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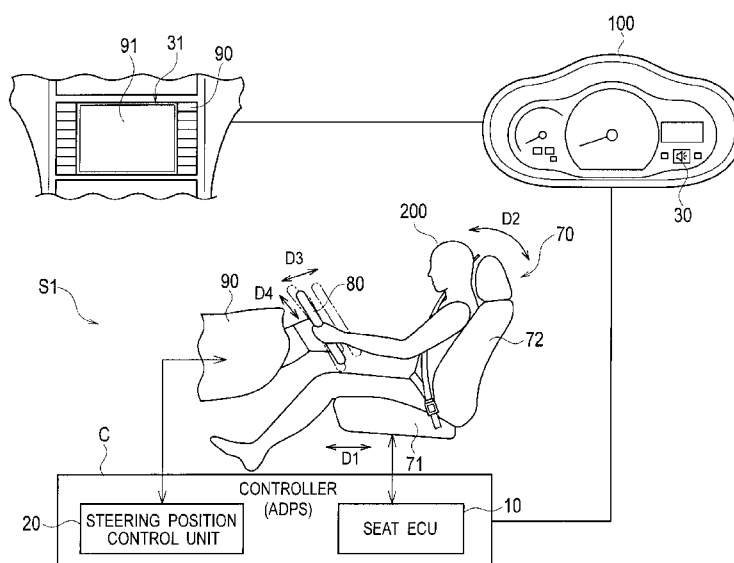
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(54) Title: VEHICLE WARNING SYSTEM



(57) Abstract: Calculation unit (50) calculates first arrangement of appropriate positions, for an airbag deployment event, set up by adjusting seat cushion (71) and seatback (72) of seat (70), on the basis of information on body size of the driver acquired by body size information acquisition unit (60), and compares the first arrangement with a second arrangement of current positions including at least a position of the seat cushion (71), an angle of the seatback (72), and a position of the steering wheel (80). Alarm unit (14) provides the driver with a warning for calling attention if a difference between the first arrangement calculated by the calculation unit (60) and the second arrangement is equal to or greater than a predetermined acceptable level.

Description

Title of Invention: VEHICLE WARNING SYSTEM

Technical Field

[0001] The present invention relates to a vehicle warning system that provides a warning regarding a vehicle airbag.

Background Art

[0002] Vehicles are provided with an airbag to protect a driver during a vehicle collision. Specifically, if an impact is applied by a vehicle during a collision or the like, an airbag is deployed between a steering wheel (steering handle) and a driver to protect the driver from the impact.

[0003] However, in a case, for example, where a small driver sits at a position close to a steering wheel while driving or other similar cases, the distance between the steering wheel and the driver is short, and the driver may be injured due to an impact of a deploying airbag in some cases.

[0004] In order to solve such a problem, various techniques have been proposed. Patent Literature 1 proposes a system including a distance measurement unit which measures a distance between an occupant and a steering wheel, and allowing positions of a seat and operation pedals to be adjusted to maintain the occupant and the steering wheel at appropriate positions.

Citation List

Patent Literature

[0005]

PLT 1

[0006] Japanese Patent No. 5026540

Summary of Invention

Technical Problem

[0007] However, the technique of Patent Literature 1 requires various sensors such as a distance sensor, a seat belt position sensor, and a seat position sensor, as the distance measurement unit, and thus has a disadvantage of high cost.

[0008] Meanwhile, in order to reduce an injury during an airbag deployment, the tilt angle (an inclination angle) of a steering wheel facing a driver is also an important factor. The technique of Patent Literature 1 has a problem of being incapable of taking a measurement for the tilt angle of a steering wheel.

[0009] The present invention has been made in view of the above-described problems. An object of the present invention is to provide a vehicle warning system capable of providing a warning regarding appropriate positions including an inclination angle of a

driver or an inclination angle of a steering wheel in accordance with the body size of the driver at a relatively low cost.

Solution to Problem

- [0010] In order to achieve the above object, a vehicle warning system according to the present invention includes: a steering wheel provided with an airbag; a seat on which a driver sits, the seat including a seat cushion movable in a vehicle front-rear direction, and a seatback whose inclination angle is adjustable; a body size information acquisition unit configured to acquire information on the body size of a driver; a calculation unit configured to perform arithmetic processing on appropriate positions of the driver and the steering wheel on the basis of the information acquired by the body size information acquisition unit; and an alarm unit configured to provide a warning to the driver on the basis of a result of a calculation performed by the calculation unit. The calculation unit calculates a first arrangement of the appropriate positions, for an airbag deployment event, set up by adjusting the seat cushion and the seatback of the seat, on the basis of the information on the body size of the driver acquired by the body size information acquisition unit, and compares the first arrangement with a second arrangement of current positions including at least a position of the seat cushion, an angle of the seatback, and a position of the steering wheel. The alarm unit calls attention to the driver with a warning if a difference between the first arrangement calculated by the calculation unit and the second arrangement is equal to or greater than a predetermined acceptable level.

Brief Description of Drawings

- [0011] [fig.1]Fig. 1 is a block diagram showing a configuration example of a vehicle warning system according to an embodiment.
- [fig.2]Fig. 2 is a schematic configuration diagram showing a schematic configuration of the vehicle warning system according to the embodiment.
- [fig.3]Fig. 3 shows explanatory drawings for illustrating, as body size information inputted into the vehicle warning system according to the embodiment, (a) the size of clothing and (b), (c) the length of a seat belt pulled.
- [fig.4]Fig. 4 shows explanatory drawings for illustrating (a) an example of appropriate positions of a driver and a steering wheel, and (b) a state of an airbag deployed with the appropriate positions.
- [fig.5]Fig. 5 is a flowchart showing a processing procedure of appropriate position-warning processing executed by the vehicle warning system according to the embodiment.
- [fig.6]Fig. 6 is a flowchart showing a processing procedure of a subroutine of appropriate position setting processing executed in the appropriate position-warning

processing.

[fig.7]Fig. 7 is a flowchart showing a processing procedure of a subroutine of alarm processing executed in the appropriate position-warning processing.

[fig.8]Fig. 8 is a flowchart showing a processing procedure of a subroutine of airbag inflation focus-checking processing executed in the appropriate position-warning processing.

Description of Embodiments

[0012] Hereinafter, an embodiment of the present invention will be described in detail based on the drawings. The same reference signs denote the same members in the attached drawings, and overlapped description will be omitted.

[0013] <Configuration of Vehicle Warning System according to Embodiment>

With reference to Figs. 1 and 2, the configuration and so forth of a vehicle warning system S1 according to the embodiment will be described.

[0014] Fig. 1 is a block diagram showing a configuration example of the vehicle warning system S1 according to the embodiment.

[0015] In addition, Fig. 2 is a schematic configuration diagram showing a schematic configuration of the vehicle warning system S1.

[0016] As shown in Fig. 1, the vehicle warning system S1 includes a controller C configured to control various devices, a keyless entry unit 11 configured to authorize the controller C to or not to perform various operations or the like through a user ID registered in a key (vehicle key) which a driver possesses, a seat position detector 12 configured to output a detection signal of a seat position to the controller C, a seat driver 13 configured to drive a seat under the control of the controller C, an input unit 60 configured to receive information on a body size (hereinafter referred to as body size information), an alarm unit 14 configured to provide a warning regarding appropriate positions of the seat and a steering wheel under the control of the controller C, and the like.

[0017] The keyless entry unit 11 is constituted of a system that enables locking and unlocking of a door, a trunk, and the like of a vehicle, or start up of an engine, without using a physical key. More specifically, for example, a key is provided with a transmitter configured to wirelessly transmit information such as a user ID, while the vehicle is provided with a receiver configured to receive the user ID or the like transmitted from the transmitter for authentication.

