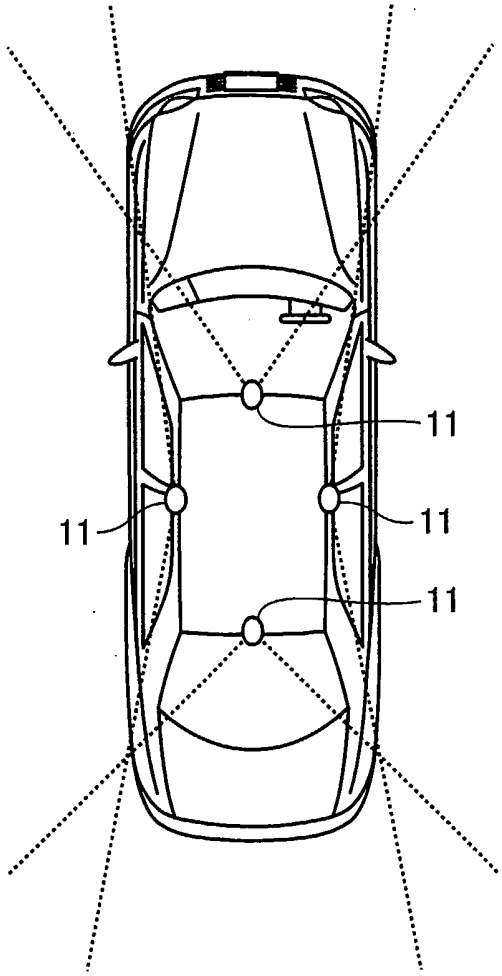


FIG. 4

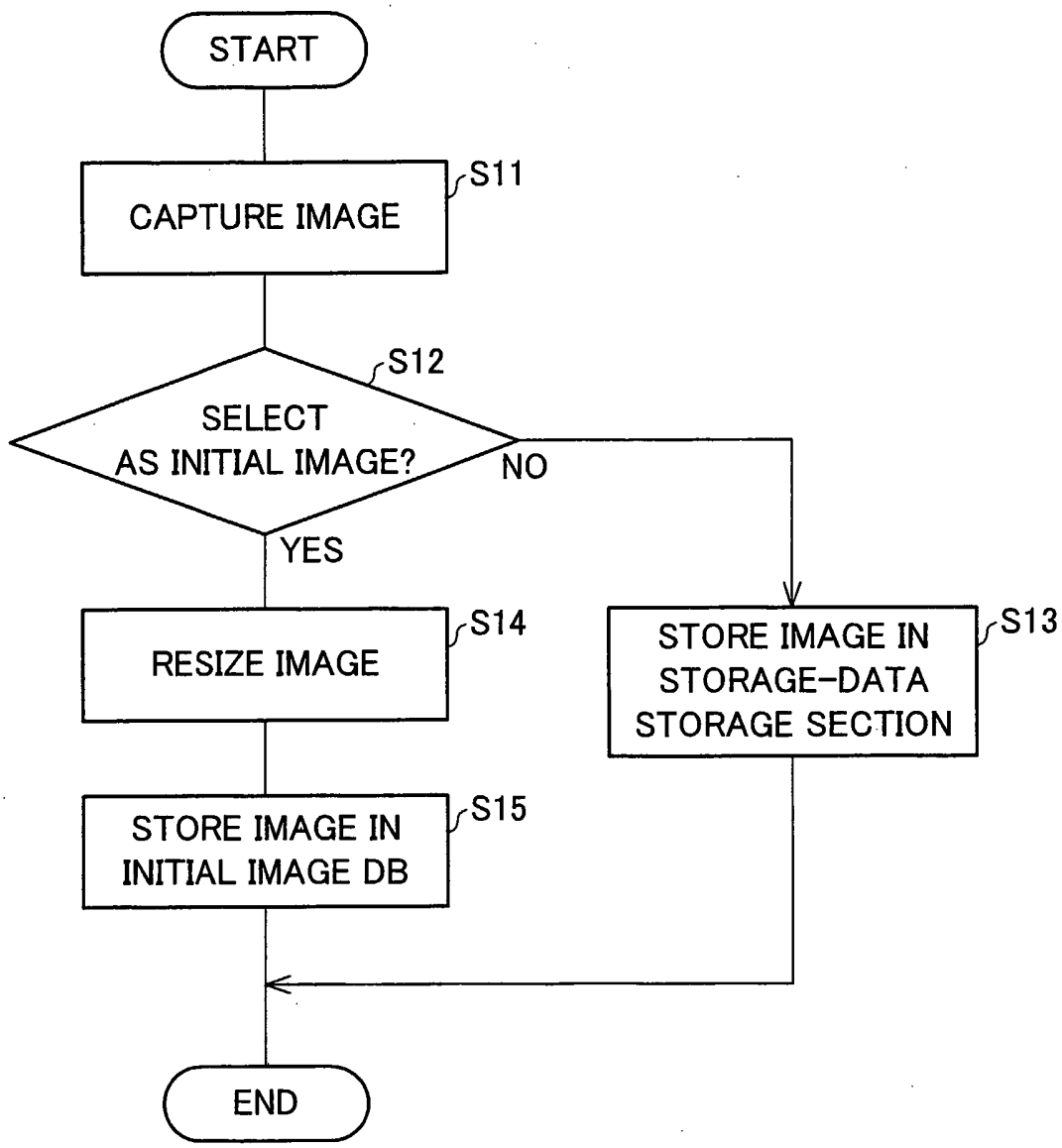

START
CAPTURE IMAGE
S11
S12
SELECT AS INITIAL IMAGE?
NO
YES
RESIZE IMAGE
S14
STORE IMAGE IN STORAGE-DATA STORAGE SECTION
S13
STORE IMAGE IN INITIAL IMAGE DB
S15
END

FIG. 5

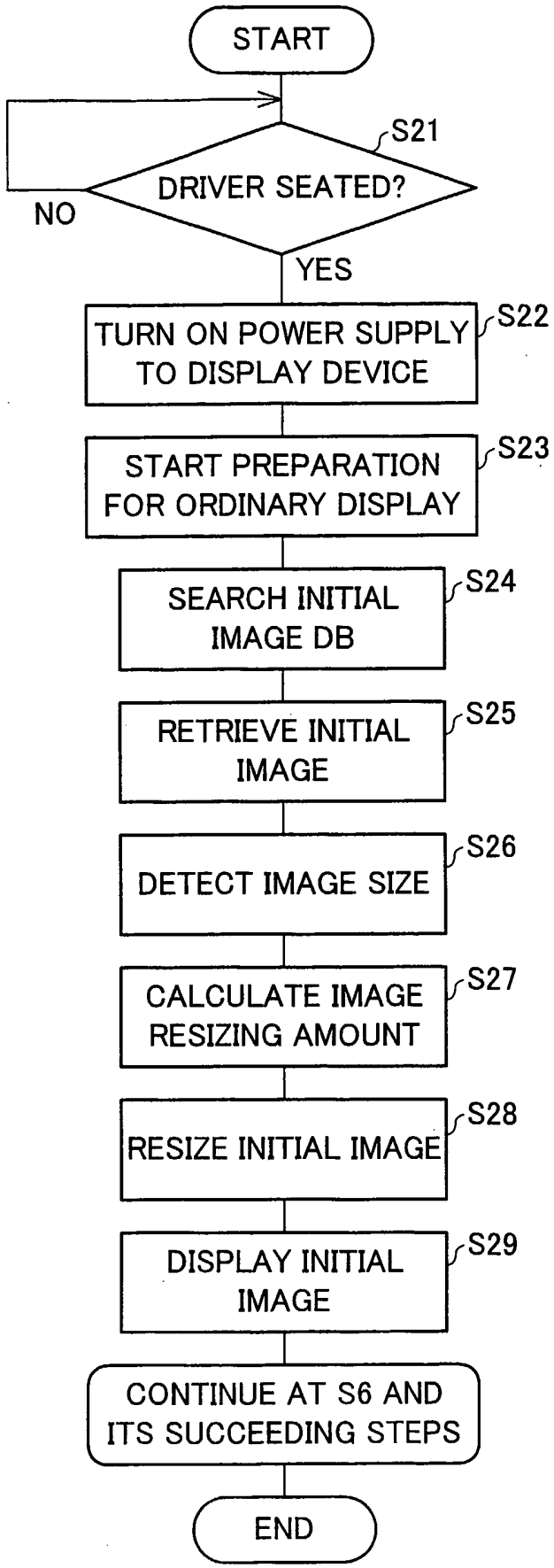

START
S21
DRIVER SEATED?
NO
YES
TURN ON POWER SUPPLY TO DISPLAY DEVICE
S22
START PREPARATION FOR ORDINARY DISPLAY
S23
SEARCH INITIAL IMAGE DB
S24
RETRIEVE INITIAL IMAGE
S25
DETECT IMAGE SIZE
S26
CALCULATE IMAGE RESIZING AMOUNT
S27
RESIZE INITIAL IMAGE
S28
DISPLAY INITIAL IMAGE
S29
CONTINUE AT S6 AND ITS SUCCEEDING STEPS
END

