# SHIELD SUPPORT STRUCTURE OF HELMET

## TECHNICAL FIELD

[0001]

The present invention relates to a shield support structure of a helmet.

## BACKGROUND ART

[0002]

It is known that a shield support structure of a helmet rotatably supports side parts of right and left end portions of a shield provided so as to cover a front open part of a full face helmet or an open face helmet in a direction for opening and closing the front open part with respect to both of the right and left side parts of the shell.

[0003]

In order to reduce the wind noise while running, the support structure is housed in a recessed portion provided at the side part of the shell, so that the thickness made by the base plate, the shield and the cover member which are overlapping each other does not protrude from the side part of the shell, and that the surface of the base plate constituting the outermost surface of the support structure is flush with the side part of the shell.

[0004]

The recessed portion described above is made by recessing the portion where the support structure at the side part of the shell is housed and recessing the surface of the shock absorbing liner provided inside of the shell so as to correspond to the recession of the shell, therefore, the thickness of the side part where the recessed portion is provided is thinner than the thickness of other portions of the helmet.

[0005]

Although the temple area where the arrangement part of the support shaft is disposed described above is likely to come into contact with the road surface and the like and which are likely to receive an impact when it falls, the recessed portion housing the arrangement part of the support shaft must be extended to the upper portion thereof,

and it is necessary to make a hole in the shell itself to arrange the support shaft, therefore it is inevitable to reduce the rigidity.

[0006]

In order to prevent a reduction in the rigidity of the helmet due to the thickness of the recessed portion, the following reinforcement means are adopted in general; reinforcing the portion corresponding to the recessed portion of the shell. However, it is unavoidable to increase the weight of the helmet and the cost of manufacturing of the helmet in such reinforcement means.

[0007]

The object of the present invention is, at least, to reduce the area of the recessed portion at the side part of the helmet. Accordingly, it is able to reduce the area to which the reinforcement means is appliedeven when the area to which the reinforcement means is applied is reduced, to reduce the weight of the helmet by reducing the area to which the reinforcement means is applied, and to reduce the manufacturing cost of the helmet.

[0008]

The shield support structure of the helmet with respect to the present invention includes at least the following elements to achieve the object.

[0009]

There is provided a shield support structure of a helmet for opening and closing a front open part of a shell, comprising a support mechanism, wherein the support mechanism includes a first guide part and a second guide part provided from the shell to the shield, the support mechanism rotatably supports the shield in an open and close direction at a side part of the shell, and guides an open and close operation achieved by a rotation of the shield from a fully-closed state to a fully-opened state, the first guide part includes an immovable guide part provided at the shell and a guide rail part provided at the shield to engage with the immovable guide part, and the second guide part includes a movable guide part provided at the shield and a support rail part provided at the shell to engage with the movable guide part, the guide rail part is provided at the side part of the shell and below a virtual rotational center of the shield that is set above an upper end of the shield, and is formed in an arc shape so as to be able to guide the shield to rotate based on the virtual rotational center, and the support

rail part is provided below the virtual rotational center, and extends over a moving range of the movable guide part caused by the rotation of the shield.

## BRIEF DESCRIPTION OF DRAWINGS

[0010]

Fig. 1 illustrates a side view of a helmet to which a shield support structure is applied, and shows a fully-closed state of the shield as an embodiment of the present invention.

Fig. 2 illustrates a state of the shield when the shield is rotating in the open and close direction of Fig. 1.

Fig. 3 illustrates a fully-opened state of the shield of Fig. 1.

Fig. 4 illustrates a sectional view taken along the line (IV)-(IV) of Fig. 1.

## DESCRIPTION OF EMBODIMENTS

[0011]

In the present invention, the support rail part is preferably formed in an arc shape capable of guiding the shield to rotate based on the virtual rotational center.

[0012]

A part or all of the support rail part is preferably configured in a direction for guiding the movable guide part so as to move the virtual rotational center with the rotation operation of the shield.

[0013]

A part or all of the guide rail part is preferably configured in a direction for guiding the movement of the virtual rotational center.

[0014]

The helmet hereinafter explained includes a full face helmet having a front open part, a front surface open portion, in which the face of the wearer except the jaw portion is exposed, and also includes an open face helmet in which all of the facial portion of the wearer is exposed.

[0015]

The shell hereinafter explained constitutes an outermost layer of the helmet, and is formed in a full face helmet shape and an open face helmet shape using fiber reinforced plastics, FRP, CFRP and the like, made by impregnating a reinforcing fiber material, glass fiber, carbon fiber and the like, with a thermosetting resin, epoxy resin, phenol resin and the like, or a thermoplastic resin material, polycarbonate and the like.

