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(54) **CONTROL DEVICE FOR VEHICLE**

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(57) **ABSTRACT**

The cockpit is capable of executing a light show by outputting music from a speaker and operating a movable part. In addition, the cockpit can perform rainfall determination processing for determining whether rain is occurring. When the cockpit determines that it is raining, the cockpit causes music to be output from the speaker without operating an opening/closing component that can be in a second state in which the vehicle interior space and the vehicle exterior space are connected among the movable parts when the light show is executed.

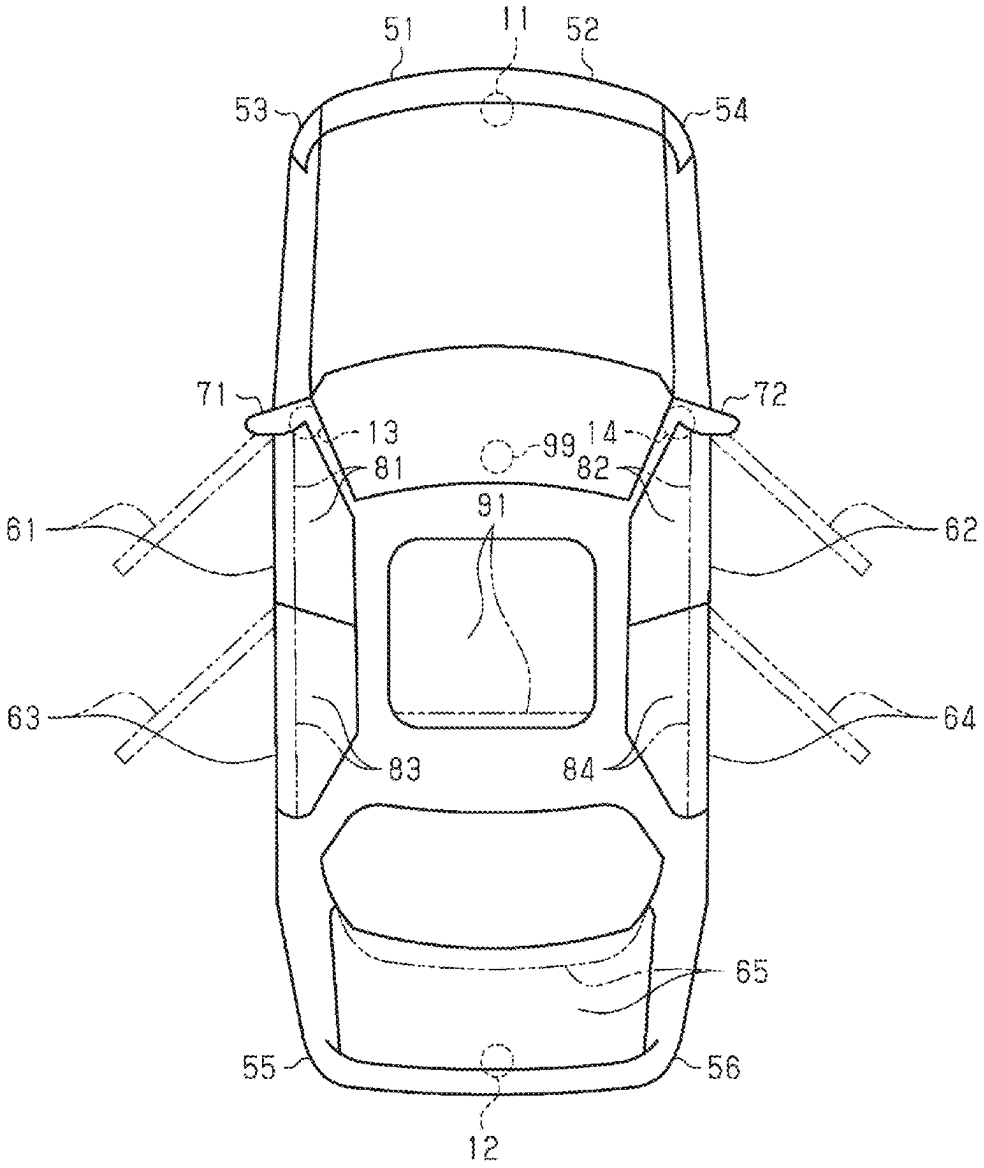


FIG. 1

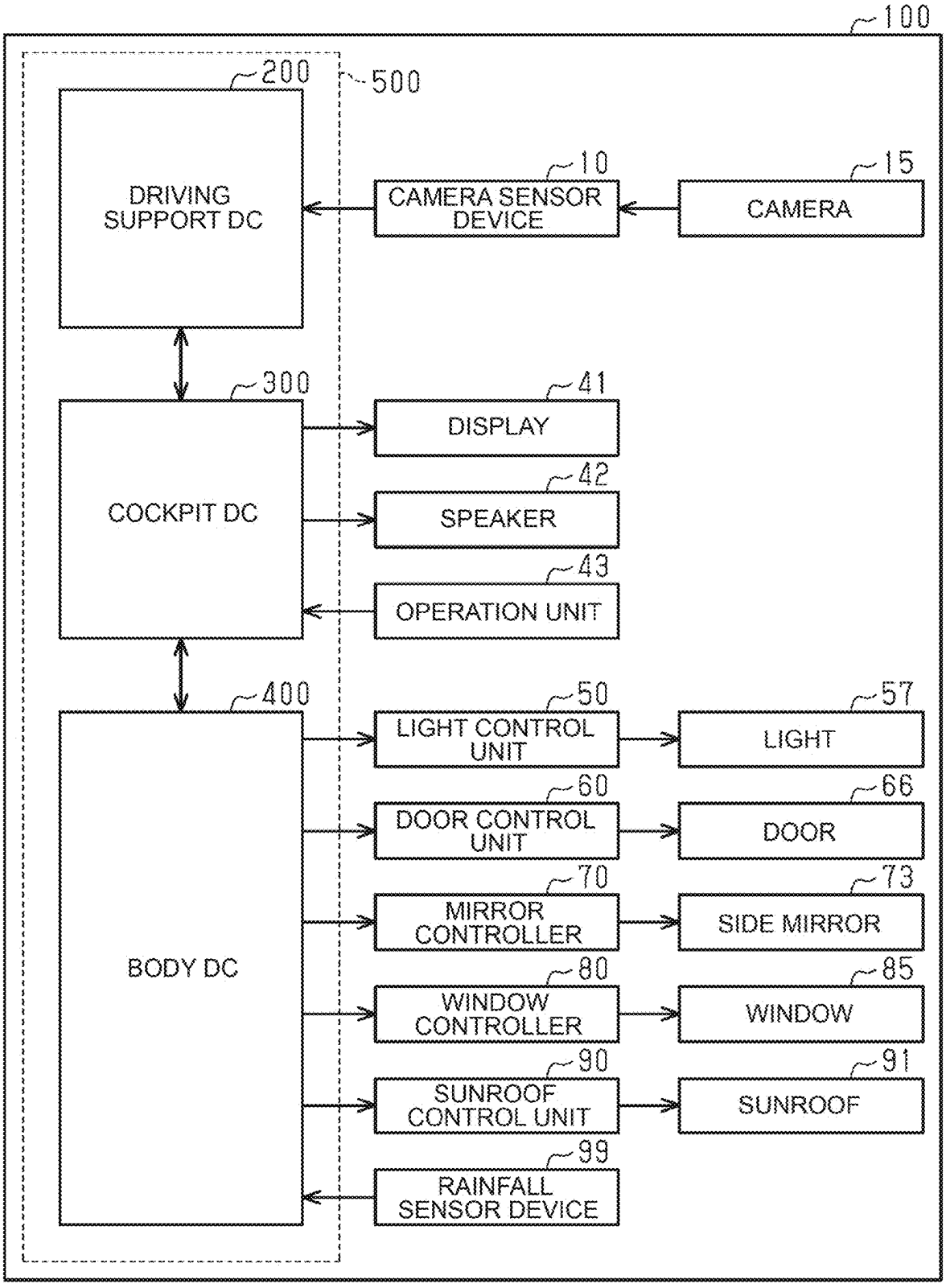

100
200
500
DRIVING SUPPORT DC
10
CAMERA SENSOR DEVICE
15
CAMERA
300
41
DISPLAY
COCKPIT DC
42
SPEAKER
43
OPERATION UNIT
400
50
LIGHT CONTROL UNIT
57
LIGHT
60
DOOR CONTROL UNIT
66
DOOR
70
MIRROR CONTROLLER
73
SIDE MIRROR
BODY DC
80
WINDOW CONTROLLER
85
WINDOW
90
SUNROOF CONTROL UNIT
91
SUNROOF
99
RAINFALL SENSOR DEVICE

