

DESCRIPTION

Title of the Invention: EYEGLASSES FRAME

TECHNICAL FIELD

[0001]

The present invention relates to an eyeglasses frame.

BACKGROUND ART

[0002]

There is a technique aiming at betterment of safety and the like for a wearer and prevention of damage to an eyeglasses frame in the case in which an external force such as shock acts on the eyeglasses frame because of exercise or the like (see, for example, Patent Document 1).

Citation List

Patent Document

[0003]

Patent Document 1: Japanese Unexamined Patent Application, Publication No. 2023-157908

DISCLOSURE OF THE INVENTION

Problems to be Solved by the Invention

[0004]

However, further improvement of the betterment of safety and the like for the wearer and the prevention of damage to the eyeglasses frame has been demanded.

[0005]

The present invention has been made in view of such a situation, and an object of the present invention is to improve safety of a wearer and performance for preventing damage to an eyeglasses frame.

Means for Solving the Problems

[0006]

In order to achieve the object, an eyeglasses frame according to an aspect of the present invention is an eyeglasses frame including: a pair of rims that fixes lenses; a bridge that connects the pair of rims; and a temple connected to the rims via a endpiece, wherein the eyeglasses frame includes an outer shell section and an inner shell section that is softer than the outer shell section and is provided at least in a part on an inner side of the outer shell section, and the inner shell section includes a temple inner shell section provided on the inner side of the temple of the outer shell section.

Effects of the Invention

[0007]

According to the present invention, it is possible to improve safety of a wearer and performance for preventing damage to the eyeglasses frame.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

FIG. 1 is a perspective view illustrating an overall image of eyeglasses to which an eyeglasses frame in an embodiment according to the present invention is applied;

FIG. 2 is a perspective view illustrating the overall image of the eyeglasses to which the eyeglasses frame in the embodiment according to the present invention is applied, the perspective view illustrating the overall image from a direction different from a direction in FIG. 1;

FIG. 3 is a front view of the eyeglasses illustrating in FIG. 1 and FIG. 2;

FIG. 4 is a plan view of the eyeglasses illustrated in FIG. 1 and FIG. 2;

FIG. 5 is a reference diagram illustrating further cut sections and signs in the plan view of the eyeglasses illustrated in FIG. 4;

FIG. 6 is a bottom view of the eyeglasses illustrated in FIG. 1 and FIG. 2;

FIG. 7 is a left side view of the eyeglasses illustrated in FIG. 1 and FIG. 2;

FIG. 8 is a rear view of the eyeglasses illustrated in FIG. 1 and FIG. 2;

FIG. 9 is an A-B-C-D line combined sectional view of the eyeglasses illustrated in FIG. 4;

FIG. 10 is an E-E line sectional view of the eyeglasses illustrated in FIG. 5;

FIG. 11 is an F-F line sectional view of the eyeglasses illustrated in FIG. 5; and

FIG. 12 is a G-G line sectional view of the eyeglasses illustrated in FIG. 7.

PREFERRED MODE FOR CARRYING OUT THE INVENTION

[0009]

An embodiment of the present invention is explained below with reference to the drawings. First, an overall image of eyeglasses to which an eyeglasses frame in an embodiment according to the present invention is applied is explained with reference to FIG. 1 and FIG. 2.

[0010]

Note that, in explanation of the eyeglasses frame in the embodiment according to the present invention, directions defined as follows are used unless specifically noted otherwise. That is, a three-dimensional orthogonal coordinate system including an axis X, an axis Y, and an axis Z explained below is used.

[0011]

When the eyeglasses frame is worn on a wearer facing the eyeglasses, the axis X is set in the left-right direction for the wearer. A direction on the left for the wearer is referred to as "axis X positive direction" and a direction opposite to the axis X positive direction is referred to as "axis X negative direction". The axis Y is set in the front-rear direction for the wearer. A direction in the front for the wearer is referred to as "axis Y negative direction" and a direction opposite to the axis Y negative direction is

referred to as "axis Y positive direction". The axis Z is set in the up-down direction for the wearer, that is, the gravity acting direction. A direction (the upward direction) opposite to the gravity acting direction is referred to as "axis Z positive direction" and a direction (the downward direction) opposite to the axis Z positive direction is referred to as "axis Z negative direction".

[0012]

The axis Y negative direction is referred to as "front side" as appropriate, the axis Y positive direction is referred to as "rear side" as appropriate, the axis Z positive direction is referred to as "upper side" as appropriate, and the axis Z negative direction is referred to as "lower side" as appropriate. In an X-Y plane, a direction away from the head of the wearer is referred to as "outer side" as appropriate and a direction opposite to the outer side is referred to as inner side as appropriate.

[0013]

Note that the eyeglasses frame in the present embodiment has a shape symmetrical in the axis X direction based on a Y-Z plane. Thus, in the following explanation, about parts configuring the eyeglasses and respectively provided on the left and the right of the wearer, parts on the left side for the wearer are explained with a sign L added thereto and parts on the right side for the wearer are explained with a sign R added thereto.

[0014]

<Overall image>

FIG. 1 is a perspective view illustrating an overall image of the eyeglasses to which the eyeglasses frame in the embodiment according to the present invention is applied. FIG. 2 is a perspective view illustrating the overall image of the eyeglasses to which the eyeglasses frame in the embodiment of the present invention is applied, the perspective view illustrating the overall image from a direction different from a direction in FIG. 1.

[0015]

A eyeglasses frame 1 includes rims 11R and 11L, a bridge 12, endpieces 13R and 13L, and temples 14R and 14L.

[0016]

Here, the eyeglasses frame 1 in the present embodiment is integrally molded using a thermoplastic resin rubber elastic body (TPE: Thermoplastic elastomer). That is, the rims 11R and 11L, the bridge 12, the endpieces 13R and 13L, and the temples 14R and 14L are integral and inseparable. In the following explanation, for convenience of explanation, the integral and inseparable eyeglasses frame is divided into respective parts of the rims 11R and 11L, the bridge 12, the endpieces 13R and 13L, and the temples 14R and 14L and explained. In the figures, auxiliary lines dividing the respective parts are illustrated with signs starting from S added thereto.

