ABSTRACT

An object of the present invention is to enable accurate positioning and provide a uniform gap between a cover and a steering wheel. A steering wheel includes a steering wheel main body 2, an airbag module 3, and a horn switch device. Long holes for positioning 2e to 2g are provided in a cored bar section 2b of the steering wheel main body 2. Positioning pins 3e are provided in the airbag module 3. The long holes for positioning 2e to 2g have length L1 in longitudinal directions larger than width d1 of the positioning pins 3e and are arranged such that longitudinal directions of the long hole for positioning 2e and the long holes for positioning 2f and 2g are different from each other. In an attached state, the positioning pins 3e are inserted through the long holes for positioning 2e to 2g and at least a part of the positioning pins 3e are in contact with side surfaces 2eb to 2gb of the long holes for positioning 2e to 2g in a direction orthogonal to the longitudinal directions.

CLAIMS

1. A steering wheel comprising:

a steering wheel main body;

an airbag module attached to a cored bar section configuring the steering wheel main body; and

a horn switch device that closes a circuit when the airbag module is pushed,

a plurality of airbag module long holes for positioning being provided in the cored bar section, while a plurality of positioning pins for positioning the airbag module by being inserted through the long holes for positioning being provided in the airbag module, wherein

the long holes for positioning have pin insertion allowed regions in longitudinal directions so as to have length in the longitudinal directions larger than the width of the positioning pins, and are arranged such that longitudinal directions of at least two of the long holes for positioning are directions different from each other, and

in a state in which the airbag module is attached to the cored bar section, the positioning pins are inserted through the long holes for positioning and at least a part of the positioning pins are in contact with side surfaces of the long holes for positioning in a direction orthogonal to the longitudinal directions.

2. The steering wheel according to claim 1, wherein the positioning pins are configured by at least two or more positioning pins, and the two or more positioning pins are in contact with the

side surfaces of the long holes for positioning in the direction orthogonal to the longitudinal directions.

3. The steering wheel according to claim 1 or 2, wherein the plurality of long holes for positioning are arranged such that lines extended in the longitudinal direction from at least one long hole for positioning cross lines extended in the longitudinal directions from the other long holes for positioning, those lines being projected on a same plane when the steering wheel is viewed from a front surface side.

4. The steering wheel according to claim 3, wherein the long holes for positioning are three long holes for positioning including two long holes for positioning having a same longitudinal direction and one long hole for positioning having a longitudinal direction orthogonal to the longitudinal direction of the two long holes for positioning.

5. The steering wheel according to any one of claims 1, 2, and 4, wherein the long holes for positioning are provided on an outer circumferential side of the airbag module as much as possible.

6. The steering wheel according to claim 3, wherein the long holes for positioning are provided on an outer circumferential side of the airbag module as much as possible.

7. The steering wheel according to any one of claims 1, 2, and 4, wherein the long holes for positioning are formed narrow in a center portion with respect to an incoming side and an outgoing side.

8. The steering wheel according to claim 3, wherein the long holes for positioning are formed narrow in a center portion with respect to an incoming side and an outgoing side.

9. The steering wheel according to claim 5, wherein the long holes for positioning are formed narrow in a center portion with respect to an incoming side and an outgoing side.

10. The steering wheel according to any one of claims 1, 2, and 4, wherein the positioning pins are formed in contact with side surfaces of the long holes for positioning in a direction orthogonal to the longitudinal directions in outer circumferential positions on lines orthogonal to the side surfaces of the long holes for positioning in the direction orthogonal to the longitudinal direction from cross sectional centers.

11. The steering wheel according to claim 3, wherein the positioning pins are formed in contact with side surfaces of the long holes for positioning in a direction orthogonal to the longitudinal directions in outer circumferential positions on lines orthogonal to the side surfaces of the long holes for positioning in the direction orthogonal to the longitudinal direction from cross sectional centers.

12. The steering wheel according to claim 5, wherein the positioning pins are formed in contact with side surfaces of the long holes for positioning in a direction orthogonal to the longitudinal directions in outer circumferential positions on lines orthogonal to the side surfaces of the long holes for positioning

in the direction orthogonal to the longitudinal direction from cross sectional centers.

13. The steering wheel according to claim 7, wherein the positioning pins are formed in contact with side surfaces of the long holes for positioning in a direction orthogonal to the longitudinal directions in outer circumferential positions on lines orthogonal to the side surfaces of the long holes for positioning in the direction orthogonal to the longitudinal direction from cross sectional centers.

14. The steering wheel according to any one of claims 1, 2, and 4, wherein the airbag module is attached to the cored bar section in a state in which the airbag module is urged in a direction separating from the cored bar section at normal time, and the airbag module is caused to approach the cored bar section resisting the urging force to actuate the horn switch device.

15. The steering wheel according to claim 3, wherein the airbag module is attached to the cored bar section in a state in which the airbag module is urged in a direction separating from the cored bar section at normal time, and the airbag module is caused to approach the cored bar section resisting the urging force to actuate the horn switch device.

16. The steering wheel according to claim 5, wherein the airbag module is attached to the cored bar section in a state in which the airbag module is urged in a direction separating from the cored bar section at normal time, and the airbag module is caused to approach

the cored bar section resisting the urging force to actuate the horn switch device.

17. The steering wheel according to claim 7, wherein the airbag module is attached to the cored bar section in a state in which the airbag module is urged in a direction separating from the cored bar section at normal time, and the airbag module is caused to approach the cored bar section resisting the urging force to actuate the horn switch device.

18. The steering wheel according to claim 10, wherein the airbag module is attached to the cored bar section in a state in which the airbag module is urged in a direction separating from the cored bar section at normal time, and the airbag module is caused to approach the cored bar section resisting the urging force to actuate the horn switch device.

19. The steering wheel according to any one of claims 1, 2, and 4, wherein the positioning pins are formed from an elastic member.

20. The steering wheel according to claim 3, wherein the positioning pins are formed from an elastic member.

21. The steering wheel according to claim 5, wherein the positioning pins are formed from an elastic member.

22. The steering wheel according to claim 7, wherein the positioning pins are formed from an elastic member.

23. The steering wheel according to claim 10, wherein the positioning pins are formed from an elastic member.

24. The steering wheel according to claim 14, wherein the positioning pins are formed from an elastic member.

25. The steering wheel according to any one of claims 1, 2, and 4, wherein the positioning pins have length to be inserted through the long holes for positioning before Z tabs formed on a rear surface of the airbag module engage with second hooks formed in the cored bar section when the airbag module is attached to the cored bar section.

26. The steering wheel according to claim 3, wherein the positioning pins have length to be inserted through the long holes for positioning before Z tabs formed on a rear surface of the airbag module engage with second hooks formed in the cored bar section when the airbag module is attached to the cored bar section.

27. The steering wheel according to claim 5, wherein the positioning pins have length to be inserted through the long holes for positioning before Z tabs formed on a rear surface of the airbag module engage with second hooks formed in the cored bar section when the airbag module is attached to the cored bar section.

28. The steering wheel according to claim 7, wherein the positioning pins have length to be inserted through the long holes for positioning before Z tabs formed on a rear surface of the airbag module engage with second hooks formed in the cored bar section when the airbag module is attached to the cored bar section.

29. The steering wheel according to claim 10, wherein the positioning pins have length to be inserted through the long holes for positioning before Z tabs formed on a rear surface of the airbag module engage with second hooks formed in the cored bar section when the airbag module is attached to the cored bar section.

