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VEHICLE DRIVING CONTROL APPARATUS

Abstract

A vehicle driving control apparatus has a modular configuration integrating a steering wheel, an acceleration control system, a braking control system, a shift control system, an emergency light control system, a direction indication control system, and a display into one system. The vehicle driving control apparatus provides a manual driving mode and an autonomous driving mode. The steering wheel is configured to be coupled to a vehicle panel in the manual driving mode and to be separated from the vehicle panel in the autonomous driving mode.

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Background/Summary

CROSS-REFERENCE TO THE RELATED APPLICATION

[0001] This application claims priority from Korean Patent Application No. 10-2024-0025151, filed on Feb. 21, 2024, in the Korean Intellectual Property Office, the disclosure of which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

[0002] The present disclosure relates to a vehicle driving control apparatus, and more particularly to technology related to a vehicle driving control apparatus having a modular configuration obtained by integrating control systems for steering, acceleration, braking, and shifting into one system, in which the vehicle driving control apparatus is capable of being mounted on and removed from a vehicle.

BACKGROUND

[0003] An autonomous vehicle is a smart vehicle equipped with autonomous driving technology that enables the vehicle to reach a desired destination of a driver while sensing environmental conditions without direct control of the driver, such as driver manipulation of a steering wheel, an accelerator pedal, or a brake pedal.

[0004] When autonomous driving technology is widely and generally applied to a vehicle, a driver may select one of a manual driving mode and an autonomous driving mode. Here, a driver directly drives a vehicle in the manual driving mode, and a vehicle is capable of reaching a desired destination of a driver without driver operation of the vehicle in the autonomous driving mode.

[0005] In some cases, an autonomous vehicle may include a plurality of control systems for steering, acceleration, braking, and shifting. In this case, these control systems are not integrated into one system, which may cause inconvenience in use.

[0006] In some cases, a driving control system may be fixed to a vehicle, which may also cause inconvenience in use.

[0007] The information disclosed in this Background of the Disclosure section is only for enhancement of understanding of the general background of the disclosure, and should not be taken as an acknowledgement or any form of suggestion that this information forms the related art already known to a person skilled in the art.

SUMMARY

[0008] Therefore, the present disclosure has been made in view of the above problems, and it is an object of the present disclosure to provide a vehicle driving control apparatus having a modular configuration obtained by integrating control systems for steering, acceleration, braking, and shifting into one system, in which the vehicle driving control apparatus is configured to reduce weight and costs by reducing the number of parts and to maximally reduce the size of a layout area for an installation space, thereby making it possible to maximally improve utilization of a vehicle interior space.

[0009] It is another object of the present disclosure to provide a vehicle driving control apparatus capable of being mounted on and removed from a vehicle, in which the vehicle driving control apparatus is mounted on the vehicle in a manual driving mode and is removed from the vehicle in an autonomous driving mode, thereby making it possible to efficiently improve utilization of a vehicle interior space.

[0010] It is a further object of the present disclosure to provide a vehicle driving control apparatus having a configuration in which a display maintains, regardless of a steering operation, a fixed

position thereof without rotation and is not blocked by a steering control system, thereby making it possible to use the display more safely and conveniently.

[0011] In accordance with the present disclosure, the above and other objects can be accomplished by the provision of a vehicle driving control apparatus including a steering wheel gripped by a hand of a driver, wherein the driver rotates the steering wheel to perform a steering operation, a first installation part and a second installation part respectively disposed, relative to the steering wheel in a neutral state, at one upper end corner portion of the steering wheel and the other upper end corner portion thereof, and an acceleration control system and a braking control system provided at the first installation part.

[0012] The vehicle driving control apparatus may further include an emergency light control system and a direction indication control system provided at the second installation part.

[0013] The vehicle driving control apparatus may further include a display provided at a center portion of the steering wheel and configured to maintain a fixed state thereof during rotation of the steering wheel, wherein the display may be disposed closer to the driver than the steering wheel so as to prevent a screen from being blocked by the steering wheel.

[0014] The vehicle driving control apparatus may further include a shift control system disposed on the display.

[0015] The steering wheel may include handle parts respectively provided on left and right sides of the steering wheel and symmetrically formed on the left and right sides thereof, wherein each of the handle parts may have a circular arc shape protruding outwards and is gripped by the hand of the driver, an upper connection part configured to connect upper ends of the handle parts respectively provided on the left and right sides of the steering wheel, wherein the upper connection part may have the first installation part and the second installation part respectively provided at opposite corner portions thereof respectively connected to the handle parts, a lower connection part configured to connect lower ends of the handle parts respectively provided on the left and right sides of the steering wheel, and a center part provided at a center portion between the handle parts respectively provided on the left and right sides of the steering wheel and configured to connect the upper connection part to the lower connection part, wherein the center part may allow the display to pass therethrough.

[0016] The braking control system may be disposed on a left side of the acceleration control system and may be formed to have a larger external size than an external size of the acceleration control system, and a height at which the braking control system protrudes outwards from the first installation part may be greater than a height at which the acceleration control system protrudes outwards from the first installation part.

[0017] The direction indication control system more frequently used than the emergency light control system may be disposed below the emergency light control system so as to be located close to the hand of the driver.

[0018] The first installation part and the second installation part may respectively have inclined front surfaces, wherein each of the inclined front surfaces may have an upper end protruding farther in a direction toward the driver than a lower end.

[0019] The upper connection part and an inner surface of the first installation part may form a first groove having an acute angle, the first groove may allow a thumb of a right hand of the driver to be inserted thereinto so as to perform the steering operation, the upper connection part and an inner surface of the second installation part may form a second groove having an acute angle, and the second groove may allow a thumb of a left hand of the driver to be inserted thereinto so as to perform the steering operation.

[0020] The first installation part may have an outer surface protruding farther outwards than the right handle part of the steering wheel so as to form a third groove between the outer surface of the first installation part and the right handle part, the third groove may allow an index finger of a right hand of the driver to be inserted thereinto so as to perform the steering operation, the second

installation part may have an outer surface protruding farther outwards than the left handle part of the steering wheel so as to form a fourth groove between the outer surface of the second installation part and the left handle part, and the fourth groove may allow an index finger of a left hand of the driver to be inserted thereinto so as to perform the steering operation.