[0017]

The eyeglasses frame 1 in the present embodiment is simultaneously integrally molded by double injection molding

using two thermoplastic resin rubber elastic bodies having different hardnesses. As explained in detail below, an outer shell section of the eyeglasses frame 1 is molded by a hard thermoplastic resin rubber elastic body. An inner shell section of the eyeglasses frame 1 is molded by a thermoplastic resin rubber elastic body softer compared with the outer shell section. That is, the outer shell section and the inner shell section are integrally and inseparably molded using two thermoplastic resin rubber elastic bodies having different hardnesses. As explained above, no metal is used as the material of the eyeglasses frame 1. Accordingly, safety of the wearer and the like is improved. In the present embodiment, the outer shell section of the eyeglasses frame 1 includes rim outer shell sections 11RO and 11LO, a bridge outer shell section 12O, the endpieces 13R and 13L, and temple outer shell sections 14RO and 14LO. The inner shell section of the eyeglasses frame 1 includes rim inner shell sections 11RI and 11LI, a bridge inner shell section 12I, and temple inner shell sections 14RI and 14LI.

[0018]

Note that, in the following explanation, the outer shell sections molded by a hard thermoplastic resin rubber elastic body are explained with a sign O further added to the signs of the sections and the inner shell sections molded by a thermoplastic resin rubber elastic body softer compared with the outer shell sections are explained with a sign I further added to the signs of the sections.

[0019]

Each of the rims 11R and 11L is a part of the eyeglasses frame 1 that surrounds and fixes each of the lenses LR and LL.

[0020]

The rim 11R includes the rim inner shell section 11RI and the rim outer shell section 11RO. The rim 11L includes a rim inner shell section 11LI and a rim outer shell section 11LO. As illustrated in FIG. 1, the rim inner shell sections 11RI and 11LI include pluralities of bottomed holes. Specific structures of the rim inner shell sections 11RI and 11LI and the rim outer shell sections 11RO and 11LO of the rims 11R and 11L and advantages by having the structures are explained below. Note that, in the following explanation, when it is unnecessary to individually distinguish the rims 11R and 11L, the rims 11R and 11L are collectively referred to as "rims 11".

[0021]

The bridge 12 connects the pair of rims 11R and 11L. The bridge 12 is connected to the rim 11R via a part indicated by an auxiliary line S1 and is connected to the rim 11L via a part indicated by an auxiliary line S4 to connect the pair of rims 11R and 11L.

[0022]

The bridge 12 includes the bridge inner shell section 12I and the bridge outer shell section 12O. As illustrated in FIG. 1, the bridge inner shell section 12I includes a plurality of apertures piercing in the up-down direction or a plurality of

bottomed holes. Specific structures of the bridge inner shell section 12I and the bridge outer shell section 12O of the bridge 12 and advantages by having the structures are explained below.

[0023]

Each of the endpieces 13R and 13L connects each of the rims 11R and 11L and each of the temples 14R and 14L explained below. The endpiece 13R is connected to the rim 11R via a part indicated by an auxiliary line S2 and connected to the temple 14R via a part indicated by an auxiliary line S3 to connect the rim 11R and the temple 14R. The endpiece 13L is connected to the rim 11L via a part indicated by an auxiliary line S5 and connected to the temple 14L via a part indicated by an auxiliary line S6 to connect the rim 11L and the temple 14L.

[0024]

The endpieces 13R and 13L respectively include recesses 13R-C and 13L-C recessed from the outer side toward the inner side of the eyeglasses frame. Since the endpieces 13R and 13L respectively include the recesses 13R-C and 13L-C, even if the temples 14 are deformed in any one of a closing direction (a direction in which the end portions in the axis Y positive direction are brought into contact with each other) and an opening direction (a direction in which the end portions in the axis Y positive direction are separated from each other), the temples 14 are flexibly deformed and do not cause a crack and the like. Note that, in the following explanation, when it is unnecessary to individually distinguish the endpieces 13R

and 13L, the endpieces 13R and 13L are collectively referred to as "endpieces 13".

[0025]

Each of the temples 14R and 14L is connected to each of the rims 11R and 11L via each of the endpieces 13R and 13L. The temple 14R is connected to the endpiece 13R via the part indicated by the auxiliary line S3. The endpiece 13R is connected to the rim 11R via the part indicated by the auxiliary line S2. The temple 14L is connected to the endpiece 13L via the part indicated by the auxiliary line S6. The endpiece 13L is connected to the rim 11L via the part indicated by the auxiliary line S5.

[0026]

The temple 14R includes the temple inner shell section 14RI and the temple outer shell section 14RO. The temple 14L includes the temple inner shell section 14LI and the temple outer shell section 14LO. As illustrated in FIG. 1, the temple inner shell sections 14RI and 14LI include a plurality of apertures piercing in the up-down direction or a plurality of bottomed holes. Specific structures of the temple inner shell sections 14RI and 14LI and the temple outer shell sections 14RO and 14LO of the temples 14R and 14L and advantages by having the structures are explained below. Note that, in the following explanation, when it is unnecessary to individually distinguish the temples 14R and 14L, the temples 14R and 14L are referred to as "temples 14".

[0027]

The overall image of the eyeglasses to which the eyeglasses frame 1 in the embodiment according to the present invention is applied is explained above with reference to FIG. 1 and FIG. 2.

[0028]

<Detailed structure>

A detailed structure of the eyeglasses to which the eyeglasses frame 1 in the embodiment according to the present invention is applied is explained with reference to FIG. 3 to FIG. 7 in addition to FIG. 1 and FIG. 2.