FIG. 2

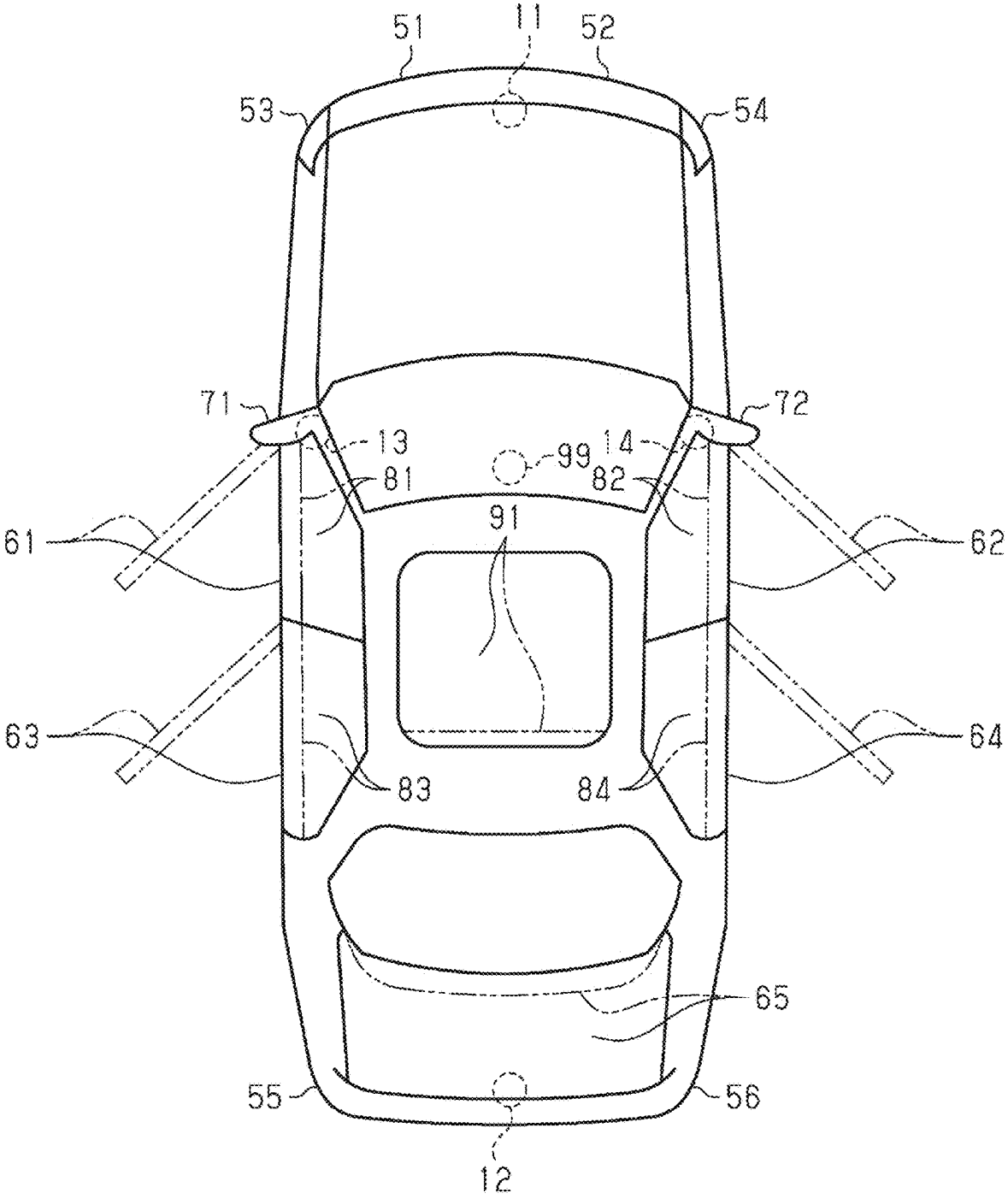


FIG. 3

