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Inventor(s)	Shin; Woo Jin

Steering system for vehicle

Abstract

Collision load is reliably absorbed by preventing any abnormal motion in which the collision load is not absorbed by a bending plate.

Inventors: **Shin; Woo Jin (Gyeonggi-do, KR)**

Applicant: **HL MANDO CORPORATION** (Gyeonggi-do, KR)

Family ID: **1000008213217**

Assignee: **HL MANDO CORPORATION (Gyeonggi-do, KR)**

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Primary Examiner: Brown; Drew J

Attorney, Agent or Firm: WOMBLE BOND DICKINSON (US) LLP

Background/Summary

CROSS REFERENCE TO RELATED APPLICATION

(1) This application claims priority from Korean Patent Application No. 10-2024-0059810, filed on May 7, 2024, which is hereby incorporated by reference for all purposes as if fully set forth herein.

BACKGROUND

Field

(2) Embodiments relate to a steering system for a vehicle and, more particularly, to a steering system for a vehicle that may reliably absorb collision load by preventing an abnormal motion in which the collision load is not absorbed by a bending plate.

Description of Related Art

(3) In general, a steering column for a vehicle is a device configured to surround a steering shaft which transmits a rotational force generated in response to a driver operating the steering wheel, to a rack-and-pinion device so as to support the rotation of the steering shaft. The steering column is coupled to a vehicle body by a bracket so as to fix the position of the steering shaft.

(4) In the event of a collision, the driver's upper body may hit the steering wheel, which would otherwise lead to serious injury. To prevent this problem, a shock-absorbing steering column which is provided with a collapse function enabling both the steering column and the steering shaft to axially retract is used. In other words, when a collision occurs during the vehicle operation, the driver's upper body hits the steering wheel due to inertia, and when the driver's upper body hits the steering wheel, the steering column and steering shaft provided in the lower part of the steering wheel contract to reduce the impact on the driver.

(5) In general, such a steering column is provided with a bending plate to absorb shock load.
(6) However, in conventional steering columns, an assembly tolerance between parts or the like may cause an abnormal motion in which the transmission path of the shock load bypasses the bending plate and thus may not be absorbed. When such an abnormal motion occurs, there is a risk of a large impact force being applied to the driver if the driver's upper body hits the steering wheel.
SUMMARY
(7) Embodiments are related to a steering system for a vehicle that may reliably absorb collision load by preventing an abnormal motion in which the collision load is not absorbed by a bending plate.
(8) According to embodiments, provided is a steering system for a vehicle, the steering system including: an upper column; a lower column including a pair of distance brackets to which an adjusting bolt is coupled comprised in or coupled to the lower column; a bending plate including fixed gear holes, a first portion coupled to an outer peripheral surface of the upper column, and a second portion bent from the first portion and disposed inside the upper column; and a movable gear coupled to the adjusting bolt coupled to the distance brackets, the movable gear including movable gear teeth provided on a lower surface of the movable gear and configured to be engageable with the fixed gear holes of the bending plate and a protrusion supported on an upper surface of the bending plate.
(9) In addition, according to embodiments, provided is a steering system for a vehicle, the steering system including: an upper column; a lower column including a pair of distance brackets to which an adjusting bolt is coupled are comprised in or coupled to the lower column; a movable gear coupled to the adjusting bolt coupled to the distance brackets, the movable gear including movable gear teeth provided on a lower surface of the movable gear; and a fixed gear (or a bending plate) including a first portion coupled to an outer peripheral surface of the upper column and a second portion bent from the first portion and disposed inside the upper column, wherein the first portion of the bending plate has fixed gear holes, configured to be engageable with the movable gear teeth, and a protrusion supported on the movable gear.
(10) According to exemplary embodiments, the collision load may be reliably absorbed by preventing any abnormal motion in which the collision load is not absorbed by the bending plate.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
(1) The above and other objects, features, and advantages of the present disclosure will be more clearly understood from the following detailed description, taken in conjunction with the accompanying drawings, in which:
(2) FIG. **1** is a perspective view illustrating a steering system for a vehicle according to embodiments;
(3) FIG. **2** is a plan view illustrating portions of the steering system for a vehicle steering system for a vehicle;
(4) FIG. **3** is a cross-sectional view illustrating portions of the steering system for a vehicle steering system for a vehicle;
(5) FIG. **4** is a cross-sectional view illustrating portions of the steering system for a vehicle steering system for a vehicle; and
(6) FIG. **5** is a cross-sectional view illustrating portions of the steering system for a vehicle steering system for a vehicle.
DETAILED DESCRIPTION
(7) In the following description of examples or embodiments of the present disclosure, reference will be made to the accompanying drawings in which it is shown by way of illustration specific