[0029]

FIG. 3 is a front view of the eyeglasses illustrated in FIG. 1 and FIG. 2. FIG. 4 is a plan view of the eyeglasses illustrated in FIG. 1 and FIG. 2. FIG. 5 is a reference diagram illustrating further cut sections and signs in the plan view of the eyeglasses illustrated in FIG. 4. FIG. 6 is a bottom view of the eyeglasses illustrated in FIG. 1 and FIG. 2. FIG. 7 is a left side view of the eyeglasses illustrated in FIG. 1 and FIG. 2. FIG. 8 is a rear view of the eyeglasses illustrated in FIG. 1 and FIG. 2. Note that a right side view is omitted because the right side view is symmetrical to the left side view.

[0030]

As illustrated in FIG. 1, FIG. 2, and the like, the rim inner shell sections 11RI and 11LI of the rims 11 include holes having bottoms recessed in the upward or downward direction (hereinafter referred to as bottomed holes).

[0031]

Specifically, for example, on an upper edge side 11RI-ST of the rim inner shell section 11RI of the rim 11R, a plurality of bottomed holes recessed from the upper side toward the lower side are formed along the left-right direction (the X direction). Similarly, on an upper edge side 11LI-ST of the rim inner shell section 11LI of the rim 11L, a plurality of bottomed holes recessed from the upper side toward the lower side are formed along the left-right direction. Here, the upper edge sides 11RI-ST and 11LI-ST of the rim inner shell sections 11RI and 11LI respectively refer to portions of edges that are sides in the axis Z positive direction of the rims 11R and 11L.

[0032]

On a lower edge side 11RI-SB of the rim inner shell section 11RI of the rim 11R, a plurality of bottomed holes recessed from the lower side toward the upper side are formed along the left-right direction (the axis X direction). Similarly, on a lower edge side 11LI-SB of the rim inner shell section 11LI of the rim 11L, a plurality of bottomed holes recessed from the lower side to the upper side are formed along the left-right direction. Here, the lower edge sides 11RI-SB and 11LI-SB of the rim inner shell sections 11RI and 11LI respectively refer to portions of edges that are sides in the axis Z negative direction of the rims 11R and 11L.

[0033]

In an upper surface 12I-ST of the bridge inner shell

section 12I of the bridge 12, a plurality of apertures piercing in the up-down direction are formed.

[0034]

In the temple inner shell section 14RI of the temple 14R, a plurality of apertures piercing in the up-down direction are formed along the longitudinal direction of the temple 14R. Similarly, in the temple inner shell section 14LI of the temple 14L, a plurality of apertures piercing in the up-down direction are formed along the longitudinal direction of the temple 14L. Here, the longitudinal directions of the temple inner shell sections 14RI and 14LI respectively refer to substantial axis Y directions of the temples 14R and 14L.

[0035]

Here, a structure of the plurality of apertures piercing in the up-down direction included in the temples 14 and advantages by having the structure are explained.

[0036]

As illustrated in FIG. 1 to FIG. 4, the temple inner shell section 14RI of the temple 14R includes a surface 14RI-ST on the upper side, a surface 14RI-SI on the inner side, and a surface 14RI-SB on the lower side. Note that the surface 14RI-ST on the upper side and the surface 14RI-SB on the lower side are smoothly connected as one surface at an end in the axis Y positive direction (a +Y side end portion) of the temple 14R. Similarly, the temple inner shell section 14LI of the temple 14L includes a surface 14LI-ST on the upper side, a surface 14LI-SI on the inner side, and a surface 14LI-SB on

the lower side. The surface 14LI-ST on the upper side and the surface 14LI-SB on the lower side are smoothly connected as one surface at an end in the axis Y positive direction (a +Y side end portion) of the temple 14L.

[0037]

In the temple inner shell section 14RI, as illustrated in FIG. 1, FIG. 2, and the like, a plurality of apertures are formed along the longitudinal direction of the temple 14R to pierce from the surface 14RI-ST on the upper side toward the surface 14RI-SB on the lower side of the temple inner shell section 14RI. Similarly, in the temple inner shell section 14LI, a plurality of apertures are formed along the longitudinal direction of the temple 14R to pierce from the surface 14RI-ST on the upper side toward the surface 14RI-SB on the lower side of the temple inner shell section 14RI.

[0038]

As illustrated in FIG. 5, each of the plurality of apertures adjacent to one another of the temple inner shell section 14RI is formed to be partitioned by each of wall sections 14RI-W1 to 14RI-W6. Each of the wall sections 14RI-W1 to 14RI-W6 is inclined from the front side (the -Y side) to the rear side (the +Y side) toward the inner side from the outer side of the eyeglasses frame 1. Note that, in the following explanation, when it is unnecessary to individually distinguish the wall sections 14RI-W1 to 14RI-W6, the wall sections 14RI-W1 to 14RI-W6 are collectively referred to as "wall sections 14RI-W". Similarly, each of the plurality of

apertures adjacent to one another of the temple inner shell section 14LI is formed to be partitioned by each of wall sections 14LI-W1 to 14LI-W6. Each of the wall sections 14LI-W1 to 14LI-W6 is inclined from the front side (the -Y side) to the rear side (the +Y side) toward the inner side from the outer side of the eyeglasses frame 1. Note that, in the following explanation, when it is unnecessary to individually distinguish the wall sections 14LI-W1 to 14LI-W6, the wall sections 14LI-W1 to 14LI-W6 are collectively referred to as "wall sections 14LI-W".

[0039]

Here, for example, it is assumed that a predetermined object, for example, has collided with the temple 14R from the axis X negative direction toward the axis X positive direction and shock has been applied to the temple 14R. In this case, the temple 14R and the like of the eyeglasses frame 1 are deformed. Specifically, for example, first, the surface 14RI-SI on the inner side of the temple inner shell section 14RI comes into contact with the wearer. As explained above, the temple inner shell section 14R is formed by the thermoplastic resin rubber elastic body softer compared with the outer shell section. For that reason, after coming into contact with the wearer, the temple inner shell section 14RI is deformed earlier compared with the temple outer shell section 14RO. Since the plurality of apertures are formed in the temple inner shell section 14RI as explained above, the temple inner shell section 14RI is more easily deformed by the plurality of

apertures being deformed (crushed). Accordingly, the shock is mitigated by the temple inner shell section 14RI and the safety of the wearer is improved.