FIG. 6

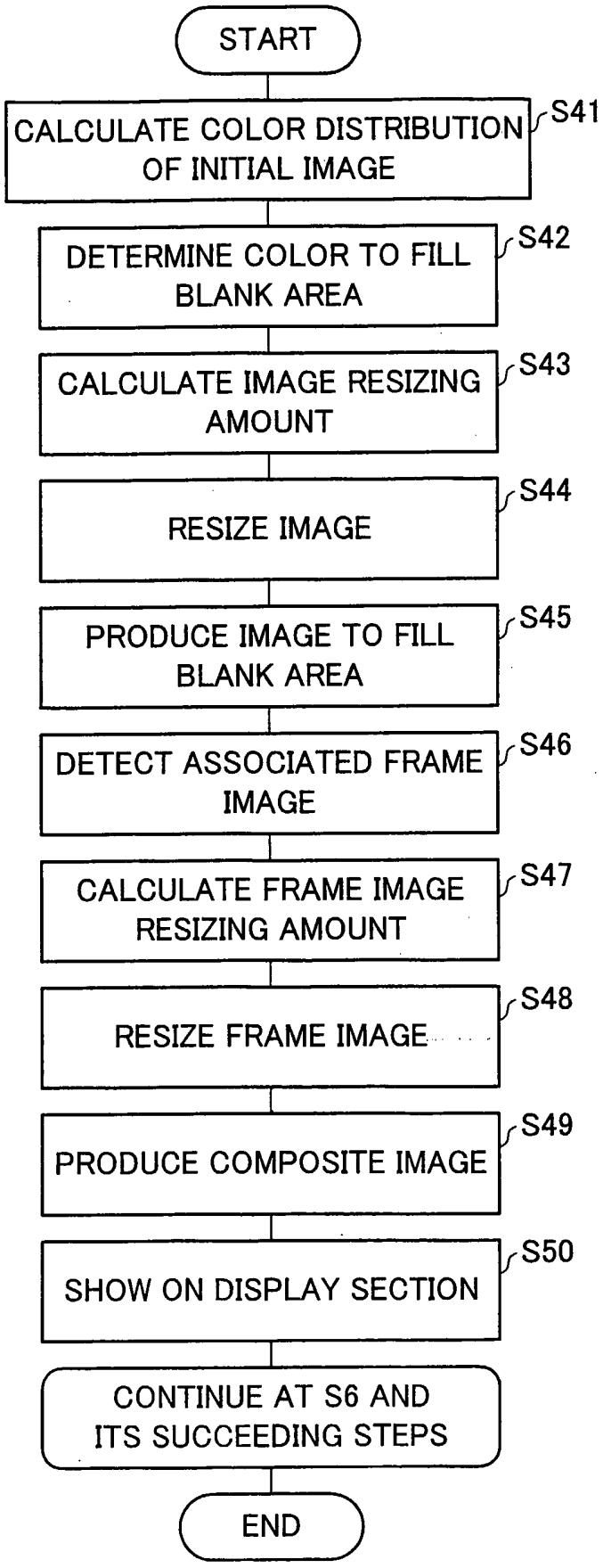

START
CALCULATE COLOR DISTRIBUTION OF INITIAL IMAGE
S41
DETERMINE COLOR TO FILL BLANK AREA
S42
CALCULATE IMAGE RESIZING AMOUNT
S43
RESIZE IMAGE
S44
PRODUCE IMAGE TO FILL BLANK AREA
S45
DETECT ASSOCIATED FRAME IMAGE
S46
CALCULATE FRAME IMAGE RESIZING AMOUNT
S47
RESIZE FRAME IMAGE
S48
PRODUCE COMPOSITE IMAGE
S49
SHOW ON DISPLAY SECTION
S50
CONTINUE AT S6 AND ITS SUCCEEDING STEPS
END

FIG. 7

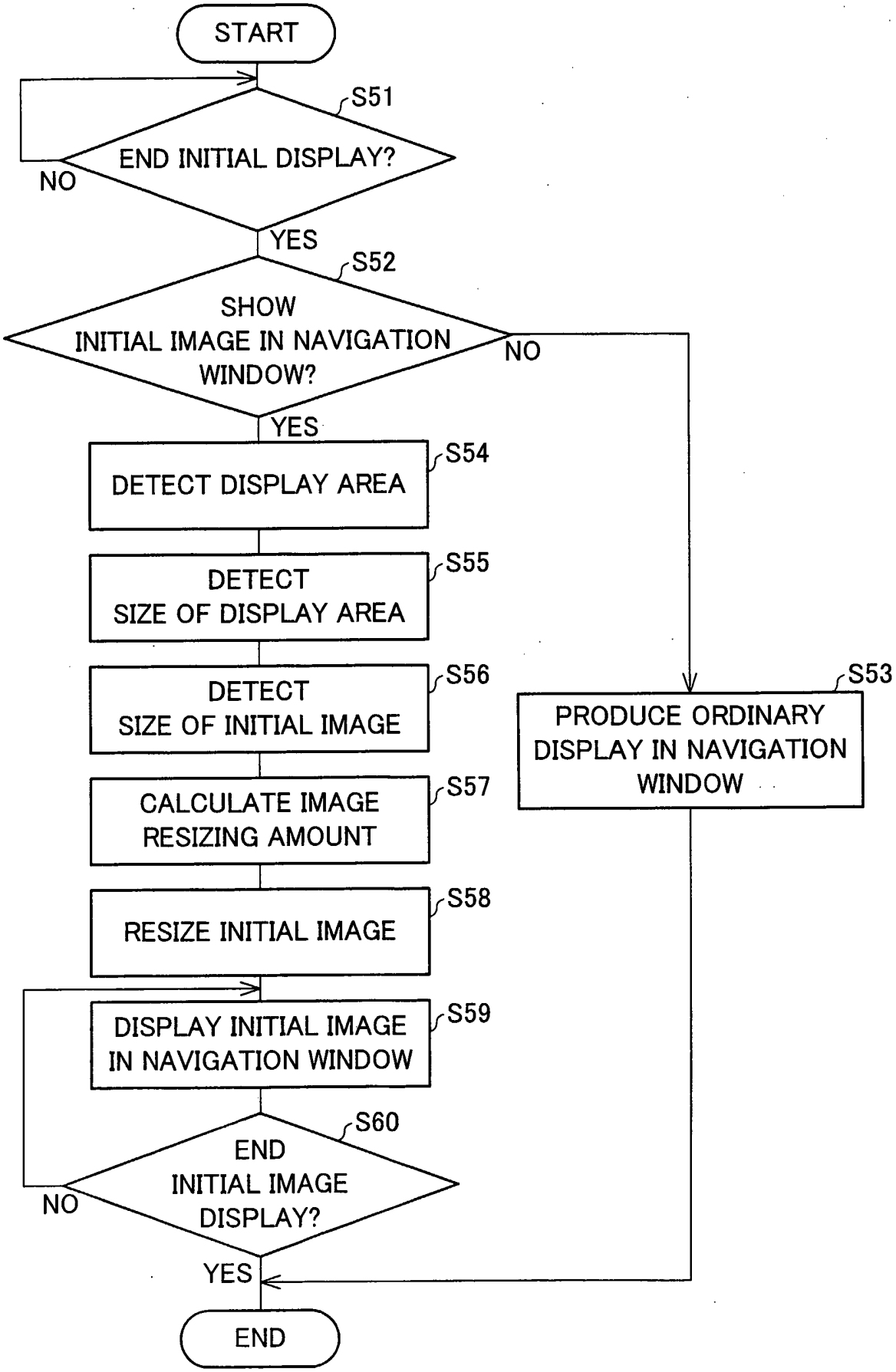

START
S51
END INITIAL DISPLAY?
NO
YES
S52
SHOW INITIAL IMAGE IN NAVIGATION WINDOW?
NO
YES
S54
DETECT DISPLAY AREA
S55
DETECT SIZE OF DISPLAY AREA
S56
DETECT SIZE OF INITIAL IMAGE
S57
CALCULATE IMAGE RESIZING AMOUNT
S58
RESIZE INITIAL IMAGE
S59
DISPLAY INITIAL IMAGE IN NAVIGATION WINDOW
S60
END INITIAL IMAGE DISPLAY?
NO
YES
S53
PRODUCE ORDINARY DISPLAY IN NAVIGATION WINDOW
END