examples or embodiments that can be implemented, and in which the same reference numerals and signs can be used to designate the same or like components even when they are shown in different accompanying drawings from one another. Further, in the following description of examples or embodiments of the present disclosure, detailed descriptions of well-known functions and components incorporated herein will be omitted when it is determined that the description may make the subject matter in some embodiments of the present disclosure rather unclear. The terms such as “including”, “having”, “containing”, “constituting”, “made up of”, and “formed of” used herein are generally intended to allow other components to be added unless the terms are used with the term “only”. As used herein, singular forms are intended to include plural forms unless the context clearly indicates otherwise.

(8) Terms, such as “first”, “second”, “A”, “B”, “(A)”, or “(B)” may be used herein to describe elements of the disclosure. Each of these terms is not used to define essence, order, sequence, or number of elements etc., but is used merely to distinguish the corresponding element from other elements.

(9) When it is mentioned that a first element, for example, “is connected or coupled to” or “contacts or overlaps” a second element, it should be interpreted that, not only can the first element “be directly connected or coupled to” or “directly contact or overlap” the second element, but a third element can also be “interposed” between the first and second elements, or the first and second elements can “be connected or coupled to”, “contact or overlap”, etc. each other via a fourth element. Here, the second element may be included in at least one of two or more elements that “are connected or coupled to”, “contact or overlap”, etc. each other.

(10) When time relative terms, such as “after”, “subsequent to”, “next,” “before,” and the like, are used to describe processes or operations of elements or configurations, or flows or steps in operating, processing, manufacturing methods, these terms may be used to describe non-consecutive or non-sequential processes or operations unless the term “directly” or “immediately” is used together.

(11) In addition, when any dimensions, relative sizes etc. are mentioned, it should be considered that numerical values for an elements or features, or corresponding information (e.g., level, range, etc.) include a tolerance or error range that may be caused by various factors (e.g., process factors, internal or external impact, noise, etc.) even when a relevant description is not specified. Further, the term “may” fully encompasses all the meanings of the term “can”.

(12) FIG. **1** is a perspective view illustrating a steering system for a vehicle according to embodiments, FIG. **2** is a plan view illustrating portions of the steering system for a vehicle steering system for a vehicle, FIG. **3** is a cross-sectional view illustrating portions of the steering system for a vehicle steering system for a vehicle, FIG. **4** is a cross-sectional view illustrating portions of the steering system for a vehicle steering system for a vehicle, and FIG. **5** is a cross-sectional view illustrating portions of the steering system for a vehicle steering system for a vehicle.

(13) First, the present disclosure will be described with reference to FIGS. **1** to **4**. According to embodiments, provided is a steering system for a vehicle, the steering system including: an upper column **102**; a lower column **103** including a pair of distance brackets **105** to which an adjusting bolt **107** is coupled are comprised in or coupled to the lower column **103**; a bending plate **120** including fixed gear holes **121**, a first portion **120***a* coupled to an outer peripheral (or circumferential) surface of the upper column **102**, and a second portion **120***b* bent from the first portion **120***a* and disposed inside the upper column **102**; and a movable gear **110** coupled to the adjusting bolt **107** coupled to the distance brackets **105**, the movable gear **110** including movable gear teeth **311** provided on the lower surface of the movable gear **110** and configured to be engageable with the fixed gear holes **121** of the bending plate **120** and a protrusion **411** supported on an upper surface of the bending plate **120**.