[0021] The vehicle driving control apparatus may further include a first connector formed to be coupled with a portion of the display penetrating the steering wheel, a second connector fixed to a vehicle panel and detachably coupled to the first connector, and a locking guide movably provided on the vehicle panel and configured to lock and unlock the first connector and the second connector.

[0022] The vehicle driving control apparatus may further include a first permanent magnet provided at the steering wheel and disposed to face the first connector, and a first PCB provided at the first connector and disposed to face the first permanent magnet, wherein the first PCB may generate, during the rotation of the steering wheel, a steering signal by recognizing a signal of the first permanent magnet.

[0023] The vehicle driving control apparatus may further include a steering spring having opposite ends respectively connected to the steering wheel and the first connector and configured to provide return force during the rotation of the steering wheel.

[0024] The first connector may have a connector protrusion formed to protrude from an end thereof, the connector protrusion may penetrate a connector hole formed in the vehicle panel and may be inserted into a connector groove formed in the second connector, and when the locking guide is coupled to the connector protrusion in a state in which the connector protrusion is inserted into the connector groove, the first connector and the second connector may be prevented from being separated from each other so as to maintain a coupled state therebetween.

[0025] The locking guide may be installed to slidably move, by using a guide spring, upwards and downwards relative to the vehicle panel, the connector hole may be partially covered by the locking guide and is fully opened only when the locking guide moves, and the connector protrusion may penetrate, only when the connector hole is fully opened, the connector hole so as to be inserted into and coupled to the connector groove.

[0026] The locking guide may be installed to slidably move upwards and downwards relative to the vehicle panel and may have wing parts provided at an end thereof and formed to extend in a longitudinal direction thereof, the connector protrusion may have locking grooves respectively formed in side surfaces thereof and configured to allow the wing parts to be respectively inserted thereinto, wherein each of the locking grooves may be formed to extend in a movement direction of the locking guide, and when the wing parts are respectively inserted into the locking grooves by movement of the locking guide, the first connector and the second connector may be prevented from being separated from each other so as to maintain the coupled state therebetween.

[0027] The locking guide may further have a locking hook formed thereon, the first connector may have a hook groove formed therein and configured to allow the locking hook to be inserted thereinto, and the locking hook and the hook groove may be coupled to each other when the wing parts and the locking grooves are coupled to each other, thereby strengthening coupling force between the first connector and the second connector.

[0028] The first connector may have an arc-shaped guide protrusion provided at one end thereof and formed to protrude in a longitudinal direction thereof, the vehicle panel may have an arc-shaped guide groove formed therein and configured to allow the guide protrusion to be inserted thereinto, and the guide protrusion and the guide groove may be coupled to each other when the connector protrusion penetrates the connector hole and is coupled to the connector groove, thereby strengthening the coupling force between the first connector and the second connector.

[0029] The display may have a protrusion provided on a surface thereof, the surface facing a front side of a vehicle, and the protrusion of the display may penetrate the center portion of the steering wheel so as to be coupled with the first connector in a male and female coupling manner.

[0030] Each of the wing parts may have a lower end formed to have a larger cross-sectional thickness than a cross-sectional thickness of an upper end, and the cross-sectional thickness gradually may become thinner from the lower end to the upper end.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0031] The above and other objects, features and other advantages of the present disclosure will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings.

[0032] FIG. **1** is a view showing an example of a vehicle driving control apparatus coupled to a vehicle panel.

[0033] FIG. **2** is a view showing an example state in which the vehicle driving control apparatus is separated from the vehicle panel.

[0034] FIG. **3** is a view showing the vehicle driving control apparatus shown in FIG. **2** and viewed from the front side.

[0035] FIG. **4** and FIG. **5** are exploded views of the vehicle driving control apparatus.

[0036] FIG. **6** is a view showing a state in which a first connector is separated from the vehicle driving control apparatus shown in FIG. **3**.

[0037] FIG. **7** is a plan cross-sectional view of the vehicle driving control apparatus shown in FIG. **3**.

[0038] FIG. **8** and FIG. **9** are right and left side views of the vehicle driving control apparatus.

[0039] FIG. **10** and FIG. **11** are views each showing a state in which a driver grips a steering wheel with the right and left hands.

[0040] FIG. **12** is a view showing a direction indication control system according to the present disclosure.

[0041] FIG. **13** is a view showing an acceleration control system and a braking control system according to the present disclosure.

[0042] FIG. **14**, FIG. **15**, FIG. **16**, FIG. **17**, and FIG. **18** are views each showing a coupling structure of a first connector, a second connector, and a locking guide according to the present disclosure.

[0043] FIG. **19** is a view showing a state in which the steering wheel is coupled to the first connector shown in FIG. **18**.

DETAILED DESCRIPTION

[0044] Hereinafter, the present disclosure will be described in detail through one or more implementations thereof with reference to the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts, and redundant descriptions thereof will be omitted.

[0045] In the present disclosure, a unit or a control unit included in the names of a motor control unit (MCU), a hybrid control unit (HCU), and the like is only a term widely used in the naming of a controller configured to control a specific function of a vehicle, and does not mean a generic functional unit.

[0046] In order to control various functions, a controller may include a communication apparatus configured to communicate with another controller or a sensor, a memory configured to store a control system, a logical command, and input/output information, and one or more processors configured to perform determination, calculation, and the like to control a corresponding function.

[0047] Hereinafter, a vehicle driving control apparatus of the present disclosure will be described with reference to the attached drawings.

[0048] In some implementations, as shown in FIGS. **1** to **19**, the vehicle driving control apparatus

according to the present disclosure may include a steering wheel **100** gripped by the hand of a driver, in which the driver rotates the steering wheel **100** to perform a steering operation, a first installation part **200** and a second installation part **300** respectively disposed, relative to the steering wheel **100** in the neutral state, at one upper end corner portion of the steering wheel **100** and the other upper end corner portion of the steering wheel **100**, an acceleration control system **400** and a braking control system **500** provided at the first installation part **200**, and an emergency light control system **600** and a direction indication control system **700** provided at the second installation part **300**.