[0040]

After coming into contact with the wearer, the surface 14RI-SI on the inner side of the temple inner shell section 14RI generates a frictional force against the wearer. Then, the wall sections 14RI-W inclined from the front side to the rear side toward the inner side from the outer side of the eyeglasses frame 1 are deformed such that the temple 14R moves in the axis Y negative direction with respect to the surface 14RI-SI on the inner side of the temple inner shell section 14RI. Accordingly, the rim 11R and the lens LR are prevented from coming into contact with the wearer and, if the rim 11R and the lens LR come into contact with the wearer, a pressing force against the wearer is mitigated. Therefore, the safety of the wearer is improved.

[0041]

When the wall sections 14RI-W inclined from the front side to the rear side are deformed, two or more wall sections 14RI-W overlap one another in the axis X direction. As a result, the thickness of the wall sections 14RI-W in the axis X direction is a total of the thicknesses of the overlapping wall sections 14R. That is, the temple inner shell section 14RI, which is the thermoplastic resin rubber elastic body softer compared with the outer shell section, has room of deformation by the total of the thicknesses of the overlapping

wall sections 14RI-W. In an entire range including the plurality of apertures piercing in the up-down direction, the wall sections 14RI-W can include regions that substantially uniformly overlap when the wall sections 14RI-W are deformed. Accordingly, the safety of the wearer is improved.

[0042]

When the temples 14 are deformed in the opening direction (the direction in which the end portions in the axis Y positive direction are separated from each other), a restoration force acts in the long side direction on the X-Y plane of the wall sections 14RI-W. Accordingly, the eyeglasses frame 1 easily returns to a shape at an ordinary time. That is, since the eyeglasses frame 1 more easily returns to the shape itself at the ordinary time, a wearing feeling is improved. Further, since the eyeglasses frame 1 easily returns to the shape at the ordinary time even in repeated deformation or the like, the life of the eyeglasses frame 1 is improved. Note that the same applies when shock has been applied to the temple 14L.

[0043]

The pluralities of apertures piercing in the up-down direction are provided in noncontact regions with which the head of the wearer wearing the eyeglasses frame do not come into contact in the temple inner shell sections 14RI and 14LI. The noncontact regions refer to regions that do not come into contact with the wearer at the ordinary time and, more specifically, refer to regions excluding parts that come into

contact with the head of the wearer at the end portions on the rear side (the +Y side end portions) of the temples and the ears when the wearer wears the eyeglasses frame. As explained above, the plurality of apertures piercing in the up-down direction are present to pass the surface 14RI-ST on the upper side and the surface 14RI-SB on the lower side of the temple inner shell section 14RI. Specifically, for example, the plurality of apertures piercing in the up-down direction do not have a structure on the surface 14RI-SI on the inner side of the temple inner shell section 14RI with which the head of the wearer comes into contact. Accordingly, since the wearer does not touch unevenness and the like due to the plurality of apertures and the like piercing in the up-down direction, there is an effect that the wearer does not have discomfort in the wearing feeling, that is, the wearing feeling is improved. [0044]

In the vicinity where the plurality of apertures of the temple inner shell section 14RI of the temple 14R are provided, the length in the substantial axis Y direction of the surface 14RI-SI on the inner side is larger compared with the length in the substantial axis Y direction of a surface that is in contact with the temple outer shell section 14RO. Accordingly, even if the temples 14 are deformed in the opening direction (the direction in which the end portions in the axis Y positive direction are separated from each other), the temples 14 are flexibly deformed and a risk of occurrence of a crack and the like can be reduced.

[0045]

The specific structure of the pluralities of apertures piercing in the up-down direction included in the temples 14 and the advantages by having the structure are explained above mainly with reference to the temple 14R. As illustrated in FIG. 5 and the like, the temple 14L has basically the same structure as the structure of the temple 14R and has the advantages by having the structure.

[0046]

Subsequently, a structure of the pluralities of bottomed holes included in the rims 11 and advantages by having the structure are explained with reference to the rim 11R.

[0047]

Each of the plurality of bottomed holes adjacent to one another of the rim inner shell section 11RI is formed to be partitioned by each of wall sections 11RI-W as in the temple inner shell section 14RI. Each of a plurality of wall sections 11RI-W of the rim inner shell section 11RI is inclined from the bridge 12 side to the endpiece 13R side toward the inner side from the outer side of the eyeglasses frame 1.

[0048]

Here, for example, it is assumed that a predetermined object, for example, has collided with the rim inner shell section 11RI from the axis Y negative direction toward the axis Y positive direction and shock has been applied to the rim inner shell section 11RI. In this case, the rim 11R and the like of the eyeglasses frame 1 are deformed. Specifically,

for example, the surface on the inner side of the rim inner shell section 11RI comes into contact with the wearer. As explained above, the rim inner shell section 11RI is formed by the thermoplastic resin rubber elastic body softer compared with the rim outer shell section 11RO. For that reason, the rim inner shell section 11RI is deformed earlier compared with the rim outer shell section 11RO. Since the plurality of bottomed holes are formed in the rim inner shell section 11RI as explained above, the rim inner shell section 11RI is more easily deformed by the plurality of bottomed holes being deformed (crushed). Accordingly, shock is mitigated by the rim inner shell section 11RI and the safety of the wearer is improved.

[0049]

After coming into contact with the wearer, the surface on the inner side of the rim inner shell section 11RI generates a frictional force against the wearer. Then, wall sections 120-W inclined from the bridge 12 side to the endpiece 13R side toward the inner side from the outer side of the eyeglasses frame 1 are deformed such that the rim 11R moves in the axis X positive direction with respect to the surface on the inner side of the rim inner shell section 11RI. The axis X positive direction is a direction away from the right eye of the wearer in a nose pad section and the like of the rim 11R. Accordingly, the nose pad section and the like of the rim 11R is prevented from coming into contact with the wearer (in particular, the right eyeball) and, if the nose pad section

and the like come into contact with the wearer, a pressing force against the wearer is mitigated. Therefore, the safety of the wearer is improved.