(14) The steering system for a vehicle according to embodiments includes the upper column **102**,

the lower column **103**, the bending plate **120**, and the movable gear **110**. The upper column **102** receives the steering shaft **101** therein, and is coupled to the lower column **103** in an axially slidable manner. The lower column **103** is coupled to a mounting bracket **104** fixed to the vehicle body. The driver may lock or unlock a telescoping motion and a tilting motion by operating a lever **106** coupled to the adjusting bolt **107**.
(15) The pair of distance brackets **105** facing each other are provided on the outer peripheral surface of the lower column **103**, and an adjusting bolt **107** extends through the distance brackets **105** and is coupled to the lower column **103**. A fixed cam and a movable cam (not shown) are provided on the end of the adjusting bolt **107**, and when the driver operates the lever **106**, the adjusting bolt **107** rotates and a tension force is generated or released to lock or unlock the tilting motion.
(16) In addition, the movable gear **110** is provided on an intermediate portion of the adjusting bolt **107**, and engages with a first portion **120***a* of the bending plate **120** coupled to the upper column **102**. The movable gear **110** has the movable gear teeth **311** provided on the lower surface. The movable gear **110** is rotated about the adjusting bolt **107** by the adjusting bolt **107** and a torsion spring **211**, and engages with, while being supported on, the first portion **120***a* of the bending plate **120** or is spaced apart from the first portion **120***a*.
(17) In the bending plate **120**, the first portion **120***a* is coupled to the outer peripheral surface of the upper column **102**, and the second portion **120***b* is bent from the first portion **120***a* and disposed inside the upper column **102**. In a telescoping motion, the movable gear **110** is spaced apart from the first portion **120***a* of the bending plate **120**, and the bending plate **120** slides axially together with the upper column **102**. However, in a collapsing motion, the movable gear **110** engages with the first portion **120***a* of the bending plate **120**, and only the upper column **102** slides axially. In the collapsing motion, the upper column **102** (or a coupling bracket **320**) slides while supported on a bent portion connecting the first portion **120***a* and the second portion **120***b* of the bending plate **120**, and the bending plate **120** is plastically deformed by the sliding of the upper column **102** to absorb the collision load.
(18) In other words, the collision load transmitted from the steering wheel to the driver in a collision is transmitted in the order of the upper column, the bending plate, the movable gear, and the adjusting bolt in a normal collapsing motion, and the bending plate is plastically deformed and absorbs the collision load to protect the driver.
(19) However, due to an assembly tolerance (e.g., an assembly tolerance between the adjusting bolt and the movable gear) or the like, a phenomenon (called “stamping”) in which the gear teeth of the movable gear forcibly press the upper column (or the coupling bracket described later) may occur. If this phenomenon occurs, a portion of the collision load is transferred directly from the upper column to the movable gear, resulting in an abnormal collapsing motion that bypasses the bending plate. In the abnormal collapsing motion, the bending plate may be unable to sufficiently absorb the collision load, and the driver may be exposed to the risk of a strong impact.
(20) However, the steering system for a vehicle according to embodiments may be provided not only with the movable gear teeth **311** but also with the protrusion **411** on the lower surface of the movable gear **110** to prevent the collision load from bypassing the bending plate **120**. The depth to which the movable gear teeth **311** are inserted into the fixed gear holes **121** is limited by the protrusion **411**, and thus the collision load is not transmitted directly from the upper column **102** to the movable gear **110**.
(21) In an embodiment, the coupling bracket **320** may be provided between the first portion **120***a* of the bending plate **120** and the upper column **102**. That is, the bending plate **120** may be coupled to the upper column **102** by means of the coupling bracket **320**. The coupling bracket **320** may be fixed to the upper column **102**, and may be welded, for example. The first portion **120***a* of the bending plate **120** may be coupled to the coupling bracket **320** by means of a fracture member **321**. When the collapsing motion is started, the fracture member **321** is fractured under the collision

load, the coupling bracket **320** is supported on the bent portion connecting the first portion **120***a* and the second portion **120***b* of the bending plate **120**, and the bending plate **120** is plastically deformed.

(22) In an embodiment, the movable gear teeth **311** and the coupling bracket **320** are spaced apart from each other. the movable gear teeth **311** are spaced apart from the coupling bracket **320** positioned between the first portion **120***a* of the bending plate **120** and the upper column **102**. That is, due to the formation of the protrusion **411**, the movable gear teeth **311** are spaced apart from the coupling bracket **320** while being inserted into the fixed gear holes **121**. Thus, the "stamping" phenomenon in which the movable gear teeth **311** forcibly press the coupling bracket **320** due to the assembly tolerance or the like is prevented. Accordingly, the abnormal motion in which at least a portion of the shock load is transmitted directly from the coupling bracket **320** to the movable gear **110** by bypassing the bending plate **120** is prevented.