[0049] The steering wheel **100** is installed in a rotatable structure on a vehicle panel **10**, and the driver may perform the steering operation by gripping the steering wheel **100** with the hand and rotating the same clockwise or counterclockwise.

[0050] The vehicle panel **10** refers to an interior panel of a vehicle, and may be a center fascia panel.

[0051] The steering wheel **100** may be mounted on the vehicle panel **10** when the steering wheel **100** is used or may be removed from the vehicle panel **10** when the steering wheel **100** is not used.

[0052] That is, in a manual driving mode, the steering wheel **100** is used by being mounted on the vehicle panel **10**, and in an autonomous driving mode, the steering wheel **100** may be removed from the vehicle panel **10**, thereby efficiently improving utilization of a vehicle interior space in the autonomous driving mode.

[0053] When the steering wheel **100** is in the neutral state, the first installation part **200** and the second installation part **300** may be provided to protrude in the radial direction and may be respectively disposed at the upper end corner portion on the right side of the steering wheel **100** and the upper end corner portion on the left side thereof.

[0054] The neutral state of the steering wheel **100** refers to a state in which the driver does not rotate the steering wheel **100** clockwise or counterclockwise. In this state, vehicle wheels may be arranged to face forwards.

[0055] The acceleration control system **400** and the braking control system **500** may be installed at the first installation part **200**, and the emergency light control system **600** and the direction indication control system **700** may be installed at the second installation part **300**.

[0056] In a state in which a right hand **20** of the driver and a left hand **30** of the driver respectively grip the right side and the left side of the steering wheel **100**, the acceleration control system **400** and the braking control system **500** may be operated by a thumb **21** of the right hand **20**, and the emergency light control system **600** and the direction indication control system **700** may be operated by a thumb **31** of the left hand **30**.

[0057] Each of the acceleration control system **400** and the braking control system **500** may be formed as a button type, and the driver may operate the acceleration control system **400** and the braking control system **500** by pressing the same with the thumb **21** of the right hand **20**.

[0058] The emergency light control system **600** may be formed as an ON-and-OFF type switch, and the direction indication control system **700** may be formed as a three-stage rocker switch.

[0059] Referring to FIG. **12**, the direction indication control system **700** that is formed as the three-stage rocker switch does not generate a direction indication signal when the switch is not operated (neutral position). When a left side of the switch is pressed as shown by an arrow P**1**, a left turn signal may be generated, and when a right side of the switch is pressed as shown by an arrow P**2**, a right turn signal may be generated.

[0060] In addition, the vehicle driving control apparatus according to the present disclosure may further include a display **800** provided at a center portion of the steering wheel **100** and configured to maintain a fixed state thereof during rotation of the steering wheel **100**, in which the display **800** is disposed closer to the driver than the steering wheel **100** so as to prevent a screen from being blocked by the steering wheel **100**.

[0061] When the steering wheel **100** is rotated by the steering operation, the display **800** is not

rotated and maintains a fixed position thereof. Particularly, the display **800** is disposed closer to the driver than the steering wheel **100**, thereby preventing the screen from being blocked by the steering wheel **100**. In this manner, the driver may look at the display **800** more stably and comfortably.

[0062] Additionally, the vehicle driving control apparatus according to the present disclosure may further include a shift control system **900** disposed on the display **800**.

[0063] For example, the shift control system **900** may be formed as a button and may be disposed below the display **800** or may be disposed on one side of the display **800**.

[0064] As another example, the shift control system **900** may be formed as a capacitive touchscreen so as to be integrated with the display **800**.

[0065] The shift control system **900** may generate, when operated by the driver, a shift stage signal of any one of the P stage, the R stage, the N stage, and the D stage.

[0066] The vehicle driving control apparatus according to the present disclosure has a modular configuration in which the steering wheel **100**, the acceleration control system **400**, the braking control system **500**, the emergency light control system **600**, the direction indication control system **700**, the display **800**, and the shift control system **900** are integrated into one system. Through the modular configuration, it is possible to reduce the number of parts and to achieve weight reduction and cost reduction. In particular, the size of a layout area for an installation space may be maximally reduced, thereby having an effect of maximally improving utilization of a vehicle interior space.

[0067] The steering wheel **100** may include handle parts **110** respectively provided on the left and right sides thereof and formed to be symmetrical to the left and right sides thereof, in which each of the handle parts **110** has a circular arc shape protruding outwards and is gripped by the hand of a driver, an upper connection part **120** configured to connect the upper ends of the handle parts **110** respectively provided on the left and right sides of the steering wheel **100**, in which the upper connection part **120** has the first installation part **200** and the second installation part **300** respectively provided at opposite corner portions thereof respectively connected to the handle parts **110**, a lower connection part **130** configured to connect the lower ends of the handle parts **110** respectively provided on the left and right sides of the steering wheel **100**, and a center part **140** provided at a center portion between the handle parts **110** respectively provided on the left and right sides of the steering wheel **100** and configured to connect the upper connection part **120** to the lower connection part **130**, in which the center part **140** allows the display **800** to pass therethrough.

[0068] The steering wheel **100** according to the present disclosure is configured to form a small-sized appearance only using the handle parts **110** respectively provided on the left and right sides of the steering wheel **100**, the upper connection part **120**, the lower connection part **130**, and the center part **140**, thereby having an effect of being light in weight and securing strength and rigidity as compared with other steering wheels.

[0069] In particular, each of the handle parts **110** respectively provided on the left and right sides of the steering wheel **100** has a circular arc shape protruding outwards, thereby providing a larger space defined between the center part **140** and the circular-arc-shaped handle parts **110** than a space defined between the center part **140** and straight-shaped handle parts. Through this structural configuration, when gripping the handle parts **110**, a driver may grip the handle parts **110** more comfortably without interfering with the center part **140**.

[0070] According to the present disclosure, the acceleration control system **400** and the braking control system **500** are provided at the first installation part **200**, the acceleration control system **400** is disposed on the right side of the braking control system **500**, and the braking control system **500** is disposed on the left side of the acceleration control system **400**. In particular, the braking control system **500** may have a larger external size than that of the acceleration control system **400**.

