TRANSPERFECT

[January 18, 2024]

I, [Sayuri Anderson] , declare;

1. That I am a citizen of the [USA].
2. That the translator responsible for the attached translation is well acquainted with the Japanese and English languages.
3. That the attached is, to the best of my knowledge and belief, a true translation into the English language of document, "Japanese Patent Application H10-19937 to Koji Hosoda."
4. That I believe that all statements made herein of my own knowledge are true and that all statements made on information and belief are true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the patent application in the United States of America or any patent issuing thereon.

Sayuri Anderson

[Sayuri Anderson]
[January 18, 2024]

(19) Japan Patent Office (JP)

(12) Japanese Unexamined Patent Application Publication (A)

(11) Japanese Unexamined Patent Application Publication Number

H11-220807

(43) Publication date August 10, 1999

(51) Int.Cl.[6]		Identification codes	FI		
B60L	11/44		B60L	11/44	Z
B60K	35/00		B60K	35/00	N
B60L	3/00		B60L	3/00	640D
B60R	16/02	640	B60R	16/02	D
F02D	29/02		F02D	29/02	

Request for Examination Number of unexamined claims 9 OL (13 pages in total) continues on the final page

(21) Application number Japanese Patent Application H10-19937

(22) Date of application January 30, 1998

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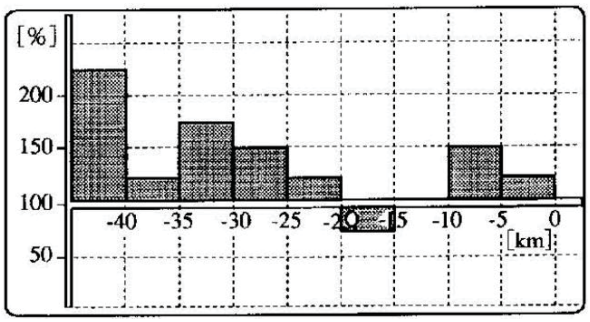
(54) [Title of the invention] Travel Display Device in Hybrid Electric Vehicles

(57) [Abstract]

[Problems] Display so that changes in fuel efficiency can be easily understood based on the driving conditions of the vehicle and the operation of the driver.

[Means for solving] Calculate the standard fuel efficiency according to the driving condition, and display the actual fuel efficiency compared to this standard fuel efficiency. Here, the standard fuel efficiency can be set to the calculated value in the driving state in which fuel efficiency is generally the maximum, the average fuel efficiency when the driver's vehicle is running, and the fuel efficiency of gasoline vehicles with the same exhaust volume. And, the actual fuel efficiency is set to a positive value or a negative value for the standard fuel efficiency, and the standard fuel efficiency is set to a value such that the smaller the electricity recovery rate by the brake is set to the smaller the value.



[Scope of patent claims]

[Claim 1] In a travel display device in a hybrid electric vehicle that travels in combination with an electric motor that generates a driving force due to power and an engine that generates a driving force due to an internal combustion engine,

A driving display device in a hybrid electric vehicle characterized by calculating the standard fuel efficiency according to the driving condition of the driver's vehicle and displaying the actual fuel efficiency of the driver's vehicle compared to the standard fuel efficiency.

[Claim 2] The driving display device in a hybrid electric vehicle according to Claim 1, characterized such that the standard fuel efficiency is fuel efficiency of a gasoline engine.

[Claim 3] A driving display device in a hybrid electric vehicle according to Claim 1 or 2, characterized such that the aforementioned standard fuel efficiency is calculated under a driving condition in which the fuel efficiency of the vehicle is generally maximal.

[Claim 4] A driving display device in a hybrid electric vehicle according to Claim 1 or 2, characterized such that the standard fuel efficiency is the average fuel efficiency when driving a vehicle.

[Claim 5] A driving display device in a hybrid electric vehicle according to any one of Claims 1 to 4, characterized such that the actual fuel efficiency is expressed as a positive value or a negative value for the fuel efficiency standard.

[Claim 6] A travel display device in a hybrid electric vehicle according to any one of Claims 1 to 5, characterized such that the reference fuel efficiency is corrected in a direction in which the greater the power recovery amount, the higher.

[Claim 7] A driving display device in a hybrid electric vehicle according to any one of Claims 1 to 6, characterized such that as to the actual fuel efficiency, the average value of the actual fuel efficiency calculated every predetermined time is displayed in comparison with the standard fuel efficiency.

[Claim 8] A driving display device in a hybrid electric vehicle according to any one of Claims 1 to 7, characterized such that the instantaneous fuel efficiency at the present time is displayed in comparison with the standard fuel efficiency.

[Claim 9] A travel display device in a hybrid electric vehicle according to any one of Claims 1 to 8, characterized such that the total fuel efficiency from the specified time point to the present time is displayed.

[Detailed Description of the Invention]

[0001]

[Technical field to which the invention belongs] The present invention relates to travel display devices in hybrid electric vehicles.

[0002]

[Prior art] Japanese Unexamined Patent Application Publication H9-1 07601 discloses a hybrid electric vehicle that displays the state of efficiency of the engine and the state of energy transfer when driving.

[0003]

[Problems to be solved by the invention] However, although the state of transmission of engine efficiency and energy can be easily confirmed with the above-mentioned conventional technology, it is not possible to confirm the fuel efficiency of the driver's vehicle, and it is necessary to inform the driver that fuel efficiency will decrease when driving at low fuel efficiency.

[0004] The present invention is made in light of the above-mentioned issues, and its purpose is to provide a driving display device in a hybrid electric vehicle that can easily understand changes in fuel efficiency based on the driving condition of the vehicle and the driving operation of the driver and does not cause discomfort to the driver.

[0005]

[Methods for solving problems] In order to solve the above issues and achieve the objectives, the driving display device in the hybrid electric vehicle of the present invention comprises the following configuration. In other words, in a travel display device in a hub lid electric vehicle that travels with an electric motor that generates a driving force due to power and an engine that generates a driving force due to an internal combustion engine, the standard fuel efficiency is calculated according to the driving condition of the vehicle, and the actual fuel efficiency of the vehicle compared to the standard fuel efficiency is displayed.

[0006] Also, preferably, the aforementioned standard fuel efficiency is the fuel efficiency of the gasoline engine.

[0007] Also, preferably, the aforementioned standard fuel efficiency is calculated in a driving state in which the fuel efficiency of the driver's vehicle is generally the maximum.

[0008] Also, preferably, the aforementioned standard fuel efficiency is the average fuel efficiency when driving the vehicle.

[0009] Also, the fuel efficiency is preferably displayed as a positive value or a negative value for the standard fuel efficiency.

[0010] Also, preferably, the reference fuel efficiency is corrected in a direction in which the greater the power recovery amount the higher the correction.

[0011] Also, the fuel efficiency is preferably displayed by comparing the average fuel efficiency calculated at a predetermined time to the standard fuel efficiency.