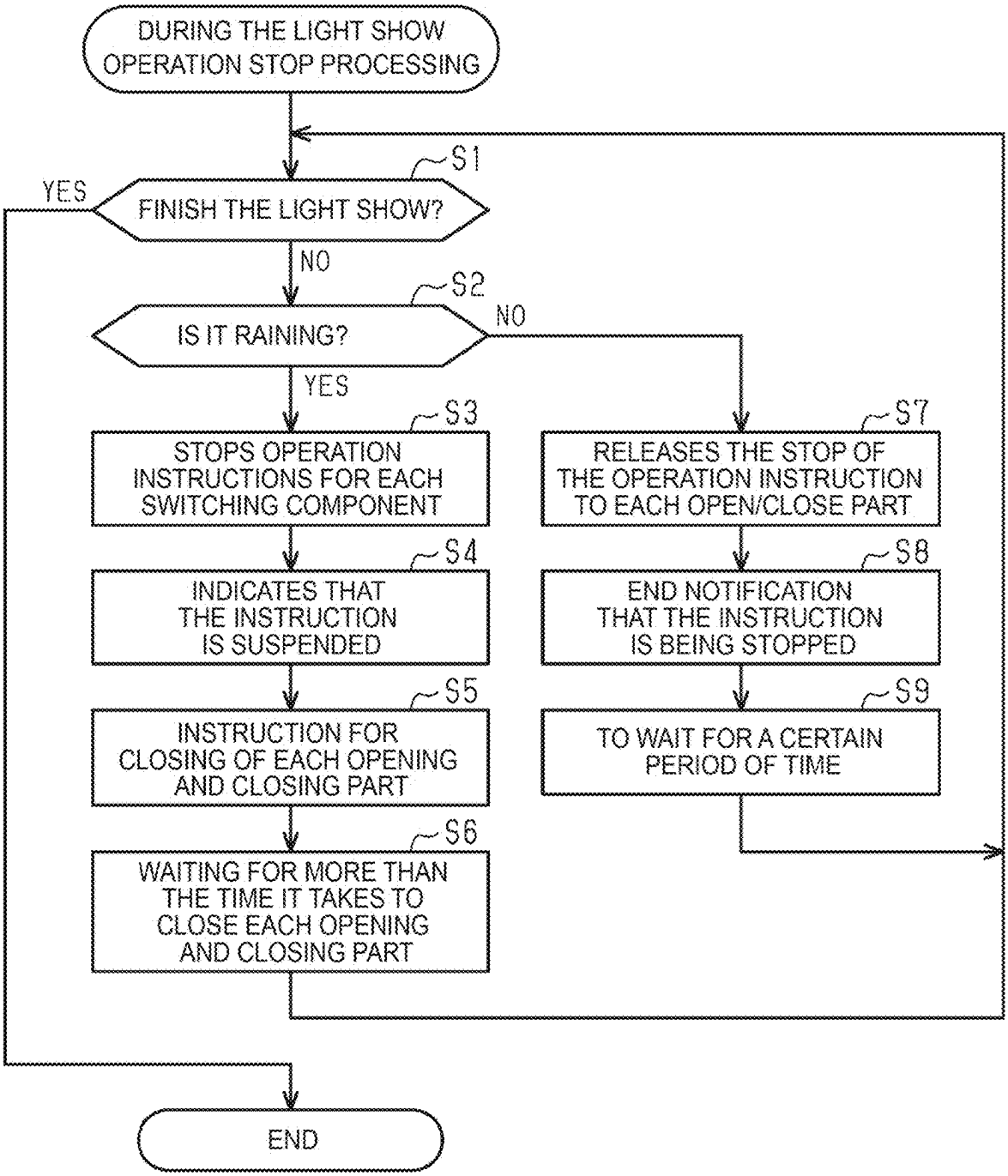
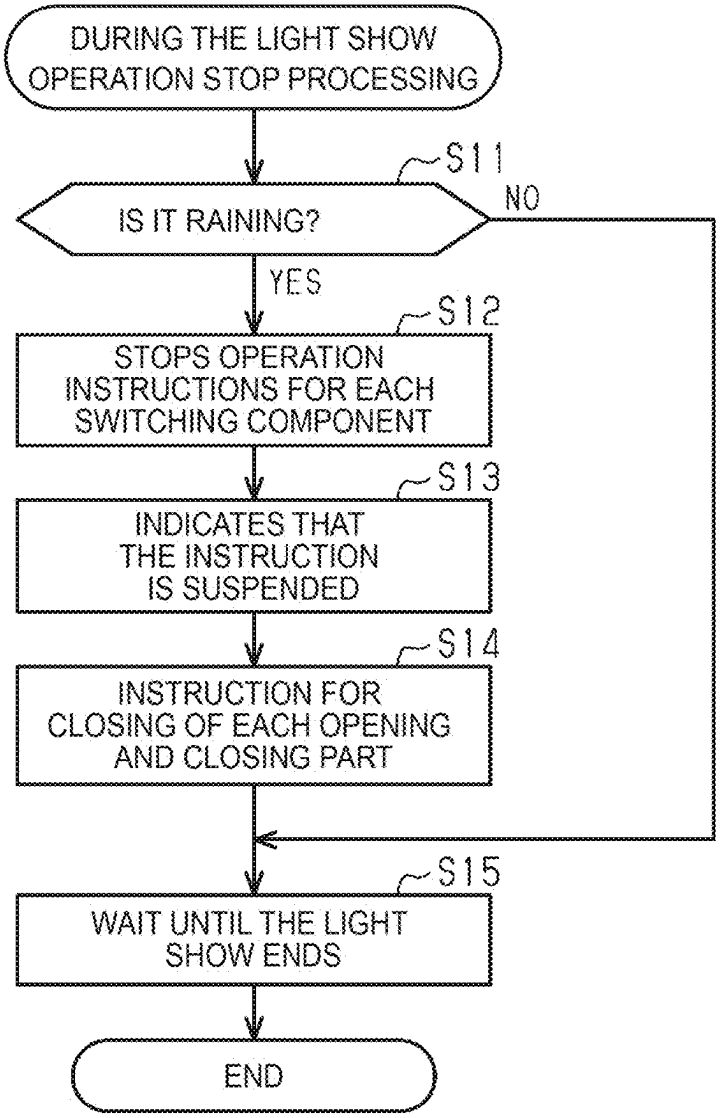