FIG. 8

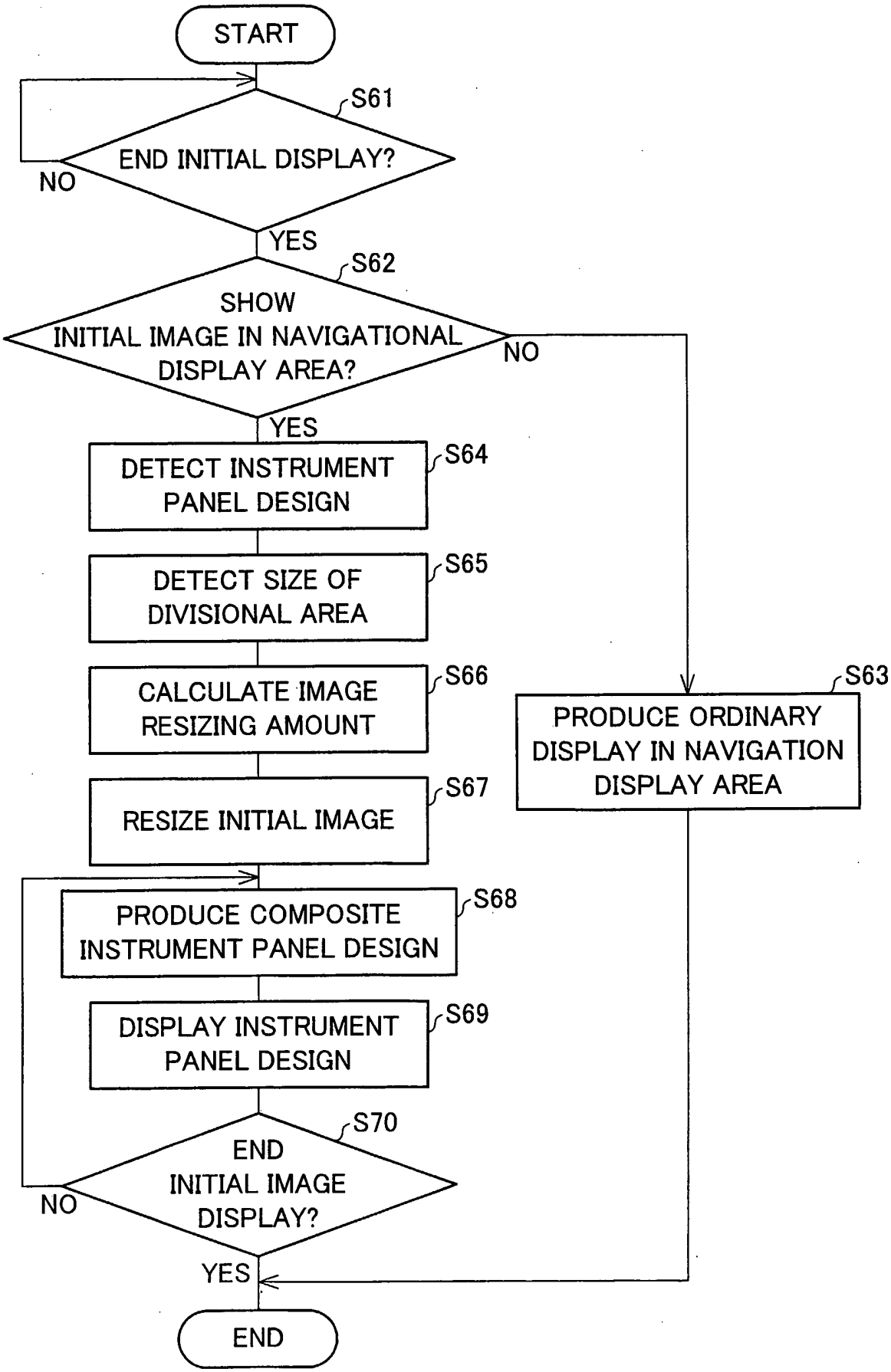

START
S61
END INITIAL DISPLAY?
NO
YES
S62
SHOW INITIAL IMAGE IN NAVIGATIONAL DISPLAY AREA?
NO
YES
S64
DETECT INSTRUMENT PANEL DESIGN
S65
DETECT SIZE OF DIVISIONAL AREA
S66
CALCULATE IMAGE RESIZING AMOUNT
S67
RESIZE INITIAL IMAGE
S68
PRODUCE COMPOSITE INSTRUMENT PANEL DESIGN
S69
DISPLAY INSTRUMENT PANEL DESIGN
S70
END INITIAL IMAGE DISPLAY?
NO
YES
S63
PRODUCE ORDINARY DISPLAY IN NAVIGATION DISPLAY AREA
END

FIG. 9

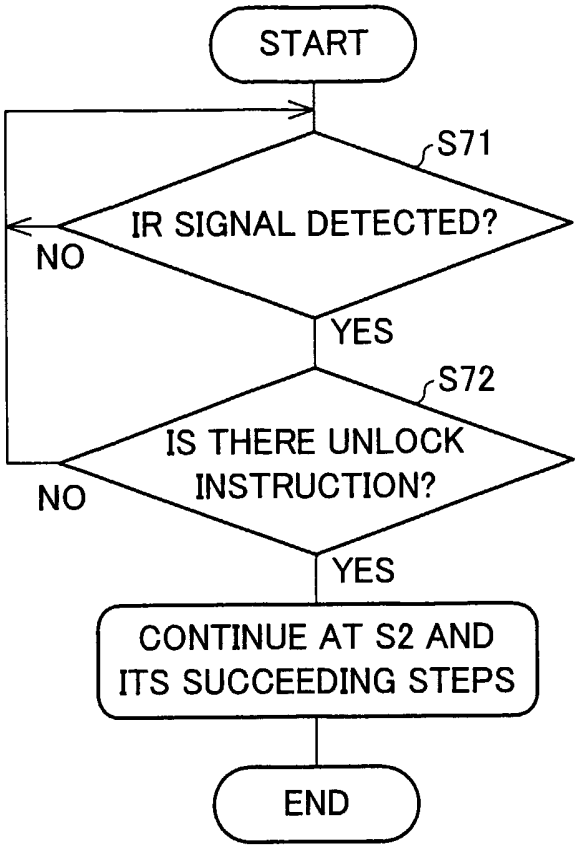

START
S71
IR SIGNAL DETECTED?
NO
YES
S72
IS THERE UNLOCK INSTRUCTION?
NO
YES
CONTINUE AT S2 AND ITS SUCCEEDING STEPS
END

FIG. 10

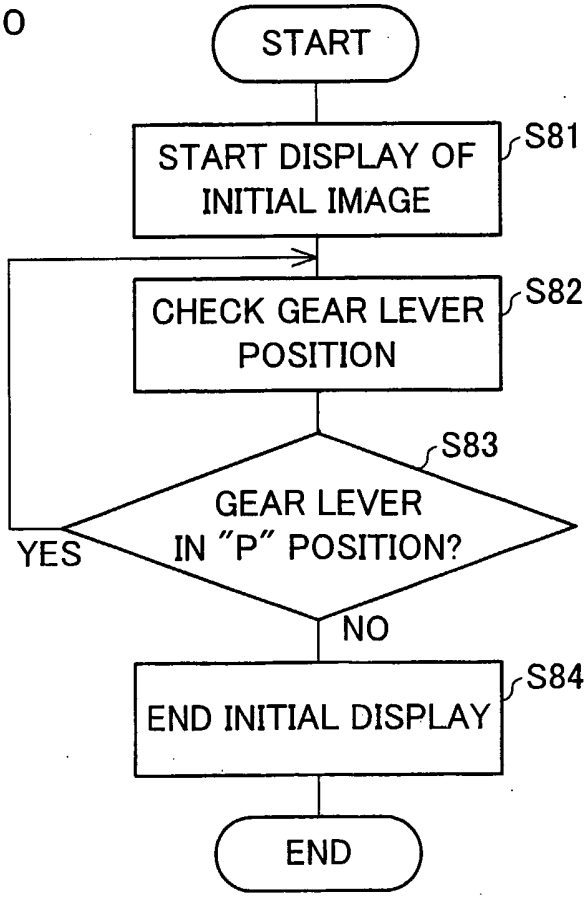

START
START DISPLAY OF INITIAL IMAGE
S81
CHECK GEAR LEVER POSITION
S82
S83
GEAR LEVER IN "P" POSITION?
YES
NO
END INITIAL DISPLAY
S84
END

FIG. 11

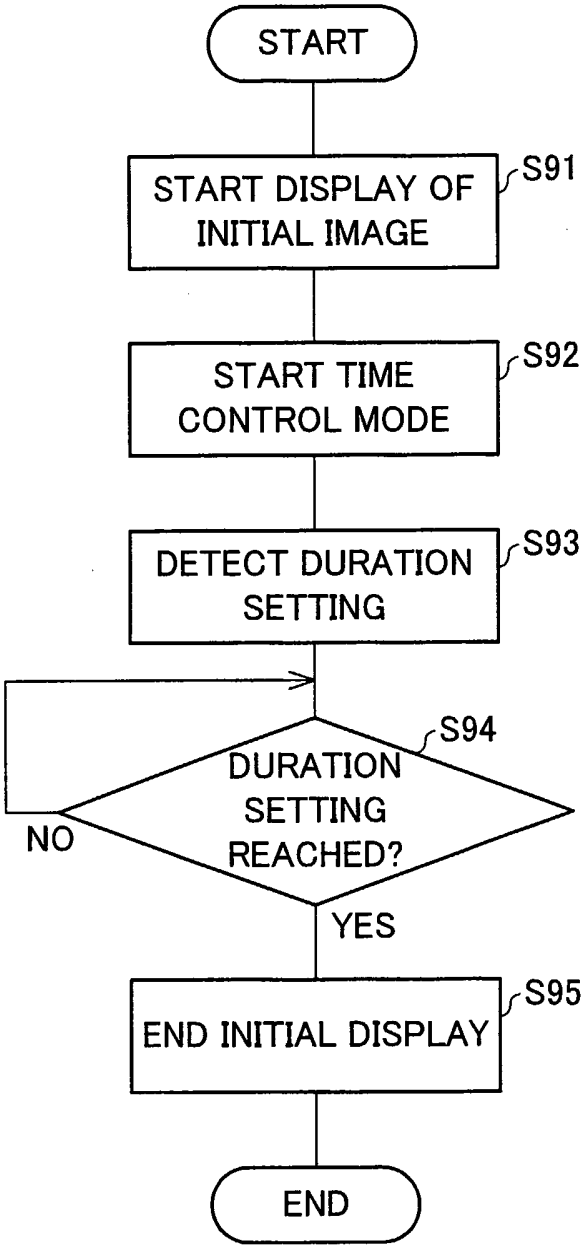

START
START DISPLAY OF INITIAL IMAGE
S91
START TIME CONTROL MODE
S92
DETECT DURATION SETTING
S93
DURATION SETTING REACHED?
S94
NO
YES
END INITIAL DISPLAY
S95
END