(23) The structure of the movable gear **110** will be discussed in more detail with reference to FIG. **4**. According to an embodiment, the protrusion **411** may be supported on the upper surface of the first portion **120***a* of the bending plate **120**. More specifically, the protrusion **411** of the movable gear **110** is supported on an upper surface of the first portion **120***a* of the bending plate **120** coupled to the outer peripheral surface of the upper column **102**. the first portion **120***a* of the bending plate **120** includes connectors **331** provided between the fixed gear holes **121**, and the protrusion **411** may be supported on the upper surface of the connectors **331**. When the protrusion **411** is supported on the upper surface of the connectors **331**, the movable gear teeth **311** are deeply inserted into the fixed gear holes **121** and are prevented from being supported or stamped on the upper column **102** or the coupling bracket **320**.

(24) In an embodiment, in a state where the protrusion **411** is supported on the bending plate **120**, the lower surface of the movable gear **110** and the upper surface of the first portion **120***a* of the bending plate **120** may be parallel. a lower surface of the movable gear **110** is arranged to be parallel to the upper surface of the first portion **120***a* of the bending plate **120** coupled to the outer peripheral surface of the upper column **102**. That is, the height to which the protrusion **411** protrudes from the lower surface of the movable gear **110** may be the distance in a state where the lower surface of the movable gear **110** and the upper surface of the first portion **120***a* of the bending plate **120** are parallel. As shown, the movable gear teeth **311** may be provided in a plurality, and since the lower surface of the movable gear **110** and the upper surface of the first portion **120***a* of the bending plate **120** are parallel in a state where the protrusion **411** is supported on the bending plate **120**, the depths to which the movable gear teeth **311** are inserted into the corresponding fixed gear holes **121** are the same. Accordingly, the collision load transmitted to the movable gear **110** from the first portion **120***a* of the bending plate **120** may be uniformly distributed to the movable gear teeth **311** inserted at the same depth into the fixed gear holes **121**, thereby preventing the load from being concentrated in a particular portion.

(25) In addition, the lower surface of the movable gear **110** and the upper surface of the first portion **120***a* of the bending plate **120** are spaced apart parallel to each other by the protrusion **411**, and only the ends of the movable gear teeth **311** are inserted into the fixed gear holes **121** and are axially supported on the first portion **120***a* of the bending plate **120**. Accordingly, the movable gear teeth **311** may be smoothly disengaged from the fixed gear holes **121** when the movable gear **110** is rotated (counterclockwise with respect to the figure).

(26) According to an embodiment, a coupling hole **110***a* into which the adjusting bolt **107** is inserted to be coupled thereto may be provided in a first portion of the movable gear **110**. The coupling hole **110***a* is provided in the first portion of the movable gear **110**, which is rotated about the center of the coupling hole **110***a* to engage with the fixed gear holes **121** or be spaced apart from the fixed gear holes **121**.

(27) Here, the coupling hole **110***a* of the movable gear **110** comprises an obstructing groove **110***b* provided on an inner surface of the coupling hole **110***a* of the movable gear **110**, and the adjusting

bolt **107** comprises an obstructing protrusion **109** protruding radially outward and inserted in the obstructing groove **110***b* of the movable gear **110**. Accordingly, when the adjusting bolt **107** is rotated in one direction or the opposite direction, the movable gear **110** is rotated in one direction or the opposite direction together with the adjusting bolt **107**.

(28) In an embodiment, the movable gear teeth **311** may be spaced apart in the direction from a first side to a second side on the lower surface of the movable gear **110**, and may be provided in a plurality. The figure shows an embodiment in which three movable gear teeth **311** are provided in the direction from the first side to the second side (i.e., in the direction from left to right in the figure) on the lower surface of the movable gear **110**. Each of the movable gear teeth **311** may be configured such that a beveled surface and a perpendicular surface substantially is perpendicular to the lower surface of the movable gear **110** so that the movable gear teeth **311** are easily inserted into the fixed gear holes **121** while being axially supported on the bending plate **120**.