30. The steering wheel according to claim 14, wherein the positioning pins have length to be inserted through the long holes for positioning before Z tabs formed on a rear surface of the airbag module engage with second hooks formed in the cored bar section when the airbag module is attached to the cored bar section.

31. The steering wheel according to claim 19, wherein the positioning pins have length to be inserted through the long holes for positioning before Z tabs formed on a rear surface of the airbag module engage with second hooks formed in the cored bar section when the airbag module is attached to the cored bar section.

Dated: this 22nd day of April 2014.

J SURESH
PATENT AGENT FOR THE APPLICANT

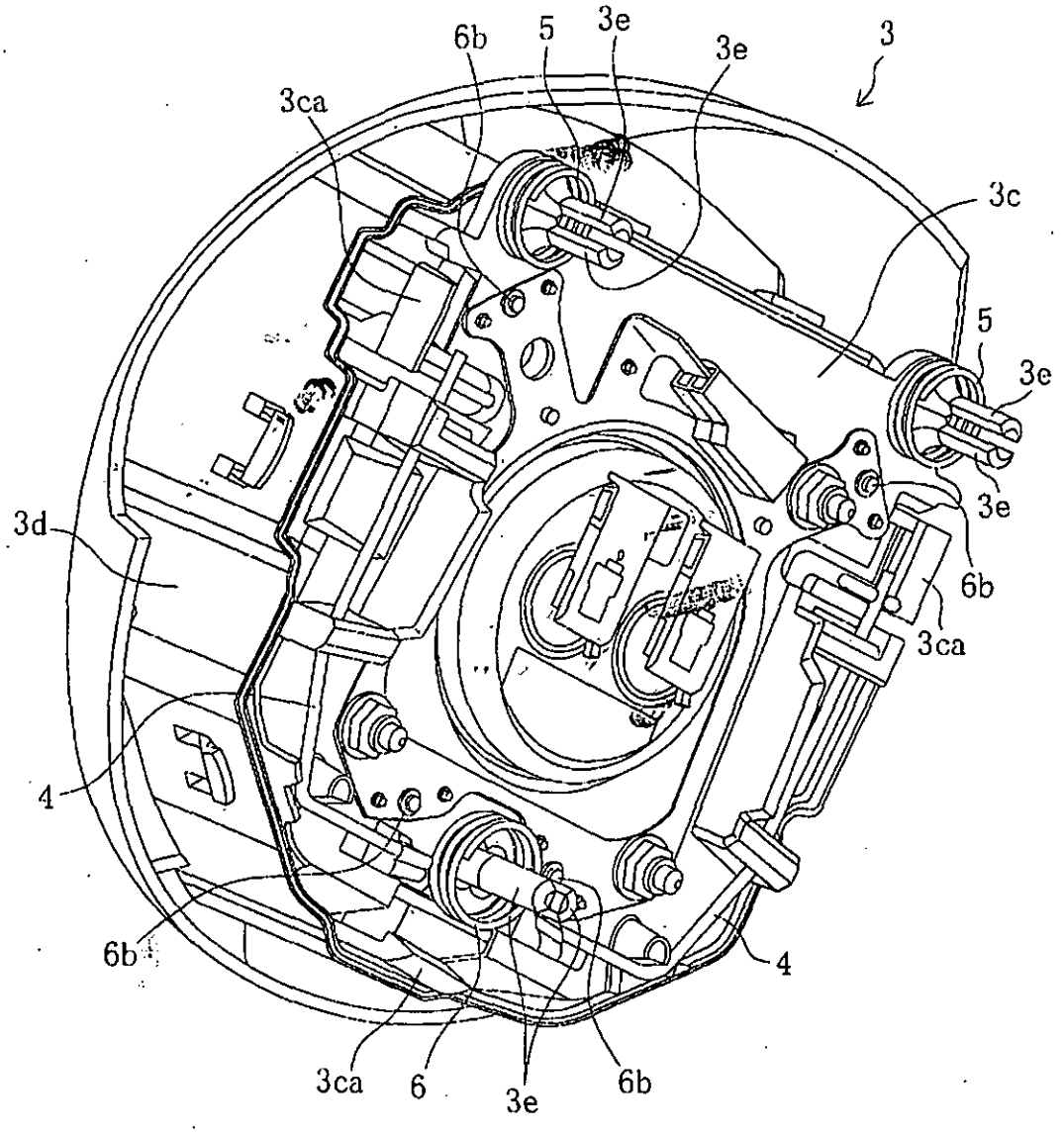

Fig.1

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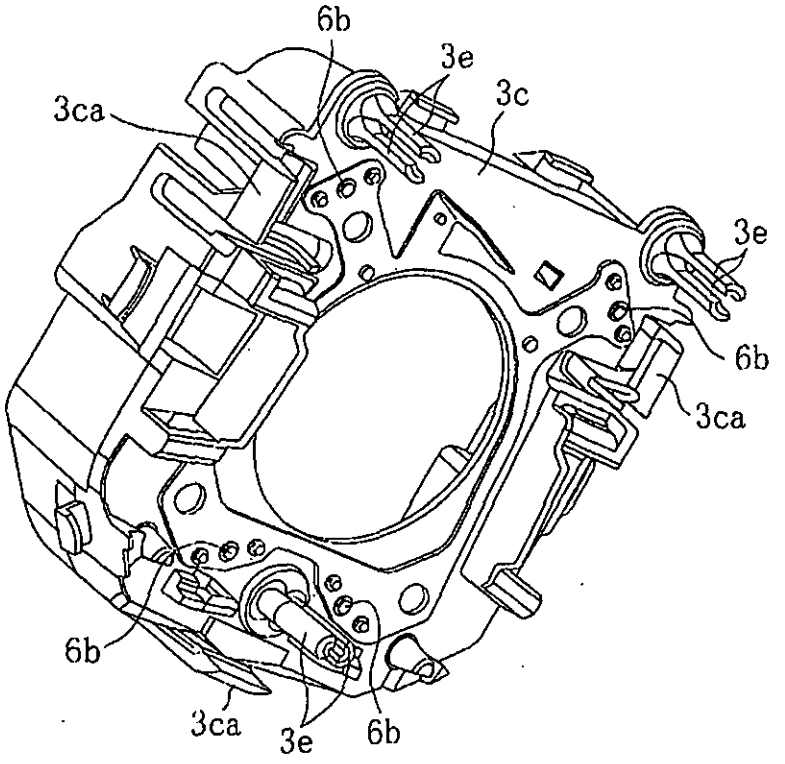