[0012] Also, preferably, the instantaneous fuel efficiency at the present time is compared to the standard fuel efficiency.

[0013] Also, the total fuel efficiency from the specified time point to the present time is preferably displayed.

[0014]

[Embodiment of the Invention] The following describes the embodiments of the present invention in detail with reference to the accompanying drawings.

[Mechanical configuration of hybrid electric vehicles] Fig. 1 is a block diagram illustrating the mechanical configuration of the hybrid electric vehicles of this embodiment.

[0015] As shown in Fig. 1, the hybrid electric vehicle of this embodiment travels in combination with motor 2 driven by power supplied from battery 3 and engine 1 driven by the explosive force of liquid fuel such as gasoline, as a power unit for generating driving force, and depending on the driving condition of the vehicle described below, it is realized to travel by motor 2 alone, by engine alone, or by both motor 2 and engine 1.

[0016] Engine 1 transmits the drive force to automatic

transmission 7 by fastening clutch 6 via torque converter 5. The automatic transmission 7 converts the drive force input from the engine 1 into a predetermined torque and number of revolutions depending on the driving state (or by operation of the driver) and transmits it to the drive wheels 9, 10 via the gear train 11 and differential mechanism 8. And, the engine 1 also drives the generator 4 to charge the battery 3.

[0017] Motor 2 is driven by the power supplied from battery 3 and transmits the driving force to drive wheels 9 and 10 via gear train 11.

[0018] The engine and motor control ECU 100 consists of CPU, ROM, RAM, inverter, etc., and provide the overall controls of engine 1 and motor 2. Engine 1 is controlled by engine and motor control ECU 100 for ignition timing and fuel injection amount, and motor 2 is controlled by engine and motor control ECU 100 for charging to battery 3 and output voltage, etc.

[0019] Where engine 1 is mounted, for example, by a type that delays Valve closing timing for high fuel efficiency valves , motor 2 is for instance an IPM synchronous motor, and battery 3 is mounted, for example, a nickel-metal hydride battery.

[0020] Next, with reference to Figs. 2-7, the transmission form of the driving force according to the driving state of the hybrid electric vehicle of this embodiment will be described.

[On start and slow travel] As shown in Fig. 2, during start and slow travel, the engine and motor control ECU 100 drives only the motor 2 and transmits the driving force of this motor 2 to the drive wheels 9, 10 via the gear train 11. Moreover, motor 2 travels at low speeds after starting.

[During acceleration] As shown in Fig. 3, at acceleration, the engine and motor control ECU 100 drives both the engine 1 and the motor 2 and transmits the driving force of the engine 1 and the motor 2 together to the drive wheels 9 and 10.

[When running at steady state] As shown in Fig. 4, the engine and motor control ECU 100 drives only the engine 1 and transmits the driving force from the engine 1 to the drive wheels 9, 10 via the gear train 11. Steady driving is driving in the most fuel-efficient area with engine rotation number of about 2000 to 3000 rpm.

[During deceleration] As shown in FIG. 5, during deceleration, the clutch 6 is released, the driving force of the drive wheels 9, 10 is regenerated to the motor 2 via the gear train 11, and the motor 2 is the driving source and the battery 3 is charged.

[during Steady driving and during charging] As shown in Figure 6, during steady driving and charging , the clutch 6 is engaged, the drive force is transferred from the engine 1 to the drive wheels 9, 10 via the gear train 11, and the engine 1 drives the generator 4 to charge the battery 3.

[during Charging] As shown in Fig. 7, when charging, the clutch 6 is released so that no driving force is transferred from the engine 1 to the automatic transmission 7, and the engine 1 drives the generator 4 to charge the battery 3.

[Electrical Configuration of Hybrid Electric Vehicles] Fig. 8 is a block diagram illustrating the electrical configuration of the hybrid electric vehicle of this embodiment.

[0021] As shown in FIG. 8, the hybrid electric vehicle of this embodiment controls engine 1 and motor 2 by the engine and motor control ECU 100. The engine and motor control ECU 100 includes a signal from the car speed sensor 101 to detect the speed of the vehicle, a signal from the engine rotation number sensor 102 to detect the number of rotation number of the engine 1, a signal from the voltage sensor 103 supplied to engine 1, signal from throttle opening sensor 104 to detect the openness of the throttle valve of the engine 1, a signal from the remaining gasoline amount sensor 105, a signal from the remaining electrical storage volume sensor 106 to detect the remaining power of the battery 3, a signal from the shift range sensor 107 to detect the shift range by the selector lever, a signal from the pedal depth volume sensor 108 to detect the amount of the accelerator pedal depth volume by the operator, and other sensors 109 such that signals etc. from oil temperature sensor that detects the operation oil temperature of the automatic transmission is input to control the ignition time and fuel injection volume for engine 1, and control the power supply volume to motor 2.

[0022] In addition, the engine and motor control ECU 100 outputs signals from each of the sensors 101 to 109 described above and control signals to engine 1 and motor 2 to the display control ECU 200.

[0023] Display control ECU 200 performs display control to display 201, voice output control from speaker 202, display switching control by display switching switch 203, read/write control to memory 204, or operation processing by navigation device 20 5, etc.

[Display form] FIGS. 9-11 are diagrams illustrating display form in a hybrid electric vehicle of the present embodiment.

[0024] As shown in Figure 9, display 201 is a liquid crystal display for displaying an instrument panel or navigation screen, etc. opposite the driver's seat. Display 201 is controlled by display control ECU 200 to Fuel & storage remaining amount display section 210, vehicle speed indicator 220, left winker indicator 221, right winker indicator 222, operation key 223, select position indicator 230, and engine speed indicator 240.

[0025] Fig. 10 shows an example of switching the fuel and power storage remaining amount display 210 to the navigation display 250 by operating the display switch 203 from the display form shown in Fig. 9, and shrinking the vehicle speed display 220 and the fuel and power storage remaining amount display 210 into parallel in the center of the display 210.

[0026] Figure 11 shows an example of switching the navigation display 250 to the drive force transmission display 260 by operation of the display switching switch 203 from the display form shown in Figure 10.

[0027] In addition to the fuel and power storage remaining amount display 210 described above, vehicle speed display 220, left winker display 221, right winker display 222, operation key 223, select position display 230, engine speed display 240, navigation display 250, drive force transmission display 260, the fuel efficiency improvement rate, etc. described below, is also displayed, and these can be displayed by switching switch 203.

[Fuel & Energy Storage Level Indicator Control] Next, the display control of the fuel & energy storage level indicator 210 is described.

[0028] Figures 12 and 13 show an example display of the fuel and energy storage remaining amount display 210.

[0029] In the display example shown in Figure 12, the battery

charge remaining volume 210 a and gasoline remaining volume 210 b are displayed independently. Therefore, the unit of battery charge remaining volume 210 a is watts and the unit of gasoline remaining volume 210 b is liters.