FIG. 12

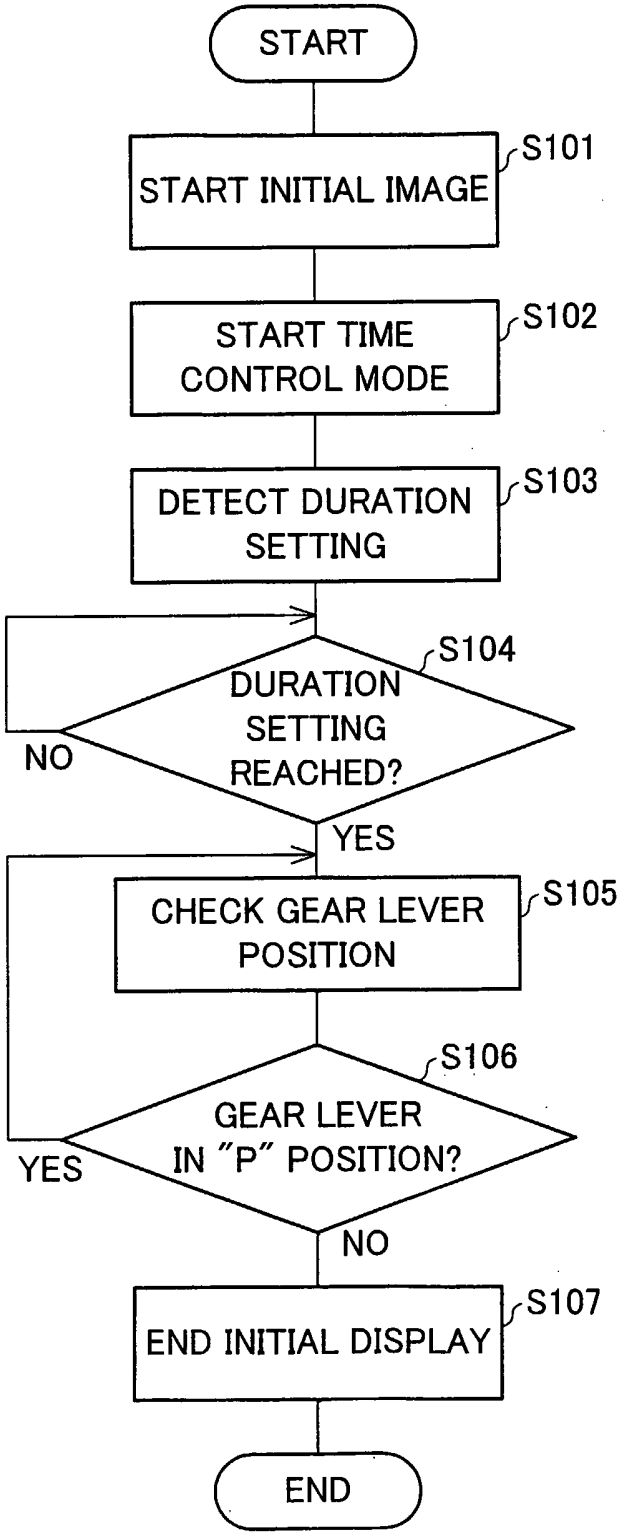

START
START INITIAL IMAGE
S101
START TIME CONTROL MODE
S102
DETECT DURATION SETTING
S103
DURATION SETTING REACHED?
S104
NO
YES
CHECK GEAR LEVER POSITION
S105
GEAR LEVER IN "P" POSITION?
S106
YES
NO
END INITIAL DISPLAY
S107
END

FIG. 13

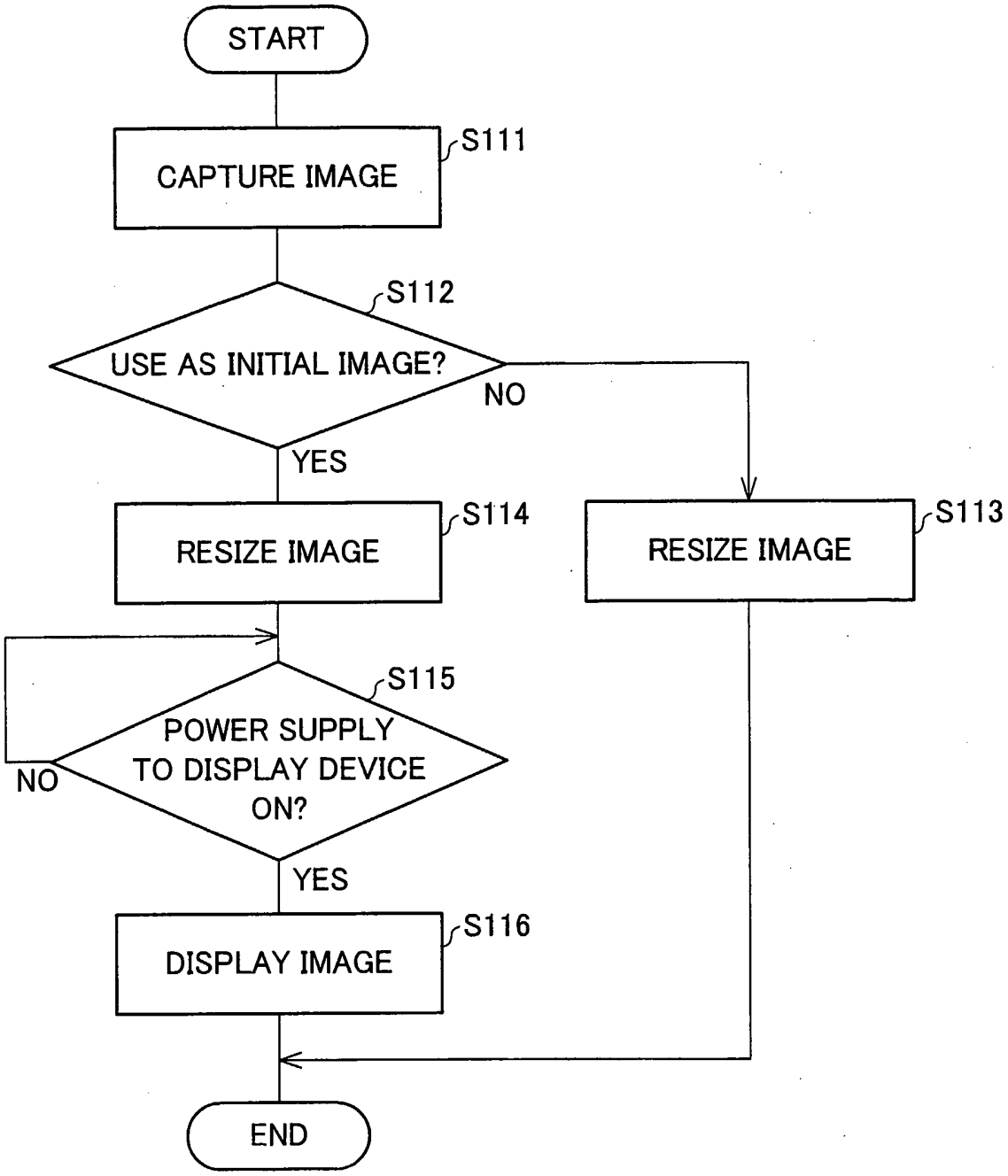

START
CAPTURE IMAGE
S111
S112
USE AS INITIAL IMAGE?
NO
YES
RESIZE IMAGE
S114
RESIZE IMAGE
S113
S115
POWER SUPPLY TO DISPLAY DEVICE ON?
NO
YES
DISPLAY IMAGE
S116
END

FIG. 14 (a)

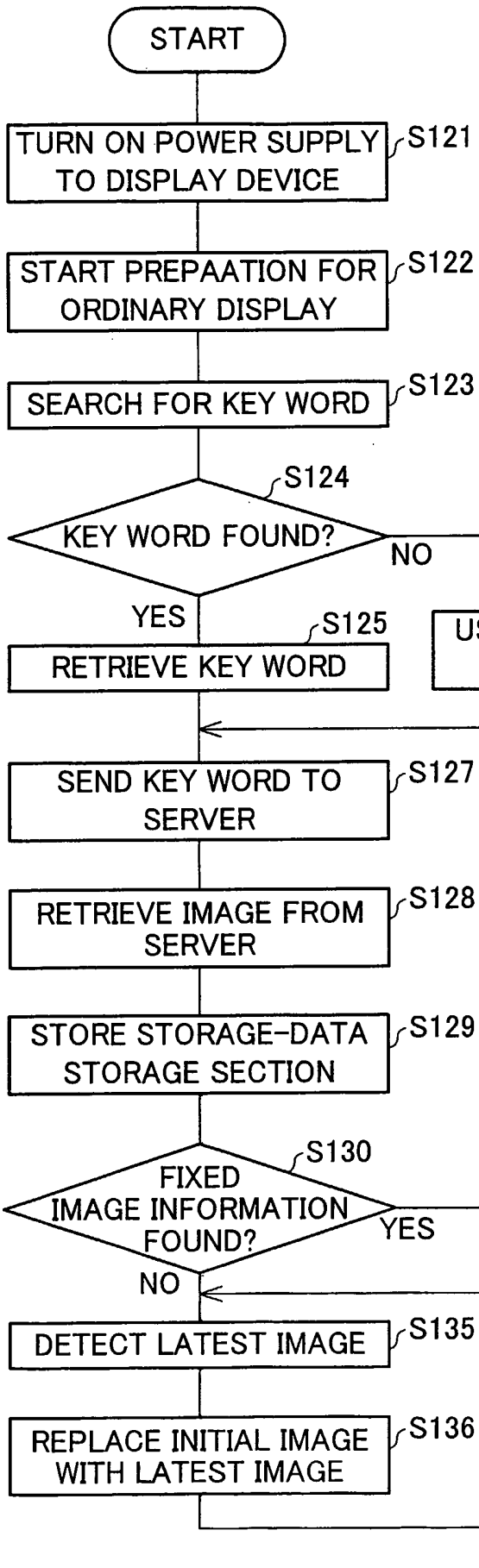


FIG. 14 (b)