[0018] The controller C is constituted of an Auto Driving Position System (ADPS) constituted of, for example, a microcomputer or the like. The controller C includes a storage unit 40 constituted of a nonvolatile memory or the like, and a calculation unit 50 constituted of a CPU or the like.

- [0019] Further, in the present embodiment, the controller C includes a seat position control unit (Seat ECU) 10 configured to control the seat driver 13, and a steering position control unit 20 configured to control a steering position.
- [0020] The seat position detector 12 includes a sensor SN1 for detecting a front-rear position of a seat cushion (Slide Sensor), a sensor SN2 for detecting a reclining position or angle of a seatback (Reclining Sensor), a sensor SN3 for detecting the position of a front portion of the seat cushion (Front lift Sensor), and a sensor SN4 for detecting the position of a rear portion of the seat cushion (Rear lifter Sensor).
- [0021] The seat driver 13 includes a motor M1 for frontward-rearward movement of the seat cushion (Slide Motor), a reclining motor for reclining the seatback (Reclining Motor) M2, a motor M3 for lifting the front portion of the seat cushion (Front lift Motor), and a motor M4 for lifting the rear portion of the seat cushion (Rear lifter Motor).
- [0022] An adjustment switch SW1 configured to adjust the front-rear position, the reclining position, and the like of the seat to desired positions is connected to the seat position control unit 10 and the steering position control unit 20.
- [0023] Sensors for detecting the position of the steering wheel 80, i.e., a tilt angle sensor (Tilt Sensor) SN10 and a distance sensor or an axial position sensor (Telescopic Sensor) SN11 are connected on an input side of the steering position control unit 20.
- [0024] Moreover, motors for adjusting the position of the steering wheel 80, i.e., a motor for adjusting the tilt angle of the steering wheel (Tilt Motor) M10 and a distance adjusting motor or a motor for adjusting the axial position of the steering wheel (Telescopic Motor) M11 are connected on an output side of the steering position control unit 20.
- [0025] In the present embodiment, the input unit 60 constitutes a portion of a body size information acquisition unit, and is disposed, for example, in a center console or the like in the vehicle interior. The input unit 60 is constituted of Information Telematics (ITM) including a display 91 constituted of a liquid crystal touch panel or the like, switches 90 for various operations, and the like.
- [0026] The calculation unit 50 is configured to calculate a first arrangement of the appropriate positions for an airbag deployment event, set up by adjusting the seat cushion and a seatback of the seat, on the basis of the driver's body size information acquired through the input unit 60, wherein the appropriate positions include at least a position of the seat cushion 71, an angle of the seatback 72, and a position of the steering wheel 80 in an appropriate positional relationship, and to compare the first arrangement with a second arrangement of current positions which include at least a current position of the seat cushion 71, a current angle of the seatback 72, and a current position of the steering wheel 80.
- [0027] The alarm unit 14 includes, for example, as shown in Fig. 2, an alarm 30 built in an instrument panel 100, on which a speedometer or the like is disposed, and the display

91 of the ITM, which also serves as the input unit 60. Additionally, if a difference between the first arrangement calculated by the calculation unit and the second arrangement is equal to or greater than a predetermined acceptable level, the alarm unit 14 provides a warning regarding appropriate positions under the control of the controller C. More specifically, the alarm 30 is configured to vocally output a warning sound, a voice message, or the like, and the display 91 is configured to display a warning message or the like.

[0028] Thereby, the driver can recognize that current adjusted positions of the seat 70 and the steering wheel 80 are not appropriate positions.

[0029] <Usage of Vehicle Warning System according to Embodiment>

Now, a usage of the vehicle warning system S1 according to the embodiment having such a configuration as described above will be described briefly with reference to Figs. 1 to 4. Note that the processing procedure will be described in detail later with reference to flowcharts.

[0030] When getting in the vehicle for the first time, a driver 200 operates the adjustment switch SW1 (see Fig. 1) while seated on the seat 70 as shown in Fig. 2 to thereby perform adjustments on a seat cushion 71 of the seat 70 in a vehicle front-rear direction D1 and an inclination angle (D2 direction) of a seatback 72 and other adjustments so that the driver can be seated in a comfortable position to drive.

[0031] Moreover, by similarly operating the adjustment switch SW1 and so forth, the driver 200 adjusts a perspective distance (D3 direction) between the steering wheel 80 and the driver 200 as well as a tilt angle (D4 direction).

[0032] The controller C stores data on the above-described adjusted positions in the storage unit 40 in such a manner that the data corresponds to a user ID of the driver 200.

[0033] Next, the driver 200 inputs information on his or her body size through the input unit 60. Examples of the inputted information on body size include the size of clothes being worn, such as the size of a shirt (XS, S, M, L, XL, etc.) as shown in Fig. 3(a), the length of a seat belt 110 pulled as shown in Fig. 3(b), the height, the weight, and the like.

[0034] The length of the seat belt 110 pulled can be acquired by providing the seat belt 110 with a measure 111 showing a dimension as shown in Fig. 3(c), for example, and reading a scale of the measure 111 through an observation window 112a when the seat belt 110 is pulled and fastened. The observation window 112a is an opening provided in a case 112 through which the seat belt 110 is inserted.

[0035] Incidentally, instead of the measure 111, multiple regions may be provided in accordance with pulled lengths (for example, regions denoted by reference signs such as A to E, colored regions) to check a corresponding region through the observation window 112a.

- [0036] Then, the length measured with the measure 111, or the reference sign, color, or the like corresponding to the region is inputted through the input unit 60.
- [0037] The controller C stores in the storage unit 40 the body size information inputted through the input unit 60 in such a manner that the information corresponds to the user ID.
- [0038] Subsequently, the calculation unit 50 calculates a first arrangement of the appropriate positions, for an airbag deployment event, set up by adjusting the seat cushion 71 and the seatback 72 of the seat 70, on the basis of the driver's body size information stored in the storage unit 40, and compares the first arrangement with a second arrangement of current positions before an adjustment (this means before a re-adjustment to be made after a warning).
- [0039] More specifically, for example, the value of a distance from a top surface position of an airbag housing 300 in the steering wheel 80 to a front surface of the seatback 72 of the seat 70 is added to the value of a thickness of the body of the driver 200 (such as thickness of the chest) obtained by arithmetic processing according to the body size information. The first arrangement calculated from this added value is compared with the second arrangement of the current positions before the adjustment stored in the storage unit 40. Note that, in this event, the tilt angle of the steering wheel 80 is also considered as a parameter.
- [0040] Additionally, the body size of the driver can be estimated based on a body mass index (BMI) calculated from the height and weight. More specifically, the BMI index enables a calculation of a standard body size according to a calculation formula: $BMI=W/H^2$, where W represents the weight (kg), and H represents the height (m). The thickness of the body (such as thickness of the chest) can be estimated based on the correlation graph.
- [0041] Incidentally, other than the calculation based on the above calculation formula and the like, the body size of the driver may be acquired, for example, on the basis of a table in which body size information and the thickness of the body (such as thickness of the chest) are stored in association with each other in advance.
- [0042] Then, if a difference between the first arrangement calculated by the calculation unit 50 and the second arrangement is equal to or greater than a predetermined acceptable level, the alarm unit 14 provides the driver 200 with a warning for calling attention.
- [0043] For example, as shown in Fig. 4(a), the first arrangement of the appropriate positions may be an arrangement where the distance from the top surface position of the airbag housing 300 in the steering wheel 80 to a portion around the chest of the driver 200 is 10 inches or longer and an angle between a horizontal line and an axis of the steering wheel 80 is 30 degrees or higher.
- [0044] Meanwhile, it is possible to employ an arithmetic equation formulated in such a

manner that the difference between the first arrangement and the second arrangement is equal to or greater than the acceptable level if the distance from the top surface position of the airbag housing 300 in the steering wheel 80 to a portion around the chest of the driver 200 is shorter than 10 inches and the angle between the horizontal line and the axis of the steering wheel 80 is lower than 30 degrees.