[0016]

The shield hereinafter explained is formed into a predetermined shape using a transparent or colored transparent thermoplastic resin material, polycarbonate and the like, having elasticity.

[0017]

In the explanation below, the front open part side is defined as a front direction, and the back side of the head of the helmet which is opposite to the front open part is defined as a back direction. A direction perpendicular to the front and back direction in a horizontal plane is defined as a right and left direction, and a direction perpendicular to the front and back direction or the right and left direction in the vertical plane is defined as an up and down direction.

[0018]

Hereinafter, a support structure of a shield 1 of a helmet A of an embodiment according to the present invention will be explained with reference to Fig. 1 to 4. The helmet shown as an example in the present embodiment is a full face helmet. It is noted that the present invention is not limited by the embodiment explained below.

[0019]

The helmet A includes a shell A1, a shock absorbing liner (not shown) provided on the inner surface of the shell A1, and a cushion body (not shown) provided on the inner surface of the shock absorbing liner and the inside of the shell A1. The shield 1 is axially supported at both of the right and left side parts outside of the shell A1 in such a manner that the shield 1 can rotate in a direction for opening and closing the front open part A2 of the shell A1.

[0020]

The shock absorbing liner described above is formed into a shape filling a space between the inner surface of the shell A1 and the head portion of the wearer using a

material having shock absorption performance (for example, styrofoam material) or a material having the shock absorption performance equivalent to the material, and includes extent of protection, the top of the head, the front of the head, the back of the head, the sides of the head defined by SNELL (Snell Memorial Foundation) or JIS (Japanese Industrial Standards).

[0021]

Hereinafter, the support structure of the shield 1 will be explained more specifically. The shield 1 is supported by a support mechanism B which rotatably supports the shield 1 at the side part of the shell A1 in an open and close direction and which guides the open and close operation of the shield 1 with the rotation from the fully-closed state of the shield 1 to the fully-opened state of the shield 1.

[0022]

The entire area of the support mechanism B including a right and left supported portions 10 of the shield 1 is covered by the cover member B1.

[0023]

While the shield 1 is guided by the support mechanism B, the shield 1 is configured to rotate in the open and close direction along the surface of the shell A1 so as to rotate base on a virtual rotational center P located at the side part of the shell A1 and located above the upper edge of the shield 1. The supported portion 10 is formed to have such a vertical width that the upper edge of the supported portion 10 is not exposed from the upper edge of the cover member B1 when the shield 1 is in the fully-closed state.

[0024]

The virtual rotational center P is configured to be at the same position as the axial center 102 of the support shaft 101 according to the support structure of a conventional shield 100 indicated by long and short dashed lines when the shield 1 is in the fully-closed state, and is configured so that the position of the virtual rotational center P moves downward when the shield 1 is in the fully-opened state (see Fig. 3).

[0025]

In accordance with the downward movement of the virtual rotational center P, the front upper edge of the shield 1 moves in a direction to come closer to the surface of the shell A1 when the shield 1 is in the fully-opened state.

[0026]

Specifically, when the shield 1 is rotated in the upward direction from the fully-closed state, the shield 1 starts to rotate substantially about the virtual rotational center P along the track guided to the contact point of the immovable guide part 20 on the first guide part 2 and the second guide part 3, and the support rail part 31 of the movable guide part 30. The upper edge of the shield 1 opens in a direction away from the shell A1, and reaches the upper limit of the rotation in such state that the shield 1 moves closer to the shell A1 from before the fully-opened state to the fully-opened state.

[0027]

The virtual rotational center P is a virtual center that is set at the side part of the shell A1. The virtual rotational center P is not physically provided unlike the support shaft 101 provided on the base plate 103 reaching the temple portion of the wearer as in the conventional example. Therefore, it is not needed to provide a recessed portion on the helmet A from the virtual rotational center P to a portion close to the upper edge of the support mechanism B, and the thickness can be ensured.

[0028]

More specifically, the virtual rotational center P is configured to be at the position coaxial to the support shaft 101 when the shield 1 is in the fully-closed state, and is configured to move downward below the support shaft 101 when the shield 1 is in the fully-opened state, therefore, the support mechanism B, the supported portion 10 and the cover member B1 are housed, and the thickness made by the overlapping thereof is reduced, and the area of the recessed portion A3 where the surface of the cover member B1 and the surface of the shell A1 are flush with each other can be configured to be smaller than the area of the recessed portion 105 housing the support structure of the conventional shield 100 and the cover member 104.