[0071] In a state in which the driver grips the right handle part **110** of the steering wheel **100** with

the right hand **20**, the driver may operate the acceleration control system **400** and the braking control system **500** with the thumb **21** of the right hand **20**.
[0072] At this time, it is desirable to position the braking control system **500** closer to the thumb **21** of the right hand **20** of the driver than the acceleration control system **400**, thereby making it possible to perform an emergency operation of the braking control system **500**. To this end, in a structure in which the acceleration control system **400** and the braking control system **500** are arranged at the left and right sides of the first installation part **200**, it is desirable to dispose the braking control system **500** on the left side of the acceleration control system **400** so as to perform an emergency operation by the driver.
[0073] In some implementations, the braking control system **500** may have a larger external size than that of the acceleration control system **400** for smooth and safe operation by the driver. In particular, the left and right widths of the braking control system **500** may be larger than those of the acceleration control system **400**, but the present disclosure is not limited thereto.
[0074] According to the present disclosure, a height at which the braking control system **500** protrudes outwards from the first installation part **200** (a height at which the braking control system **500** protrudes in the direction toward the driver) is set to be greater than a height at which the acceleration control system **400** protrudes outwards from the first installation part **200** (a height at which the acceleration control system **400** protrudes in the direction toward the driver). Through this structural configuration, the driver may easily perform an emergency operation of the braking control system **500** with the thumb **21** of the right hand **20**, and maloperation may be prevented by a height difference between the acceleration control system **400** and the braking control system **500**.
[0075] According to the present disclosure, the second installation part **300** is provided with the emergency light control system **600** and the direction indication control system **700**. In the case of the emergency light control system **600** and the direction indication control system **700**, the direction indication control system **700** which is relatively frequently used may be disposed below the emergency light control system **600** so as to be positioned close to the driver's hand.
[0076] In a state in which the driver grips the left handle part **110** of the steering wheel **100** with the left hand **30**, the driver may operate the emergency light control system **600** and the direction indication control system **700** with the thumb **31** of the left hand **30**.
[0077] In this case, it is desirable to position the frequently used direction indication control system **700** closer to the thumb **31** of the driver's left hand **30** than the emergency light control system **600**. To this end, in the second installation part **300** having the emergency light control system **600** and the direction indication control system **700** disposed in the vertical direction, the direction indication control system **700** may be disposed below the emergency light control system **600**.
[0078] Referring to FIGS. **8** and **9**, a front surface **210** of the first installation part **200** and a front surface **310** of the second installation part **300** according to the present disclosure are respectively formed to have inclined surfaces such that the upper ends of the front surface **210** and the front surface **310** protrude more in the direction toward the driver than the lower ends thereof connected to the steering wheel **100**. Here, the upper ends are disposed opposite the lower ends.
[0079] Surfaces of the first installation part **200** and the second installation part **300** facing the driver may be respectively defined as the front surface **210** of the first installation part **200** and the front surface **310** of the second installation part **300**.
[0080] Each of the front surface **210** of the first installation part **200** and the front surface **310** of the second installation part **300** may be formed to have an inclined surface, in which the upper end of the inclined surface protrudes more toward the driver than the lower end thereof. Here, an angle A of the inclined surface may be formed as an angle between 90 degrees and 180 degrees with respect to a vertical extension line Li along which the handle part **110** of the steering wheel **100** extends.
[0081] In this manner, when the front surface **210** of the first installation part **200** and the front

surface **310** of the second installation part **300** are formed as inclined surfaces, the acceleration control system **400** and the braking control system **500** provided at the first installation part **200**, and the emergency light control system **600** and the direction indication control system **700** provided at the second installation part **300** are all disposed in the inclined direction so as to be located closer to the thumbs **21** and **31** of the right hand **20** and the left hand **30** of the driver. As a result, in a state in which the driver grips the handle part **110** of the steering wheel **100**, the driver may easily and stably operate the braking control system **500**, the acceleration control system **400**, the emergency light control system **600**, and the direction indication control system **700** with the thumbs **21** and **31** of the right hand **20** and the left hand **30**.

[0082] Referring to FIGS. **10** and **11**, in the steering wheel **100**, a first groove **150** formed by the upper connection part **120** and an inner side surface **220** of the first installation part **200** is formed at an acute angle, and the thumb **21** of the right hand **20** of the driver is inserted into the first groove **150** so as to perform the steering operation.

[0083] In addition, in the steering wheel **100**, a second groove **160** formed by the upper connection part **120** and an inner side surface **320** of the second installation part **300** is formed at an acute angle, and the thumb **31** of the left hand **30** of the driver is inserted into the second groove **160** so as to perform the steering operation.

[0084] According to the present disclosure, a width in the left-and-right direction of the upper end of the first installation part **200** is formed to be longer than a width in the left-and-right direction of the lower end thereof. As a result, the first groove **150** formed by the upper connection part **120** and the inner side surface **220** of the first installation part **200** may be formed at an acute angle.

[0085] In a state in which the driver grips the right handle **110** with the right hand **20**, the driver may perform the steering operation while inserting the thumb **21** of the right hand **20** into the first groove **150**. Through this structural configuration, the right hand **20** may be prevented from being separated from the steering wheel **100** during steering operation, and steering operability may be particularly improved.

[0086] In addition, in the present disclosure, a width in the left-and-right direction of the upper end of the second installation part **300** is formed to be longer than a width in the left-and-right direction of the lower end thereof, and the second groove **160** formed by the upper connection part **120** and the inner side surface **320** of the second installation part **300** may be formed at an acute angle.

[0087] The first groove **150** and the second groove **160** may be formed to have the same angle so as to achieve symmetry in the left-and-right direction, but the present disclosure is not limited thereto.

[0088] In a state in which the driver grips the handle part **110** on the left side with the left hand **30**, the driver may perform the steering operation while inserting the thumb **31** of the left hand **30** into the second groove **160**. Through this structural configuration, the left hand **30** may be prevented from being separated from the steering wheel **100** during steering operation, and steering operability may be particularly improved.

[0089] Referring to FIGS. **10** and **11**, in the steering wheel **100**, an outer side surface **230** of the first installation part **200** protrudes farther outwards than the right handle part **110** of the steering wheel **100**, thereby forming a third groove **170** between the outer side surface **230** of the first installation part **200** and the handle part **110** on the right side. Accordingly, an index finger **22** of the right hand **20** of the driver is inserted into the third groove **170** so as to perform the steering operation.