[0045] Hence, by a warning sound or a warning message alarmed if the difference between the first arrangement calculated by the calculation unit 50 and the second arrangement is equal to or greater than the predetermined acceptable level, the driver 200 can recognize that sufficient safety in an airbag deployment event is not guaranteed at the positions adjusted at that time (second arrangement).

[0046] Moreover, for example, when advice is given regarding the adjustment amount, adjustment direction, or the like by a synthetic voice or a warning message, the driver 200 can perform a re-adjustment according to the advice by operating the adjustment switch SW1 in such a manner that the seat 70 and the steering wheel 80 are positioned at appropriate positions (first arrangement).

[0047] By adjusting the positions of the seat 70 and the steering wheel 80 to appropriate positions as described above (for example, such positions that the distance from the top surface position of the airbag housing 300 in the steering wheel 80 to a portion around the chest of the driver 200 is 10 inches or longer and the angle between the horizontal line and the axis of the steering wheel 80 is 30 degrees or higher), it is possible to set up a condition where the driver 200 will not be injured by an airbag body 301 in an event when the airbag body 301 is deployed as shown in Fig. 4(b), while the driver 200 is protected from a collision.

[0048] <Other Configuration Examples>

Next, other configuration examples of the vehicle warning system S1 according to the present embodiment will be described.

[0049] First of all, it is possible to further provide determination unit for determining the weight of the driver 200; hence, the calculation unit 50 may be configured to calculate the difference between the first arrangement and the second arrangement on the basis of the height inputted through the input unit 60 and the weight determined by the determination unit.

[0050] More specifically, as the determination unit, a load sensor provided to the seat cushion 71 of the seat 70 or an on-board tire pressure monitoring system (TPMS) may be used to determine the weight of an occupant such as a driver.

[0051] Note that the TPMS is a system configured to detect and alarm a change in an air pressure of a tire using a sensor. On the basis of the tire pressure, the weight of an occupant such as a driver can be determined.

[0052] Meanwhile, the weight of an occupant such as a driver may be determined according

to, for example, a map in which the weight and a stroke amount of a suspension are associated with each other, the map being created by measuring a voltage outputted in accordance with the stroke amount to thereby estimate the suspension stroke amount.

[0053] It is also possible to further provide a detector for detecting a position of the face of the driver 200; hence, the calculation unit 50 may be configured to calculate the difference between the first arrangement and the second arrangement on the basis of a height calculated from the position of the face detected by the detector and the weight determined by the above-described determination unit.

[0054] As the detector for detecting a position of a face, a face recognition camera mounted on a vehicle for monitoring dozing while driving or the like can be employed.

[0055] It is also possible to further provide a detector (sensor) for detecting the length of the seat belt 110 pulled, the seat belt 110 being provided to the seat 70; hence, the calculation unit 50 may be configured to calculate the difference between the first arrangement and the second arrangement on the basis of the length of the seat belt 110 pulled detected by the detector.

[0056] <Appropriate Position-Warning Processing>

Next, an example of a processing procedure of appropriate position-warning processing executed by the vehicle warning system S1 according to the present embodiment will be described with reference to flowcharts shown in Figs. 5 to 7.

[0057] First, in Step S10 in Fig. 5, an entry is made into the keyless entry unit 11. More specifically, by operating the switch of a key possessed by the driver 200, information such as a user ID are wirelessly transmitted to the vehicle, and the controller C on the vehicle having received this information authenticates the user ID and the like. Incidentally, in a case where a more advanced smart entry system is employed, the user ID and the like can be authenticated when the driver 200 carrying the key merely approaches the vehicle.

[0058] Next, in Step S11, whether or not the user ID is matched is judged. Then, if "Yes", the processing proceeds to Step S12. On the other hand, if "No", it is determined that the driver 200 has got into the vehicle for the first time, and a subroutine SB1 of appropriate position setting processing is executed. Note that a processing procedure of the appropriate position setting processing will be described later.

[0059] In Step S12, the display unit 31 displays a message that the user ID is matched. Specifically, the display 91, which is disposed, for example, in a center console or the like in the vehicle interior and constituted of a liquid crystal touch panel or the like, displays a message that the user ID is matched.

[0060] In Step S13, body size information corresponding to the user ID is read out from the storage unit 40 and is displayed on the display unit 31. Then, the processing proceeds to Step S14.

- [0061] In Step S14, whether or not the displayed body size information is correct is judged, for example, by the driver 200. If "No", the processing proceeds to the subroutine SB1 in order to set appropriate positions again, and the appropriate position setting processing is executed.
- [0062] On the other hand, if "Yes" in Step S14, the processing proceeds to Step S15. In Step S15, the seat 70 and the steering wheel 80 are moved to the appropriate recorded positions corresponding to the body size information. Thus, the processing is ended.
- [0063] Now, the processing procedure of the appropriate position setting processing executed in the subroutine SB1 will be described with reference to the flowchart in Fig. 6.
- [0064] First, in Step S20, the display unit 31 displays a message requesting inputting body size information corresponding to a new user ID. Specifically, the display 91, which is disposed, for example, in a center console or the like in the vehicle interior and constituted of a liquid crystal touch panel or the like, displays a message such as "Please input body size information." Then, the processing proceeds to Step S21.
- [0065] In Step S21, body size information is inputted through the input unit 60. Examples of the body size information include, as described above, the size of clothing, the height, the weight, the length of the seat belt pulled, and the like.
- [0066] In Step S22, the inputted data is temporarily stored in a RAM or the like. Then, the processing proceeds to Step S23.
- [0067] In Step S23, the inputted body size information is transmitted from the input unit 60 to the controller C. Then, the processing proceeds to Step S24.
- [0068] In Step S24, the controller C stores in the storage unit 40 the received body size information in such a manner that the information corresponds to the user ID. Then, the processing proceeds to Step S25.
- [0069] In Step S25, the calculation unit 50 calculates a first arrangement of appropriate positions on the basis of the body size information. Then, the processing returns to the main processing in Fig. 5.
- [0070] In the appropriate position-warning processing in Fig. 5, after the subroutine SB1 of the appropriate position setting processing is executed, the processing proceeds to a subroutine SB2, and alarm processing is executed.
- [0071] Now, a processing procedure of the alarm processing executed in the subroutine SB2 will be described with reference to the flowchart in Fig. 7.
- [0072] First, in Step S30, the calculation unit 50 compares the first arrangement calculated in Step S25 above with a second arrangement of current positions before an adjustment.
- [0073] In Step S31, whether or not a difference between the first arrangement and the second arrangement is equal to or greater than an acceptable level is judged. If "No",

the processing returns to the main processing in Fig. 5, and the alarm processing is ended.

[0074] On the other hand, if "Yes" in Step S31, the processing proceeds to Step S32. In Step S32, the controller C transmits a warning command to the alarm unit 14. Then, the processing proceeds to Step S33.

[0075] In Step S33, the alarm unit 14 outputs a voice with the alarm 30 and displays a message on the display unit 31 on the basis of the command. Then, the processing returns to the main processing in Fig. 5.

[0076] Thereby, the driver 200 can recognize that sufficient safety in an airbag deployment event is not guaranteed at the currently adjusted positions (second arrangement). Moreover, by the synthetic voice and the warning message, advice is given regarding adjustment amount, adjustment direction, or the like, such as, for example, "Please move the seat rearwardly by 1 inch," or "Please raise the tilt angle of the steering wheel by 2 degrees." According to the advice, the driver 200 can perform a re-adjustment by operating the adjustment switch SW1 in such a manner that the seat 70 and the steering wheel 80 are positioned at the appropriate positions (first arrangement).