[0029]

Therefore, the area of the recessed portion A3 of the helmet A can be reduced, and in particular, the thickness in proximity to the virtual rotational center P can be ensured. This can reduce the area applied with reinforcement means such as reinforcing the portion corresponding to the recessed portion A3 of the shell A1, increasing the expansion ratio of the shock absorbing liner, and reinforcing the shock absorbing liner.

By reducing the area of the reinforcement means, the weight of the helmet A can be reduced, and the cost of manufacturing of the helmet A can be reduced.

[0030]

Hereinafter, the support mechanism B for guiding and supporting the rotation of the shield 1 about the virtual rotational center P will be explained specifically. The support mechanism B includes the first guide part 2 and the second guide part 3 provided to extend from the shell A1 to the shield 1.

[0031]

The first guide part 2 includes the immovable guide part 20 provided at the side part of the shell A1 and the guide rail part 21 provided at the side of the shield 1, and the guide rail part 21 is engaged with the immovable guide part 20.

[0032]

The immovable guide part 20 is a shaft-like member provided on the base plate A4 attached to the side part of the shell A1 so as to protrude toward the outside in the right and left direction.

[0033]

The base plate A4 is provided with an attaching and detaching mechanism C of the shield 1 below the first guide part 2 and the second guide part 3, and the shield 1 can be detached by operating the attaching and detaching C in the fully-opened state.

[0034]

The guide rail part 21 is an elongate hole opened in the arc shape in a shape along the rotation track of the shield 1 in the open and close direction, and when the guide rail part 21 is engaged with the immovable guide part 20, the guide rail part 21 is configured to guide the rotation of the shield 1 along the arc of the guide rail part 21 in the open and close direction while the shield 1 is supported by the immovable guide part 20.

[0035]

The length of the guide rail part 21 in the longitudinal direction is such a length that, when the shield 1 is in the fully-closed state (see Fig. 1), the front end comes into contact with the immovable guide part 20, so that this prevents the shield 1 from rotation in the

close direction beyond the fully-closed state of the shield 1, and when the shield 1 is in the fully-opened state (see Fig. 3), the rear end comes into contact with the immovable guide part 20, so that this prevents the shield 1 from rotation in the open direction beyond the fully-opened state of the shield 1.

[0036]

The second guide part 3 includes the movable guide part 30 provided on the inner surface (surface opposed to the shell A1) of the shield 1 and the support rail part 31 provided at the side part of the shell A1, and the movable guide part 30 is configured to engage with the support rail part 31.

[0037]

The movable guide part 30 is a shaft-like member provided on the shield 1 to protrude to the inner side in the right and left direction (at the shell A1).

[0038]

The support rail part 31 includes a long groove portion 31A provided in the arc shape in a shape for supporting the rotation of the shield 1 in the open and close direction which is achieved by the immovable guide part 20 and the guide rail part 21, and includes an inclined portion 31B provided continuously at the front end of the long groove portion 31A.

[0039]

The movable guide part 30 is engaged with the support rail part 31, so that the support rail part 31 supports the rotation of the shield 1 along the arc of the guide rail part 21 in the open and close direction of the shield 1 while the movable guide part 30 is supported.

[0040]

This second guide part 3 supports the rotation of the shield 1 along the arc of the guide rail part 21 in the open and close direction of the shield 1, so that when the shield 1 rotates when it is opened and closed, the immovable guide part 20 prevents the shield 1 from rotating while the immovable guide part is the axial center, and the shield 1 can rotate normally about the virtual rotational center P in the open and close direction.

[0041]

The length of the support rail part 31 in the longitudinal direction is such a length that, when the shield 1 is in the fully-closed state (see Fig. 1), the movable guide part 30 comes into contact with the rear end of the long groove portion 31A, so that this prevents the shield 1 from rotating in close direction beyond the fully-closed state of the shield 1, and when the shield 1 is in the fully-opened state (see Fig. 3), the movable guide part 30 comes into contact with the front end of the inclined portion 31B, so that this prevents the shield 1 from rotating in the open direction beyond the fully-opened state of the shield 1.

[0042]

The long groove portion 31A is formed in the arc shape about the virtual rotational center P, and with the guide rail part 21 and the support rail part 31, the rotation operation of the shield 1 in the open and close direction can be made smoothly.