[0090] In addition, in the steering wheel **100**, an outer side surface **330** of the second installation part **300** protrudes farther outwards than the left handle part **110** of the steering wheel **100**, thereby forming a fourth groove **180** between the outer side surface **330** of the second installation part **300** and the handle part **110** on the left side. Accordingly, an index finger **32** of the left hand **30** of the driver is inserted into the fourth groove **180** so as to perform the steering operation.

[0091] The outer side surface **230** of the first installation part **200** is formed to protrude farther

outwards than the handle part **110** on the right side in the radial direction. As a result, the third groove **170** having a concave shape may be formed between the outer side surface **230** of the first installation part **200** and the handle part **110** on the right side.
[0092] When the driver grips the handle part **110** on the right with the right hand **20**, the index finger **22** of the right hand **20** is inserted into the third groove **170** so as to support the outer side surface **230** of the first installation part **200** from below. When the steering operation is performed in this state, the right hand **20** may be prevented from being separated from the steering wheel **100**, and steering operability may be particularly improved.
[0093] In addition, the outer side surface **330** of the second installation part **300** is formed to protrude farther outwards than the handle part **110** on the left side in the radial direction. As a result, the fourth groove **180** having a concave shape may be formed between the outer side surface **330** of the second installation part **300** and the handle part **110** on the left side.
[0094] Each of the third groove **170** and the fourth groove **180** may be formed at an acute angle and may be formed at the same angle to form symmetry in the left-and-right direction, but the present disclosure is not limited thereto.
[0095] When the driver grips the left handle **110** with the left hand **30**, the index finger **32** of the left hand **30** is inserted into the fourth groove **180** so as to support the outer side surface **330** of the second installation part **300** from below. When the steering operation is performed in this state, the left hand **30** may be prevented from being separated from the steering wheel **100**, and steering operability may be particularly improved.
[0096] The vehicle driving control apparatus according to the present disclosure may further include a first connector **1000** coupled with a portion of the display **800** penetrating the steering wheel **100**, a second connector **2000** fixed to the vehicle panel **10** and detachably coupled to the first connector **1000**, and a locking guide **3000** movably provided on the vehicle panel **10** and configured to lock and unlock the first connector **1000** and the second connector **2000**.
[0097] The portion of the display **800** is a cylindrical protrusion **810** that may be provided on the surface of the display **800** facing the front side of the vehicle, and the protrusion **810** of the display **800** may penetrate the center part **140** of the steering wheel **100** so as to be coupled to and integrated with the first connector **1000**.
[0098] The first connector **1000** has a cylindrical outer shape, and one end of the first connector **1000** is coupled to the protrusion **810** of the display **800** in a male and female coupling manner.
[0099] The protrusion **810** of the display **800** and one end of the first connector **1000** are coupled to each other by screw coupling or snap fitting, thereby having a structure in which the display **800** and the first connector **1000** are integrated.
[0100] The first connector **1000** is coupled to the second connector **2000** fixed to the vehicle panel **10** in a detachable male and female structure.
[0101] In a case where the first connector **1000** and the second connector **2000** are coupled to each other, even if the driver performs the steering operation by rotating the steering wheel **100** clockwise or counterclockwise, the display **800** connected to the first connector **1000** does not rotate and maintains a fixed state thereof.
[0102] The vehicle driving control apparatus according to the present disclosure may further include a first permanent magnet **4000** provided at the steering wheel **100** and formed to face the first connector **1000**, and a first PCB **5000** provided at the first connector **1000**, formed to face the first permanent magnet **4000**, and configured to generate, during rotation of the steering wheel **100**, a steering signal by recognizing a signal of the first permanent magnet **4000**.
[0103] A plurality of first permanent magnets **4000** are provided to be spaced apart from each other on one surface of the center part **140** of the steering wheel **100** through which the protrusion **810** of the display **800** penetrates, in which the one surface faces one end of the first connector **1000**, and the first printed circuit board (PCB) **5000** is provided at one end of the first connector **1000**, in which the one end faces the first permanent magnets **4000**.

[0104] When the steering wheel **100** is rotated by the steering operation, the first PCB **5000** recognizes a change in magnetic flux depending on a change in position of the first permanent magnets **4000** and transmits a steering signal to a vehicle-side controller.
[0105] The vehicle driving control apparatus according to the present disclosure may further include a steering spring **6000** having opposite ends respectively connected to the steering wheel **100** and the first connector **1000** and configured to provide return force during rotation of the steering wheel **100**.
[0106] The steering spring **6000** may be formed of a coil spring. One end of the steering spring **6000** may be coupled to the center part **140** of the steering wheel **100**, and the other end thereof may be coupled to the first connector **1000**.
[0107] Additionally, a plurality of steering springs **6000** may be provided for safety.
[0108] When the steering wheel **100** is rotated to perform the steering operation, the steering spring **6000** accumulates elastic force while being compressed or tensioned, and when operating force from the driver is released from the steering wheel **100**, the shape of steering wheel **100** is restored, thereby returning the steering wheel **100** to the neutral position.
[0109] The acceleration control system **400** and the braking control system **500** according to the present disclosure may be respectively formed as button types each having the same structure and may be operated by allowing the driver to press the same with the thumb **21** of the right hand **20**.
[0110] Referring to FIG. **13**, the acceleration control system **400** and the braking control system **500** respectively have hinge parts **410** and **510** disposed at the lower ends thereof. When the driver operates the acceleration control system **400** and the braking control system **500** by pressing the same with the thumb **21** of the right hand **20**, the upper ends of the acceleration control system **400** and the braking control system **500** may be respectively rotated around the lower hinge parts **410** and **510**.
[0111] Plural second permanent magnets **420** and plural third permanent magnets **520** are respectively provided on the bottom surfaces of the acceleration control system **400** and the braking control system **500**. The first installation part **200** may have a second PCB **430** fixedly provided thereon and configured to face the second permanent magnets **420** and the third permanent magnets **520**.
[0112] The first PCB **5000** and the second PCB **430** may be configured individually or may be integrated into one PCB.
[0113] When the driver operates the acceleration control system **400**, the second PCB **430** may recognize a change in magnetic flux depending on a change in position of each of the second permanent magnets **420** and may transmit an acceleration signal to the vehicle-side controller. When the driver operates the braking control system **500**, the second PCB **430** may recognize a change in magnetic flux depending to a change in position of each of the third permanent magnets **520** and may transmit a braking signal to the vehicle-side controller.
[0114] In addition, opposite ends of an acceleration spring **440** are installed to be supported between the acceleration control system **400** and the first installation part **200**, and opposite ends of a braking spring **540** are installed to be supported between the braking control system **500** and the first installation part **200**. In this manner, the acceleration control system **400** and the braking control system **500** may be restored by spring force.
[0115] The return position (or initial position) and full stroke position of the acceleration control system **400** are regulated by contact between the acceleration control system **400** and the first installation part **200**, and the regulation position may be set to various positions through tuning.
[0116] In addition, regulation of the return position (or initial position) and full stroke position of the braking control system **500** may be set by contact between the braking control system **500** and the first installation part **200**. This configuration is the same as that of the acceleration control system **400**, but the present disclosure is not limited thereto.
[0117] According to the present disclosure, a connector protrusion **1100** is formed to protrude from