[0077] Thereafter, the processing proceeds to a subroutine SB3, and airbag inflation focus checking processing is executed.

[0078] Now, a processing procedure of the airbag inflation focus checking processing executed in the subroutine SB3 will be described with reference to the flowchart in Fig. 8.

[0079] First, in Step S40, the calculation unit 50 calculates a distance between the steering wheel 80 and the driver 200 on the basis of the position of the seat, the position of the steering wheel, and the angle of the seatback. Then, the processing proceeds to Step S41.

[0080] In Step S41, an airbag inflation focus is checked against the head and the chest of the driver 200. Herein, the airbag inflation focus may be, for example, a function of the tilt angle of the steering wheel 80 and the calculated distance between the steering wheel 80 and the driver 200.

[0081] In Step S42, whether or not the distance between the steering wheel 80 and the driver 200 is shorter than 10 inches and the angle of the seatback 72 is 30 degrees or higher is judged. Then, if the judgment result is "No", the processing returns to the main processing in Fig. 5. Meanwhile, if "Yes", the processing proceeds to Step S43.

[0082] In Step S43, it is determined that the airbag inflation focus is not accurate i.e. the airbag inflation focus is off an optimal target area which is determined relative to the positions of the head and the chest of the driver 200. The optimal target area can be set on the basis of the calculated first arrangement and the driver's body size information. Then, the processing proceeds to Step S44.

- [0083] In Step S44, the alarm unit 14 outputs a voice with the alarm 30 and displays a message on the display unit 31. Then, the processing returns to the main processing in Fig. 5.
- [0084] Thereby, the driver 200 can recognize that the current airbag inflation focus is not accurate. Moreover, by the synthetic voice and the warning message, advice is given regarding adjustment amount or the like, such as, for example, "Please adjust the airbag inflation focus by lowering the tilt angle of the steering wheel by 1 degrees." According to the advice, the driver 200 can adjust the airbag inflation focus by operating the adjustment switch SW1.
- [0085] As described above, the present embodiments make it possible to provide a vehicle warning system capable of providing a warning regarding appropriate positions including an inclination angle of a driver or an inclination angle of a steering wheel in accordance with the body size of the driver at a relatively low cost.
- [0086] Hereinabove, the inventions made by the present inventors have been specifically described based on the embodiments. However, it should be understood that the embodiments disclosed herein are all illustrative, and that the present invention is not limited to the disclosed techniques. In other words, the technical scope of the present invention should not be construed as being limited based on the descriptions in the above embodiments, but should be strictly construed according to the description of the scope of claims. Techniques equivalent to the techniques described in the scope of the claims and all modifications made within the scope of the claims are included in the technical scope of the present invention.
- [0087] For example, as the body size information inputted through the input unit 60, the gender of a driver, information on whether a driver is pregnant or not, and so forth can be added in addition to the size of clothing, the height, the weight, and the length of the seat belt pulled.

Industrial Applicability

- [0088] A vehicle warning system of the present invention can be applied to a vehicle airbag system.

Reference Signs List

- [0089] S1 vehicle warning system
C controller
10 seat position control unit
11 keyless entry unit
12 seat position detector
13 seat driver
14 alarm unit

20 steering position control unit
30 alarm
31 display unit
40 storage unit
50 calculation unit
60 input unit (body size information acquisition unit)
70 seat
71 seat cushion
72 seatback
80 steering wheel
90 operation switch
91 display
100 instrument panel
110 seat belt
111 measure
112 case
112a observation window
200 driver
300 airbag housing
301 airbag body

Claims

- [Claim 1] A vehicle warning system comprising:
a steering wheel provided with an airbag;
a seat on which a driver sits, the seat including
a seat cushion movable in a vehicle front-rear direction, and
a seatback whose inclination angle is adjustable;
a body size information acquisition unit configured to acquire information on a body size of the driver;
a calculation unit configured to perform arithmetic processing on appropriate positions of the driver and the steering wheel on basis of the information acquired by the body size information acquisition unit; and
an alarm unit configured to provide a warning to the driver on basis of a result of calculation performed by the calculation unit, wherein
the calculation unit calculates a first arrangement of the appropriate positions, for an airbag deployment event, set up by adjusting the seat cushion and the seatback, on the basis of the information on the body size of the driver acquired by the body size information acquisition unit, and compares the first arrangement with a second arrangement of current positions including at least a position of the seat cushion, an angle of the seatback, and a position of the steering wheel, and
the alarm unit provides the driver with a warning for calling attention if a difference between the first arrangement calculated by the calculation unit and the second arrangement is equal to or greater than a predetermined acceptable level.
- [Claim 2] The vehicle warning system according to claim 1, wherein
the calculation unit calculates a distance between the steering wheel and the driver on basis of a position of the seat, the position of the steering wheel, and the angle of the seatback, and judges whether an inflation focus of the airbag against the head and the chest of the driver corresponding to the calculated distance is accurate, and
the alarm unit provides a warning for calling attention to the driver if the calculation unit determines that the inflation focus of the airbag is inaccurate against the head and the chest of the driver.
- [Claim 3] The vehicle warning system according to any one of claims 1 and 2, wherein
the body size information acquisition unit includes an input unit configured to receive a size of clothing worn by the driver, and

the calculation unit calculates the difference between the first arrangement and the second arrangement on basis of the size of the clothing inputted through the input unit.

[Claim 4] The vehicle warning system according to any one of claims 1 and 2, wherein

the body size information acquisition unit includes an input unit configured to receive a height and weight of the driver, and the calculation unit calculates the difference between the first arrangement and the second arrangement on basis of the height and weight inputted through the input unit.

[Claim 5] The vehicle warning system according to claim 4, further comprising a determination unit configured to determine the weight of the driver, wherein

the calculation unit calculates the difference between the first arrangement and the second arrangement on the basis of the height inputted through the input unit and the weight determined by the determination unit.

[Claim 6] The vehicle warning system according to claim 5, further comprising a detector configured to detect a position of the face of the driver, wherein

the calculation unit calculates the difference between the first arrangement and the second arrangement on basis of a height calculated from the position of the face detected by the detector and the weight determined by the determination unit.

[Claim 7] The vehicle warning system according to any one of claims 1 to 6, wherein