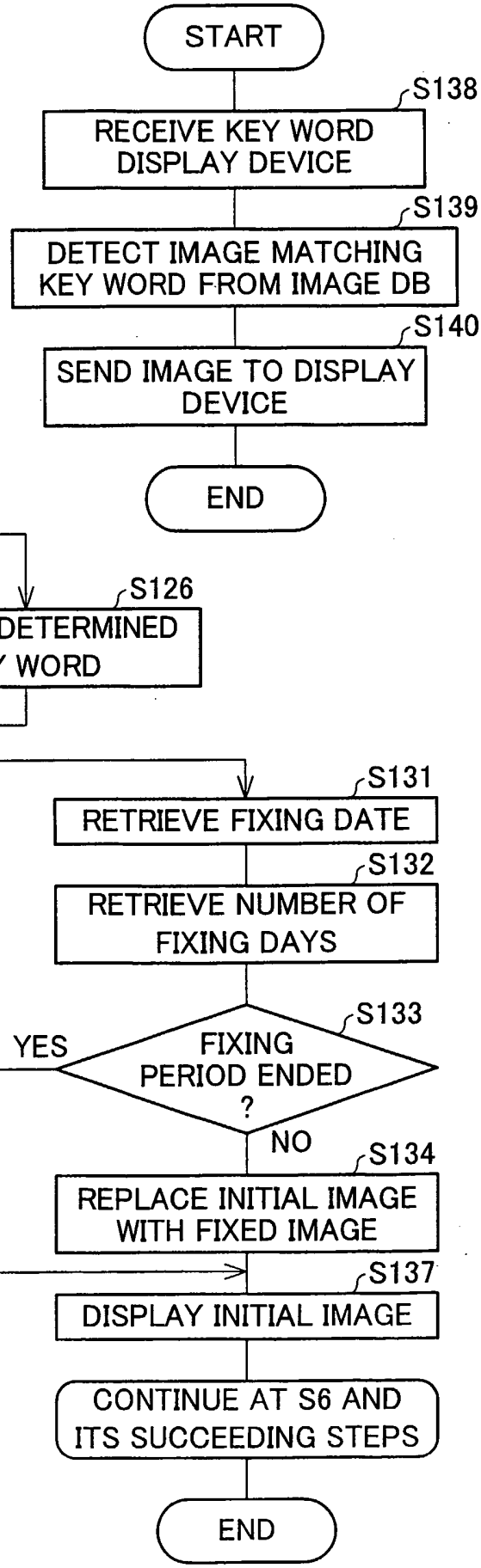


FIG. 15

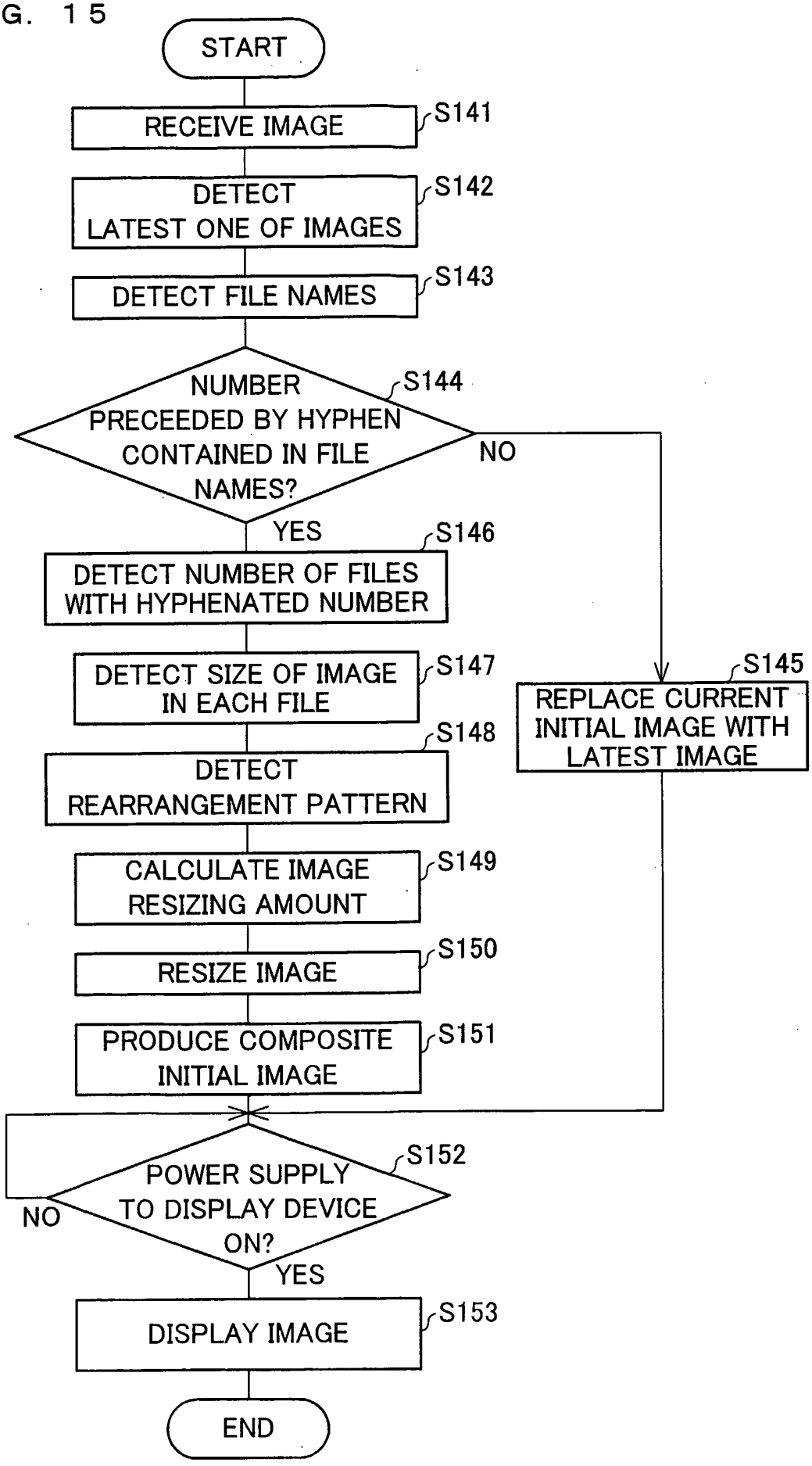

START
RECEIVE IMAGE
S141
DETECT LATEST ONE OF IMAGES
S142
DETECT FILE NAMES
S143
NUMBER PRECEEDED BY HYPHEN CONTAINED IN FILE NAMES?
S144
NO
YES
S146
DETECT NUMBER OF FILES WITH HYPHENATED NUMBER
DETECT SIZE OF IMAGE IN EACH FILE
S147
DETECT REARRANGEMENT PATTERN
S148
CALCULATE IMAGE RESIZING AMOUNT
S149
RESIZE IMAGE
S150
PRODUCE COMPOSITE INITIAL IMAGE
S151
REPLACE CURRENT INITIAL IMAGE WITH LATEST IMAGE
S145
POWER SUPPLY TO DISPLAY DEVICE ON?
S152
NO
YES
DISPLAY IMAGE
S153
END