the end of the first connector **1000**. Here, the connector protrusion **1100** penetrates a connector hole **11** formed in the vehicle panel **10** and is inserted into a connector groove **2100** formed in the second connector **2000**. In a state in which the connector protrusion **1100** is inserted into the connector groove **2100**, when the locking guide **3000** is coupled to the connector protrusion **1100**, the first connector **1000** and the second connector **2000** may be prevented from being separated from each other and may maintain a coupled state therebetween.

[0118] The locking guide **3000** according to the present disclosure is installed to slidably move, by using a guide spring **7000**, upwards and downwards relative to the vehicle panel, and the connector hole **11** formed in the vehicle panel **10** is partially covered by the locking guide **3000** and is fully opened only when the locking guide **3000** moves. Here, only when the connector hole **11** is fully opened, the connector protrusion **1100** may penetrate the connector hole **11** so as to be inserted into and coupled to the connector groove **2100**.

[0119] The locking guide **3000** according to the present disclosure is installed to slidably move upwards and downwards relative to the vehicle panel **10** and has wing parts **3100** provided at the end thereof and formed to extend in the longitudinal direction. The connector protrusion **1100** has locking grooves **1200** respectively formed in the side surfaces thereof and configured to allow the wing parts **3100** to be respectively inserted thereinto, in which each of the locking grooves **1200** is formed to extend in the movement direction of the locking guide **3000**. Here, when the wing parts **3100** are respectively inserted into the locking grooves **1200** by movement of the locking guide **3000**, the first connector **1000** and the second connector **2000** may maintain a coupled state therebetween while preventing separation therebetween.

[0120] Two wings **3100** are formed at the upper end of the locking guide **3000** and are spaced apart from each other in the left-and-right direction, and the locking grooves **1200** into which the two wings **3100** are respectively inserted are formed on the left and right sides of the connector protrusion **1100**.

[0121] The locking guide **3000** is installed to be supported by the vehicle panel **10** using the guide spring **7000**. Here, when a user does not operate the locking guide **3000**, the locking guide **3000** maintains an upward movement state thereof by elastic force of the guide spring **7000**. At this time, the two wings **3100** cover a part of the connector hole **11** formed in the vehicle panel **10**.

[0122] In a state in which the connector hole **11** is partially covered by the wing parts **3100**, the connector protrusion **1100** of the first connector **1000** may not penetrate the connector hole **11** and thus may not be coupled to the connector groove **2100** formed in the second connector **2000**.

[0123] When a user slidably moves the locking guide **3000** downwards, the wing parts **3100** are separated from the connector hole **11** and the connector hole **11** is fully opened. In this state, the connector protrusion **1100** penetrates the connector hole **11** so as to be coupled to the connector groove **2100**.

[0124] After the connector protrusion **1100** and the connector groove **2100** are coupled to each other, when the user releases the locking guide **3000**, the locking guide **3000** moves upwards and returns to the initial position thereof by elastic force of the guide spring **7000**. Here, the two wing parts **3100** are respectively inserted into the locking grooves **1200** of the connector protrusion **1100**. As a result, the first connector **1000** and the second connector **2000** are prevented from being separated from each other by the locking guide **3000**, thereby maintaining a coupled state therebetween.

[0125] Each of the wing parts **3100** is formed to have a structure in which the lower end has a larger cross-sectional thickness than that of the upper end, and the cross-sectional thickness gradually becomes thinner from the lower end to the upper end. When the wing parts **3100** are completely inserted into the locking groove **1200**, the wing parts **3100** and the locking grooves **1200** may maintain a more stable coupled state therebetween by the cross-sectional thickness of each of the wing parts **3100**.

[0126] In addition, when one ends of the wing parts **3100**, each of the one ends having a thin cross-

sectional thickness, respectively slide into the locking grooves **1200** at the beginning of insertion, the one ends are aligned with the locking grooves **1200** while absorbing a gap therebetween, thereby performing smooth coupling therebetween.

[0127] Further, the vehicle panel **10** may have guide parts **12** formed thereon and configured to guide movement of the two wing parts **3100** when the locking guide **3000** slides.

[0128] According to the present disclosure, the locking guide **3000** further has a locking hook **3200** formed thereon, and the first connector **1000** has a hook groove **1300** formed therein and configured to allow the locking hook **3200** to be inserted thereinto. When the wing parts **3100** and the locking groove **1200** are coupled to each other, the locking hook **3200** and the hook groove **1300** are also coupled to each other, thereby making it possible to strengthen the coupled state between the first connector **1000** and the second connector **2000**.

[0129] The locking guide **3000** has the two wing parts **3100** formed at the upper end thereof, and the locking hook **3200** is disposed below the wing parts **3100** and is formed to protrude upwards.

[0130] The first connector **1000** may have the connector protrusion **1100** formed to protrude from the center portion of one end thereof, and the hook groove **1300** may be formed in an edge portion below the connector protrusion **1100** in a concave shape indented toward the center portion of the first connector **1000**.