(29) Here, at least one of the movable gear teeth **311** has a beveled surface, a perpendicular surface substantially perpendicular to the lower surface of the movable gear **110**, and a curved surface between the beveled surface and the perpendicular surface. each of the movable gear teeth **311** has a curved surface on an end **313** where the beveled first surface and the perpendicular surface. This curved surface of the end **313** of each movable gear tooth **311** prevents the so-called stamping phenomenon in which the movable gear tooth **311** from is forcibly pressed against the coupling bracket **320**.

(30) In an embodiment, the protrusion **411** is located farther than the movable gear teeth **311** from the coupling hole **110***a*. the protrusion **411** may be located at an end of the second side on the lower surface of the movable gear **110**. That is, the protrusion **411** may be located at the farthest position of the second side on the lower surface of the movable gear **110**. If the lower surface of the movable gear **110** is provided with a plurality of movable gear teeth **311** in the direction from the first side to the second side, the protrusion **411** may be located on the second side of the last movable gear teeth **311**. Thus, when the movable gear **110** is rotated in the direction of engaging with the fixed gear holes **121**, the insertion of the movable gear teeth **311** into the fixed gear holes **121** is not obstructed by the protrusion **411**. In other words, the movable gear teeth **311** are inserted into the fixed gear holes **121** sequentially starting with one movable gear tooth of the movable gear teeth **311** closest to the coupling hole **110***a*. Since the protrusion **411** is located at the farthest position of the second side the second side on the lower surface of the movable gear **110**, the protrusion **411** is not supported on the upper surface of the first portion **120***a* of the bending plate **120** even when the movable gear tooth **311** farthest from the coupling hole **110***a* is inserted into a corresponding fixed gear hole of the fixed gear holes **121**. Accordingly, the insertion of the movable gear teeth **311** into the fixed gear holes **121** may be accomplished smoothly. In addition, as described above, when the protrusion **411** is supported on the upper surface of the first portion **120***a* of the bending plate **120**, the depth to which the movable gear teeth **311** are inserted into the fixed gear holes **121** is limited.

(31) Next, the present disclosure will be described with reference to FIG. **5**. The features the same as those of the foregoing embodiments will be readily understood by reference to FIGS. **1** to **4** in which the same drawing symbols are used, and detailed descriptions thereof will be omitted.

(32) According to the embodiments, provided is a steering system for a vehicle, the steering system including: an upper column **102**; a lower column **103** including a pair of distance brackets **105** to which an adjusting bolt **107** is coupled are comprised in or coupled to the lower column **103**; a movable gear **110** coupled to the adjusting bolt **107** coupled to the distance brackets **105**, the movable gear **110** including movable gear teeth **311** provided on the lower surface of the movable gear **110**; and a bending plate **120** including a first portion **120***a* coupled to an outer peripheral (or circumferential) surface of the upper column **102** and a second portion **120***b* bent from the first portion **120***a* and disposed inside the upper column **102**, wherein the first portion **120***a* of the bending plate has fixed gear holes **121** into which the movable gear teeth **311**, and a protrusion **511**

supported on the movable gear **110**.

(33) The steering system for a vehicle according to embodiments may be provided with the protrusion **511** on the upper surface of the first portion **120***a* of the bending plate **120** to prevent the collision load from bypassing the bending plate **120**. The depth to which the movable gear teeth **311** are inserted into the fixed gear holes **121** is limited by the protrusion **511**, and thus the collision load is not transmitted directly from the upper column **102** to the movable gear **110**.

(34) In an embodiment, the coupling bracket **320** may be provided between the first portion **120***a* of the bending plate **120** and the upper column **102**. That is, the bending plate **120** may be coupled to the upper column **102** by means of the coupling bracket **320**. The coupling bracket **320** is fixed to the upper column **102**, and may be welded, for example. The first portion **120***a* of the bending plate **120** may be coupled to the coupling bracket **320** by means of a fracture member **321**. When the collapsing motion is started, the fracture member **321** is fractured under the collision load, the coupling bracket **320** is supported on the bent portion connecting the first portion **120***a* and the second portion **120***b* of the bending plate **120**, and the bending plate **120** is plastically deformed.