[0043]

The inclined portion 31B is formed to incline downward. The downward inclination direction of the inclined portion 31B is a direction for moving the movable guide part 30 according to the movement in which the upper edge at the front of the shield 1 comes closer to the surface of the shell A1 within a range from when the shield 1 is being rotated in the opening direction (see Fig. 2) to when the shield is in the fully-opened state (see Fig. 3).

[0044]

In the above explanation, all of (the entire length of) the guide rail part 21 is set in a direction for guiding the movement of the virtual rotational center P. Alternatively, a part of the guide rail part 21 may be set in a direction for guiding the movement of the virtual rotational center P.

[0045]

In the above explanation, the front end of the support rail part 31 is set as the inclined portion 31B in a direction for guiding the movable guide part 30 so as to move the virtual rotational center P according to the rotation operation of the shield 1. Alternatively, the inclined portion 31B may not be provided, and all of, the entire length of the support rail part 31 may be set in a direction for guiding the movable guide part 30 while moving the virtual rotational center P according to the rotation operation of the shield 1.

[0046]

In the above explanation, the shape of the long groove portion 31A is shown as the arc shape. But this shape may be any shape as long as it is a shape capable of guiding the movable guide part 30 while moving the virtual rotational center P according to the rotation operation of the shield 1.

[0047]

In the above explanation, the virtual rotational center P is configured to rotate when the shield 1 rotates in the open and close direction. Alternatively, the virtual rotational center P may be configured not to move when the shield 1 rotates in the open and close direction.

[0048]

According to the first guide part 2 and the second guide part 3, the shield 1 can be rotated normally in the open and close direction without requiring the support shaft 101 for supporting the conventional shield 100.

[0049]

According to the support mechanism B explained above, the center of rotation of the shield 1 is defined as the virtual rotational center P that is set at the side part of the shell A1, and the first guide part 2 and the second guide part 3 for guiding and supporting the rotation of the shield 1 in the open and close direction is provided below the virtual rotational center P, therefore, the area of the recessed portion A3 at the side part of the helmet A can be reduced.

[0050]

In addition, even when the attaching and detaching mechanism C is provided on the base plate A4, it is possible to use the small base plate A4 which is smaller than the conventional base plate 103, therefore, the area of the cover member B1 can be reduced as compared with the conventional example. Therefore, the wind noise caused by the cover member B1 can be reduced while the motorcycle is running, and in addition, the weight of the helmet A can be reduced, and the design can be improved.

[0051]

Further, the shield 1 is basically supported by two shafts which are the immovable guide part 20 and the movable guide part 30, and as described above, the guide rail part 21 and the support rail part 31 can be provided to draw a certain arc so as to define the virtual rotational center P. However, the embodiment is not limited thereto. The guide rail part 21 and the support rail part 31 can set any given track. For example, the virtual rotational center P may be configured to move at all times according to the rotation of the shield 1, or the track may be a combination of straight lines, so that opening and closing of the shield 1 can be supported.

REFERENCE SIGNS LIST

[0052]
A: helmet
A1: shell
B: support mechanism
P: virtual rotational center
1: shield
2: first guide part
3: second guide part
20: immovable guide part
21: guide rail part
30: movable guide part
31: support rail part

CLAIMS

[Claim 1]

A shield support structure of a helmet for opening and closing a front open part of a shell,

comprising a support mechanism,

wherein the support mechanism includes a first guide part and a second guide part provided from the shell to the shield, the support mechanism rotatably supports the shield in an open and close direction at a side part of the shell, and guides an open and close operation achieved by a rotation of the shield from a fully-closed state to a fully-opened state,

the first guide part includes an immovable guide part provided at the shell and a guide rail part provided at the shield to engage with the immovable guide part, and the second guide part includes a movable guide part provided at the shield and a support rail part provided at the shell to engage with the movable guide part,

the guide rail part is provided at the side part of the shell and below a virtual rotational center of the shield that is set above an upper end of the shield, and is formed in an arc shape so as to be able to guide the shield to rotate based on the virtual rotational center, and

the support rail part is provided below the virtual rotational center, and extends over a moving range of the movable guide part caused by the rotation of the shield.

[Claim 2]

The shield support structure of the helmet according to claim 1, wherein the support rail part is formed in an arc shape capable of guiding the shield to rotate based on the virtual rotational center.

[Claim 3]

The shield support structure of the helmet according to claim 1 or 2, wherein a part or all of the support rail part is configured in a direction for guiding the movable guide part so as to move the virtual rotational center with the rotation operation of the shield.

[Claim 4]

The shield support structure of the helmet according to claim 3, wherein a part or all of the guide rail part is configured in a direction for guiding the movement of the virtual rotational center.