[0030] In addition, the display example shown in Figure 13 shows the total remaining amount data by adding the remaining amount of battery power storage 210 a and the remaining amount of gasoline 210 b. As to this total remaining amount data, the possible mileage is calculated based on Battery power remaining volume and gasoline remaining volume , and is displayed based on this available distance. This total remaining amount of data shows the remaining mileage by adding the possible mileage according to the remaining amount of electricity and the possible mileage according to the remaining amount of gasoline.

[0031] In addition, this calculation of total remaining amount data may be performed by calculating the possible mileage based on the remaining amount of energy storage and the remaining amount of liquid fuel, and adding each possible mileage.

[0032] In addition, the display example shown in Figure 14 calculates the realization probability according to the total remaining amount data (possible mileage), and shows the relationship between this possible mileage and the realization probability.

[0033] Here, the total remaining amount data shown in Figure 13 is displayed according to the driving conditions and driving environment, with a realization probability of about 60 to 80% in Figure 14.

[0034] The total remaining amount data, the relationship between the distance that can be traveled and the probability of realization, etc., may be displayed together on the display, or they may be displayed by switching between them.

[0035] The above possible mileage and its realization probability are calculated according to the flowchart shown in Figure 15.

[0036] In Fig. 15, in step S2, the display control ECU 200 captures signals from the engine and motor control ECU 100 to each sensor 101 to 109 and control signals to the engine 1 and motor 2. Then, in step S 4, the display control ECU 200 calculates the possible mileage based on the remaining charge storage of the battery and the remaining liquid fuel. In step S 6, the display control ECU 200 corrects the probability of realization according to the driving state of the vehicle. Here, the driving state of the vehicle is the rate of change in throttle opening due to the operation of the driver, changes in vehicle speed, shift changes, etc. In step S 8, the display control ECU 200 corrects the probability of realization according to the driving environment of the vehicle. Here, the driving environment of a car is the city, highway, road condition, etc. In step S 10, the display control ECU 200 computes the realization probability according to the possible mileage, as shown in FIG. 14, and displays the relationship between this possible mileage and the realization probability on the display 201.

[0037] In this case, the correction of the realization probability according to the driving state of step S6 above is to correct the realization probability in the direction of decline, for example, if the driver is driving with the accelerator stepped on. In addition, the realization probability correction according to the driving environment in step S8 above is that since the road conditions that one will drive in the future can be understood from the map information of the navigation system, for instance, in case one is likely to drive in the mountain pass road, etc. the realization probability will be corrected in the downward direction .

[0038] In addition, when displaying the total remaining amount data as shown in Fig. 13, it may be possible to display the remaining amount of power storage 210 a and the remaining amount of liquid fuel 210 b discernibly by display color, flashing display, graduation display, etc.

[0039] Furthermore, when displaying the relationship between the possible mileage and the realization probability as shown in the example shown in Fig. 14, as shown in Fig. 17, it may be possible to display the remaining gasoline level 210 a and the remaining power storage level 210 b discernibly.

[0040] In addition, when displaying the total remaining amount data as shown in Figure 13, it is possible to display the fluctuation rate of the remaining amount of energy storage as larger than that of the remaining amount of gasoline, and to display the fluctuation rate when the remaining amount of energy storage is reduced as larger than that of the increased amount. Since this calculation of the remaining energy storage is performed by integration every predetermined time, as shown in Figure 18, the integration time constant a is set when the remaining energy storage is increased, the integration time constant b is set when the remaining energy storage is decreased, and the integration time constant c is set when calculating the remaining gasoline. where a>b>c.

[0041] As described above, by displaying by changing the rate of variation when the amount of energy stored is increased or decreased, the rate of variation is reduced when the amount of energy stored is increased, and by increasing when the amount of energy stored is decreased, the driver is not overly relieved, and in particular, the driver can be cautioned to refuel early when the amount of gasoline is low.

[0042] In addition, when displaying the total remaining amount data as shown in the example shown in Figure 16, if the remaining amount of gasoline is greater than or equal to the specified amount, only the remaining amount of gasoline may be displayed, and if the remaining amount of gasoline is less than or equal to the specified amount, the display may be switched to the remaining amount data including the remaining amount of energy stored, or if the remaining amount of gasoline attains zero , the display may be switched to the remaining amount data based on the remaining amount of energy stored only.

[0043] In this case, it is necessary to change the color and graduation, etc., and display it discernibly whether it is the remaining amount data based on the gasoline remaining amount only, the remaining amount data based on the energy storage amount only, or the remaining amount data after adding the gasoline remaining amount and the energy storage amount..

[Indication control of fuel efficiency improvement rate] Next, the display control of fuel efficiency improvement rate will be described.

[0044] Fig. 19 is a diagram showing an example of a display

of a fuel efficiency improvement rate.

[0045] The display example shown in Figure 19 calculates the standard fuel efficiency according to the driving condition, and shows the actual fuel efficiency compared to this standard fuel efficiency. Here, the standard fuel efficiency can be set to the calculated value in the driving state in which fuel efficiency is generally the maximum, the average fuel efficiency when the driver's vehicle is running, and the fuel efficiency of gasoline vehicles with the same exhaust volume.

[0046] And the actual fuel efficiency is set to a positive value or a negative value for the standard fuel efficiency, and The reference fuel efficiency is set to a smaller value as the electric power regeneration rate by the brake is smaller.

[0047] For example, this brake regenerative rate is corrected in the direction of increasing as the driving path is in a downward slope, corrected in the direction of increasing as the vehicle speed is greater when driving an auto cruise, corrected in the direction of increasing as the vehicle speed is higher, corrected in the direction of decreasing as the vehicle steering angle is greater, and corrected in the direction of increasing during the brake operation.

[0048] The display example shown in Fig. 20 shows the average value of fuel efficiency calculated every predetermined time (e.g. every 5 minutes) compared to the standard fuel efficiency. In addition, at the same time as this average fuel efficiency, the instantaneous fuel efficiency at the present time is displayed by comparing to the standard fuel efficiency, and the total fuel efficiency from the specified time point (when the ignition switch is turned on, when the gasoline is full, etc.) to the present time is displayed.

[0049] The above fuel efficiency improvement rate is calculated according to the flowchart shown in Figure 21A.

[0050] In FIG. 21A, in step S12, the display control ECU 200 captures signals from the engine and motor control ECU 100 to each sensor 101-109 and control signals to the engine 1 and motor 2. Then, in step S14, the display control ECU 200 calculates the power recovery amount by the brake. In step S16, the display control ECU 200 compensates for the reference fuel efficiency based on a map indicating a relationship between the power recovery amount and the correction amount of FIG. 21B. In step S18, the fuel efficiency improvement rate is calculated. In step S10, the display control ECU 200 displays the fuel efficiency improvement rate per predetermined time on the display 201.