DURING THE LIGHT SHOW OPERATION STOP PROCESSING
S1
FINISH THE LIGHT SHOW?
YES
NO
S2
IS IT RAINING?
NO
YES
S3
STOPS OPERATION INSTRUCTIONS FOR EACH SWITCHING COMPONENT
S4
INDICATES THAT THE INSTRUCTION IS SUSPENDED
S5
INSTRUCTION FOR CLOSING OF EACH OPENING AND CLOSING PART
S6
WAITING FOR MORE THAN THE TIME IT TAKES TO CLOSE EACH OPENING AND CLOSING PART
S7
RELEASES THE STOP OF THE OPERATION INSTRUCTION TO EACH OPEN/CLOSE PART
S8
END NOTIFICATION THAT THE INSTRUCTION IS BEING STOPPED
S9
TO WAIT FOR A CERTAIN PERIOD OF TIME
END

FIG. 4


DURING THE LIGHT SHOW OPERATION STOP PROCESSING
S11
IS IT RAINING?
NO
YES
S12
STOPS OPERATION INSTRUCTIONS FOR EACH SWITCHING COMPONENT
S13
INDICATES THAT THE INSTRUCTION IS SUSPENDED
S14
INSTRUCTION FOR CLOSING OF EACH OPENING AND CLOSING PART
S15
WAIT UNTIL THE LIGHT SHOW ENDS
END

CONTROL DEVICE FOR VEHICLE

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims priority to Japanese Patent Application No. 2024-021338 filed on Feb. 15, 2024, incorporated herein by reference in its entirety.

BACKGROUND

1. Technical Field

[0002] The disclosure relates to a control device for a vehicle.

2. Description of Related Art

[0003] Japanese Unexamined Patent Application Publication No. 2004-351949 (JP 2004-351949 A) describes a disclosure of an in-cabin lighting device of an automobile, which is started when an occupant enters or exits the automobile, and in which a plurality of light fixtures is sequentially turned on or off in a form that is set in advance. Also, some control devices of vehicles have a light show function of outputting music from a speaker in a form that is set in advance and also operating movable parts, such as doors, to entertain a user or a viewer.

SUMMARY

[0004] However, depending on the situation around the vehicle, controlling the vehicle in a form that is set in advance as described above may be inconvenient.

[0005] According to an aspect of the disclosure, a control device for a vehicle for solving the above problem is a control device for controlling a movable part applied to a vehicle equipped with the movable part that is able to switch between a first state in which space inside of a vehicle cabin and space outside of the vehicle are disconnected and a second state in which the space inside of the vehicle cabin and the space outside of the vehicle are connected, and that is configured to execute rainfall determination processing for determining whether rainfall is occurring, in which when determination is made that rainfall is occurring in the rainfall determination processing, the movable part is not controlled to the second state.

[0006] According to the above configuration, the inside of the vehicle cabin can be suppressed from becoming wet when the movable part is operated.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] Features, advantages, and technical and industrial significance of exemplary embodiments of the disclosure will be described below with reference to the accompanying drawings, in which like signs denote like elements, and wherein:

[0008] FIG. **1** is a diagram schematically illustrating a configuration of a control device of a vehicle;

[0009] FIG. **2** is a schematic diagram of a vehicle;

[0010] FIG. **3** is a flow chart illustrating a write show execution-time operation stopping process according to the first embodiment; and

[0011] FIG. **4** is a flowchart illustrating a write show execution-time operation stop process according to the second embodiment.

DETAILED DESCRIPTION OF EMBODIMENTS

First Embodiment

Configuration of The Control Device

[0012] Hereinafter, a first embodiment of the present disclosure will be described with reference to FIGS. **1** to **3**. First, a configuration of a control device according to the present embodiment will be described with reference to FIG. **1**. As illustrated in FIG. **1**, the vehicles **100** are equipped with in-vehicle devices such as a driving support DC **200**, a cockpit DC **300**, and a body DC **400**. Note that "DC" is an abbreviation for Domain Controller. These in-vehicle devices are communicably connected to each other. The driving support DC **200**, the cockpit DC **300**, and the body DC **400** constitute the control device **500** of the vehicle.

[0013] The driving support DC **200** is an electronic control unit that provides a driving support function such as an automated braking device or a sudden start preventing device. A cockpit DC **300** is an electronic control unit that provides multimedia-related functions such as navigational and audio. The body DC **400** is an electronic control unit that controls various electrical components such as lights, doors, and mirrors.