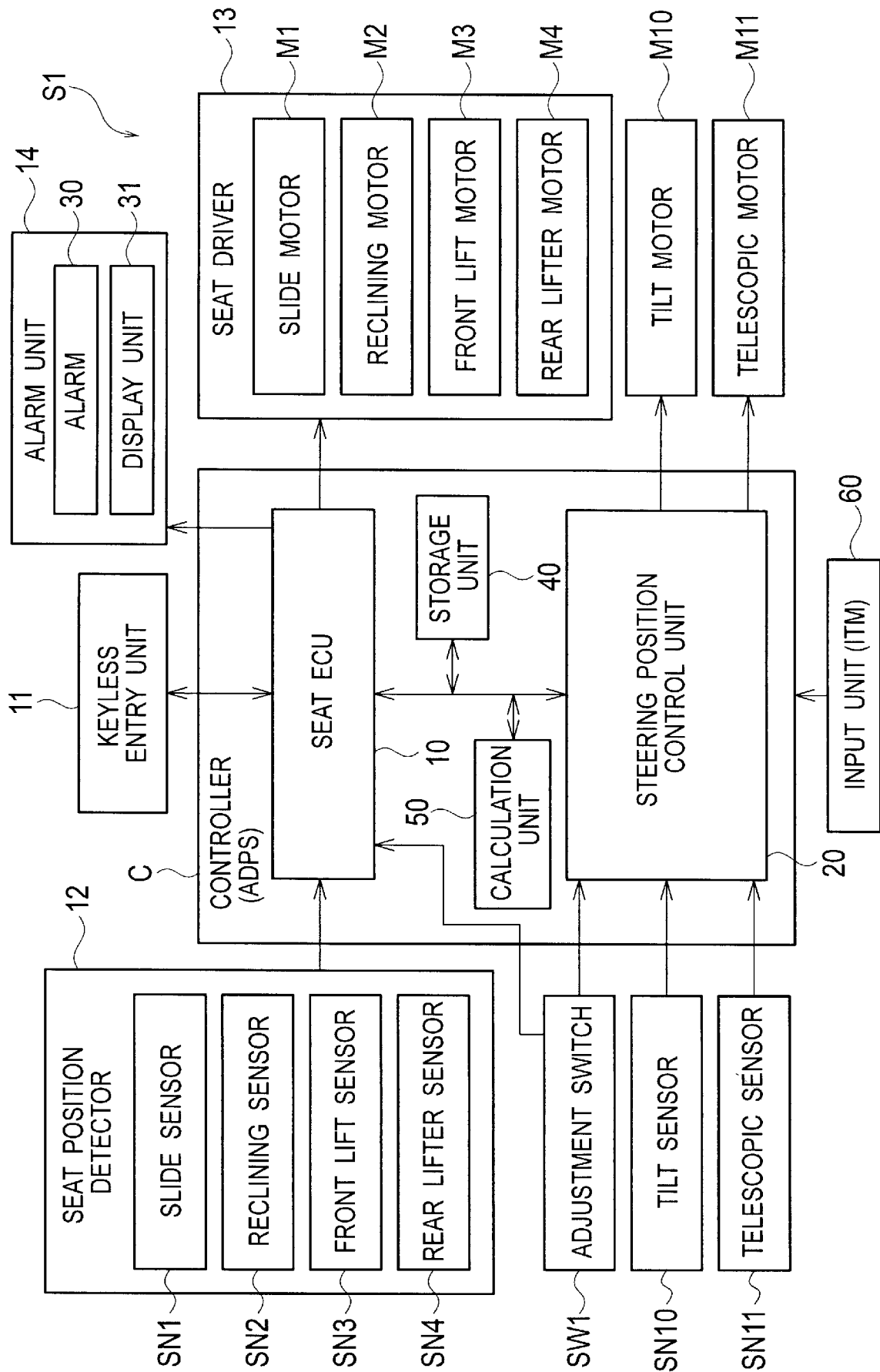
the body size information acquisition unit includes the input unit configured to receive a length of a seat belt pulled, the seat belt being provided to the seat, and

the calculation unit calculates the difference between the first arrangement and the second arrangement on basis of the length of the seat belt pulled inputted through the input unit.

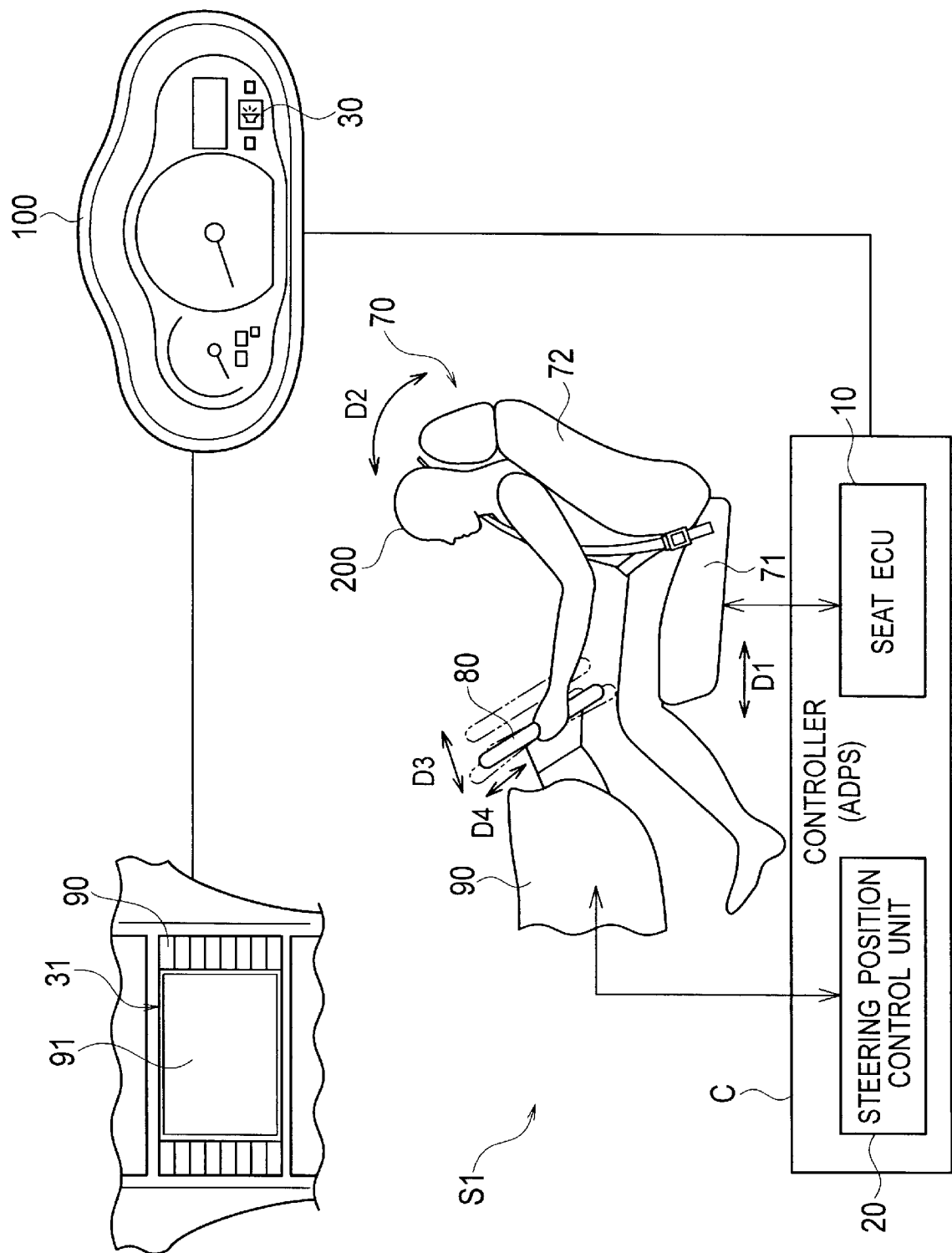
[Claim 8] The vehicle warning system according to any one of claims 1 to 5, further comprising a detector configured to detect a length of a seat belt pulled, the seat belt being provided to the seat, wherein

the calculation unit calculates the difference between the first arrangement and the second arrangement on basis of the length of the seat belt pulled detected by the detector.