[0051] In step S16 above, correcting the standard fuel efficiency to a lower amount of power recovery will appear to have greatly improved fuel efficiency, especially when the power recovery amount is large, and will give the driver a sense of gap with actual fuel cost. Therefore, when the amount of power recovered is high, the standard fuel consumption is corrected in a direction that increases so that the difference from the actual fuel consumption does not increase.

[0052] As described above, by displaying the fuel efficiency improvement rate compared to the standard fuel efficiency, it is easy to understand changes in fuel efficiency based on driving conditions and operation, and it will not cause discomfort to the driver in confirming fuel efficiency.

[Drive force transmission indication control] Next, the display control of the drive force transmission indication 260 is described.

[0053] FIGS. 22-25 are diagrams illustrating an example display of the drive force transmission display 260.

[0054] In the display example shown in Figure 22, the current output amount for the maximum output amount of the motor or engine is displayed in a discernible manner, and the current output amount is displayed for each drive wheel. That is, the magnitude of the total driving force transmitted from the engine and motor to the drive wheel is indicated by the entire arrow 261 displayed on the drive wheel, and the size of the internal display portions 261 a, 261 b relative to this overall can be used to ascertain the current driving force. The display area for the whole is changed so that it can be identified by color coding and flashing display.

[0055] Also, in the example shown in Fig. 23, the transmission diameter paths 26*2*, 263 of each drive force from the engine or motor to the drive wheel are each displayed discernibly. Again, the area of the transmission path can be changed depending on the amount of transmission of the drive force, as shown in Fig. 24, or the distribution ratio of each drive force can be displayed simultaneously.

[0056] Also, as shown in the display example shown in Fig. 25, in the event that the power storage level is small and the drive force cannot be added from the motor, it can be changed to a display form that indicates that the drive force from the motor cannot be transmitted as a display with the transmission diameter path from the motor to the drive wheel disconnected.

[0057] Due to the above, the actual driving state and the engine output power are not proportional, so the transmission state of the drive force from the engine and motor can be easily recognized without causing discomfort to the driver.

[Engine RPM display control] Next, the display control of engine RPM display 240 is described.

[0058] FIGS. 26-28 are diagrams illustrating an example display of engine RPM display 240.

[0059] In the display example shown in Figure 26, the engine speed is displayed as a numerical value, and the displayed speed is displayed as a message and an image that it is supplied for warm-up operation.

[0060] In the display example shown in Figure 27, the engine speed is displayed numerically, and the displayed speed is used for driving and charging the battery, and the distribution ratio of each is displayed as a message and image.

[0061] Furthermore, at the bottom of the allocation ratio display, the throttle opening (user opening) by the operator's accelerator pedal operation according to the engine speed, the throttle opening (control opening) by the engine and motor control ECU control, and the ratio of each throttle opening are displayed in a message and image.

[0062] If there is a change in the allocation ratio or allocation content of the engine speed due to the transition from the warm-up operation to the driving state in Fig. 26, a message [Change Mode] will be displayed as in Fig. 26 to inform the driver of the change by means of a message or image, and the allocation ratio and allocation content will be changed and displayed as in Fig. 27.

[0063] In this case, when changing the allocation content, the display changes to the direction in which the engine fuel efficiency increases (the direction in which the engine speed

decreases) are slow, and the display changes to the direction in which the fuel efficiency decreases (the direction in which the engine speed increases) are fast, and the driver is alerted to the engine fuel efficiency.

[0064] In addition, as shown in Fig. 28, when the engine is stopped, after the number of rotations is displayed as zero, a message [Engine Stop] is displayed, and the image is switched.

[Indication control from power on to running] Next, the display control of the drive force transmission indicator 260 from power on to running by the ignition switch is described.

[0065] FIGS. 29-35 are diagrams illustrating display examples from power on to running. FIG. 36 is a flowchart illustrating an indication control procedure from power on to travel.

[0066] The display control from power on to travel is calculated according to the flowchart shown in Figure 36.

[0067] As shown in FIG. 36, in step S22, the display control E CU 200 waits for the ignition switch to power on. If powered on in step S22, proceed to step S24 and an initial check is performed on the engine and motor control ECU 100, and as shown in FIG. 29, the [CHECK] and [Initial Checking] messages are displayed by voice and image until the initial check is complete, and the drive force transmission path from the motor to the drive wheel is displayed blank.

[0068] If the system is normal in step S26, it proceeds to step S30, if the system is abnormal, it proceeds to step S28, and as shown in FIG. 30, a message of [Cannot travel] and [System error] is displayed by voice and image, and an image is displayed indicating that the drive force transmission route from the motor to the drive wheel is not passing through, and that the drive force cannot be transmitted.

[0069] In step S30, it is determined whether or not the travel range (1, 2, D, R range) is selected by operation of the selector lever of the operator. If the travel range is selected in step S 30, proceed to step S 34, if the travel range is not selected, proceed to step S 32, and as shown in FIG. 31, a message [OK] and [System Normal] is displayed by voice and image, and the drive force transfer path from the motor to the drive wheel is colored or flashing, images are displayed indicating that the drive force can be transmitted.

[0070] In step S34, it is determined whether it is a charging mode for the battery. If not in charge mode in step S34, [RU N] and [Travel Standby] messages are displayed by voice and image to indicate that the drive force is being transferred from the motor to the drive wheel, as shown in FIG. 32.

[0071] In addition, in the case of charging mode in step S34, as shown in FIG. 33, messages [RUN] and [Travel Standby & Charging] are displayed by voice and image, and images indicating that the driving force is being transmitted from the engine to the drive wheel and images indicating that the engine is charging to the battery are displayed. In this charging mode, the engine will charge the battery while driving, so it will not be able to drive at high speed and fuel efficiency will be low. Therefore, character images such as turtles are displayed to remind the driver that high speed driving is not possible.

[0072] In addition, as shown in Fig. 30, when the system is abnormal in step S26 above, when the power storage level is less than or equal to a predetermined value, or when the engine is cold, it is not possible to transfer the drive force from the motor to the drive wheel, so as shown in Fig. 34, a message of \"engine start\" is displayed by voice and image to indicate that the ignition switch is turned on for the engine in order to start the engine instead of starting the motor. [1]

[0073] In addition, in the travel standby, the distribution ratio of the driving force between the engine and the motor during the travel may be displayed by means of indicators, etc., as shown in Fig. 35.

[0074] As described above, it is easy to understand whether or not to drive after switching on, and it is possible to eliminate the discomfort that the driver is given..

[0075] Moreover, the present invention is applicable to modifications or variations of the above embodiments to the extent that they do not deviate from their spirit.

[0076] For example, when displaying a message in each of the above display examples, the message may be simultaneously announced by voice.

[0077]

[Effects of the Invention] As described above, according to the invention described in Claim 1, by calculating the standard fuel efficiency according to the driving condition of the driver's vehicle and displaying the actual fuel efficiency of the driver's vehicle compared to the standard fuel efficiency, it is easy to understand the change in fuel efficiency rate based on the driving condition of the vehicle and the operation of the driver.