Configuration of the Driving Support DC

[0014] The driving support DC **200** is electrically connected to the camera sensor device **10**. As illustrated in FIG. **2**, the camera sensor device **10** includes cameras including a front camera **11**, a rear camera **12**, a left camera **13**, and a right camera **14**. In the following description, the front camera **11**, the rear camera **12**, the left camera **13**, and the right camera **14** may be collectively referred to as a "camera **15**".

[0015] The front camera **11** is attached to the center of the front end portion of the vehicle **100** so as to capture an image of a scene in front of the vehicle **100**. The rear camera **12** is attached to the center of the rear end portion of the vehicle **100** so as to capture an image of a landscape behind the vehicle **100**. The left camera **13** is attached to a left end portion of the vehicle **100** so as to capture an image of a landscape on the left side of the vehicle **100**. The right camera **14** is attached to the right end portion of the vehicle **100** so as to capture an image of the scenery on the right side of the vehicle **100**.

Configuration of Cockpit DC

[0016] The driving support DC **200** can acquire information about images of the surroundings of the vehicles **100** captured by the camera **15** via the camera sensor device **10**. The cockpit DC **300** is electrically connected to the display **41**, the speaker **42**, and the operation unit **43** of the vehicle **100**.

[0017] The display **41** includes a display unit (not shown) capable of displaying various types of information. The display **41** displays various types of information on the display unit based on an instruction from the cockpit DC **300**.

[0018] The speaker **42** is configured to output sound. In the present specification, the term "sound" is intended to include any sound or music in addition to a single sound. The speaker **42** outputs a sound based on an instruction from the cockpit DC **300**.

[0019] The operation unit **43** is configured to be capable of various operations. The operation unit **43** may be a touch panel type operation unit integrated with the display **41** or an operation unit independent of the display **41**. The cockpit DC **300** is configured to be capable of inputting an operation signal indicating that the operation unit **43** is operated. The cockpit DC **300** can perform various types of control based on an operation signal inputted from the operation unit **43**.

Configuration of the Body DC

[0020] The body DC **400** includes a light control unit **50**, a door control unit **60**, a mirror control unit **70**, a window control unit **80**, a sunroof control unit **90**, and a rainfall sensor device **99**.

[0021] As illustrated in FIG. **2**, the light control unit **50** is electrically connected to various lights including a left headlight **51**, a right headlight **52**, a left winker **53**, a right winker **54**, a left tail light **55**, and a right tail light **56** of the vehicle **100**. In the following description, various lights including the respective lights **51** to **56** are collectively referred to as "lights **57**". The light **57** is configured to be blinkable. The light control unit **50** blinks the light **57** based on an instruction from the body DC **400**.

[0022] The door control unit **60** is electrically connected to various types of doors including the first door **61** to the fifth door **65** of the vehicle **100**. In the following description, various doors including the first door **61** to the fifth door **65** are collectively referred to as "doors **66**". The door **66** is configured to be openable and closable by manual operation, and is configured to be openable and closable by control of the door control unit **60**. The door control unit **60** opens and closes the door **66** based on an instruction from the body DC **400**.

[0023] The first door **61** is rotatably supported on the left front side of the vehicle **100** so as to be openable and closable with respect to the vehicle **100**. Further, the second door **62** is pivotally supported on the right front side of the vehicle **100**, the third door **63** is pivotally supported on the left rear side of the vehicle **100**, the fourth door **64** is pivotally supported on the right rear side of the vehicle **100**, and the fifth door **65** is pivotally supported on the rear side of the vehicle **100** so as to be openable and closable with respect to the vehicle **100**.

[0024] The mirror control unit **70** is electrically connected to the left side mirror **71** and the right side mirror **72** of the vehicle **100**. In the following description, the left side mirror **71** and the right side mirror **72** are collectively referred to as a "side mirror **73**". The side mirror **73** is configured to be rotatable under the control of the mirror control unit **70**. The mirror control unit **70** rotates the side mirror **73** based on an instruction from the body DC **400**. The side mirror **73** is an example of a movable part of the vehicle **100**.

[0025] The left side mirror **71** is pivotally supported on the left front side of the vehicle **100** so as to be rotatable relative to the first door **61**. The right side mirror **72** is pivotally supported on the right front side of the vehicle **100** so as to be rotatable with respect to the second door **62**.

[0026] The window control unit **80** is electrically connected to the fourth window **84** from the first window **81**. In the following description, the first window **81** to the fourth window **84** are collectively referred to as a "window **85**". The window **85** is configured to be openable and closable under the control of the window control unit **80**. The window control unit **80** opens and closes the window **85** based on an instruction from the body DC **400**. That is, the window **85** of the present embodiment is a power window electrically controlled by the window control unit **80**.

[0027] The first window **81** is configured to be openable and closable on the left front side of the vehicle **100**. Further, the second window **82** is configured to be openable and closable in a right front side of the vehicle **100**, the third window **83** is configured to be openable and closable in a left rear side of the vehicle **100**, and the fourth window **84** is configured to be openable and closable in a right rear side of the vehicle **100**.

[0028] The sunroof control unit **90** is electrically connected to the sunroof **91**. The sunroof **91** is configured to be openable and closable under the control of the sunroof control unit **90**. The sunroof control unit **90** opens and closes the sunroof **91** based on an instruction from the body DC **400**. The sunroof **91** is configured to be openable and closable in a ceiling portion of the vehicle **100**.

[0029] The door **66**, the window **85**, and the sunroof **91** can take a first state in which the vehicle interior space and the vehicle exterior space are shut off, and a second state in which the vehicle interior space and the vehicle exterior space are connected. That is, the door **66**, the window **85**, and the sunroof **91** are examples of movable parts of the vehicle **100**, and in particular, correspond to a first movable part that can take a first state in which the vehicle interior space and the vehicle exterior space are shut off, and a second state in which the vehicle interior space and the vehicle exterior space are connected. In the following description, the door **66**, the window **85**, and the sunroof **91** may be collectively referred to as an "opening/closing component". Further, in the following description, the control of the opening and closing parts of the door **66**, the window **85**, and the sunroof **91** to the second state may be referred to as "opening", and the control of the opening and closing parts to the first state may be referred to as "closing".