[0050]

When the wall sections 11RI-W of the rim inner shell section 11RI are deformed, two or more wall sections 11RI-W overlap one another in the axis Y direction. As a result, the thickness of the wall sections in the axis Y direction is a total of the thicknesses of the overlapping wall sections 11RI-W. That is, the rim inner shell section 11RI, which is the thermoplastic resin rubber elastic body softer compared with the outer shell section, has room of deformation by the total of the thicknesses of the overlapping wall sections 11RI-W. In an entire range including the plurality of bottomed holes, the wall sections 11RI-W can include regions that substantially uniformly overlap when the wall sections 11RI-W are deformed. Accordingly, the safety of the wearer is improved.

[0051]

As explained above, when the temples 14 are deformed in the closing direction (the direction in which the end portions in the axis Y positive direction are brought into contact with each other) or the opening direction (the direction in which the end portions in the axis Y positive direction are separated from each other), the temples 14 are flexibly deformed by the recesses 13R-C and 13L-C of the respective endpieces 13R and 13L and a crack and the like do not occur.

However, when the rims 11 are further deformed as well, a restoration force acts in the long side direction of the wall sections 11RI-W. Accordingly, the eyeglasses frame 1 easily returns to the shape at the ordinary time. That is, since the eyeglasses frame 1 more easily returns to the shape itself at the ordinary time, a wearing feeling is improved. Further, since the eyeglasses frame 1 easily returns to the shape at the ordinary time even in repeated deformation or the like, the life of the eyeglasses frame 1 is improved.

[0052]

The specific structure of the plurality of bottomed holes included in the rims 11 and the advantages by having the structures are explained above with reference to the rim 11R. As illustrated in FIG. 5 and the like, the rim 11L basically has the same structure as the rim 11R and has the advantages by having the structure.

[0053]

Subsequently, a structure of apertures piercing in the up-down direction included in the bridge 12 and advantages by having the structure are explained.

[0054]

Apertures piercing in the up-down direction of the bridge inner shell section 12I are formed side by side with the bottomed holes provided in the rim inner shell sections 11RI and 11LI adjacent to the bridge inner shell section 12I and are partitioned by wall sections 120-W. The wall sections 120-W forming the apertures of the bridge inner shell section 12I

are inclined from the center of the bridge 12 to the endpieces 13 side toward the inner side from the outer side of the eyeglasses frame 1.

[0055]

Here, for example, it is assumed that a predetermined object, for example, has collided with the bridge inner shell section 12I from the axis Y negative direction toward the axis Y positive direction. In this case, the bridge 12 of the eyeglasses frame 1 is deformed together with the rims 11R and 11L and the like. Specifically, for example, the surface on the inner side of the bridge inner shell section 12I comes into contact with the wearer. As explained above, the bridge inner shell section 12I is formed by the thermoplastic resin rubber elastic body softer compared with the outer shell section. For that reason, the bridge inner shell section 12I is deformed earlier compared with the bridge outer shell section 12O. Since the apertures piercing in the up-down direction are formed in the bridge inner shell section 12I as explained above, the bridge inner shell section 12I is more easily deformed by the through-apertures being deformed (crushed). Accordingly, shock (in particular, shock from the front direction for the wearer) is mitigated by the bridge inner shell section 12I and the safety of the wearer is improved.

[0056]

When the wall sections 120-W of the bridge inner shell section 12I are deformed, the wall sections 120-W overlap in

the axis Y direction together with the wall sections 11RI-W of the pluralities of bottomed holes of the rim inner shell sections 11RI and 11RI adjacent to each other. As a result, the thickness of the wall sections in the axis Y direction is a total of the thicknesses of the overlapping wall sections 11RI-W and 120-W. That is, the bridge inner shell section 12I, which is the thermoplastic resin rubber elastic body softer compared with the outer shell section, has room of deformation by the total of the thicknesses of the overlapping wall sections. In an entire range including the apertures piercing in the up-down direction, the wall sections can include regions that substantially uniformly overlap when the wall sections are deformed. Accordingly, the safety of the wearer is improved.

[0057]

The specific structure of the apertures piercing in the up-down direction included in the bridge 12 and the advantages by having the structure are explained above.

[0058]

<Shapes of the apertures piercing in the up-down direction and the bottomed holes>

The shapes of the apertures piercing in the up-down direction or the bottomed holes explained above are explained below with reference to FIG. 9 to FIG. 12.

[0059]

FIG. 9 is an A-B-C-D line combined sectional view of the eyeglasses illustrated in FIG. 4. As illustrate in FIG. 9, the

holes provided on the upper edge side 11RI-ST of the rim inner shell section 11RI of the rim 11R include bottom sections 11RI-B. Accordingly, not only the wall sections 11RI-W of the upper edge side 11RI-ST of the rim inner shell section 11RI of the rim 11R but also the bottom sections 11RI-B can prevent deformation against a force on the X-Y plane. As a result, deformation of the rim inner shell section 11RI and the rim 11R becomes negligible with respect to a slight force (for example, an inertial force involved in exercise of the wearer). Therefore, the wearing feeling is improved. The holes on the upper edge side 11RI-ST (the axis Z positive side) of the rim inner shell section 11RI of the rim 11R are bottomed holes recessed from the upper side toward the lower side of the upper edge side 11RI-ST. The bottoms (the bottom sections 11RI-B) are formed on the lower side (the axis Z negative side). Accordingly, when the eyeglasses are worn, the plurality of bottomed holes can be visually recognized from the axis Z positive direction. Accordingly, the advantage of the improvement of the wearing feeling explained above can be enjoyed while designability of the eyeglasses frame 1 being improved. Since the holes on the upper edge side 11RI-ST (the axis Z positive side) are recessed from the upper side toward the lower side on the upper edge side 11RI-ST, when the eyeglasses frame 1 is manufactured by upper and lower dies, die cutting can be easily performed and the eyeglasses frame can be more easily manufactured. Further, the rim inner shell section can be reduced in weight. A material used for the rim

inner shell section can be reduced. It is possible to contribute to a cost reduction. As illustrated in FIG. 9 and the like, the rim 11L basically has the same structure as the structure of the rim 11R and has the advantages by having the structure.