[0078] In addition, according to the invention described in Claim 2, conventional data can be used for the standard fuel efficiency because the standard fuel efficiency is the fuel efficiency of the gasoline engine.

[0079] In addition, according to the invention described in Claim 3, conventional data can be used for standard fuel efficiency by calculating the standard fuel efficiency in the driving state in which the fuel efficiency of the driver's vehicle is generally the maximum.

[0080] In addition, according to the invention described in Claim 4, conventional data can be used for standard fuel efficiency because the standard fuel efficiency is the average fuel efficiency when driving the vehicle.

[0081] In addition, according to the invention described in Claim 5, by displaying the actual fuel efficiency as a positive value or a negative value for the standard fuel efficiency, a more accurate fuel efficiency can be displayed.

[0082] In addition, according to the invention described in Claim 6, the standard fuel consumption can be corrected in a direction in which the amount of power recovered is higher, thereby suppressing a sudden increase in fuel consumption and eliminating the discomfort of the driver.

[0083] In addition, according to the invention described in Claim 7, fuel efficiency can be confirmed for each prescribed time by comparing the average value of fuel efficiency calculated for each prescribed time to the aforementioned standard fuel efficiency.

[0084] In addition, according to the invention described in Claim 8, instantaneous fuel efficiency can be confirmed by displaying the instantaneous fuel efficiency at the present time compared to the said standard fuel efficiency.

[0085] In addition, according to the invention described in

Claim 9, total fuel efficiency can be confirmed by displaying the total fuel efficiency from the predetermined time point to the present time.

[0086]

[Brief description of the drawings]

[Figure 1] A block diagram showing the mechanical configuration of the hybrid electric vehicle of this embodiment.

[Figure 2] A diagram illustrating the transmission mode of the driving force during the start and slow speed driving of the hybrid electric vehicle in this embodiment.

[Fig. 3] A diagram illustrating a mode of transmission of the driving force during acceleration of the hybrid electric vehicle of this embodiment.

[Fig. 4] A diagram illustrating a mode of transmission of the driving force during steady driving of a hybrid electric vehicle in this embodiment.

[Fig. 5] A diagram illustrating a mode of transmission of the driving force during the deceleration of the hybrid electric vehicle of this embodiment.

[Fig. 6] A diagram illustrating the transmission form of the driving force during steady driving and charging of the hybrid electric vehicle in this embodiment.

[Fig. 7] A diagram illustrating the transmission form of the driving force during charging of the hybrid electric vehicle of this embodiment.

[Figure 8] A block diagram illustrating the electrical configuration of the hybrid electric vehicle of this embodiment.

[Figure 9] A diagram illustrating a display configuration in a hybrid electric vehicle of this embodiment.

[FIG. 10] A diagram illustrating a display form in a hybrid electric vehicle of this embodiment.

[FIG. 11] A diagram illustrating a display configuration in a hybrid electric vehicle of this embodiment.

[Figure 12] A diagram showing an example display of the fuel and energy storage remaining amount display 210.

[Figure 13] A diagram showing an example display of the fuel and energy storage remaining amount display 210.

[Figure 14] A diagram showing an example display of the fuel and energy storage remaining amount display portion 210.

[Figure 15] A flowchart showing the calculation processing procedure for the distance that can be traveled and its realization probability.

[Figure 16] A diagram showing an example display of the fuel and energy storage remaining amount display portion 210.

[Figure 17] A diagram showing an example display of the fuel and energy storage remaining amount display portion 210.

[Figure 18] A map diagram showing the integration time constant during the operation of the travelable distance.

[Figure 19] A diagram showing an example of the display of the fuel efficiency improvement rate.

[Figure 20] A diagram showing an example of the display of the fuel efficiency improvement rate.

[Figure 21A] A flowchart showing the calculation processing procedure for the fuel efficiency improvement rate.

[Figure 21B] A map diagram showing the relationship between the power recovery amount and the corrected value of the fuel efficiency improvement rate.

[Figure 22] A diagram showing an example display of the drive force transmission display 260.

[Figure 23] A diagram showing an example display of the drive force transmission display 260.

[Figure 24] A diagram showing an example display of the drive force transmission display 260.

[Figure 25] A diagram showing an example display of the drive force transmission display 260.

[Figure 26] A diagram showing an example display of the engine speed display 240.

[Figure 27] A diagram showing an example display of the engine speed display 240.

[Figure 28] A diagram showing an example display of engine speed display 240.

[Figure 29] A diagram showing an example display from power on to running.

[Figure 30] A diagram showing an example display from power on to running.

[Figure 31] A diagram showing an example display from power on to running.

[Figure 32] A diagram showing an example display from power on to running.

[Figure 33] A diagram showing an example display from power on to running.

[Figure 34] A diagram showing an example display from power on to running.

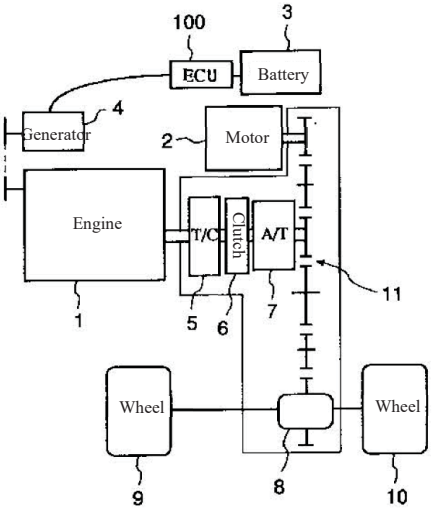
[Figure 35] A diagram showing an example of the display from power on to running.

[Figure 36] This is a flowchart showing the display control procedure from power on to travel.

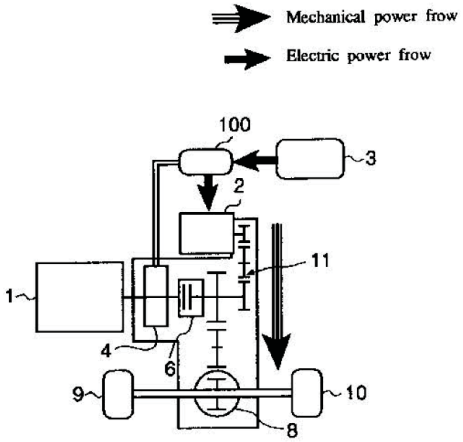
[Explanation of references]

1 Engine
2 Motors
3 Batteries
4 Generators

[Figure 1]

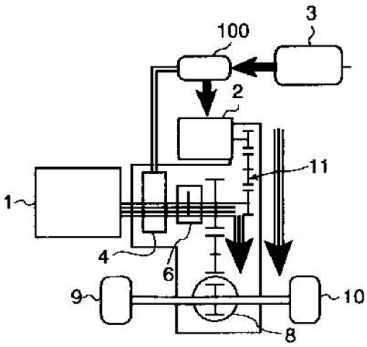


[FIG2]