[0131] Therefore, when the wing parts **3100** of the locking guide **3000** are respectively inserted into and coupled to the locking grooves **1200** of the connector protrusion **1100**, the locking hook **3200** of the locking guide **3000** is also inserted into and coupled to the hook groove **1300** of the first connector **1000**, thereby further strengthening coupling force between the first connector **1000** and the second connector **2000**.

[0132] Furthermore, according to the present disclosure, the first connector **1000** has an arc-shaped guide protrusion **1400** provided at one end thereof and formed to protrude in the longitudinal direction thereof, and the vehicle panel **10** has an arc-shaped guide groove **13** formed therein and configured to allow the guide protrusion **1400** to be inserted thereinto. Here, when the connector protrusion **1100** penetrates the connector hole **11** so as to be coupled to the connector groove **2100**, the guide protrusion **1400** and the guide groove **13** are also coupled to each other so as to strengthen coupling force between the first connector **1000** and the second connector **2000**.

[0133] The first connector **1000** has the arc-shaped guide protrusion **1400** provided at one end thereof, disposed along the circular edge thereof, and formed to protrude in the longitudinal direction thereof.

[0134] In the vehicle panel **10**, the guide groove **13** having the same arc shape as that of the guide protrusion **1400** is formed to have an inwardly concave cross section.

[0135] The arc-shaped guide groove **13** may be formed to surround the periphery of the connector hole **11**.

[0136] Therefore, when the connector protrusion **1100** of the first connector **1000** penetrates the connector hole **11** of the vehicle panel **10** so as to be coupled to the connector groove **2100** of the second connector **2000**, the guide protrusion **1400** of the first connector **1000** is also inserted into and coupled to the guide groove **13** of the vehicle panel **10**, thereby further strengthening coupling force between the first connector **1000** and the second connector **2000**.

[0137] As described above, according to the embodiments of the present disclosure, it is possible to simultaneously perform, when the steering wheel **100** is coupled to the vehicle panel **10**, first coupling between the connector protrusion **1100** and the connector groove **2100**, second coupling between the wing parts **3100** of the locking guide **3000** and the locking groove **1200** of the connector protrusion **1100**, third coupling between the locking hook **3200** of the locking guide **3000** and the hook groove **1300** of the first connector **1000**, and fourth coupling between the guide protrusion **1400** of the first connector **1000** and the guide groove **13** of the vehicle panel **10**. Through the four coupling procedures, movement of the steering wheel **100** coupled to the vehicle panel **10** may be prevented. In particular, coupling force of the steering wheel **100** may be further

strengthened, thereby preventing the steering wheel **100** from being unintentionally separated from the vehicle panel **10**.

[0138] As described above, the vehicle driving control apparatus according to the present disclosure has a modular configuration in which the steering wheel **100**, the acceleration control system **400**, the braking control system **500**, the emergency light control system **600**, the direction indication control system **700**, the display **800**, and the shift control system **900** are integrated into one system. Through the modular configuration, it is possible to reduce the number of parts and to achieve weight reduction and cost reduction. Particularly, the size of a layout area for an installation space may be maximally reduced, thereby having an effect of maximally improving utilization of a vehicle interior space.

[0139] Further, in the vehicle driving control apparatus according to the present disclosure, the steering wheel **100** is used by being coupled to the vehicle panel **10** in the manual driving mode, and the steering wheel **100** may be removed from the vehicle panel **10** in the autonomous driving mode, thereby having an effect of maximally improving utilization of a vehicle interior space in the autonomous driving mode.

[0140] Furthermore, in the vehicle driving control apparatus according to the present disclosure, the display **800** does not rotate and maintains the fixed position thereof even when the steering wheel **100** is rotated by a steering operation. Particularly, the display **800** is located closer to a driver than the steering wheel **100**, thereby preventing the screen from being blocked by the steering wheel **100**. In this manner, there is an advantage in that the driver may look at the display **800** more stably and comfortably.

[0141] As is apparent from the above description, the present disclosure provides a vehicle driving control apparatus having a modular configuration obtained by integrating a steering wheel, an acceleration control system, a braking control system, an emergency light control system, a direction indication control system, a display, and a shift control system into one system. Through this modular configuration, it is possible to reduce the number of parts and to achieve weight reduction and cost reduction. Particularly, the size of a layout area for an installation space is maximally reduced, thereby having an effect of maximally improving utilization of a vehicle interior space.

[0142] Additionally, the vehicle driving control apparatus provides a manual driving mode and an autonomous driving mode. Here, in the manual driving mode, the steering wheel is used by being coupled to a vehicle panel, and in the autonomous driving mode, the steering wheel may be removed from the vehicle panel, thereby having an effect of maximally improving utilization of a vehicle interior space in the autonomous driving mode.

[0143] Furthermore, in the vehicle driving control apparatus, the display does not rotate and maintains the fixed position thereof even when the steering wheel is rotated by a steering operation. Particularly, the display is located closer to a driver than the steering wheel such that the screen is prevented from being blocked by the steering wheel, thereby having an effect of enabling the driver to look at the display more stably and comfortably.

[0144] Although the implementations of the present disclosure have been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the disclosure as disclosed in the accompanying claims.

Claims

1. A vehicle driving control apparatus comprising: a steering wheel configured to be gripped by a driver and to perform a steering operation based on being rotated by the driver; a first installation part disposed at a first upper end corner portion of the steering wheel; a second installation part disposed at a second upper end corner portion of the steering wheel; an acceleration control system

disposed at the first installation part; and a braking control system disposed at the first installation part.

2. The vehicle driving control apparatus of claim 1, further comprising: an emergency light control system disposed at the second installation part; and a direction indication control system disposed at the second installation part.

3. The vehicle driving control apparatus of claim 1, further comprising a display disposed at a center portion of the steering wheel and configured to maintain a fixed state during rotation of the steering wheel, wherein the display comprises a screen that is disposed closer to the driver than the steering wheel to thereby provide access to the screen without being blocked by the steering wheel.