Fig.2

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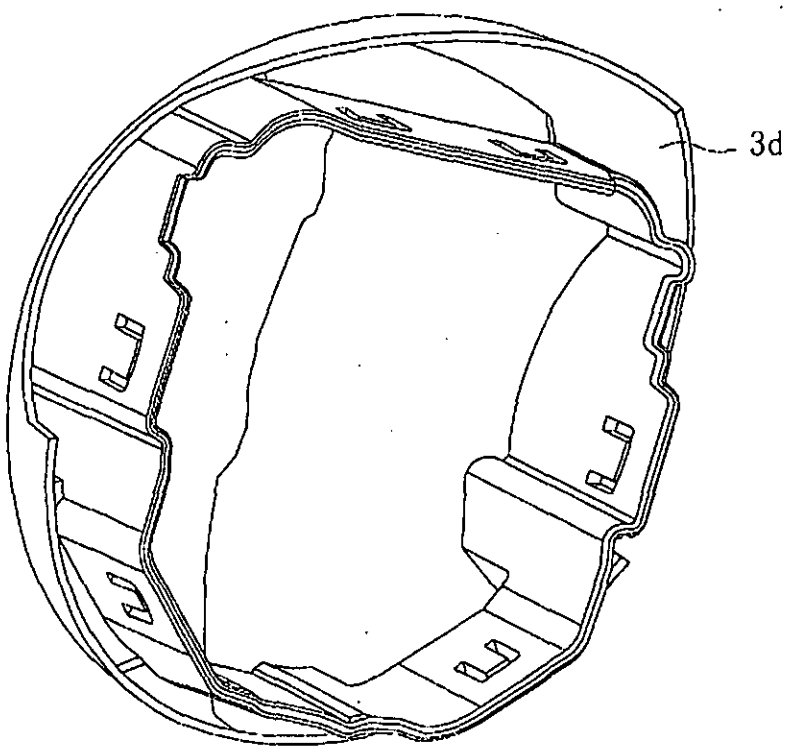

Fig.3

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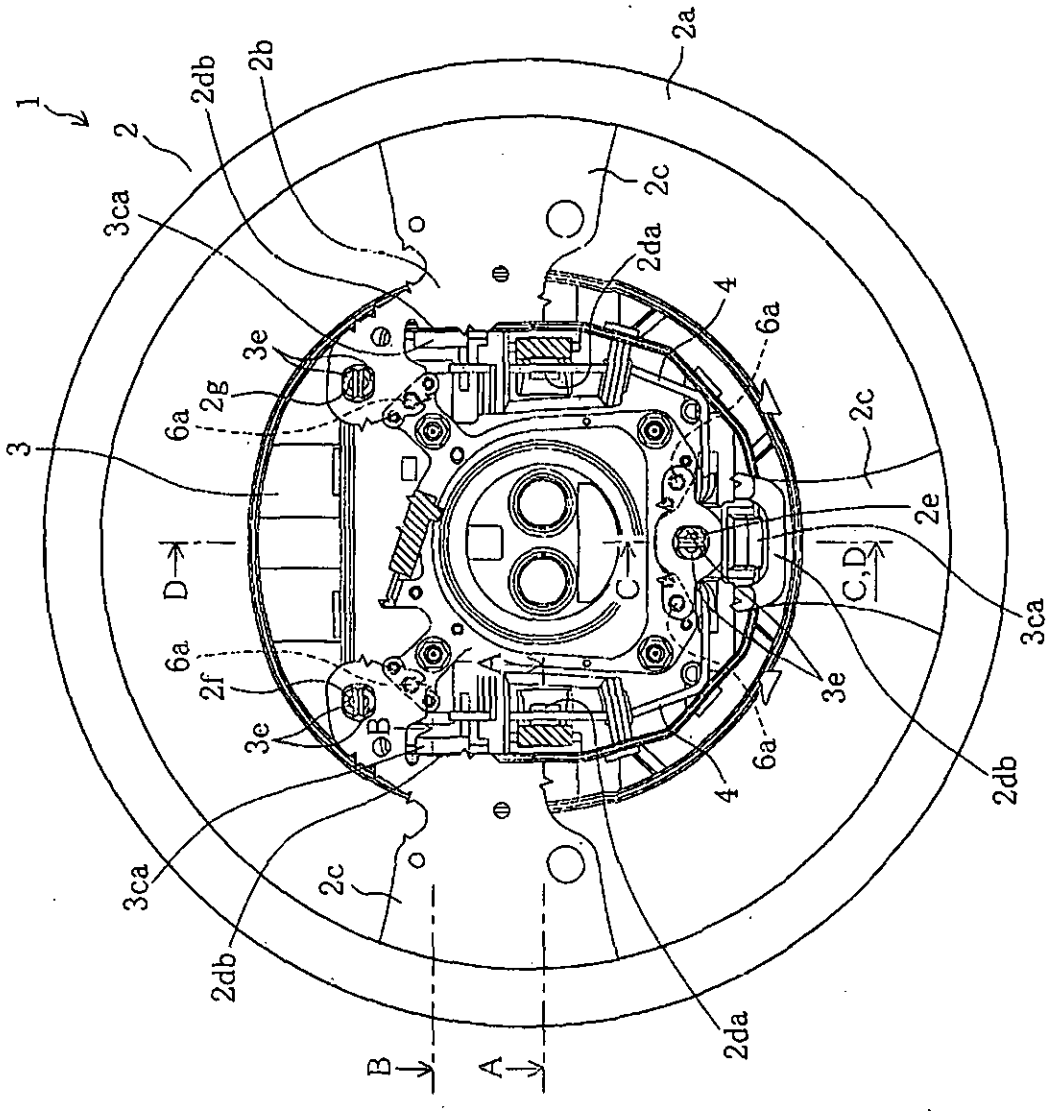

Fig.4

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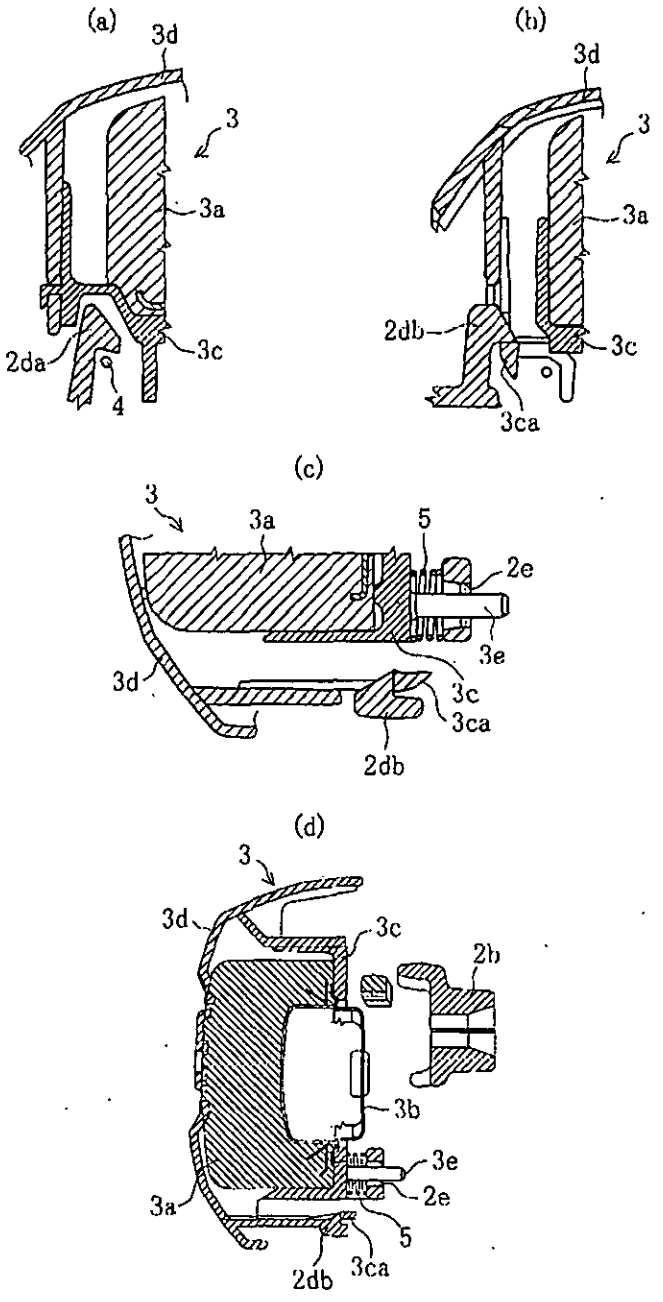