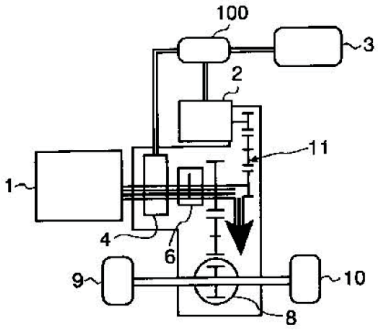
Starting & Slow Speed

(Figure3]



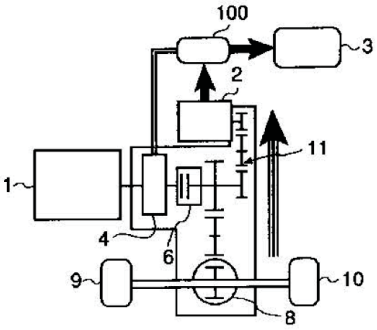
At acceleration

(Figure4]



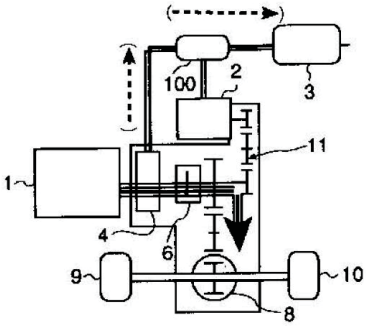
When running regularly

(Figure5]



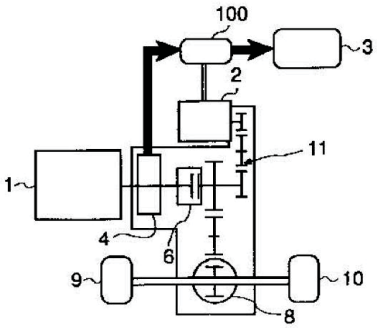
At deceleration

(Figure6]



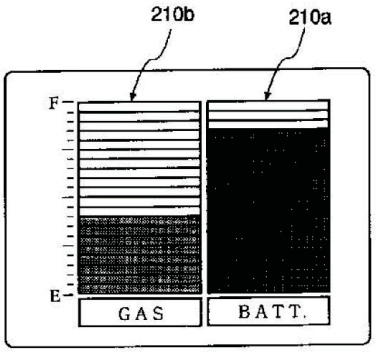
Constant driving & charging

(Figure7]



During charging

[FIG12]



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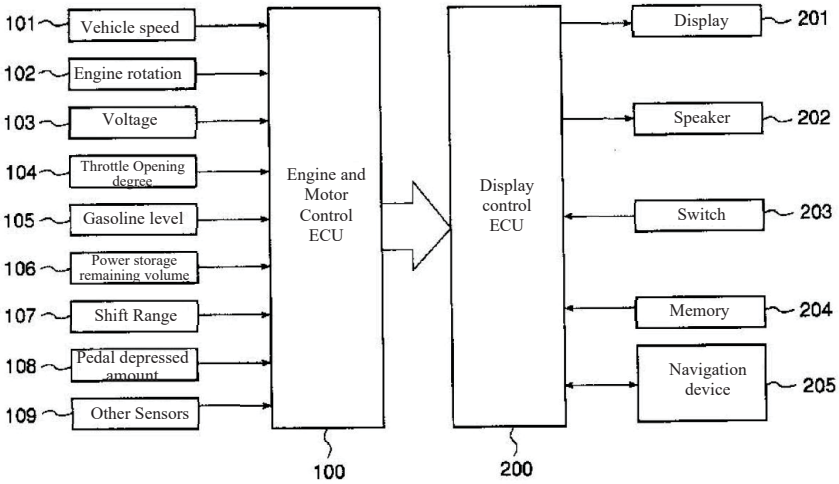

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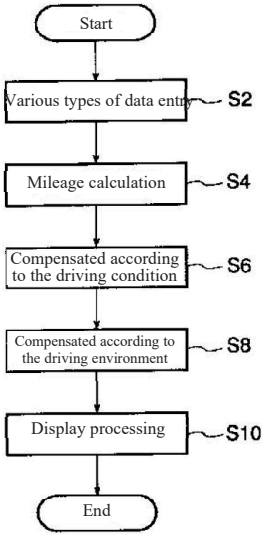
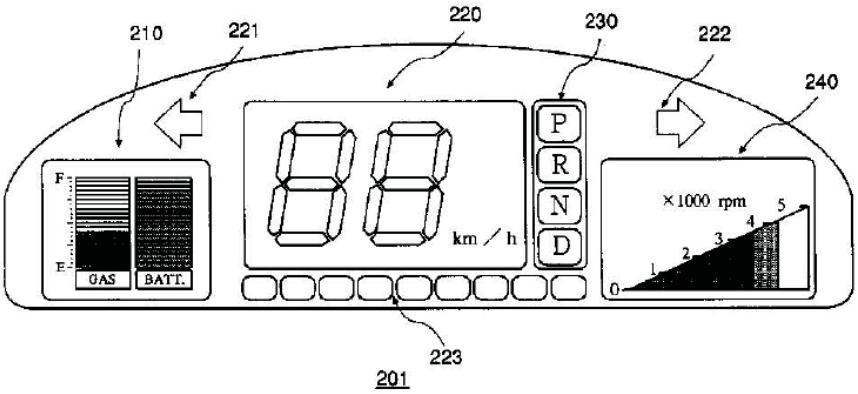
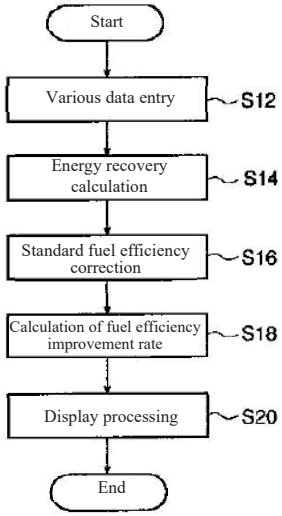


[FIG9]



[Figure 21A]



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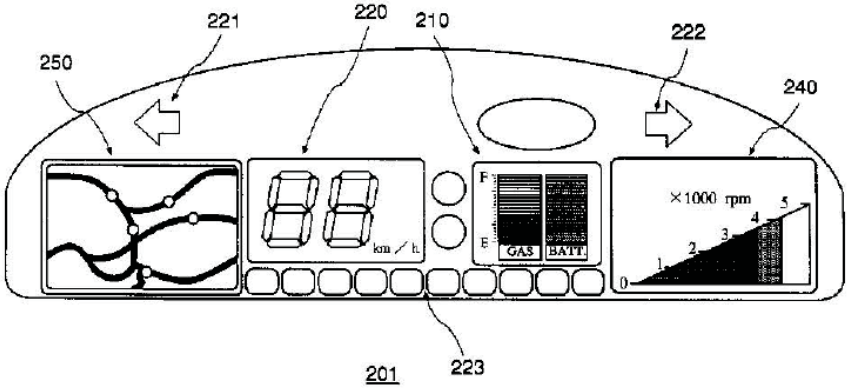