[0030] On the other hand, the side mirror **73** is not in the second state of connecting the vehicle interior space and the vehicle exterior space. That is, the side mirror **73** is an example of a movable part of the vehicle **100**, and in particular, corresponds to a second movable part that is not a second state that connects the vehicle interior space and the vehicle exterior space.

[0031] The rainfall sensor device **99** is attached to the windshield of the vehicle **100**. The rainfall sensor device **99** irradiates the windshield with infrared light. Further, the rainfall sensor device **99** receives the reflected infrared light. Then, the rainfall sensor device **99** detects raindrops on the windshield based on the amount of the received infrared light. Processing When Running Light Show

[0032] The body DC **400** can acquire information about the detection result of raindrops by the rainfall sensor device **99**. The cockpit DC **300** can execute a light show process for causing the vehicles **100** to execute the light show. The light show is performed in such a manner that music is output from the speaker **42** in accordance with a predetermined program pattern and various electric components of the vehicle **100** operate.

[0033] The write show execution process can be executed triggered by an operation of the operation unit **43**. The cockpit DC **300** performs a write show execution process on the basis of an operation signal inputted from the operation unit **43**, and performs control so as to execute the write

show. In the present embodiment, the write show execution process corresponds to a specific process.

[0034] In the light show executing process, the cockpit DC **300** controls the speaker **42** so that a predetermined musical tone is outputted. Further, in the light show execution process, the cockpit DC **300** outputs, to the body DC **400**, information instructing the operation of various electrical components of the vehicle **100** at predetermined timings during the light show execution. The information instructing the operation of various electrical components of the vehicle **100** includes, for example, information instructing the blinking of the light **57**, information instructing the operation of the door **66**, the side mirror **73**, the window **85**, and the sunroof **91**, and the like. The body DC **400** operates various electrical components of the vehicles **100** based on data inputted from the cockpit DC **300**. That is, in the light show execution process, the control device **500** operates various movable parts including the door **66**, the side mirror **73**, the window **85**, and the sunroof **91**, and controls blinking of the light **57** of the vehicle **100**. Further, the cockpit DC **300** controls the display **41** to execute an execution notification notifying that the light show is being executed as the light show starts.

[0035] After that, the cockpit DC **300** terminates the write show by terminating the write show executing process in response to the completion of the predetermined program pattern. At this time, the cockpit DC **300** controls the speaker **42** to stop outputting a predetermined musical tone. The cockpit DC **300** also controls the display **41** to terminate the running notification.

Processing of Stopping the Operation of Movable Parts When Executing a Light Show

[0036] When executing the light show, the cockpit DC **300** performs a light show execution operation stop process for stopping the operation of the movable parts included in the various electrical components of the vehicle **100**. The write show execution-time operation stop process is executed over a period during which the write show is being executed.

[0037] As illustrated in FIG. **3**, in the write show execution-time operation stopping process, the cockpit DC **300** determines whether the write show has ended (S**1**). If the light show has not ended (S**1**: NO), the cockpit DC **300** determines if it is raining (S**2**). The process of S**2** in the operation stopping process at the time of executing the light show corresponds to the rainfall determination process. Specifically, the cockpit DC **300** receives, from the driving support DC **200**, information on images of the surroundings of the vehicles **100** captured by the camera **15** acquired via the camera sensor device **10**. In addition, the cockpit DC **300** receives, from the body DC **400**, the raindrop detected by the rainfall sensor device **99**. Then, the cockpit DC **300** determines whether rain is occurring based on the driving support DC **200** and the data inputted from the body DC **400**.

[0038] When it is determined that it is raining (S**2**: YES), the cockpit DC **300** performs control so as to stop the operation instruction to the respective opening/closing components (S**3**). Specifically, when it is determined that it is raining, the cockpit DC **300** does not cause the body DC **400** to transmit information instructing the operation of the door **66**, the window **85**, and the sunroof **91** in the light show executing process. That is, the cockpit DC **300** does not control the opening/closing components to be in the second condition that connects the vehicle interior space and the vehicle exterior space in the light show executing process when it is determined that the vehicle is raining.

[0039] Then, the cockpit DC **300** causes the display **41** to execute an operation stop notification, which is a notification indicating that the operation instruction to the respective opening/closing components is stopped (S**4**). Specifically, the cockpit DC **300** displays on the display **41** that the operation of the opening and closing components is stopped due to the rain.

[0040] Subsequently, the cockpit DC **300** outputs information for instructing closing of the respective opening and closing components to the body DC **400** (S**5**). The body DC **400** controls the door **66**, the window **85**, and the sunroof **91** to be in the first condition for shutting off the vehicle interior space and the vehicle exterior space. Thereafter, the cockpit DC **300** waits for a period of time equal to or longer than a period of time required for closing the respective opening/closing components (S**6**), and then repeats the processes after S**1**.

[0041] On the other hand, when it is determined that it is not raining (S**2**: NO), the cockpit DC **300** releases the stopping of the operation instruction to the respective opening/closing components (S**7**). Subsequently, the cockpit DC **300** terminates the operation stop notification (S**8**). After that, the cockpit DC **300** waits for a certain period of time (S**9**), and then repeats the processes after S**1**. Note that the waiting time in S**9** may be the same time as the waiting time (S**6**) after outputting the information instructing closing of the respective opening/closing components, or may be a different time.

[0042] When the write show ends (S**1**: YES), the cockpit DC **300** ends the write show execution-time operation stopping process. Incidentally, the cockpit DC **300** is controlled to release the stop of the operation instruction to the respective opening/closing components and to terminate the operation stop notification in accordance with the termination of the operation stop process at the time of executing the write show.