Fig.5

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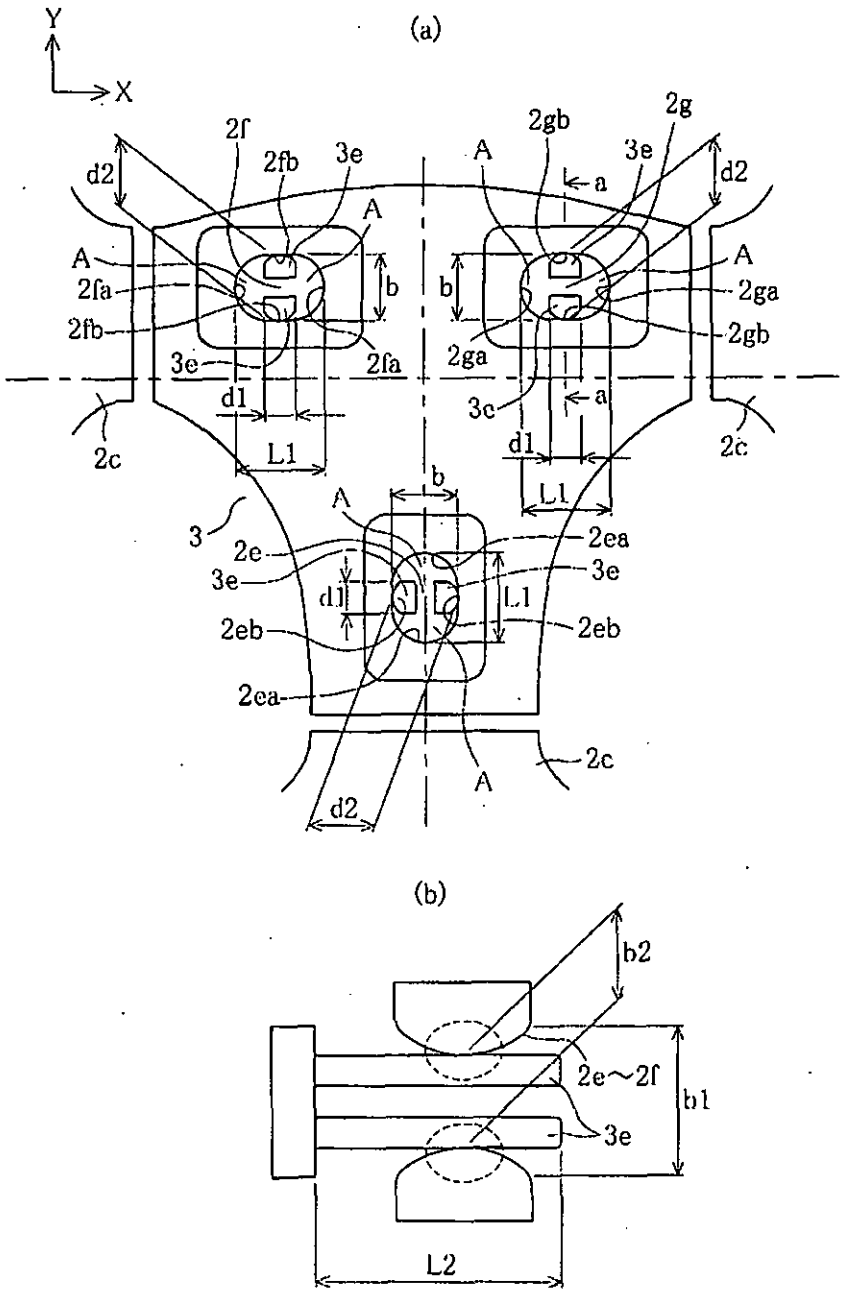

Fig.6

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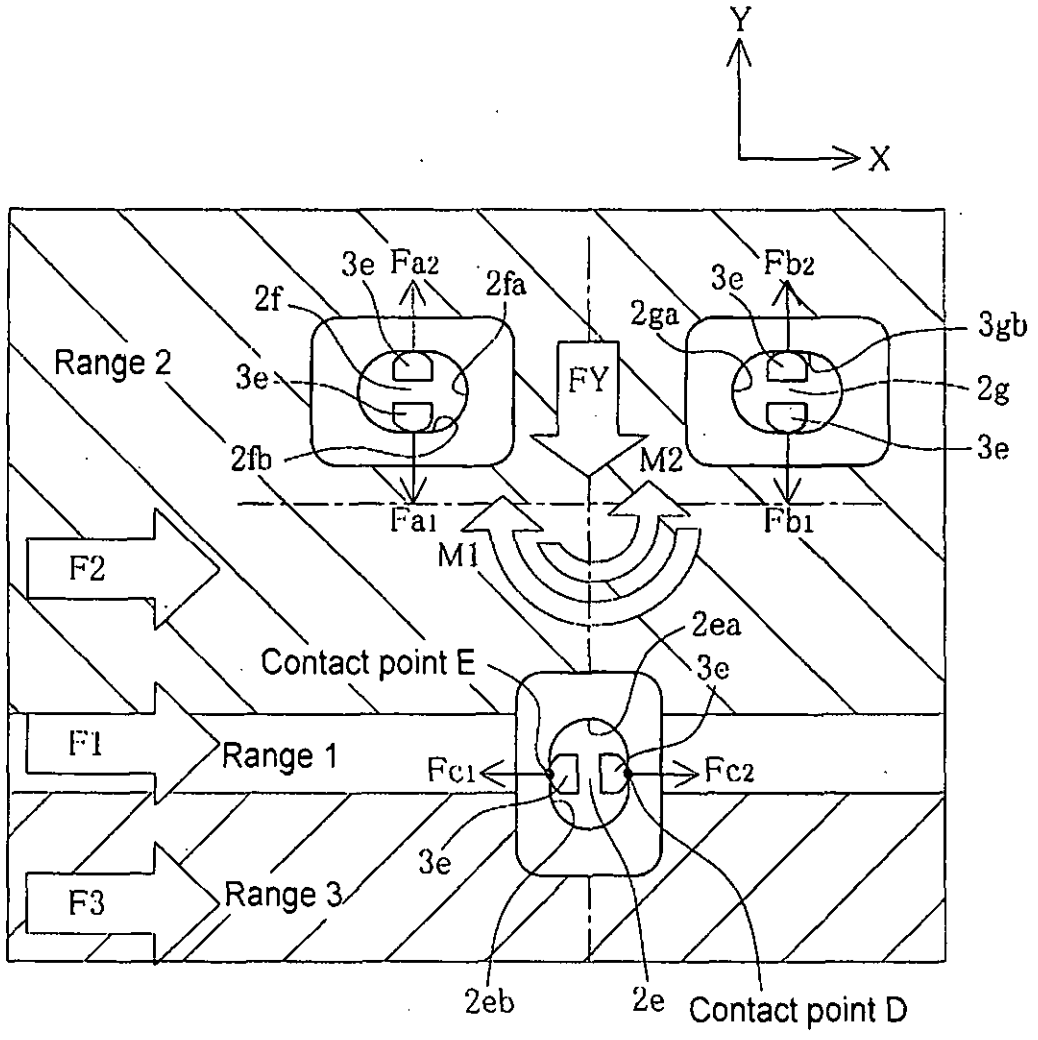