FIG. 16

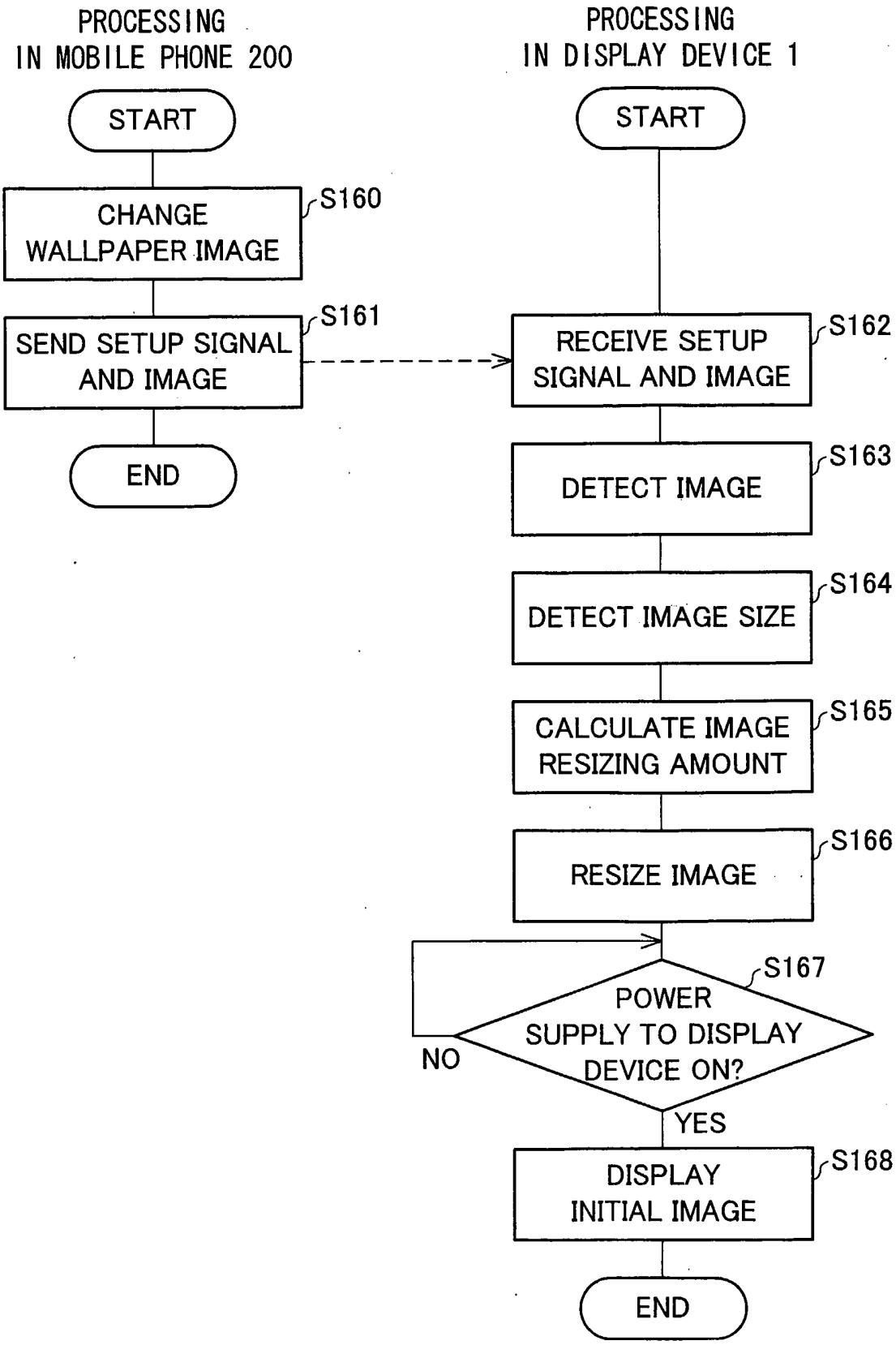

PROCESSING IN MOBILE PHONE 200
START
CHANGE WALLPAPER IMAGE
S160
SEND SETUP SIGNAL AND IMAGE
S161
END
PROCESSING IN DISPLAY DEVICE 1
START
RECEIVE SETUP SIGNAL AND IMAGE
S162
DETECT IMAGE
S163
DETECT IMAGE SIZE
S164
CALCULATE IMAGE RESIZING AMOUNT
S165
RESIZE IMAGE
S166
POWER SUPPLY TO DISPLAY DEVICE ON?
S167
NO
YES
DISPLAY INITIAL IMAGE
S168
END

FIG. 17

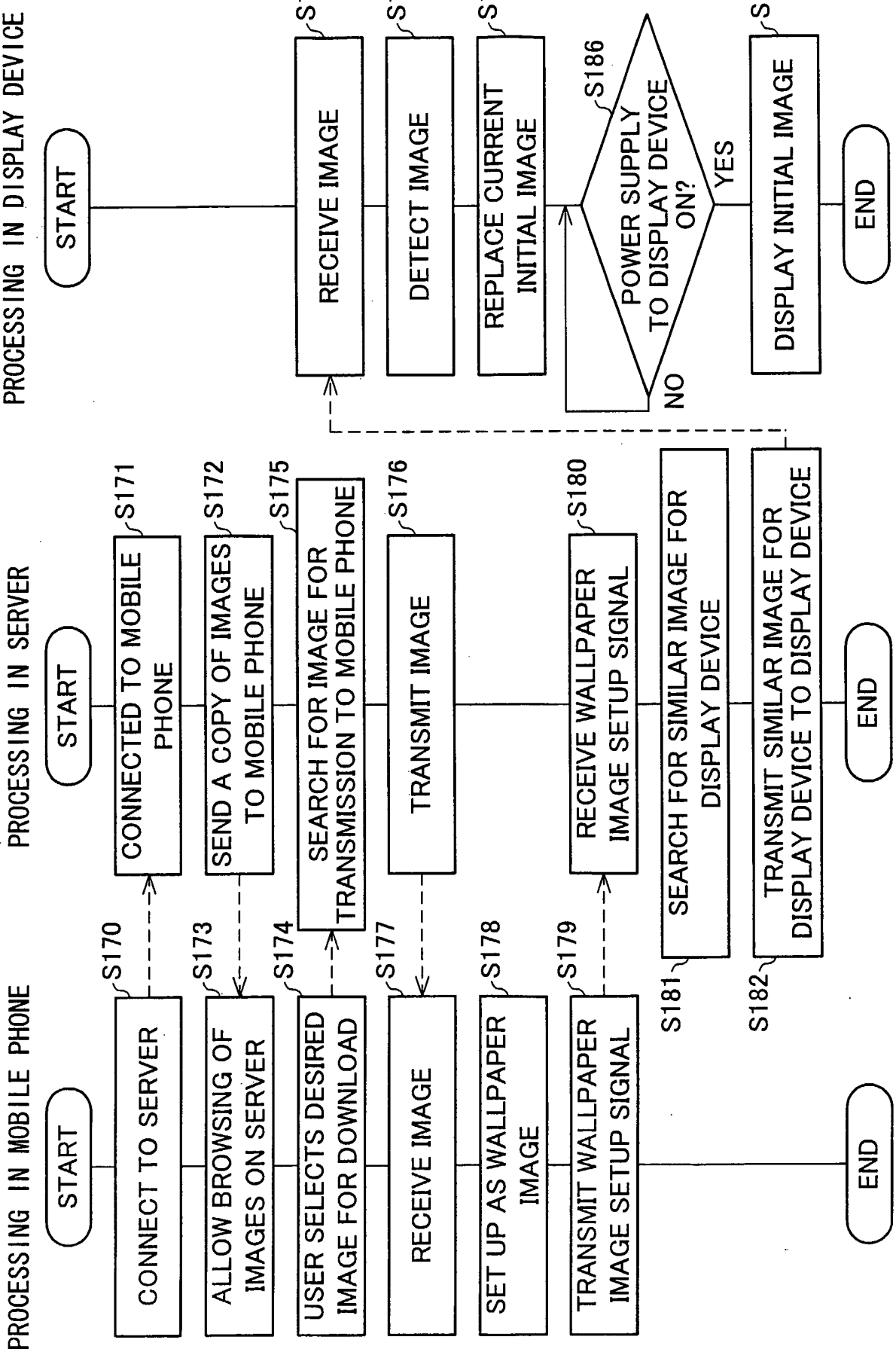

PROCESSING IN MOBILE PHONE
START
S170
CONNECT TO SERVER
S173
ALLOW BROWSING OF IMAGES ON SERVER
S174
USER SELECTS DESIRED IMAGE FOR DOWNLOAD
S177
RECEIVE IMAGE
S178
SET UP AS WALLPAPER IMAGE
S179
TRANSMIT WALLPAPER IMAGE SETUP SIGNAL
END
PROCESSING IN SERVER
START
S171
CONNECTED TO MOBILE PHONE
S172
SEND A COPY OF IMAGES TO MOBILE PHONE
S175
SEARCH FOR IMAGE FOR TRANSMISSION TO MOBILE PHONE
S176
TRANSMIT IMAGE
S180
RECEIVE WALLPAPER IMAGE SETUP SIGNAL
S181
SEARCH FOR SIMILAR IMAGE FOR DISPLAY DEVICE
S182
TRANSMIT SIMILAR IMAGE FOR DISPLAY DEVICE TO DISPLAY DEVICE
END
PROCESSING IN DISPLAY DEVICE
START
S183
RECEIVE IMAGE
S184
DETECT IMAGE
S185
REPLACE CURRENT INITIAL IMAGE
S186
POWER SUPPLY TO DISPLAY DEVICE ON?
YES
NO
S187
DISPLAY INITIAL IMAGE
END