Operation of the First Embodiment

[0043] According to the above-described light show execution processing, in addition to the music being output from the speaker **42** and the various movable parts of the vehicle **100** being operated, the light **57** of the vehicle **100** blinks.

[0044] Further, according to the above-described operation stop process at the time of executing a light show, when it is determined that rain is falling, an operation instruction for an opening/closing component that can be in a second state of connecting the vehicle interior space and the vehicle exterior space is stopped. Therefore, in the write show execution process, the music is output from the speaker **42** without the opening/closing component being operated. Further, according to the light show execution operation stop process, when it is determined that rain is falling, each opening/closing component is controlled to be in the first state of shutting off the vehicle interior space and the vehicle exterior space.

[0045] In particular, in the light show execution time operation stop process, when it is determined that rain is falling, the operation instruction for the opening/closing component that can be the second state connecting the in-vehicle space and the out-of-vehicle space among the movable parts is stopped, while the operation instruction for

the movable part other than the opening/closing component is not stopped. Therefore, in the light show execution process, music is output from the speaker **42** without the respective opening and closing components being operated, and the movable parts different from the respective opening and closing components are operated.

Effect of the 1 Embodiment

[0046] The effects of the present embodiment will be described.

[0047] (1-1) When the opening/closing component is operated, since the operation instruction to each opening/closing component is stopped when it is determined that it is raining, it is possible to suppress the wetting of the vehicle interior space.

[0048] (1-2) In particular, in a case where it is determined that it is raining, since the operation instruction to the door **66**, the window **85**, and the sunroof **91** is stopped, it is possible to prevent the interior space from being wetted due to the opening and closing parts being in the second state.

[0049] (1-3) The determination as to whether or not it is raining is performed in the operation stop process at the time of executing the light show. Therefore, when the user or the viewer is enjoyed by the combination of the music output and the operation of the movable part in the light show, it is possible to suppress the wetting of the vehicle interior space.

[0050] (1-4) Even in a case where it is determined that rain is falling, an operation instruction to a movable part that is not in the second state of connecting the vehicle interior space and the vehicle exterior space is not stopped. Therefore, the user and the viewer can be enjoyed by the combination of the output of music and the operation of the movable part while suppressing the wetting of the interior space in the light show.

[0051] (1-5) In particular, the side mirror **73** does not stop the operation instruction even when it is determined that it is raining. Therefore, the user and the viewer can be enjoyed by the combination of the music output and the operation of the side mirror **73** while suppressing the wetting of the vehicle interior space in the light show.

[0052] (1-6) In the display **41**, an operation stop notification is executed, which is a notification indicating that the operation instruction to each opening/closing component is stopped, so that it is possible to prevent the user or the spectator from feeling uncomfortable because the opening/closing component does not operate in the light show.

[0053] (1-7) When it is determined that rain is falling in the light show execution-time operation stopping process, each opening/closing component is closed. Therefore, when the operation instruction to each opening/closing component is stopped, the opening/closing component is in the second state, so that wetting of the vehicle interior space can be suppressed.

[0054] (1-8) In the write-show execution-time operation stop process, it is repeatedly determined whether or not it is raining at regular time intervals during a period in which the write-show is being executed. Then, when it is determined that the rain is falling, the operation instruction to each opening and closing component is stopped, and when it is determined that the rain is not falling, the stop of the operation instruction to each opening and closing component is released. Therefore, it is possible to prevent the interior space from becoming wet even when rain falls during the execution of the light show. If the rain stops while the light show is being performed, the user and the viewer can be enjoyed by combining the operations of the opening and closing parts thereafter.

Second Embodiment

Operation Stop Processing at the Time of Executing the Write Show in the Second Embodiment

[0055] Next, a second embodiment of the present disclosure will be described with reference to FIG. **4**. The cockpit DC **300** performs an operation stopping process at the time of executing the write show at the time of starting the write show.

[0056] As illustrated in FIG. **4**, in the light show execution-time operation stopping process, the cockpit DC **300** determines whether it is raining (S**11**). When it is determined that it is raining (S**11**: YES), the cockpit DC **300** performs control so as to stop the operation instruction to the respective opening/closing components (S**12**). Subsequently, the cockpit DC **300** controls the display **41** to execute the operation stop notification (S**13**).

[0057] Subsequently, the cockpit DC **300** outputs information for instructing closing of the respective opening and closing components to the body DC **400** (S**14**). Then, the cockpit DC **300** waits until the light show ends (S**15**). Thereafter, the cockpit DC **300** ends the write show execution-time operation stopping process. Incidentally, the cockpit DC **300** releases the stop of the operation instruction to the movable part that is stopping the operation instruction in accordance with the end of the operation stop process at the time of executing the write show, and controls so as to terminate the operation stop notification.

Operation and Effect of the 2 Embodiment

[0058] (2-1) In the light show execution time operation stop process of the second embodiment, after determining whether or not it is raining at the start of the light show, it waits until the light show ends. According to this, as compared with the case of repeating the determination of whether or not rain is falling every fixed time or every time the opening and closing component is operated, it is possible to simplify the process for stopping the operation instruction to each opening and closing component.

Modifications

[0059] The present embodiment can be realized with the following modifications. The present embodiment and the following modifications can be combined with each other within a technically consistent range to be realized.

[0060] When the operation stop notification is executed on the display **41**, the execution stop notification may be interrupted or terminated. When the operation stop notification is executed on the display **41**, the operation stop notification and the execution notification may be executed in parallel.

[0061] The in-execution notification and the operation stop notification may be executed on different displays. The display **41** for executing the operation stop notification is not limited to the one provided in the vehicle **100**, and may be, for example, a display of a mobile terminal held by a user. In this case, the cockpit DC **300** may be configured to provide the display of the mobile terminal of the user with

information about the movable part whose operation instruction is stopped via the radio network.