Fig.7

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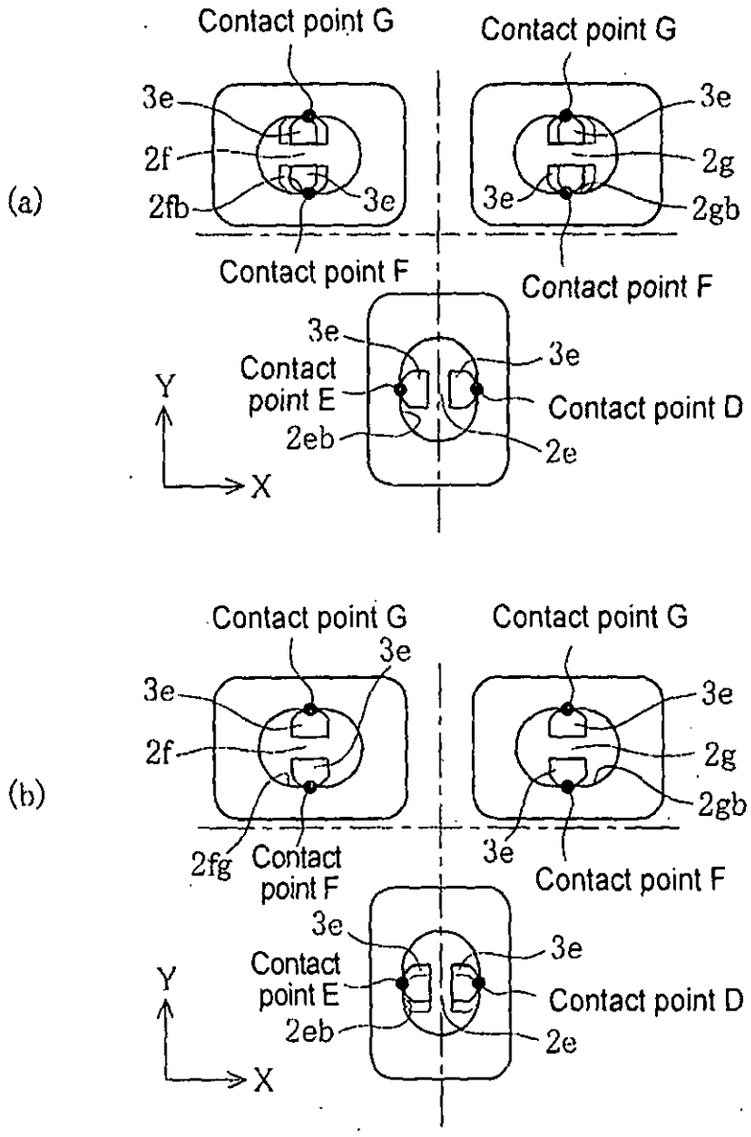

Fig.8

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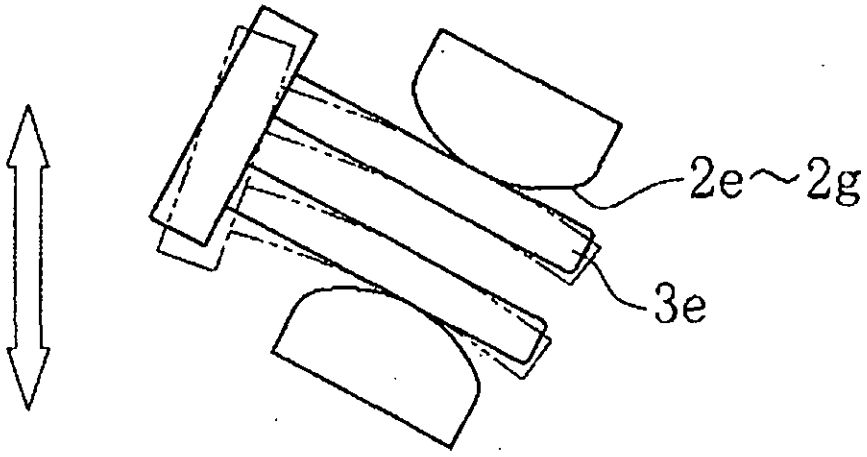

Fig.9

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DESCRIPTION

STEERING WHEEL

TECHNICAL FIELD

[0001] The present invention relates to a steering wheel of an automobile or the like including an airbag module and a horn switch device.

BACKGROUND ART

[0002] In recent years, in a steering wheel of an automobile or the like, an airbag module for ensuring safety of a driver during collision is set in addition to a horn switch device for emitting horn sound (e.g., Patent Literature 1).

[0003] In the steering wheel disclosed in Patent Literature 1, the airbag module is attached to a steering wheel cored bar by hooking, on a hook section provided in the steering wheel cored bar, a wire arranged on the rear surface side of the airbag module.

[0004] Positioning of the steering wheel is performed by, after provisionally fixing an engaging pin to a boss section provided in the steering wheel cored bar, inserting and pushing a positioning convex section formed in the airbag module into a positioning concave section formed in a supporting section of the engaging pin.

[0005] In this configuration, the airbag module is pushed down resisting an urging force of a coil spring retained by the engaging pin, whereby a fixed contact provided in the steering wheel cored bar and a moving contact provided in the airbag module come into

contact with each other, a circuit of the horn switch device is closed, and a horn sound is emitted.

[0006] However, both of the positioning convex section formed in the airbag module and the positioning concave section formed in the supporting section of the engaging pin disclosed in Patent Literature 1 have a shape obtained by cutting a distal end side of a conical shape. Therefore, there are problems enumerated below.

[0007] 1) Since a function of adjusting a dimensional error in manufacturing is absent, when a dimensional error is present, the airbag module is obliquely attached to the steering wheel cored bar. In this case, even if fitting of the positioning convex section and concave section is performed without problems, the engaging pin is tilted with respect to a through-hole provided in the boss section of the steering wheel main body. It is likely that sliding resistance, which occurs between the engaging pin and the through-hole during actuation of a horn switch, increases and hinders the actuation.

[0008] 2) When the dimensions and the shapes of a cover, which configures the airbag module, and the steering wheel change because of an ambient temperature or the like, a gap between the cover and the steering wheel sometimes becomes uneven.

[0009] Patent Literature 1: Japanese Patent Application Publication No. 2011-63167

DISCLOSURE OF THE INVENTION

[0010] A problem to be solved by the present invention is that, in the conventional positional structure for the airbag module to the steering wheel cored bar, when an dimensional error is present in the components, the airbag module is obliquely attached to the steering wheel cored bar. In this case, even if fitting of the positioning convex section and concave section is performed without problems, since the engaging pin is tilted with respect to the through-hole provided in the steering wheel main body, it is likely that sliding resistance, which occurs between the engaging pin and the through-hole during actuation of the horn switch, increases and hinders the actuation. When the dimensions and the shapes of the cover and the steering wheel change because of an ambient temperature or the like, a gap between the cover and the steering wheel sometimes becomes uneven.

[0011] The present invention has been devised to solve the problems. That is, according to the present invention, accurate positioning can be achieved even if a dimensional error is present in the components, and a gap between the cover and the steering wheel can be made uniform even if the dimensions and the shapes of the cover and the steering wheel change because of an ambient temperature or the like, whereby the problems can be solved.