4. The vehicle driving control apparatus of claim 3, further comprising a shift control system disposed at the display.

5. The vehicle driving control apparatus of claim 3, wherein the steering wheel comprises: handle parts that are respectively disposed at left and right sides of the steering wheel and symmetrically arranged at the left and right sides of the steering wheel, wherein each of the handle parts has a circular arc shape protruding outward and is configured to be gripped by the driver; an upper connection part that connects upper ends of the handle parts to each other and has corner portions respectively connected to the handle parts, wherein the first installation part and the second installation part are respectively disposed at the corner portions of the upper connection part; a lower connection part that connects lower ends of the handle parts to each other; and a center part that is disposed at a center portion between the handle parts and connects the upper connection part to the lower connection part, wherein at least a portion of the display passes through the center part.

6. The vehicle driving control apparatus of claim 1, wherein the braking control system is disposed on a left side of the acceleration control system and has a larger external size than an external size of the acceleration control system, wherein the braking control system protrudes outward from the first installation part and defines a first height from the first installation part, and wherein the acceleration control system protrudes outward from the first installation part and defines a second height from the first installation part, wherein the first height is greater than the second height.

7. The vehicle driving control apparatus of claim 2, wherein the direction indication control system is disposed below the emergency light control system and disposed closer to a hand of the driver than the emergency light control system.

8. The vehicle driving control apparatus of claim 1, wherein the first installation part and the second installation part respectively have inclined front surfaces, wherein each of the inclined front surfaces has an upper end protruding further in a direction toward the driver than a lower end thereof.

9. The vehicle driving control apparatus of claim 5, wherein the first installation part has a first inner side surface that defines a first groove with the upper connection part, the first inner side surface defining an acute angle with respect to the upper connection part, wherein the first groove is configured to receive a thumb of a right hand of the driver during the steering operation, wherein the second installation part has a second inner side surface that defines a second groove with the upper connection part, the second inner side surface defining an acute angle with respect to the upper connection part, and wherein the second groove is configured to receive a thumb of a left hand of the driver during the steering operation.

10. The vehicle driving control apparatus of claim 5, wherein the handle parts comprise a right handle part and a left handle part that are respectively disposed at the left and right sides of the steering wheel, wherein the first installation part has a first outer side surface that protrudes outward relative to the right handle part and that defines a third groove between the first outer side surface of the first installation part and the right handle part, wherein the third groove is configured to receive an index finger of a right hand of the driver during the steering operation, wherein the second installation part has a second outer surface that protrudes outward relative to the left handle part and that defines a fourth groove between the second outer surface of the second installation

part and the left handle part, and wherein the fourth groove is configured to receive an index finger of a left hand of the driver during the steering operation.

11. The vehicle driving control apparatus of claim 3, further comprising: a first connector that is coupled to a portion of the display, wherein the portion of the display is configured to pass through the steering wheel; a second connector configured to be fixed to a vehicle panel and detachably coupled to the first connector; and a locking guide movably disposed at the vehicle panel and configured to lock and unlock the first connector and the second connector.

12. The vehicle driving control apparatus of claim 11, further comprising: a first permanent magnet that is disposed at the steering wheel and faces the first connector; and a first printed circuit board (PCB) that is disposed at the first connector and faces the first permanent magnet, wherein the first PCB is configured to, during rotation of the steering wheel, generate a steering signal by recognizing a signal of the first permanent magnet.

13. The vehicle driving control apparatus of claim 11, further comprising a steering spring having opposite ends respectively connected to the steering wheel and the first connector, the steering spring being configured to provide return force to the steering wheel during rotation of the steering wheel.

14. The vehicle driving control apparatus of claim 11, wherein the first connector comprises a connector protrusion that protrudes from an end thereof, wherein the second connector defines a connector groove that receives the connector protrusion, wherein the connector protrusion is configured to pass through a connector hole of the vehicle panel and be inserted into the connector groove of the second connector, and wherein the first connector and the second connector are configured to maintain a coupled state based on the locking guide being coupled to the connector protrusion in a state in which the connector protrusion is inserted into the connector groove.

15. The vehicle driving control apparatus of claim 14, further comprising a guide spring disposed at the locking guide and configured to guide the locking guide to slidably move upward and downward relative to the vehicle panel, wherein the locking guide is configured to cover at least a part of the connector hole of the vehicle panel, the locking guide being configured to fully open the connector hole based on movement of the locking guide, and wherein the connector protrusion is configured to pass through the connector hole based on the connector hole being fully opened, and to be inserted into and coupled to the connector groove.

16. The vehicle driving control apparatus of claim 14, wherein the locking guide is configured to slidably move upward and downward relative to the vehicle panel, the locking guide comprises wing parts that are disposed at an end of the locking guide and extend in a longitudinal direction of the locking guide, wherein the connector protrusion defines locking grooves at side surfaces thereof, the locking grooves being configured to receive the wing parts respectively, wherein each of the locking grooves extending in a movement direction of the locking guide, and wherein the first connector and the second connector are configured to maintain the coupled state based on the wing parts being respectively inserted into the locking grooves by movement of the locking guide.

17. The vehicle driving control apparatus of claim 16, wherein the locking guide further comprises a locking hook, wherein the first connector defines a hook groove configured to receive the locking hook, and wherein the locking hook and the hook groove are configured to be coupled to each other based on the wing parts and the locking grooves being coupled to each other.

18. The vehicle driving control apparatus of claim 17, wherein the first connector has a guide protrusion that is disposed at a first end of the first connector and has an arc shape, the guide protrusion protruding in a longitudinal direction of the first connector being configured to be inserted into a guide groove that is defined at the vehicle panel and has an arc-shape, and wherein the guide protrusion and the guide groove are configured to be coupled to each other based on the connector protrusion passing through the connector hole and being coupled to the connector groove.

19. The vehicle driving control apparatus of claim 11, wherein the portion of the display includes a

protrusion disposed at a surface of the display that faces a front side of a vehicle, and wherein the protrusion of the display passes through the center portion of the steering wheel and is coupled to the first connector.

20. The vehicle driving control apparatus of claim 16, wherein each of the wing parts has a lower end and an upper end disposed above the lower end, and wherein a cross-sectional thickness of each of the wing parts decreases from the lower end to the upper end.