[0060]

FIG. 10 is an E-E line sectional view of the eyeglasses illustrated in FIG. 5. As illustrated in FIG. 10, the holes provided on the lower edge side 11RI-SB of the rim inner shell section 11RI of the rim 11R include the bottom sections 11RI-B. Accordingly, not only the wall sections 11RI-W of the lower edge side 11RI-SB of the rim inner shell section 11RI of the rim 11R but also the bottom sections 11RI-B prevent deformation against a force on the X-Y plane. As a result, deformation of the rim inner shell section 11RI and the rim 11R becomes negligible with respect to a slight force (for example, an inertial force involved in exercise of the wearer). Therefore, the wearing feeling is improved. The holes on the lower edge side 11RI-SB (the axis Z negative side) of the rim inner shell section 11RI of the rim 11R are bottomed holes recessed from the lower side toward the upper side of the lower edge side 11RI-SB. The bottoms (the bottom sections 11RI-B) are formed on the upper side (the axis Z positive side). Accordingly, when the eyeglasses are worn, the plurality of bottomed holes can be visually recognized from the axis Z negative direction. Accordingly, the advantage of the improvement of the wearing feeling explained above can be

enjoyed while designability of the eyeglasses frame 1 being improved. Since the holes on the lower edge side 11RI-SB (the axis Z negative side) are recessed from the lower side toward the upper side on the lower edge side 11RI-SB, when the eyeglasses frame 1 is manufactured by upper and lower dies, there are also effects that die cutting can be easily performed and the eyeglasses frame can be more easily manufactured. Further, the rim inner shell section can be reduced in weight. A material used for the rim inner shell section can be reduced. It is possible to contribute to a cost reduction. As illustrated in FIG. 10 and the like, the rim 11L basically has the same structure as the structure of the rim 11R and has the advantages by having the structure.

[0061]

FIG. 11 is an F-F line sectional view of the eyeglasses illustrated in FIG. 5. FIG. 12 is a G-G line sectional view of the eyeglasses illustrated in FIG. 7. As illustrated in FIG. 11 and FIG. 12, the apertures provided in the temple inner shell section 14RI of the temple 14R are apertures piercing in the up-down direction. Accordingly, the temple inner shell section can be reduced in weight. A material used for the temple inner shell section can be reduced. It is possible to contribute to a cost reduction. In the temple 14R that is in contact with the side head of the wearer, sebum stain and the like tend to be accumulated in the apertures. Thus, in the temple 14R, the apertures are the apertures piercing in the up-down direction that can be more easily cleaned compared

with the bottomed holes.

[0062]

As illustrated in FIG. 9, the apertures provided in the bridge inner shell section 12I of the bridge 12 are the apertures piercing in the up-down direction. Accordingly, the bridge inner shell section 12I can be reduced in weight. A material used for the bridge inner shell section 12I can be reduced. It is possible to contribute to a cost reduction.

[0063]

<Hardnesses of the outer shell section and the inner shell section>

[0064]

Shore hardness (A) of the outer shell section (for example, the outer shell sections of the rims 11, the bridge 12, the endpieces 13, and the temples 14) is suitably set to 100 degrees or higher and 150 degrees or lower. In particular, the shore hardness (A) of the outer shell section is more suitably set to 120 degrees. Here, the shore hardness of the outer shell section lower than 100 degrees is unpreferable because it is difficult to maintain the shape of the eyeglasses frame. The shore hardness of the outer shell section higher than 150 degrees is unpreferable because deformation easiness of the eyeglasses frame is deteriorated, that is, the eyeglasses frame itself is less easily deformed, the eyeglasses frame cannot sufficiently absorb shock, and the eyeglasses frame itself is damaged. The shore hardness of the outer shell section higher than 150 degrees is unpreferable

because, when the eyeglasses frame 1 is molded by injection molding, it is difficult to take out the molded eyeglasses frame 1 from a die.

[0065]

Specifically, for example, a TED-602 standard (a product manufactured by Dongguan Changsheng New Material Technology Co., Ltd.) can be used as the thermoplastic resin rubber elastic body of the outer shell section. The thermoplastic resin rubber elastic body of the TED-602 standard contains styrene ethylene butylene styrene, naphthenic oil, polypropylene, calcium carbonate, and antioxidant as components.

[0066]

Shore hardness (A) of the inner shell section (for example, the inner shell sections of the rims 11, the bridge 12, and the temples 14) is suitably set to 30 degrees or higher and 70 degrees or lower. In particular, the shore hardness (A) of the outer shell section is more suitably set to 55 degrees. Here, the shore hardness of the inner shell section lower than 30 degrees is unpreferable because it is difficult to maintain the shape of the inner shell section of the eyeglasses frame. The shore hardness of the inner shell section higher than 70 degrees is unpreferable because it is difficult to ensure a cushioning property and shock cannot be sufficiently absorbed. If the shore hardness of the inner shell section is lower than 30 degrees, it is likely that the inner shell section peels from the outer shell section. That

is, adhesion of the outer shell section and the inner shell section decreases and the strength of the inner shell section itself decreases. As a result, it is highly likely that the inner shell section is damaged at the time of molding, molding cannot be performed, and a yield decreases.

[0067]

Specifically, for example, a P801-55A32 standard (a product manufactured by Dongguan Changsheng New Material Technology Co., Ltd.) can be used as the thermoplastic resin rubber elastic body of the outer shell section. The thermoplastic resin rubber elastic body of the P801-55A32 standard contains styrene ethylene butylene styrene, naphthenic oil, polypropylene, calcium carbonate, and antioxidant as components.