[0062] The operation stop notification and the execution notification are not limited to those displayed on the display **41**, and may be executed by, for example, audio output by the speaker **42** or blinking of the light **57**. The operation unit **43** is not limited to the one provided in the vehicle **100**, and may be, for example, an operation unit of a portable terminal held by a user. In this case, the cockpit DC **300** may be configured to execute the light show in response to the acquisition of the information indicating that the operation unit of the mobile terminal of the user is operated via the radio network.

[0063] The number and position of the cameras **15** may be changed as appropriate. The camera sensor device **10** is not limited to being connected to the driving support DC **200**, and may be connected to a cockpit DC **300** or a body DC **400**. In this case, the cockpit DC **300** may perform the rainfall determination process on the basis of information inputted from the camera sensor device connected to the cockpit DC **300** or the body DC **400**.

[0064] The cockpit DC **300** may perform a rainfall determination process based on one of information about images around the vehicles **100** and information about raindrops.

[0065] The method of the rainfall determination process may be changed as appropriate. For example, instead of the cockpit DC **300**, the driving support DC **200** or the body DC **400** may perform the rainfall determination process. In this case, the driving support DC **200** and the body DC **400** output the determination result of the rainfall determination process to the cockpit DC **300**. The cockpit DC **300** may stop and release the operation instruction to the respective opening/closing components based on the determination inputted from the driving support DC **200** or the body DC **400**.

[0066] The control device **500** may include a transmission/reception device that transmits position information of the vehicle **100** to an external server and receives rainfall information related to rainfall in an area corresponding to the position information. In this case, the control device **500** may perform the rainfall determination process on the basis of the rainfall information received from the external server via the transmission/reception device in place of or in addition to the information on the image around the vehicle **100** and the information on the detection result of the rainfall. The rainfall information may be information indicating whether or not it is raining in an area corresponding to the position information at the time of reception of the rainfall information, or may be information predicting whether or not it is raining within a predetermined time from the time of reception of the rainfall information.

[0067] In the case where the rainfall determination processing is performed based on a plurality of pieces of information, when it can be determined that the rainfall is occurring based on at least one piece of information, even when it cannot be determined that the rainfall is occurring based on other pieces of information, it may be determined that the rainfall is occurring. For example, it is assumed that rainfall determination processing is performed on the basis of information on an image around the vehicle **100**, information on a detection result of raindrops, and rainfall information received from an external server via the transmission/reception device. In this case, when it can be determined that it is raining based on at least one of the information, even when it cannot be determined that it is raining based on other information, it may be determined that it is raining.

[0068] When the cockpit DC **300** determines that it is raining, it may be configured to output, to the body DC **400**, ignore instruction information indicating that the operation instruction to the respective opening/closing components is ignored. In this case, the body DC **400** may stop the operation of the predetermined opening/closing component by ignoring the operation instruction information when the operation instruction information for instructing the operation of the predetermined opening/closing component is input after the input of the ignoring instruction information for the respective opening/closing components.

[0069] If the cockpit DC **300** determines that it is raining, it may deactivate the operation instruction to the movable part including the movable part that is not in the second condition. For example, if the cockpit DC **300** determines that it is raining, it may deactivate the operation instruction to all the movable parts.

[0070] In the light show execution operation stop process, the frequency of determining whether or not rain is occurring may be changed as appropriate. For example, the cockpit DC **300** may determine whether or not it is raining prior to the operation of the opening/closing component every time the opening/closing component is operated in the light show.

[0071] In the write show execution-time operation stopping process, the waiting time (S**6** in FIG. **3**) after outputting the information for instructing the closing of the respective opening/closing components may be changed as appropriate. For example, it may be a time less than the time it takes to close each opening and closing component.

[0072] There may be a plurality of types of music output from the speaker **42** in the light show. In this case, the music output by the operation of the operation unit **43** may be selected. There may be a plurality of types of program patterns for the light show. The program pattern of the light show may be configured to be settable by the user.

[0073] The timing at which the light show ends may be changed as appropriate. For example, the cockpit DC300 may terminate the light show when a predetermined period of time has elapsed since the light show started. The cockpit DC300 may terminate the light show based on an instruction from the operation unit **43**.

[0074] Various electrical components operated in the light show may be changed as appropriate. For example, the hood, the oil supply port, the charging port, and the like of the vehicle **100** may be operated. In addition, any or all of a door, a mirror, a light, a window, and a sunroof may not be operated. That is, in the light show, at least one movable part may operate in accordance with the output of music from the speaker **42**.

What is claimed is:

1. A control device for a vehicle

that is a control device for controlling a movable part applied to a vehicle equipped with the movable part that is able to switch between a first state in which space inside of a vehicle cabin and space outside of the vehicle are disconnected and a second state in which the space inside of the vehicle cabin and the space outside of the vehicle are connected, and

that is configured to execute rainfall determination processing for determining whether rainfall is occurring,

wherein when determination is made that rainfall is occurring in the rainfall determination processing, the movable part is not controlled to the second state.

2. The control device according to claim **1**, wherein the movable part includes at least one of a door and a power window.

3. The control device according to claim **1**, wherein

the vehicle further includes a speaker,

the control device is configured to execute particular processing of outputting music from the speaker, and also operating the movable part, and

when determination is made in the rainfall determination processing that rainfall is occurring, music is output from the speaker without controlling the movable part to the second state in the particular processing.

4. The control device according to claim **3**, wherein

the movable part is a first movable part,

the vehicle further is equipped with a second movable part that does not assume the second state,

the control device is configured to perform control to output music from the speaker, and also to operate the first movable part and the second movable part in the particular processing, and

when determination is made that rainfall is occurring in the rainfall determination processing, music is output from the speaker, and also the second movable part is operated, without controlling the first movable part to the second state in the particular processing.

5. The control device according to claim **4**, wherein the second movable part is a side mirror.

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