[0012] That is, a steering wheel of the present invention is a steering wheel including:

a steering wheel main body;

an airbag module attached to a cored bar section configuring the steering wheel main body; and

a horn switch device that closes a circuit when the airbag module is pushed,

a plurality of airbag module long holes for positioning being provided in the cored bar section, while a plurality of positioning pins for positioning the airbag module by being inserted through the long holes for positioning being provided in the airbag module,

the steering wheel having a most important characteristic in that

the long holes for positioning have pin insertion allowed regions in longitudinal directions so as to have length in the longitudinal directions larger than the width of the positioning pins, and are arranged such that longitudinal directions of at least two of the long holes for positioning are directions different from each other, and

in a state in which the airbag module is attached to the cored bar section, the positioning pins are inserted through the long holes for positioning and at least a part of the positioning pins are in contact with side surfaces of the long holes for positioning in a direction orthogonal to the longitudinal directions.

[0013] In the present invention, the at least two positioning holes formed in the cored bar section are arranged as long holes having the pin insertion allowed regions in the longitudinal directions such that the longitudinal directions are directions different from each other. When the positioning pins formed in the airbag module are inserted through the long holes for positioning, at least a part of the positioning pins are in contact with the side surfaces

of the long holes for positioning in the direction orthogonal to the longitudinal directions. Therefore, it is possible to absorb a dimensional error in manufacturing because the positioning pins move in the long holes for positioning. An attachment position of the airbag module is naturally determined by a positional relation between the long holes for positioning and the positioning pins.

[0014] In the present invention, the positioning pins can move in the at least two positioning holes formed in the cored bar section. Therefore, it is possible to absorb a dimensional error in manufacturing of the components. An attachment position of the airbag module is naturally determined according to a positional relation between the two long holes for positioning and the positioning pins. Further, even if a dimension change is caused in the components by ambient temperature or the like, a gap between the airbag module and the steering wheel main body is made uniform.

[0015] In the present invention, at least a part of the positioning pins are in contact with the side surfaces of the long holes for positioning in the direction orthogonal to the longitudinal directions. Therefore, it is possible to support the airbag module with the positioning pins that are in contact with the side surfaces of the long holes for positioning. It is possible to reduce vibration of the airbag module.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] Fig. 1 is a perspective view of an airbag module attached to a cored bar section of a steering wheel of the present invention viewed from the rear surface side.

Fig. 2 is a perspective view of an airbag housing configuring the airbag module shown in Fig. 1 viewed from the rear surface side.

Fig. 3 is a perspective view of an airbag cover configuring the airbag module shown in Fig. 1 viewed from the rear surface side.

Fig. 4 is a view of the airbag module shown in Fig. 1 viewed from the rear surface side.

Figs. 5(a) to 5(d) are sectional views of Fig. 4, wherein Fig. 5(a) is an A-A sectional view, Fig. 5(b) is a B-B sectional view, Fig. 5(c) is a C-C sectional view, and Fig. 5(d) is a D-D sectional view.

Fig. 6(a) is a schematic diagram showing a positional relation between long holes for positioning and positioning pins in Fig. 1 and Fig. 6(b) is an a-a sectional view of Fig. 6(a).

Fig. 7 is a diagram for explaining positioning of the airbag module with respect to the cored bar section.

Fig. 8(a) is a diagram for explaining absorbing action for fluctuation in an X direction of the airbag module with respect to the cored bar section and Fig. 8(b) is a diagram for explaining absorbing action for fluctuation in a Y direction of the airbag module with respect to the cored bar section.

Fig. 9 is a diagram for explaining positioning during vibration of the airbag module with respect to the cored bar section.

DESCRIPTION OF PREFERRED EMBODIMENTS

[0017] In the case of the conventional positioning structure of the airbag module to the cored bar section, when a dimensional error is present in the components, the airbag module is obliquely attached to the cored bar section. When the dimensions and the shapes of the cover and the steering wheel change because of an ambient temperature or the like, a gap between the cover and the steering wheel sometimes becomes uneven.

[0018] The present invention solves the problems by arranging at least two long holes for positioning such that longitudinal directions thereof are directions different from each other while disposing positioning pins, which are inserted through the long holes for positioning, such that at least a part of the positioning pins are in contact with the side surfaces of the long holes for positioning in the direction orthogonal to the longitudinal directions.

Embodiment

[0019] An example of a steering wheel of the present invention is explained below with reference to the accompanying drawings.

Reference numeral 1 denotes a steering wheel. The steering wheel 1 includes a steering wheel main body 2, an airbag module 3 attached to the center of the steering wheel main body 2, and a horn switch device (not shown in the figure) (see Fig. 4).

[0020] The steering wheel main body 2 is configured from, for example, an annular rim section 2a, a cored bar section 2b made of a Mg alloy arranged in a substantially center portion of the rim section 2a,

and spoke sections 2c that couple the rim section 2a and the cored bar section 2b. The steering wheel main body 2 has a structure in which the rim section 2a is covered with a casing (see Fig. 4). On a surface of the cored bar section 2b opposed to the airbag module 3, first hooks 2da for preventing the airbag module 3 from coming off and second hooks 2db engaging with the airbag module 3 are formed (see Figs. 5(a) to 5(d)).

[0021] That is, the first hooks 2da engage with bar-like springs 4 in order to prevent an airbag from coming off to an occupant side during deployment of the airbag. At a point when the airbag module 3 is attached to the steering wheel main body 2, the first hooks 2da do not come into contact with the bar-like springs 4 even if a horn is actuated.

[0022] On the other hand, the airbag module 3 includes a folded airbag 3a, a retainer 3b that supplies high-pressure gas to the airbag 3a, an airbag housing 3c that retains the airbag 3a and the retainer 3b, and an airbag cover 3d that covers that airbag 3a, the retainer 3b, and the airbag housing 3c (see Figs. 1 to 5(d)).

[0023] In the airbag module 3, the bar-like springs 4, which can engage with the first hooks 2da, are arranged and Z tabs 3ca, which engage with the second hooks 2db, are formed on the outer circumferential side of the airbag housing 3c located on the rear surface of the airbag module 3 (see Figs. 1, 2, 4, and 5(a) to 5(d)).

[0024] In an attached state by engagement of the second hooks 2db and the Z tabs 3ca, the airbag module 3 is urged in a direction

separating from the cored bar section 2b by a spring 5 interposed between the airbag module 3 and the cored bar section 2b.

[0025] The horn switch device is configured to be actuated by pressing the airbag module 3 in the urged state resisting an urging force of the spring 5 and causing the airbag module 3 to approach the cored bar section 2b.

[0026] That is, when the airbag module 3 approaches the cored bar section 2b, a moving contact 6b provided on the rear surface of the airbag housing 3c comes into contact with a fixed contact 6a provided in the cored bar section 2b and actuates the horn switch device (see Figs. 1, 2, and 4).

[0027] Incidentally, the present invention is characterized in that positioning in attaching the airbag module 3 to the cored bar section 2b is performed by positioning holes and positioning pins having configurations explained below.

[0028] That is, in the present invention, long holes for positioning of the airbag module 3 are formed in positions in the cored bar section 2b opposed to, for example, the outer circumferential side of the airbag module 3 attached to the cored bar section 2b.