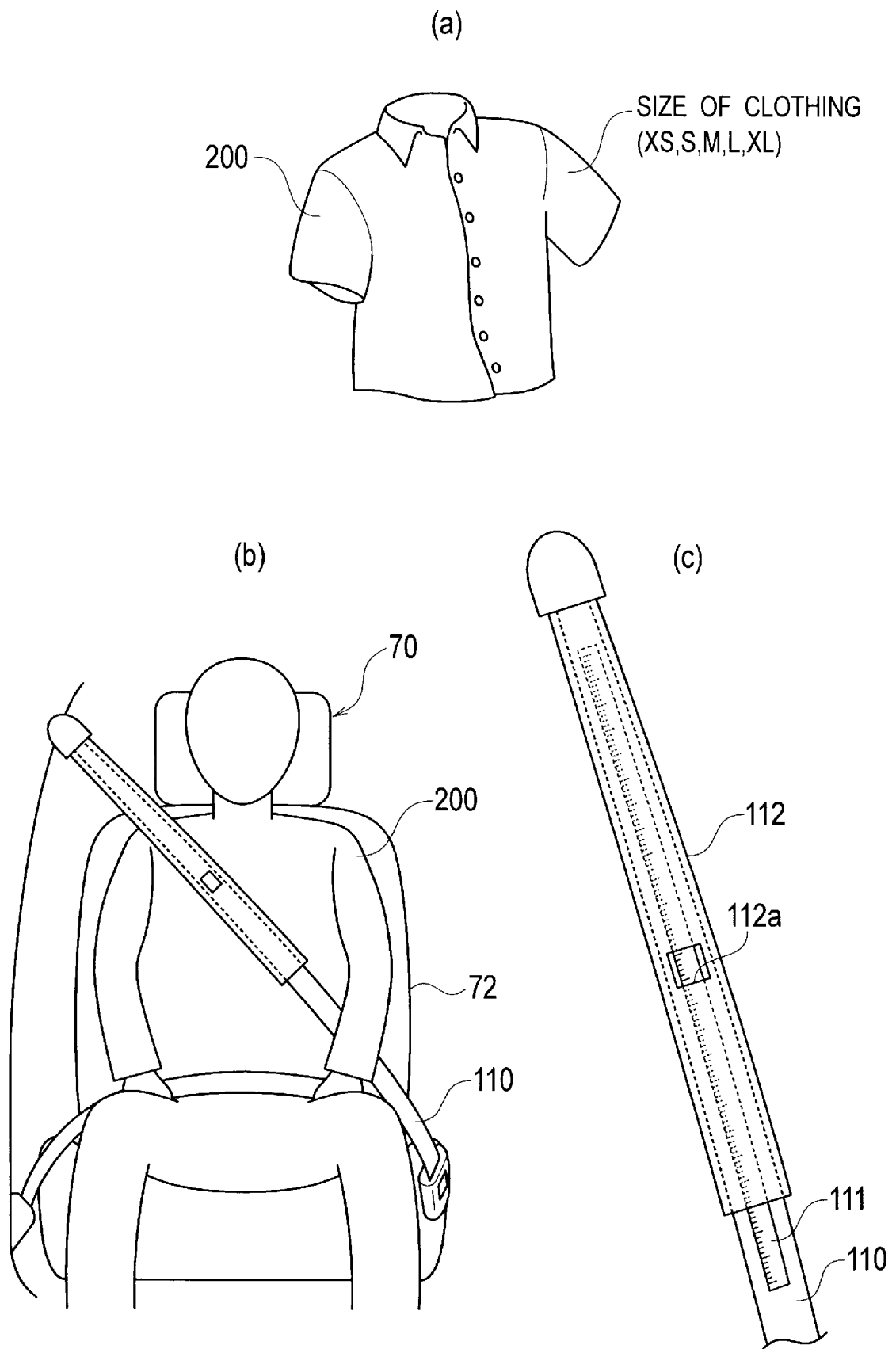
[Fig. 1]



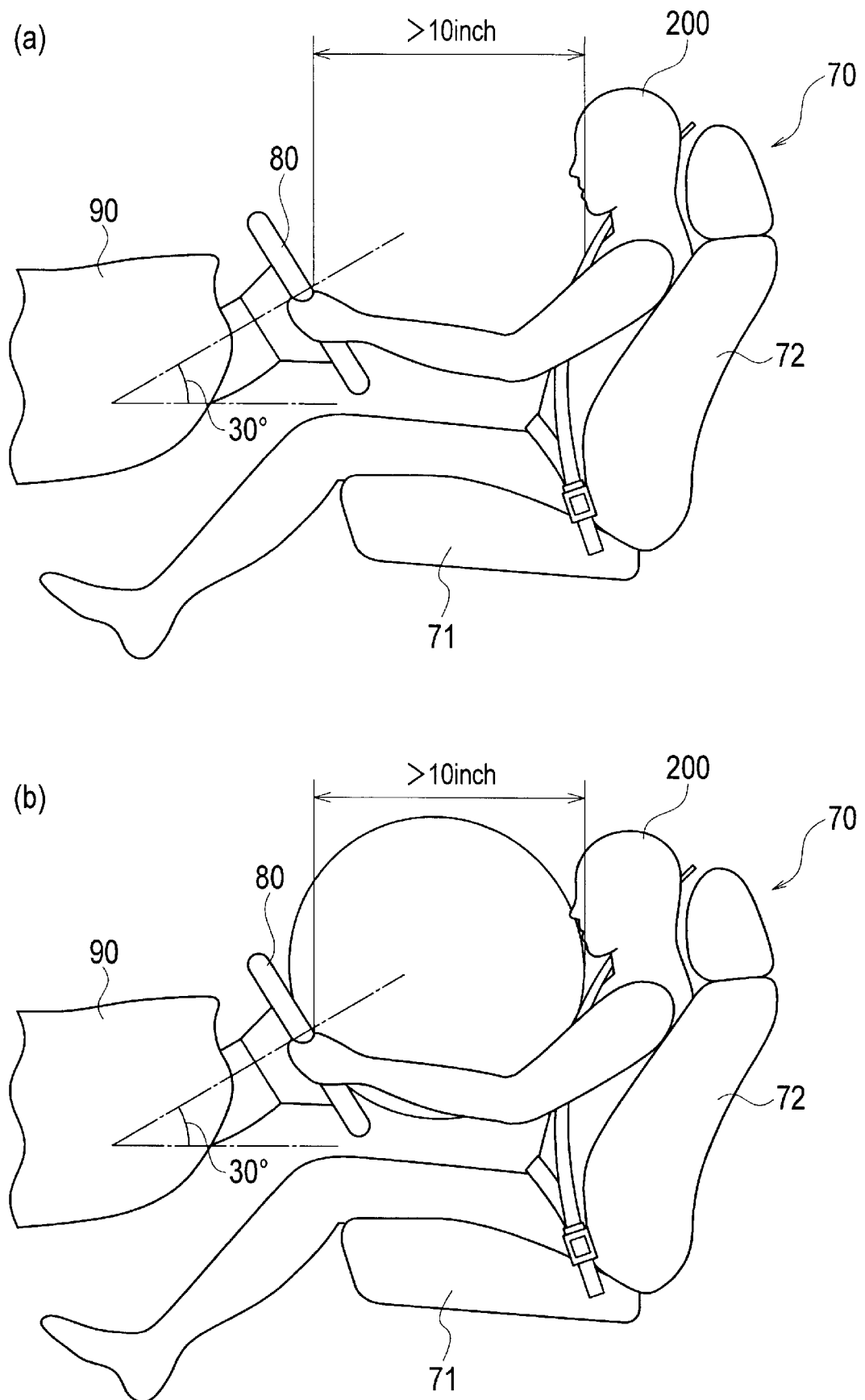
[Fig. 2]