[0068]

As the inner shell section (for example, the inner shell sections of the rims 11, the bridge 12, and the temples 14), an inner shell section having a larger frictional force compared with the outer shell section (for example, the outer shell sections of the rims 11, the bridge 12, the endpieces 13, and the temples 14) is suitable. The wearing feeling is improved by the frictional force of the inner shell section. Since friction between the inner shell section and the wearer is strong and friction between the outer shell section and the predetermined object is weak, the effect of the improvement of the safety of the wearer is improved in the case in which the predetermined object explained above, for example, has

collided with the inner shell section and shock has been applied to the inner shell section.

[0069]

The embodiment of the present invention is explained above. However, the present invention is not limited to the embodiment explained above. Modifications, improvements, and the like in a range in which the object of the present invention is achieved are regarded as being included in the present invention.

[0070]

The shape and the like of the eyeglasses frame 1 illustrated in FIG. 1 to FIG. 12 are merely an exemplification for achieving the object of the present invention and are not particularly limited.

[0071]

(Modified modes)

(1) In the embodiment explained above, an example is explained in which the pluralities of apertures piercing in the up-down direction are formed in the temple inner shell sections 14RI and 14LI of the temples 14. However, the present invention is not limited to this. For example, in the temple inner shell sections 14RI and 14LI, pluralities of bottomed holes may be provided instead of the pluralities of apertures piercing in the up-down direction. The pluralities of bottomed holes and the pluralities of apertures piercing in the up-down direction may be mixed.

(2) In the embodiment explained above, an example is explained

in which the apertures piercing in the up-down direction are formed in the bridge inner shell section 12I of the bridge 12. However, the present invention is not limited to this. For example, in the bridge inner shell section 12I, bottomed holes may be provided instead of the apertures piercing in the up-down direction.

(3) In the embodiment explained above, an example is explained in which the pluralities of bottomed holes are formed in the rim inner shell sections 11RI and 11LI of the rims 11. However, the present invention is not limited to this. For example, in the rim inner shell sections 11RI and 11LI, pluralities of apertures piercing in the up-down direction may be provided instead of the pluralities of bottomed holes. The pluralities of bottomed holes and the pluralities of apertures piercing in the up-down direction may be mixed.

(4) In the embodiment explained above, the eyeglasses frame 1 is simultaneously integrally molded by a two-color molding method using the two thermoplastic resin rubber elastic bodies having different hardnesses and is molded by the thermoplastic resin rubber elastic body softer compared with the outer shell section. However, the present invention is not particularly limited to this. That is, for example, the eyeglasses frame may be simultaneously integrally molded using three or more thermoplastic resin rubber elastic bodies.

[0072]

Summarizing the above, the eyeglasses frame to which the present invention is applied only has to have a configuration

explained below and can take various embodiments.

(1)

That is, the eyeglasses frame (the eyeglasses frame 1) to which the present invention is applied is an eyeglasses frame including: a pair of rims (the rims 11R and 11L) that fixes lenses (the lenses LR and LL); a bridge (the bridge 12) that connects the pair of rims; and a temple (each of the temples 14R and 14L) connected to the rims (each of the rims 11R and 11L) via a endpiece (each of the endpieces 13R and 13L), wherein the eyeglasses frame includes: an outer shell section; and an inner shell section that is softer than the outer shell section and is provided in at least a part of an inner side of the outer shell section, and the inner shell section includes a temple inner shell section (the temple inner shell sections 14RI and 14LI) provided on the inner side of the temple of the outer shell section.

[0073]

It is assumed that a predetermined object, for example, has collided with the temple in the left-right direction (the axis X direction) and shock is applied to the temple. In this case, the temple and the like of the eyeglasses frame are deformed. The temple inner shell section is formed of a thermoplastic resin rubber elastic body softer compared with the outer shell section. For that reason, after coming into contact with a wearer, the temple inner shell section is deformed earlier compared with the temple outer shell section.

In this way, the shock is mitigated by the temple inner shell section and safety of the wearer is improved. At an ordinary time other than a time when the shock is applied, a shape is maintained by the temple outer shell section harder compared with the temple inner shell section and a wearing feeling is improved.

[0074]

(2)

In the temple inner shell section, a plurality of apertures piercing in an up-down direction (the axis Z direction) or a plurality of bottomed holes are formed along a longitudinal direction (the substantial axis Y direction) of the temple.

[0075]

Accordingly, the temple inner shell section is more easily deformed by the plurality of apertures of the temple inner shell section being deformed (crushed). That is, the shock is mitigated by the temple inner shell section and the safety of the wearer is improved.

[0076]

(3)

In the temple inner shell section, a wall section (for example, the wall sections 14RI-W) present between the apertures or the holes adjacent to each other is inclined from a front side to a rear side (in the axis Y positive direction) toward the inner side from an outer side of the eyeglasses frame (toward the axis X positive direction in 14R).

[0077]

Accordingly, after coming into contact with the wearer, a surface on the inner side of the temple inner shell section generates a frictional force against the wearer. Then, the wall section inclined from the front side to the rear side toward the inner side from the outer side of the eyeglasses frame is deformed such that the temple moves in the axis Y negative direction with respect to the surface on the inner side of the temple inner shell section. Accordingly, the rim and the lens are prevented from coming into contact with the wearer and, if the rim and the lens come into contact with the wearer, a pressing force against the wearer is mitigated and the safety of the wearer is improved.

[0078]

(4)

The plurality of apertures or the plurality of holes are provided in a noncontact region with which a head of a wearer wearing the eyeglasses frame does not come into contact in the temple inner shell section.

[0079]

Accordingly, since the wearer does not touch unevenness and the like due to the plurality of apertures and the like piercing in the up-down direction, the wearer does not have discomfort in the wearing feeling, that is, the wearing feeling is improved.

[0080]

(5)

The inner shell section further includes a bridge inner shell section provided on the inner side of the bridge of the outer shell section.

[0081]

Accordingly, shock (in particular, shock from a front direction for the wearer) is mitigated by the bridge inner shell section and the safety of the wearer is improved.

[0082]

(6)

In the bridge inner shell section, an aperture piecing in an up-down direction or a bottomed hole is formed.