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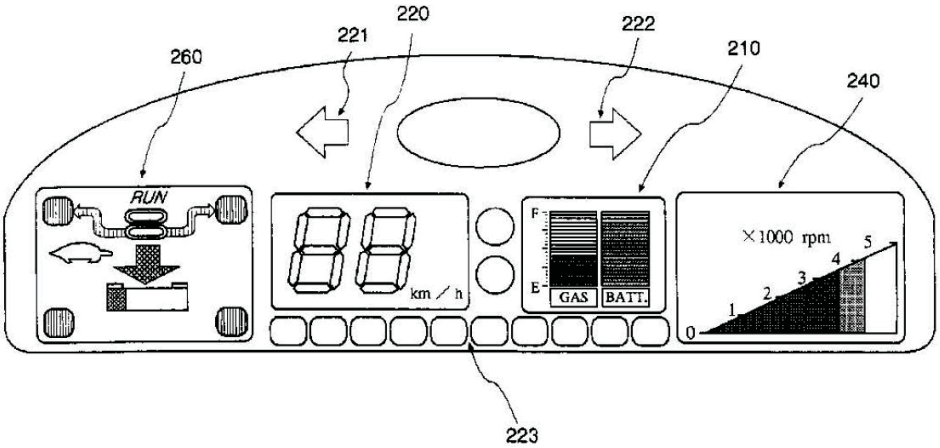

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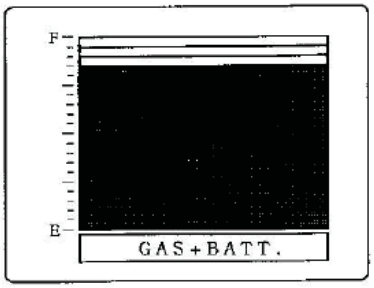

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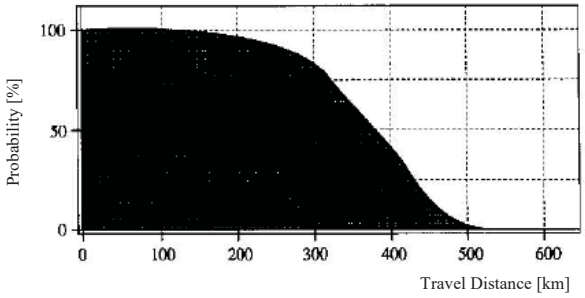

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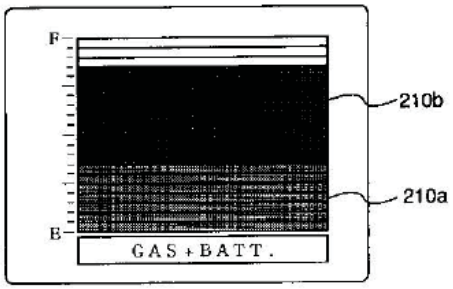

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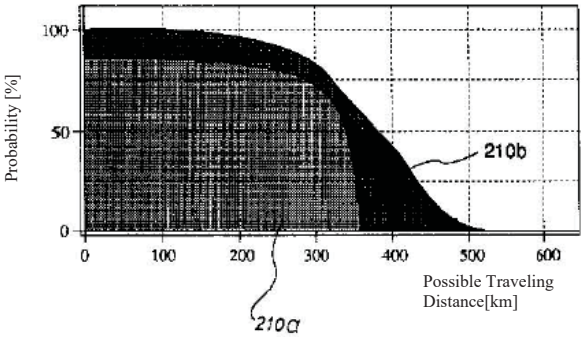

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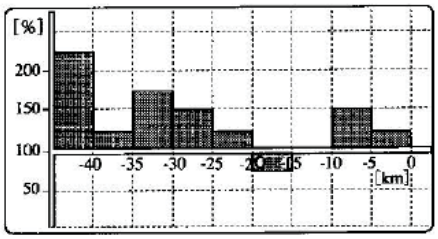

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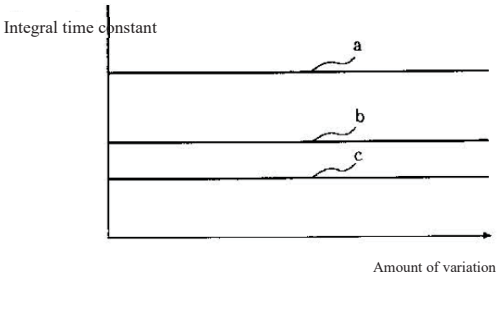

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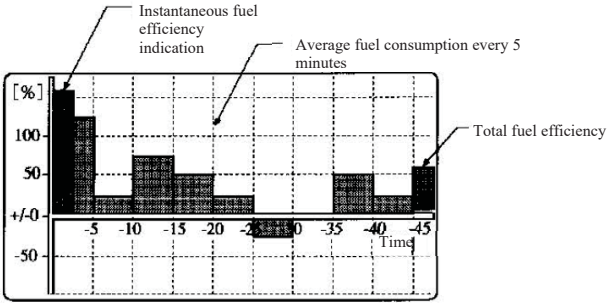

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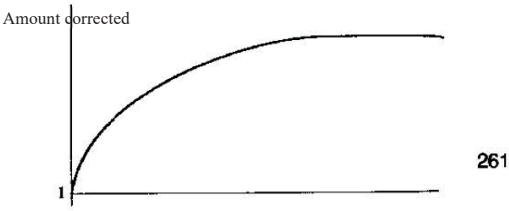

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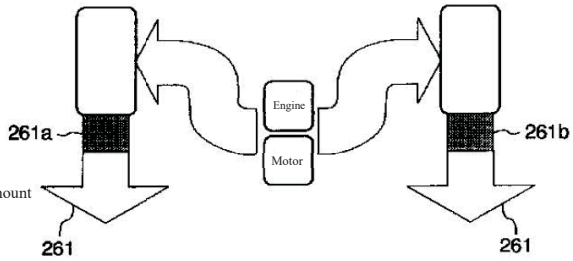

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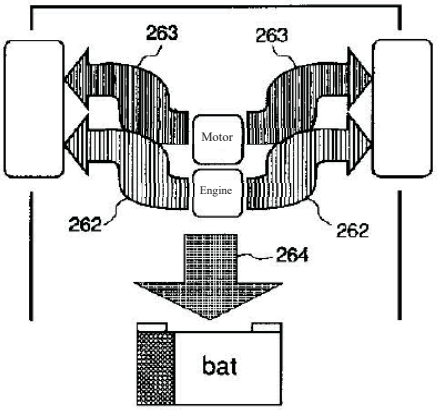