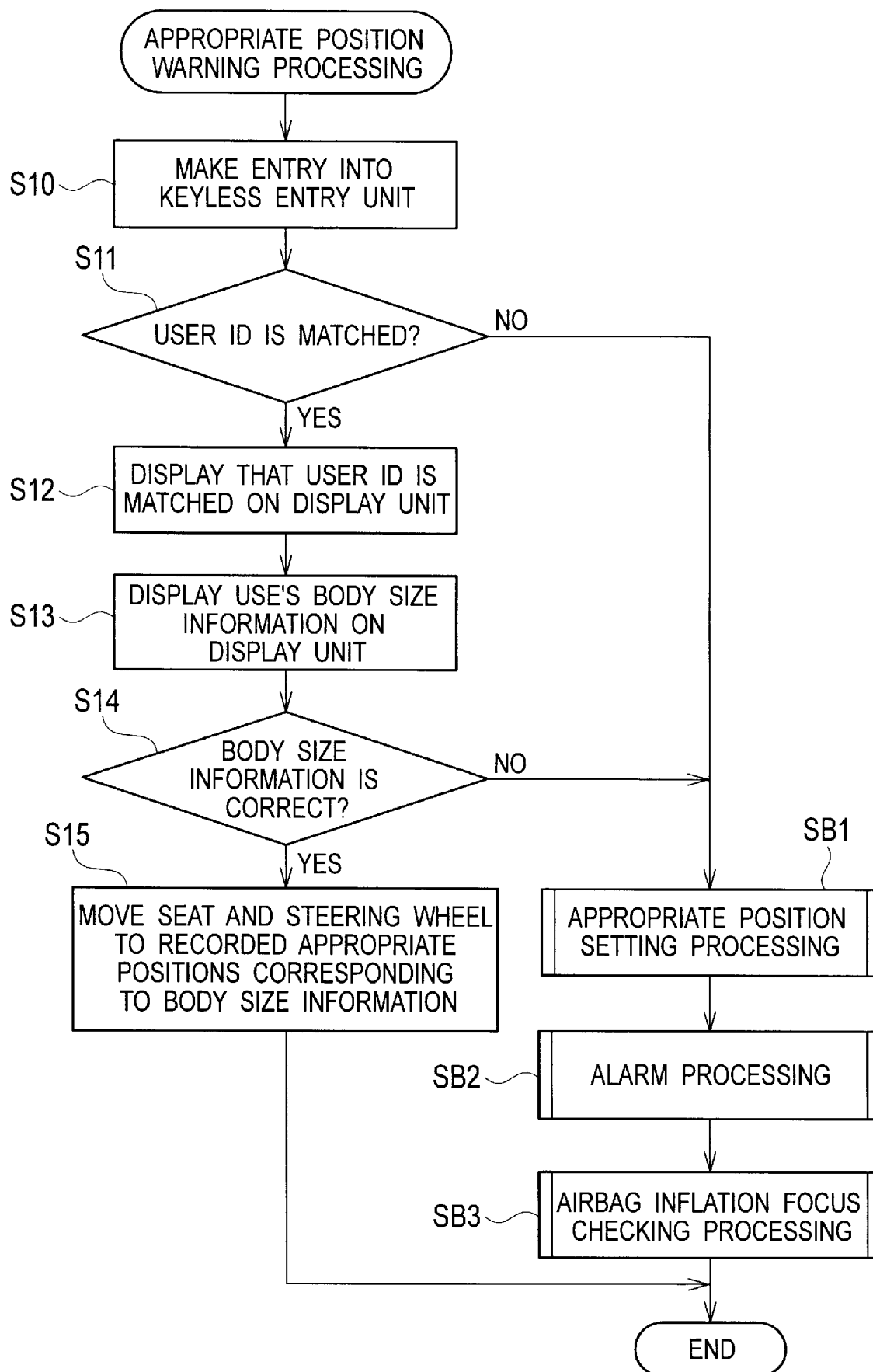
[Fig. 3]



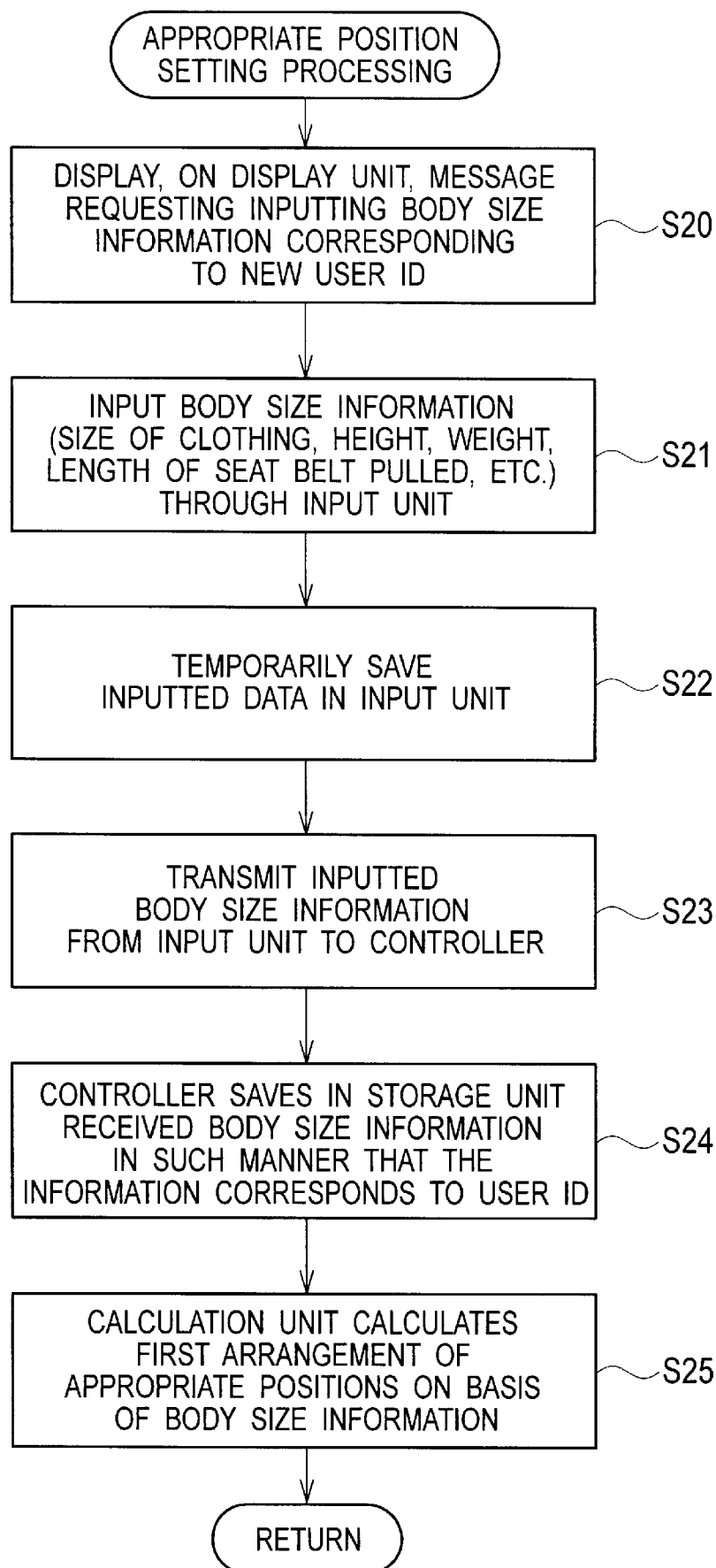
[Fig. 4]