(35) In an embodiment, the movable gear teeth **311** and the coupling bracket **320** are spaced apart from each other. the movable gear teeth **311** are spaced apart from the coupling bracket **320** positioned between the first portion **120***a* of the bending plate **120** and the upper column **102**. That is, due to the formation of the protrusion **411**, the movable gear teeth **311** are spaced apart from the coupling bracket **320** while being inserted into the fixed gear holes **121**. Thus, the “stamping” phenomenon in which the movable gear teeth **311** forcibly press the coupling bracket **320** due to the assembly tolerance or the like is prevented.

(36) Accordingly, the abnormal motion in which at least a portion of the shock load is transmitted directly from the coupling bracket **320** to the movable gear **110** by bypassing the bending plate **120** is prevented.

(37) In an embodiment, the protrusion **511** of the first portion **120***a* of the bending plate may be supported on a lower surface of the movable gear **110**. More specifically, the lower surface of the movable gear **110** has one or more movable gear teeth **311** provided thereon, and the protrusion **511** may be supported on a portion of the lower surface of the movable gear **110** without the movable gear teeth **311**. When the protrusions **511** are supported on the lower surface of the movable gear **110**, the movable gear teeth **311** may be deeply inserted into the fixed gear holes **121** and are prevented from being supported or stamped on the upper column **102** or the coupling bracket **320**.

(38) In an embodiment, in a state where the protrusion **511** is supported on the movable gear **110**, the lower surface of the movable gear **110** and the upper surface of the first portion **120***a* of the bending plate **120** may be parallel. a lower surface of the movable gear **110** is arranged to be parallel to the upper surface of the first portion **120***a* of the bending plate **120** coupled to the outer peripheral surface of the upper column **102**. That is, the height to which the protrusion **511** protrudes from the upper surface of the first portion **120***a* of the first portion **120***a* may be the distance in a state where the lower surface of the movable gear **110** and the upper surface of the first portion **120***a* of the bending plate **120** are parallel. Accordingly, the depths to which the movable gear teeth **311** are inserted into the corresponding fixed gear holes **121** are the same, and the load may be prevented from being from being concentrated in a particular portion.

(39) In an embodiment, the fixed gear holes **121** may be spaced apart from the first portion **120***a* of the bending plate **120** in the direction from a first side to a second side, and may be provided in a plurality. Accordingly, a telescoping motion may be performed by adjusting the contracted or extended position of the steering column depending on the engagement position of the movable gear **110**.

(40) In an embodiment, the bending plate **120** may include a plurality of connectors **331** provided between the fixed gear holes **121**, and the protrusions **511** may protrude from the upper surface of the connectors **331** of the bending plate **120**. The connectors **331** may be located between adjacent fixed gear holes **121**, and may be provided in a plurality like the fixed gear holes **121**. The

protrusions **511** may be provided on the connectors **331**, respectively.
(41) In an embodiment, the protrusion **511** may be located at an end of a second side on the upper surface of the connectors **331**. That is, the protrusion **511** may be located at the rightmost side on the upper surface of the connectors **331** with respect to the figure. Thus, when the movable gear **110** is rotated in the direction of engaging with the fixed gear holes **121** or in the opposite direction, the insertion of the movable gear teeth **311** into the fixed gear holes **121** or the disengagement of the movable gear teeth **311** from the fixed gear holes **121** is not obstructed by the protrusion **511**. Accordingly, the insertion of the movable gear teeth **311** into the fixed gear holes **121** may be accomplished smoothly. As described above, the protrusion **511** is supported on the upper surface of the first portion **120***a* of the bending plate **120**, and the depth to which the movable gear teeth **311** are inserted into the fixed gear holes **121** is limited.
(42) According to the steering system for a vehicle having such a shape, the collision load may be reliably absorbed by preventing any abnormal motion in which the collision load is not absorbed by the bending plate.
(43) The above description has been presented to enable any person skilled in the art to make and use the technical idea of the present disclosure, and has been provided in the context of a particular application and its requirements. Various modifications, additions and substitutions to the described embodiments will be readily apparent to those skilled in the art, and the general principles defined herein may be applied to other embodiments and applications without departing from the spirit and scope of the present disclosure. The above description and the accompanying drawings provide an example of the technical idea of the present disclosure for illustrative purposes only. That is, the disclosed embodiments are intended to illustrate the scope of the technical idea of the present disclosure. Thus, the scope of the present disclosure is not limited to the embodiments shown, but is to be accorded the widest scope consistent with the claims. The scope of protection of the present disclosure should be construed based on the following claims, and all technical ideas within the scope of equivalents thereof should be construed as being included within the scope of the present disclosure.