[0029] In an invention example, when the position of the steering wheel 1 in a straight forward state of a vehicle is set as a reference, one long hole 2e is arranged such that a longitudinal direction thereof is in the up-down direction on the paper surface of Figs. 6(a) and 6(b) of the steering wheel 1 viewed from the front (hereinafter referred to as Y direction). Two long holes 2f and 2g are arranged such that longitudinal directions thereof are in

the left-right direction on the paper surface in the same plane as the long hole 2e (hereinafter referred to as X direction). Note that the same plane is a plane orthogonal to a steering column (shaft).

[0030] Length L1 in the longitudinal directions of the three long holes 2e to 2g is set larger than width d1 on a side of positioning pins 3e, which are inserted through the long holes 2e to 2g, opposed to side surfaces 2ea to 2ga in the longitudinal directions such that the long holes 2e to 2g have pin insertion allowed regions A, for example, on both sides in the longitudinal directions (see Figs. 6(a) and 6(b)). Width b of the long holes 2e to 2g in a direction orthogonal to the longitudinal directions are set such that width b2 in the center portion is small with respect to width b1 on an incoming side and an outgoing side as shown in Fig. 6(b).

[0031] On the other hand, in the airbag module 3, two positioning pins 3e made of the same synthetic resin as the airbag module 3 are extended by resin molding respectively in each of positions opposed to the long holes 2e to 2g during attachment to the cored bar section 2b. When such positioning pins 3e by the resin molding are provided, the positioning pins 3e bend and absorb the movement of the airbag module 3 during horn operation as shown in Fig. 9. Therefore, it is possible to reduce a gap between the positioning pins 3e and the long holes 2e to 2g to zero. It is also possible to attenuate vibration energy generated by vibration of the vehicle and transmitted to the steering wheel 1.

[0032] The positioning pins 3e are provided such that portions divided into two are opposed to side surfaces 2eb to 2gb of the long holes

2e to 2g in a direction opposed to the longitudinal direction. In the invention example, in a state in which the airbag module 3 is attached to the cored bar section 2b, all of the two positioning pins 3e inserted through each of the long holes 2e to 2g are in contact with the side surfaces 2eb to 2gb of the long holes 2e to 2g in the direction orthogonal to the longitudinal directions.

[0033] Length L2 of the positioning pins 3e is desirably length for enabling the pins 3e to be inserted through the long holes 2e to 2g before the Z tabs 3ca engage with the second hooks 2db when the airbag module 3 is attached to the cored bar section 2b (see Fig. 5(c)).

[0034] The positioning pins 3e are formed to come into contact with the side surfaces 2eb to 2gb of the long holes 2e to 2g in the direction orthogonal to the longitudinal directions from the cross sectional centers. Length d2 between both side surfaces 2eb and 2eb, 2fb and 2fb, and 2gb and 2gb in positions of the positioning pins 3e in contact with the side surfaces 2eb to 2gb is shown in Fig. 6(a). In the invention example, such a configuration is obtained by forming the outer circumference of the positioning pins 3e in an arcuate shape. However, the configuration may be obtained by forming the outer circumference in a triangular shape.

[0035] In the steering wheel 1 of the present invention having the configuration explained above, positioning performed when an external force is applied to the airbag module 3 is explained with reference to Fig. 7. The up-down direction on the paper surface of Fig. 7, which is a figure of the steering wheel 1 viewed from

the front, is referred to as Y direction and the left-right direction on the paper surface of Fig. 7 is referred to as X direction.

[0036] (Positioning in the X direction)

When an external force F1 is applied to a range 1, in which the positioning pins 3e in the long hole 2e having the longitudinal directions in the Y direction are located, from the left side on the paper surface in the X direction, reaction Fc1 is generated on the side surface 2eb on the left side on the paper surface in the long hole 2e, with which the positioning pin 3e in contact, and keeps the position of the positioning pin 3e. Conversely, when an external force -F1 is applied to the range 1 from the right side on the paper surface in the X direction, reaction Fc2 is generated on the side surface 2eb on the right side on the paper surface in the long hole 2e, with which the positioning pin 3e is in contact, and keeps the position of the positioning pin 3e.

[0037] When an external force F2 is applied to a range 2 further upward in the Y direction than the range 1 from the left side on the paper surface in the X direction, a clockwise rotation moment M1 centering on a contact point E where the positioning pin 3e in the long hole 2e having the longitudinal direction in the Y direction and the side surface 2eb on the left side on the paper surface are in contact with each other is generated. Reactions Fa1 and Fb2 are generated by the rotation moment M1 on a side surface 2fb on the lower side of the paper surface in contact with the positioning pin 3e in the long hole 2f on the left side on the paper surface having the longitudinal direction in the X direction and on a side

surface 2gb on the upper side on the paper surface in contact with the positioning pin 3e in the long hole 2g on the right side on the paper surface having the longitudinal direction in the X direction and keep the positions of the positioning pins 3e.

[0038] Conversely, when an external force -F2 is applied to the range 2 from the right side on the paper surface in the X direction, a counterclockwise rotation moment -M1 centering on a contact point D where the positioning pin 3e in the long hole 2e having the longitudinal direction in the Y direction and the side surface 2eb on the right side on the paper surface are in contact with each other is generated. Reactions Fa2 and Fb1 are generated by the rotation moment -M1 on the side surface 2fb on the upper side of the paper surface in contact with the positioning pin 3e in the long hole 2f on the left side on the paper surface having the longitudinal direction in the X direction and on the side surface 2gb on the lower side on the paper surface in contact with the positioning pin 3e in the long hole 2g on the right side on the paper surface having the longitudinal direction in the X direction and keep the positions of the positioning pins 3e.

[0039] On the other hand, when an external force F3 is applied to a range 3 further downward in the Y direction than the range 1 from the left side on the paper surface in the X direction, a counterclockwise rotation moment M2 centering on the contact point E where the side surface 2eb of the long hole 2e having the longitudinal direction in the Y direction and the positioning pin 3e are contact with each other is generated. The reactions Fa2 and Fb1 are generated

by the rotation moment M2 on the side surface 2fb on the upper side of the paper surface in contact with the positioning pin 3e in the long hole 2f on the left side on the paper surface having the longitudinal direction in the X direction and on the side surface 2gb on the lower side on the paper surface in contact with the positioning pin 3e in the long hole 2g on the right side on the paper surface having the longitudinal direction in the X direction and keep the positions of the positioning pins 3e.

[0040] Conversely, when an external force -F3 is applied to the range 3 from the right side on the paper surface in the X direction, a clockwise rotation moment -M2 centering on the contact point D where the side surface 2eb of the long hole 2e having the longitudinal direction in the Y direction and the positioning pin 3e are in contact with each other is generated. The reactions Fa1 and Fb2 are generated by the rotation moment -M2 on the side surface 2fb on the lower side of the paper surface in contact with the positioning pin 3e in the long hole 2f on the left side on the paper surface having the longitudinal direction in the X direction and on the side surface 2gb on the upper side on the paper surface in contact with the positioning pin 3e in the long hole 2g on the right side on the paper surface having the longitudinal direction in the X direction and keep the positions of the positioning pins 3e.

[0041] (Positioning in the Y direction)

When an external force FY directed to the lower side on the paper surface in the Y direction is applied to an intermediate portion of the two long holes 2f and 2g having the longitudinal directions

in the X direction, the reactions Fa2 and Fb2 are generated on the side surfaces 2fb and 2gb on the upper side on the paper surface in contact with the positioning pins 3e in the two long holes 2f and 2g and keep the positions of the positioning pins 3e. Conversely, when an external force -FY directed to the upper side on the paper surface in the Y direction is applied to the intermediate portion of the two long holes 2f and 2g having the longitudinal directions in the X direction, the reactions Fa1 and Fb1 are generated on the side surfaces 2fb and 2gb on the lower side on the paper surface in contact with the positioning pins 3e in the two long holes 2f and 2g and keep the positions of the positioning pins 3e.