[0083]

Accordingly, the bridge inner shell section is more easily deformed by the plurality of apertures or the bottomed hole of the bridge inner shell section being deformed (crushed). That is, the shock is mitigated by the bridge inner shell section and the safety of the wearer is improved.

[0084]

(7)

The inner shell section further includes a rim inner shell section provided on the inner side of an upper edge and a lower edge of the rim of the outer shell section.

[0085]

For example, it is assumed that shock is applied to the rim inner shell section from the front direction for the wearer. In this case, the rim and the like of the eyeglasses frame are deformed. Specifically, for example, the surface on

the inner side of the rim inner shell section comes into contact with the wearer. As explained above, the rim inner shell section is formed by the thermoplastic resin rubber elastic body softer compared with the rim outer shell section. For that reason, the rim inner shell section is deformed earlier compared with the rim outer shell section. In the rim inner shell section, the plurality of apertures or the plurality of bottomed holes are formed as explained above. Therefore, the rim inner shell section is more easily deformed by the plurality of apertures or the plurality of bottomed holes being deformed (crushed). Accordingly, the shock is mitigated by the rim inner shell section and the safety of the wearer is improved.

[0086]

(8)

In the rim inner shell section, a plurality of bottomed holes are formed along a left-right direction.

[0087]

Accordingly, since the rim is deformed as a whole by the plurality of bottomed holes, the safety of the wearer is improved.

[0088]

(9)

In the hole on an upper edge side (the axis Z positive side) of the rim inner shell section, a bottom (the bottom section 11RI-B) is formed on a lower side (the axis Z negative side). In the hole on a lower edge side (the axis Z negative

side) of the rim inner shell section, a bottom (the bottom section 11RI-B) is formed on an upper side (the axis Z positive side).

[0089]

Accordingly, deformation of the rim inner shell section and the rim becomes negligible with respect to a slight force (for example, an inertial force involved in exercise of the wearer). Therefore, the wearing feeling is improved.

[0090]

(10)

A shore hardness (A) of the outer shell section is set to 100 degrees or higher and 150 degrees or lower.

[0091]

Accordingly, it is possible to maintain the shape of the eyeglasses frame. The shore hardness of the outer shell section can maintain deformation easiness of the eyeglasses frame. That is, it is possible to absorb deformation and shock of the eyeglasses frame itself. It is also possible to mitigate a risk of damage to the eyeglasses frame itself.

[0092]

(11)

A shore hardness (A) of the inner shell section is set to 30 degrees or higher and 70 degrees or lower.

[0093]

Accordingly, it is possible to maintain the shape of the inner shell section of the eyeglasses frame. It is possible to ensure a cushioning property. That is, it is possible to

maintain the shape while sufficiently absorbing the shock.

[0094]

(12)

The endpiece includes a recess recessed from an outer side toward the inner side.

[0095]

Accordingly, even if an end portion (an end portion on a rear side for the wearer) of the temple is deformed in a closing direction or an opening direction of the temple, the temple is flexibly deformed and does not cause a crack and the like.

EXPLANATION OF REFERENCE NUMERALS

[0096]

1 Eyeglasses frame 1, 11, 11R, 11L Rim, 11LI, 11RI
Rim inner shell section, 11LO, 11RO Bridge outer shell
section, 12 Bridge, 12I Bridge inner shell section, 12O
Bridge outer shell section, 13, 13R, 13L Endpiece, 14, 14R,
14L Temple, 14RI, 14LI Temple inner shell section, 14RI,
14LI Temple outer shell section

CLAIMS

[Claim 1]

An eyeglasses frame comprising: a pair of rims that fixes a lens; a bridge that connects the pair of rims; and a temple connected to the rims via a endpiece, wherein

the eyeglasses frame includes: an outer shell section; and an inner shell section that is softer than the outer shell section and is provided in at least a part of an inner side of the outer shell section, and

the inner shell section includes a temple inner shell section provided on the inner side of the temple of the outer shell section.

[Claim 2]

The eyeglasses frame according to claim 1, wherein, in the temple inner shell section, a plurality of apertures piercing in an up-down direction or a plurality of bottomed holes are formed along a longitudinal direction of the temple.

[Claim 3]

The eyeglasses frame according to claim 2, wherein, in the temple inner shell section, a wall section present between the apertures or the holes adjacent to each other is inclined from a front side to a rear side toward the inner side from an outer side of the eyeglasses frame.

[Claim 4]

The eyeglasses frame according to claim 2, wherein the plurality of apertures or the plurality of holes are provided in a noncontact region with which a head of a wearer wearing the eyeglasses frame does not come into contact in the temple inner shell section.

[Claim 5]

The eyeglasses frame according to any one of claims 1 to 4, wherein the inner shell section further includes a bridge inner shell section provided on the inner side of the bridge of the outer shell section.

[Claim 6]

The eyeglasses frame according to claim 5, wherein, in the bridge inner shell section, an aperture piecing in an up-down direction or a bottomed hole is formed.

[Claim 7]

The eyeglasses frame according to any one of claims 1 to 4, wherein the inner shell section further includes a rim inner shell section provided on the inner side of an upper edge and a lower edge of the rim of the outer shell section.

[Claim 8]

The eyeglasses frame according to claim 7, wherein, in the rim inner shell section, a plurality of bottomed holes are

formed along a left-right direction.

[Claim 9]

The eyeglasses frame according to claim 8, wherein
in the hole on an upper edge side of the rim inner shell
section, a bottom is formed on a lower side, and
in the hole on a lower edge side of the rim inner shell
section, a bottom is formed on an upper side.

[Claim 10]

The eyeglasses frame according to any one of claims 1 to
9, wherein a shore hardness (A) of the outer shell section is
100 degrees or higher and 150 degrees or lower.

[Claim 11]

The eyeglasses frame according to any one of claims 1 to
10, wherein a shore hardness (A) of the inner shell section is
30 degrees or higher and 70 degrees or lower.

[Claim 12]

The eyeglasses frame according to any one of claims 1 to
11, wherein the endpiece includes a recess recessed from an
outer side toward the inner side.