Claims

1. A steering system for a vehicle, the steering system comprising: an upper column; a lower column, wherein a pair of distance brackets to which an adjusting bolt is coupled are comprised in or coupled to the lower column; a bending plate comprising fixed gear holes, a first portion coupled to an outer peripheral surface of the upper column, and a second portion bent from the first portion and disposed inside the upper column; and a movable gear coupled to the adjusting bolt coupled to the distance brackets, the movable gear comprising movable gear teeth provided on a lower surface of the movable gear and configured to be engageable with the fixed gear holes of the bending plate and a protrusion supported on an upper surface of the bending plate.
2. The steering system of claim 1, further comprising a coupling bracket provided between the first portion of the bending plate and the upper column.
3. The steering system of claim 1, wherein the movable gear teeth are spaced apart from the coupling bracket positioned between the first portion of the bending plate and the upper column.
4. The steering system of claim 1, wherein the protrusion of the movable gear is supported on an upper surface of the first portion of the bending plate coupled to the outer peripheral surface of the upper column.
5. The steering system of claim 4, wherein a lower surface of the movable gear is arranged to be parallel to the upper surface of the first portion of the bending plate coupled to the outer peripheral surface of the upper column.
6. The steering system of claim 1, wherein the movable gear comprises a coupling hole in which the adjusting bolt is inserted.

7. The steering system of claim 6, wherein the coupling hole of the movable gear comprises an obstructing groove on an inner surface of the coupling hole of the movable gear, and the adjusting bolt comprises an obstructing protrusion protruding radially outward and inserted in the obstructing groove of the movable gear.
8. The steering system of claim 6, wherein the movable gear teeth are positioned to be spaced apart from each other.
9. The steering system of claim 6, wherein the protrusion is located farther than the movable gear teeth from the coupling hole.
10. The steering system of claim 1, wherein at least one of the movable gear teeth has a beveled surface, a perpendicular surface substantially perpendicular to the lower surface of the movable gear, and a curved surface between the beveled surface and the perpendicular surface.
11. A steering system for a vehicle, the steering system comprising: an upper column; a lower column, wherein a pair of distance brackets to which an adjusting bolt is coupled are comprised in or coupled to the lower column; a movable gear coupled to the adjusting bolt coupled to the distance brackets, the movable gear comprising movable gear teeth provided on a lower surface of the movable gear; and a bending plate comprising a first portion coupled to an outer peripheral surface of the upper column and a second portion bent from the first portion and disposed inside the upper column, wherein the first portion of the bending plate has fixed gear holes, configured to be engageable with the movable gear teeth, and a protrusion supported on the movable gear.
12. The steering system of claim 11, further comprising a coupling bracket provided between the first portion of the bending plate and the upper column.
13. The steering system of claim 11, wherein the movable gear teeth are spaced apart from the coupling bracket positioned between the first portion of the bending plate and the upper column.
14. The steering system of claim 11, wherein the protrusion of the first portion of the bending plate is supported on a lower surface of the movable gear.
15. The steering system of claim 14, wherein a lower surface of the movable gear is arranged to be parallel to an upper surface of the first portion of the bending plate coupled to the outer peripheral surface of the upper column.
16. The steering system of claim 11, wherein the fixed gear holes are provided at the first portion of the bending plate, and are spaced apart from each other.
17. The steering system of claim 16, wherein the bending plate comprises a plurality of connectors provided between the fixed gear holes, and the protrusion protrudes from an upper surface of the connectors of the bending plate.
18. The steering system of claim 17, wherein the protrusion is located at an end of the upper surface of the connectors.
19. The steering system of claim 11, wherein the movable gear comprises a coupling hole in which the adjusting bolt is inserted, the coupling hole of the movable gear comprises an obstructing groove provided on an inner surface of the coupling hole of the movable gear, and the adjusting bolt comprises an obstructing protrusion protruding radially outward and inserted in the obstructing groove of the movable gear.
20. The steering system of claim 11, wherein at least one of the movable gear teeth has a beveled surface, a perpendicular surface substantially perpendicular to the lower surface of the movable gear, and a curved surface between the beveled first and the perpendicular surface.