FIG. 18

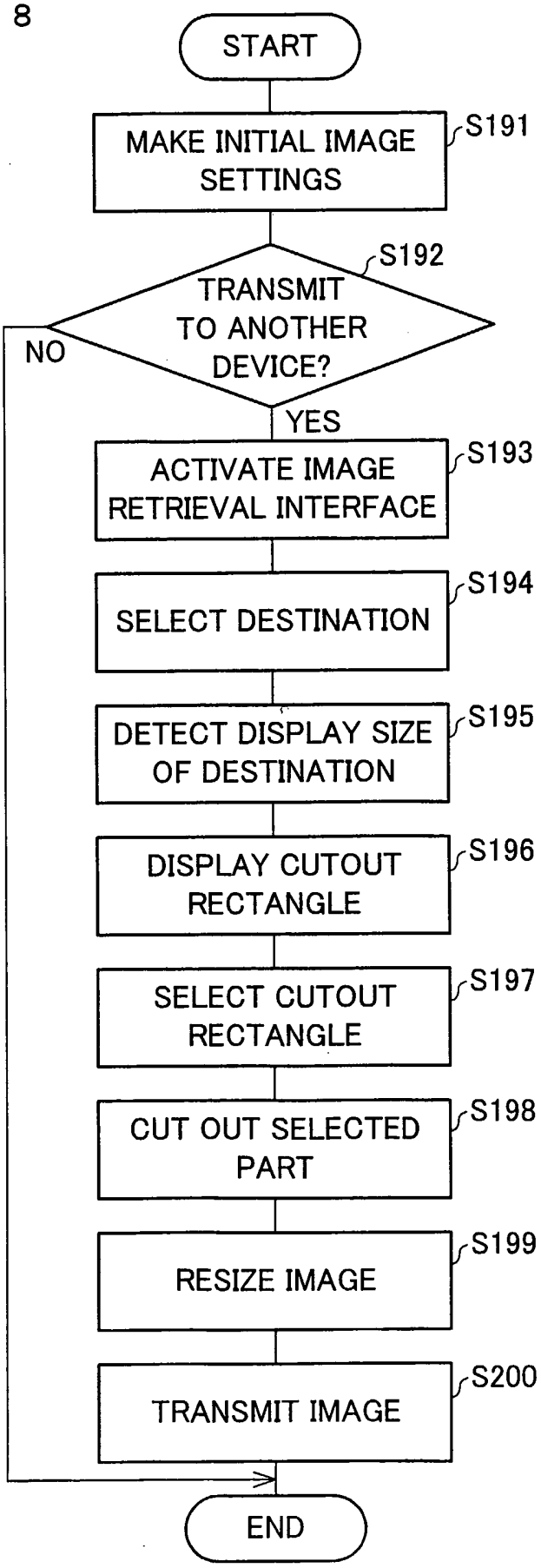

START
MAKE INITIAL IMAGE SETTINGS
S191
TRANSMIT TO ANOTHER DEVICE?
S192
NO
YES
ACTIVATE IMAGE RETRIEVAL INTERFACE
S193
SELECT DESTINATION
S194
DETECT DISPLAY SIZE OF DESTINATION
S195
DISPLAY CUTOUT RECTANGLE
S196
SELECT CUTOUT RECTANGLE
S197
CUT OUT SELECTED PART
S198
RESIZE IMAGE
S199
TRANSMIT IMAGE
S200
END

FIG. 19

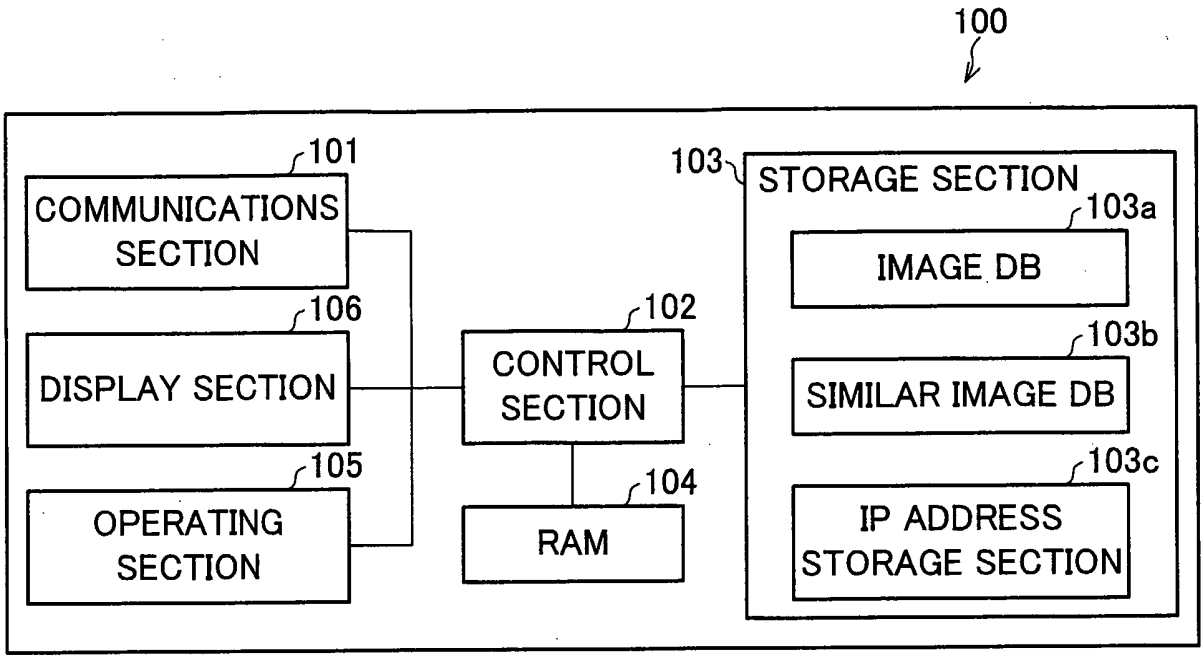

100
101
COMMUNICATIONS SECTION
106
DISPLAY SECTION
105
OPERATING SECTION
102
CONTROL SECTION
104
RAM
103
STORAGE SECTION
103a
IMAGE DB
103b
SIMILAR IMAGE DB
103c
IP ADDRESS STORAGE SECTION

FIG. 20

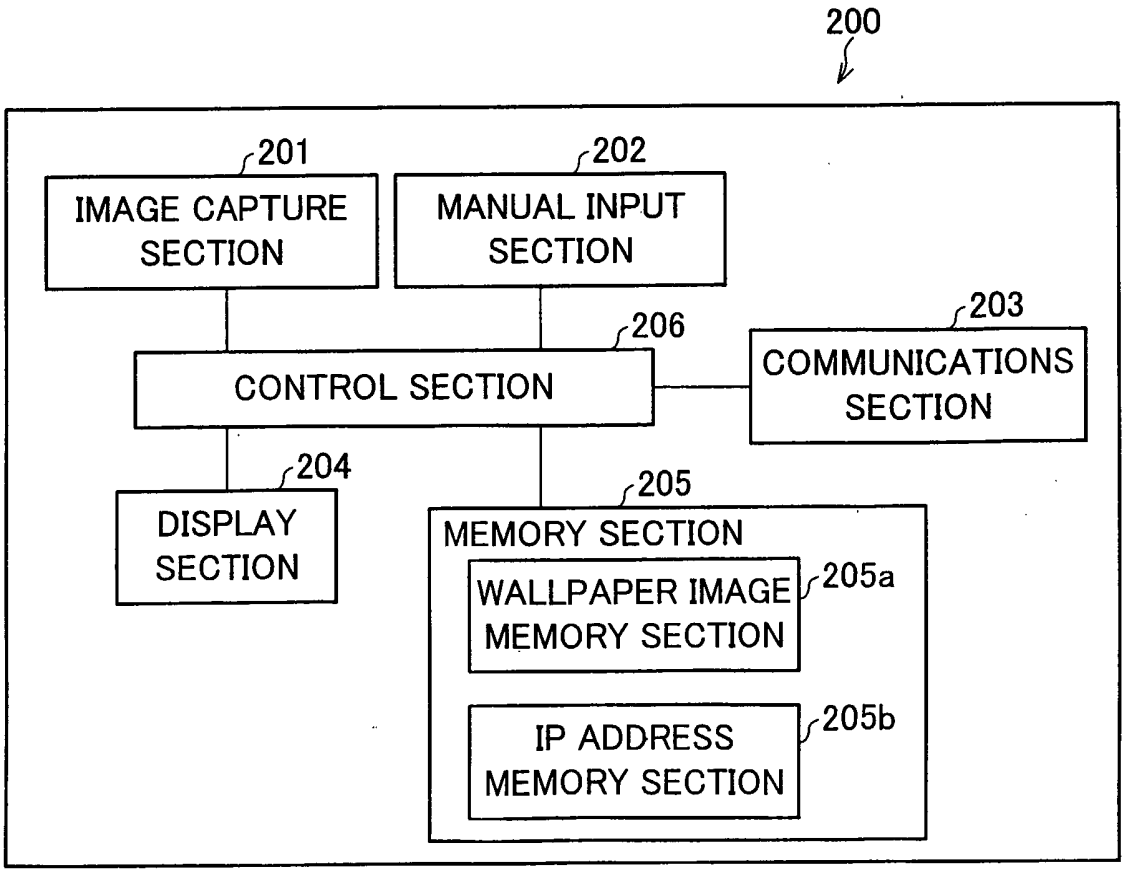

200
201
IMAGE CAPTURE SECTION
202
MANUAL INPUT SECTION
206
CONTROL SECTION
203
COMMUNICATIONS SECTION
204
DISPLAY SECTION
205
MEMORY SECTION
WALLPAPER IMAGE MEMORY SECTION
205a
IP ADDRESS MEMORY SECTION
205b

FIG. 21

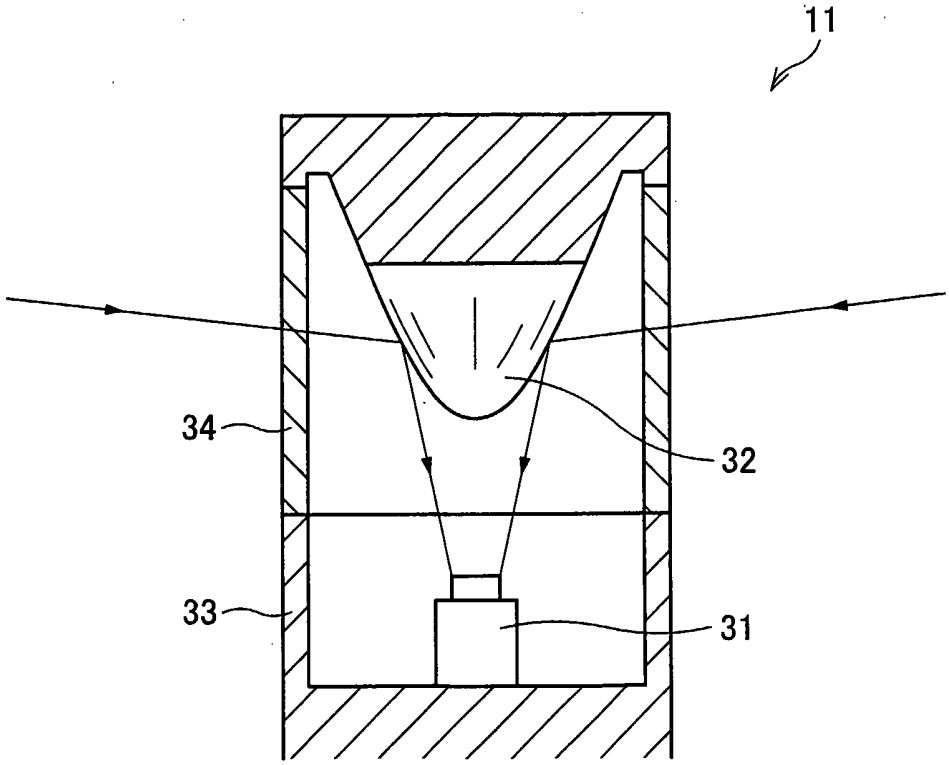


FIG. 22 (c)