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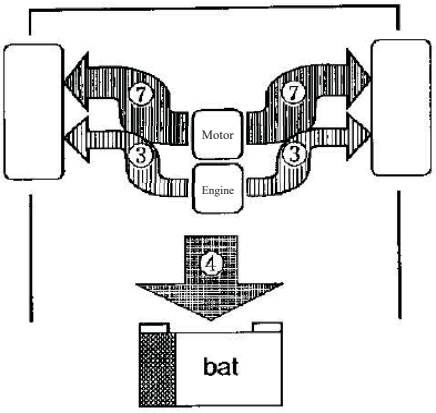

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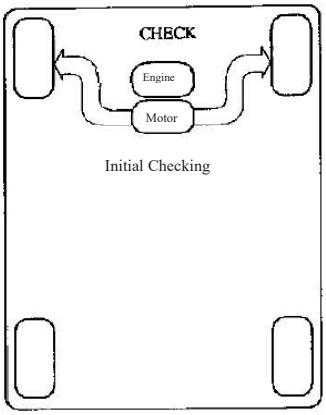

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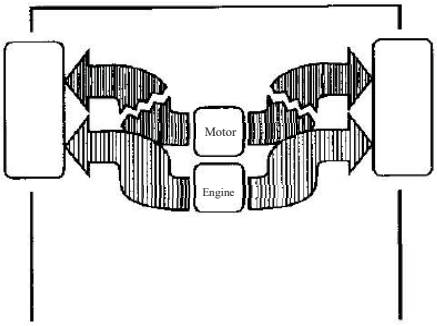

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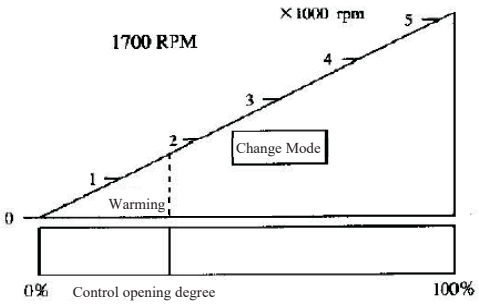

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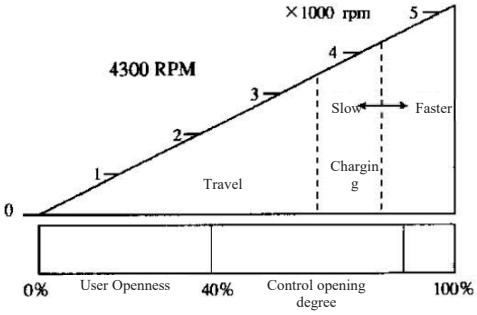

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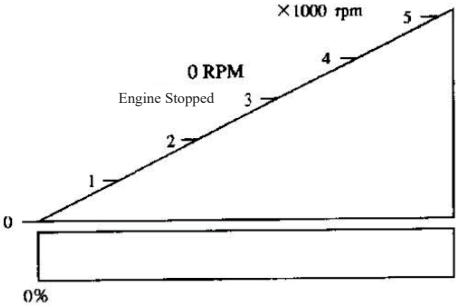

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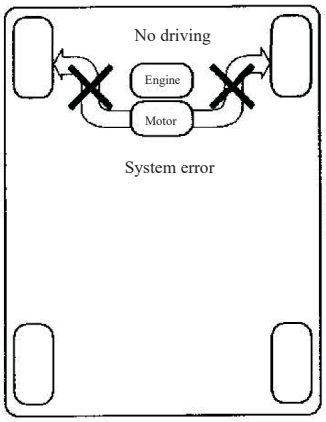

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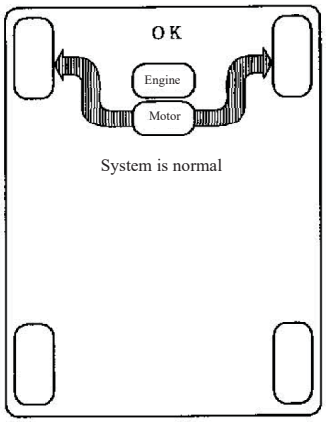

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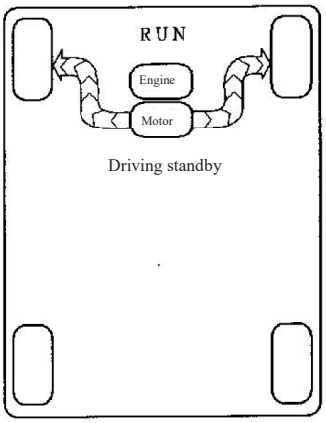

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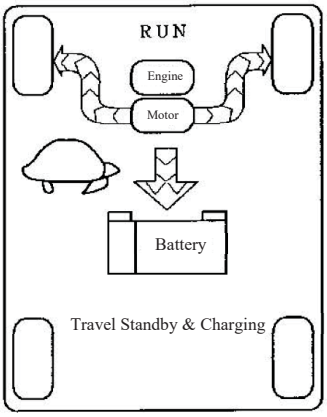

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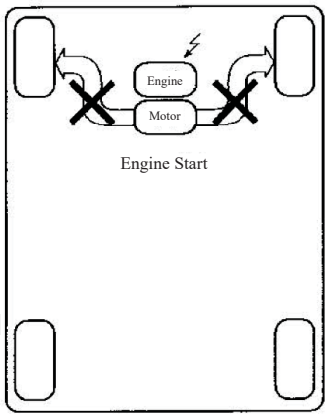

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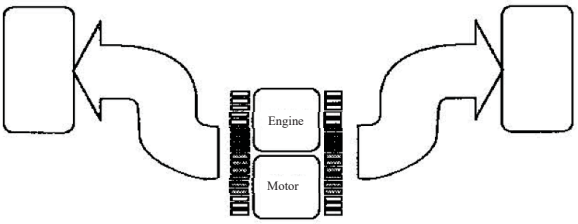

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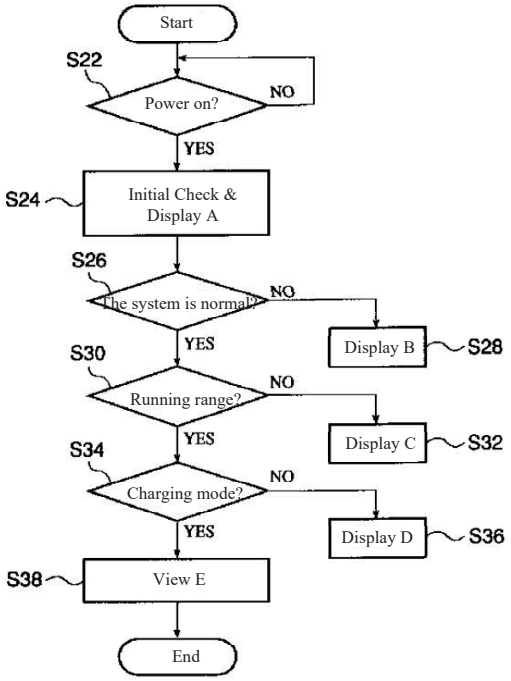

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