[0042] (Positioning in a rotating direction)

For example, when the clockwise external force (rotation moment) M1 is applied, the reactions Fa1 and Fb2 and the reaction Fc2 generated on the side surface 2eb on the right side on the paper surface in contact with the positioning pin 3e in the long hole 2e having the longitudinal direction in the Y direction are generated and keep the positions of the positioning pins 3e. Conversely, when the counterclockwise external force (rotation moment) -M1 is applied, the reactions Fa2 and Fb1 and the reaction Fc1 generated on the side surface 2eb on the left side on the paper surface in contact with the positioning pin 3e in the long hole 2e having the longitudinal direction in the Y direction are generated and keep the positions of the positioning pins 3e.

[0043] (Self-centering)

The reactions explained in paragraphs [0036] to [0042] are absorbed by the positioning pins 3e. Therefore, when the external forces are removed, the airbag module 3 returns to an initial setting position with a restoration force of the positioning pins 3e.

[0044] In the steering wheel 1 of the present invention that attains the positioning action, for example, when an interval between the two positioning pins 3e inserted through the two long holes 2f and 2g having the longitudinal directions in the X direction fluctuates in the X direction, the fluctuation is absorbed as explained below.

[0045] As shown in Fig. 8(a), the interval expands in both sides in the X direction with the contact point D or E of the side surface 2eb of the long hole 2e having the longitudinal direction in the Y direction and the positioning pin 3e inserted through the long hole 2e, as a fulcrum. Therefore, the fluctuation is absorbed in ranges of linear portions in the longitudinal directions of ellipses of the two long holes 2f and 2g.

[0046] When an interval between the two positioning pins 3e inserted through the two long holes 2f and 2g having the longitudinal directions in the X direction and the positioning pins 3e inserted through the long hole 2e having the longitudinal direction in the Y direction fluctuates in the Y direction, the fluctuation is absorbed as explained below.

[0047] As shown in Fig. 8(b), the interval expands in the Y direction with the contact point F or G of the side surfaces 2fb and 2gb of the two long hole 2f and 2g having the longitudinal direction in the X direction and the positioning pin 3e, as a fulcrum. Therefore,

the fluctuation is absorbed in ranges of linear portions in the longitudinal directions of an ellipse of the long hole 2e having the longitudinal direction in the Y direction.

[0048] As explained above, in the steering wheel 1 of the present invention, the positioning pins 3e move in the long holes for positioning 2e to 2g formed in the cored bar section 2b. Therefore, it is possible to absorb a dimensional error in manufacturing.

[0049] An attachment position of the airbag module 3 is naturally determined by a positional relation between the long holes for positioning 2e to 2g and the positioning pins 3e. Even if a dimensional change is caused by an ambient temperature or the like, a gap between the airbag module 3 and the steering wheel main body 2 is made uniform.

[0050] Further, at least one positioning pin 3e is in contact with the side surfaces 2eb to 2gb of any one of the long holes for positioning 2e to 2g in the direction orthogonal to the longitudinal directions. Therefore, the airbag module 3 is supported by the pin 3e that is in contact with the side surface. Therefore, the airbag module 3 can obtain the same effect as a dynamic damper that attenuates vibration of the vehicle transmitted to the steering wheel 1, and thus can reduce vibration of the steering wheel 1.

[0051] The present invention is not limited to the example explained above. It goes without saying that the embodiment may be changed as appropriate within the category of the technical idea described in claims.

[0052] That is, the steering wheel explained above is a preferred example of the present invention. Implementation modes other than the example can also be carried out or executed by various methods. In particular, unless there is a description indicating limitation in the specification of the application, the present invention is not limited to the detailed shapes, sizes, arrangements, and the like of the components shown in the accompanying drawings. The expressions and the terms used in the specification of this application are for the purpose of explanation. Unless there is a particular indication of limitation, the present invention is not limited to the expressions and the terms.

[0053] For example, in the invention example, the horn switch device is explained that is actuated by causing the airbag module 3 attached to the cored bar section 2b via the spring 5 to approach the cored bar section 2b resisting an urging force.

[0054] However, the horn switch device is not limited to the invention example and may be actuated by pushing down the airbag cover 3d of the airbag module 3, which is directly fixedly attached to the cored bar section 2b, to bring the moving contact into contact with the fixed contact.

[0055] The setting of the airbag module 3 in the cored bar section 2b is not limited to the setting by hooking, on the second hooks 2db formed in the cored bar section 2b, the Z tags 3ca attached to the airbag module 3, as in the example explained above.

[0056] For example, in the case of a horn switch device actuated by pushing down only the airbag cover 3d, the direct attachment

of the airbag module 3 to the cored bar section 2b may be performed by screws.

[0057] In the invention example, the action of, for example, absorbing the movement during the horn operation is performed by the positioning pins 3e. However, the action does not always have to be performed by the positioning pins 3e. Further, in the invention example, the three long holes 2e to 2g are provided. However, at least two long holes having different directions of longitudinal directions only have to be provided. Further, in the invention example, as the long holes for positioning, the long holes for positioning having the elliptical shape obtained by connecting both sides of the linear portions parallel to each other in the longitudinal directions with semicircles are shown. However, the long holes for positioning may be may be long holes for positioning having an oval shape as long as the pins can move while being in contact with side walls of the long holes for positioning in the longitudinal directions.

[0058] Further, in the invention example, the number of the positioning pins 3e inserted through the long holes for positioning 2e to 2g is two. However, for example, three positioning pins in total may be provided; one on the Y-direction upper side and two on the Y-direction lower side. The number of long holes for positioning can be arbitrarily set.

[0059] Further, the strengths of the positioning pins 3e inserted through three places may be the same. However, for example, the rigidity of the positioning pins 3e inserted through the lower side in the Y direction may be set high compared with the two positioning

pins 3e inserted through the upper side in the Y direction. The rigidities of the positioning pins 3e can be set as appropriate.

[0060] Further, in the invention example, the shapes of the respective positioning pins 3e corresponding to the long holes for positioning 2e to 2g are equal. However, for example, the X-direction width d2 on the lower side in the Y direction may be set large with respect to the X-direction width d2 on the upper side in the Y direction. The widths can be arbitrarily set.

[0061] Further, unlike the invention example, the cored bar section 2b does not have to be made of the Mg alloy. For example, cored bar sections made of synthetic resin, carbon fiber reinforced plastic (CFRP), other alloys, and the like may be adopted. The material of the cored bar section is not limited.

[0062] Further, in the invention example, lines extended in the longitudinal directions from the long holes 2e to 2g provided in the same plane cross one another. However, the present invention is not limited to this. For example, even if the long holes 2e to 2g are provided in different height positions (front-back direction positions on the paper surface of Figs. 6(a) and 6(b)), the lines extended in the longitudinal directions from the long holes 2e to 2g only have to cross one another when the long holes 2e to 2g are projected on the same plane. The long holes 2e to 2g may be respectively provided on planes tilted at angles.

EXPLANATION OF REFERENCE NUMERALS

[0063] 1 Steering wheel