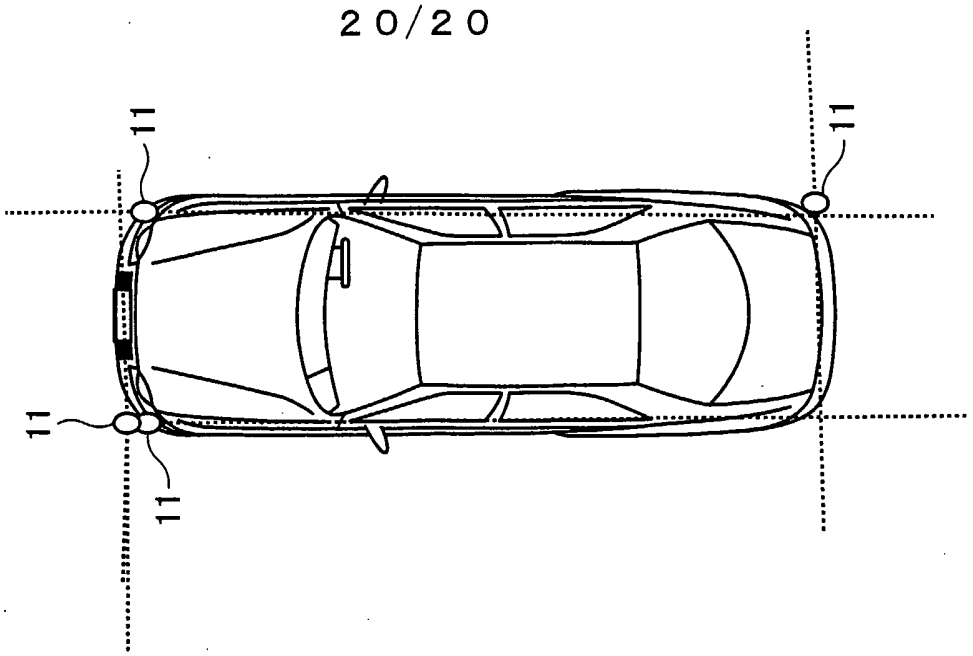


FIG. 22 (b)

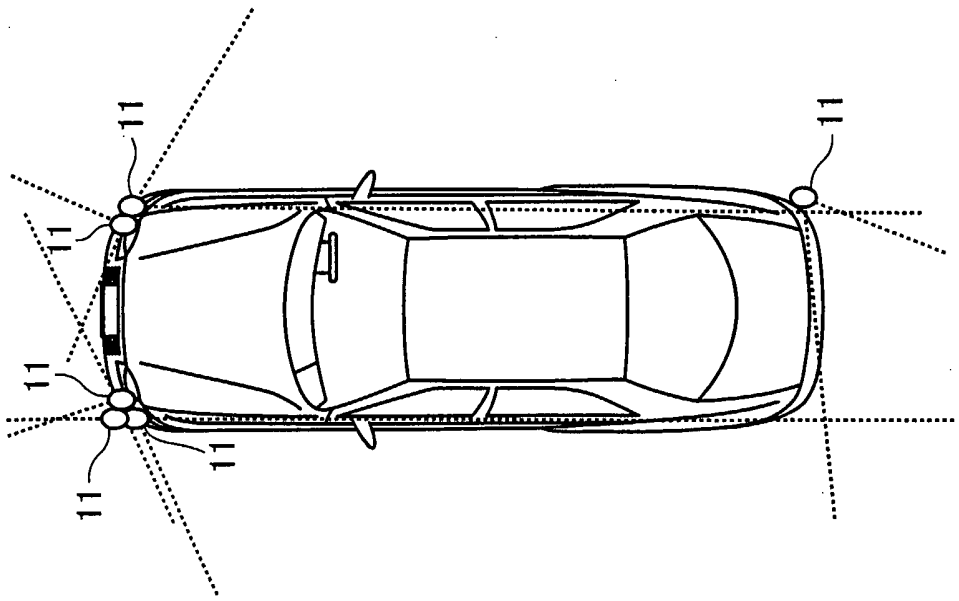
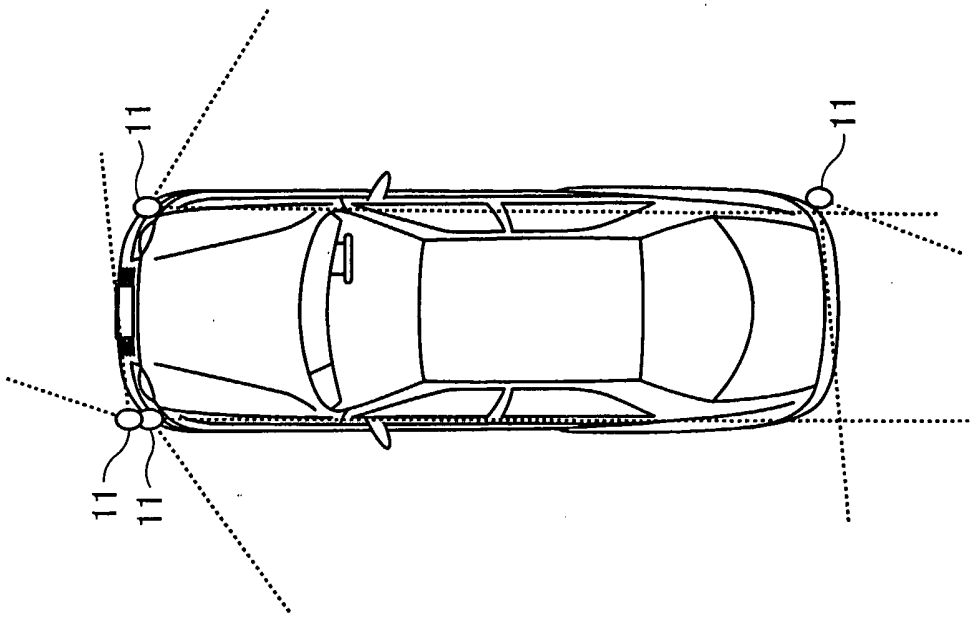


FIG. 22 (a)



INTERNATIONALSEARCHREPORT

International application No.
PCT/JP2005/010636

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl.[7] G09G 5/00, G01C 21/00

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)
Int.Cl.[7] G09G 5/00-5/42, G01C 21/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Published examined utility model applications of Japan 1922-1996
Published unexamined utility model applications of Japan 1971-2005
Registered utility model specifications of Japan 1996-2005
Published registered utility model applications of Japan 1994-2005

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	JP 2002-340572 A (MITSUBISHI ELECTRIC CORP.) 2002.11.27, [0002],[0018]-[0025], Fig.1-4	1-2,4-8,22,29,37-38
Y	& US 2002174427 A1 & DE 10157405 A1	1-2,4-8,22,29,37-38
Y	JP 2001-296848 A (NEC SHIZUOKA LTD.) 2001.10.26, [0015]-[0020], Fig.1-2 (family: none)	1-2,4-8,22,29,37-38
Y	JP 11-24677 A (YAMAHA CORP.) 1999.01.29, [0017]-[0033], Fig.3-8 (family: none)	1-2,4-8,22,29,37-38
Y	JP 9-65273 A (MATSUSHITA ELECTRIC IND. CO., LTD.) 1997.03.07, [0005]-[0009], Fig.1-2 (family: none)	1-2,4-8,22,29,37-38

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

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"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
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search
22.08.2005

Date of mailing of the international search report
06.9.2005

Name and mailing address of the ISA/JP
Japan Patent Office
3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan

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Form PCT/ISA/210 (second sheet) (January 2004)

INTERNATIONALSEARCHREPORT

International application No.
PCT/JP2005/010636

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
The subject matter common to claims 1-2,4-8,22,29,37-38, claim 3, claims 9-10, claim 11, claim 12, claims 13-16, claims 17-20, claim 21, claim 23, claim 24, claim 25, claim 26, claim 27, claim 28, claims 30-31, claim 32, claim 33, claim 34, claims 35-36, is "a display device including a display section displaying an image, the device being mounted to a vehicle, the device comprising a control section replacing an initial image with a given image, the initial image being displayed on the display section from immediately after startup of the display device". the search has revealed that the subject matter is disclosed in document JP 2002-340572 A (MITSUBISHI ELECTRIC CORP.) 2002.11.27,[0002],[0018]-[0025], [Fig.1-4] and therefore appears to be not novel. As a result, this subject matter does not overcome the prior art and is therefore not a special technical feature within the meaning of the second sentence of PCT Rule 13.2. Consequently, there is no subject matter common to all of claims 1-38.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☑ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
1-2,4-8,22,29,37-38

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.