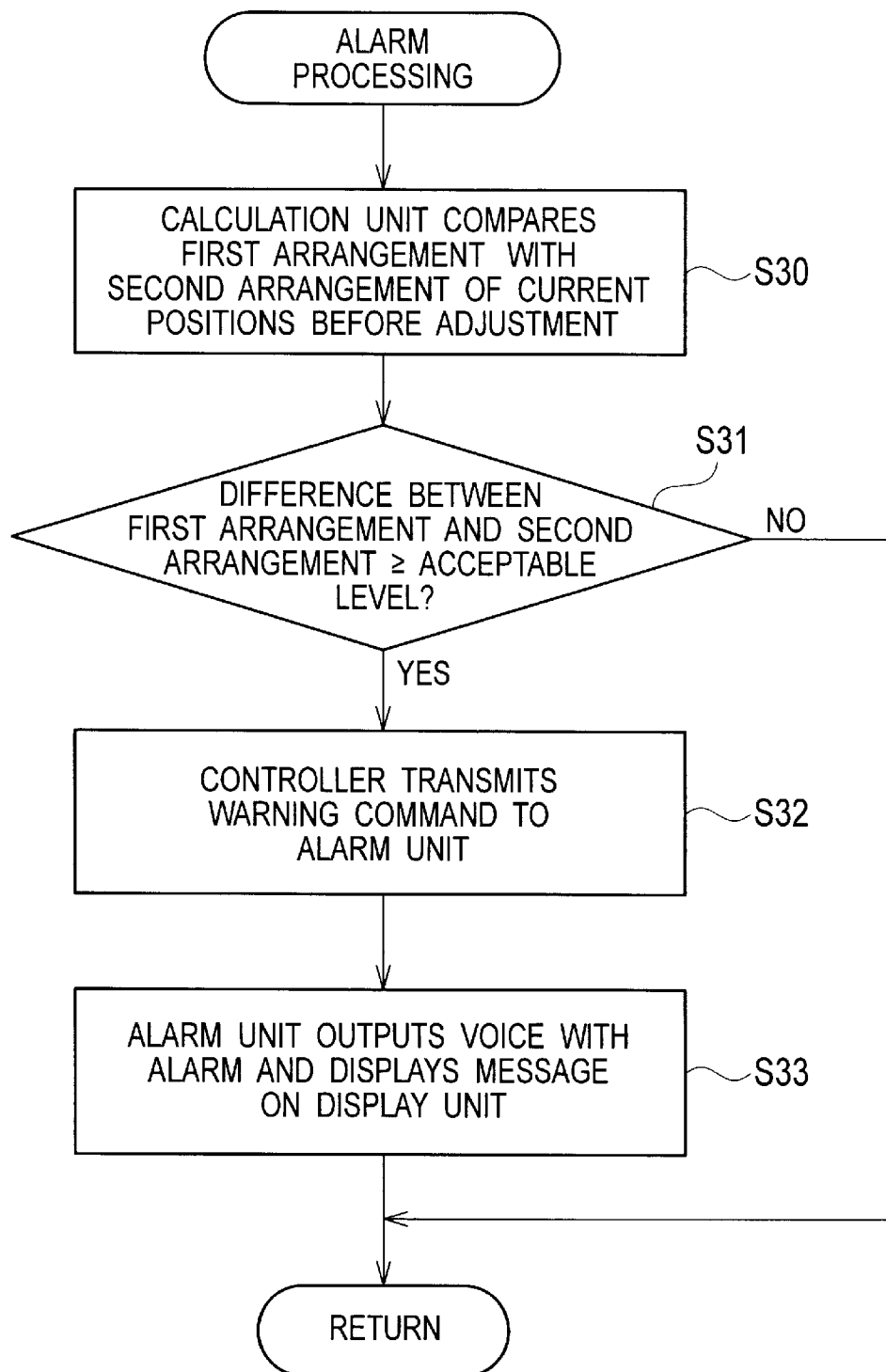
[Fig. 5]



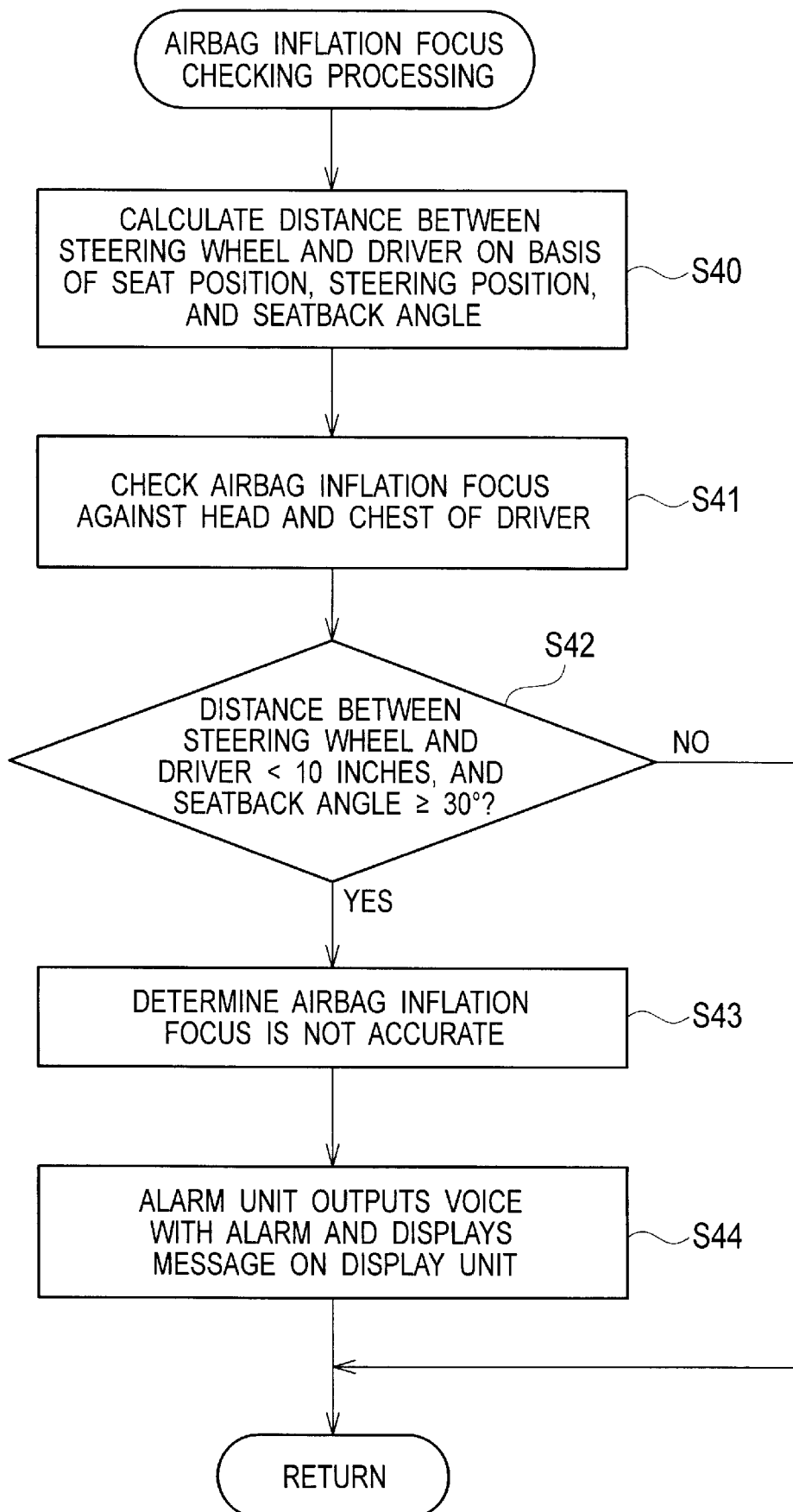
[Fig. 6]



[Fig. 7]



[Fig. 8]



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2014/003694

A. CLASSIFICATION OF SUBJECT MATTER		
Int.Cl. B60R21/203 (2006.01) i		
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. B60R21/203		
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 1971-2014 Registered utility model specifications of Japan 1996-2014 Published registered utility model applications of Japan 1994-2014		
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.
A	JP 2010-100142 A (TOYOTA MOTOR CORPORATION) 2010.05.06, [0028]-[0030], [0035], Figs.3-4 (No Family)	1-8
A	JP 2007-261299 A (NSK LTD.) 2007.10.11, the whole document, Figs.1-16 (No Family)	1-8
A	WO 2005/073033 A1 (DAIMLERCHRYSLER AG) 2005.08.11, the whole document, Fig.1 & JP 2007-519560 A & US 2008/0023946 A1	1-8
A	JP 10-71878 A (TOKAIRIKA, CO, LTD.) 1998.03.17, the whole document, Figs.1-13 (No Family)	1-8
☐ 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		
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22.09.2014		30.09.2014
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