

A HINGE ASSEMBLY FOR AN INTERCHANGEABLE EYEWEAR FRAME AND TEMPLE SYSTEM

Field of the Invention

5 This invention relates to an eyewear system that allows the temples and frames designed in accordance with this eyewear system to be easily and conveniently interchanged with other temples or other frames. More particularly, this invention relates to a hinge assembly for an eyewear system that allows for a fully cross compatible and
10 completely interchangeable frames and/or temples having different colours, designs, shapes and/or sizes using any frames and/or temples that are designed in accordance with an embodiment of this invention.

Prior Art

15 Eyeglasses or spectacles (as they are commonly known) generally comprise a frame attached to a pair of optical lenses and a pair of arms. These lenses are typically arranged such that when in use, the frame will hold the lenses in front of the wearer's eyes while the pair of arms will be used to hold the eyeglass against the wearer's head. Eyeglasses may
20 be broadly divided into two categories, vision correction glasses or eye protection glasses. Vision correction glasses usually utilize a pair of corrective lenses that correct refractive errors of each respective eye. This is achieved by altering the effective focal length of the lens thereby allowing the wearer to compensate for conditions such as nearsightedness, farsightedness or astigmatism. Eye protection glasses or safety glasses provide protection
25 to the wearer from debris or from visible and/or near visible light or radiation. Safety glasses that provided protection from debris usually utilize shatter-resistant lenses to protect the eyes from physical damage. Sunglasses are a type of safety glasses that protect the wearer from visible and/or near visible light such as the sun's rays. Sunglasses allow a
30 wearer to have better vision in bright daylight while offering some form of protection to the eyes from damage that may be caused by high levels of ultraviolet light.

Over the years, eyeglasses have evolved from being a functional necessity to becoming a fashion item. Eyeglasses no longer comprise simple designs and basic colours. In the contrary, eyeglasses nowadays come in a variety of designs, colours, shapes, sizes
35 and materials. As such, a single person may have multiple pairs of eyeglasses, each unique pair selected for a specific purpose or design. For example, an eyeglass may be selected to match the colour of a particular outfit or a particular event. Vision correction glasses and

sunglasses are also used interchangeably by a single user. The user would wear vision correction glasses when indoors and when outdoors, the user would switch to a pair of sunglasses or a pair of sunglasses having vision correction lenses. In the sporting industry, sportsmen and sportswomen tend to select eyeglasses that are made from lightweight materials or designs that ensure that the eyeglass may be firmly attached to the wearer. Examples of these would be lightweight sunglasses made for runners, cyclists, or water sport enthusiasts, just to name a few. Unfortunately, the high price of eyeglasses prevents this from being widely adopted by the eyeglass wearing public. In other words, it becomes extremely costly for an eyeglass wearer to switch between different pairs of eyeglasses.

A cost effective way of varying the design, colour and/or size of one's eyeglasses would be to use parts or components that may be interchanged. For example, US Patent No. 7,237,892 published on 3 July 2007 in the name of Bacou-Dalloz Eye & Face Protection Inc. discloses eyeglasses having arms that are detachable. This document discloses that the arms of the eyeglass may be detached from the temples and reattached to the temples through the use of a novel hinge assembly. The disclosed hinge assembly comprises ball-shaped sockets, which are molded into the temples of the frame; and ball-shaped protrusions, which are molded onto the ends of each arm. The arm may be attached to a corresponding temple by first aligning the ball-shaped protrusion at the end of the arm with the ball-shaped socket. These two elements are then forced together, until the ball-shaped protrusion fits snugly into the ball-shaped socket. Similarly, when the arm is to be detached from the temple, these two elements are forced apart, until the two components are detached. The downside is that if too much force is applied during the attaching of the arm or the detaching of the arm, there is the risk that either the arm or the temple may break.

Another document that discloses of an eyeglass that comprises interchangeable components is described in US Publication No. 2009/0299047 A1 published on 12 November 2009 in the name of York Tsai. This document discloses an eye gear that has a frame with quick release coupling blocks that allow the arms to be easily detached and attached to the frame. Generally, the coupling blocks comprise a T-shaped pivot segment located at the arm and a pin retaining space located at the edge of the frame. It is disclosed that in order to attach the arm to the frame, the T-shaped pivot is initially deformed and pressed into the pin retaining space disposed at the edge of the frame. Once within the retaining space, the T-shaped pivot expands thereby connecting the arm to the frame. When the arm is to be detached from the frame, a force has to be applied to the T-shaped pivot, causing the T-shaped pivot to deform. The T-shaped pivot may then be pried out from the retaining space at the frame.

US Publication No. 2013/0003013 published on 3 January 2013 in the name of Brittnay Collins et al. discloses an interchangeable eyewear that utilizes interchangeable temples having quick release connectors. It is disclosed that a plurality of male ball plungers are disposed at the ends of the arms while quick release connectors disposed at the temples have a plurality of female bored cylinders for receiving the plurality of male ball plungers. To attach the arms to the frame of the eyewear, the ball plungers are brought together against the bored cylinders until these two components engage together. To detach the arms from the temples, a separating force is applied to the arm and to the temple, thereby pulling the interchangeable temple in one direction and the arm in an opposing direction. This separating motion causes the ball plungers to disengage from the bored cylinders thereby causing the arm to detach from the temple.

Existing hinges for eyeglasses with interchangeable components typically require the application of force to attach the arms to the temples and/or to separate the arms from the temples. Other proposed solutions involve hinges that are awkward to use, requiring certain parts of the temple and/or arm to be forcibly deformed before they can be attached or detached. Hence, those skilled in the art are constantly looking for ways to devise a hinge assembly for eyeglasses that allows the temples and/or arms to be easily and quickly interchanged, with minimal effort and with the least possibility of causing breakages.

Summary of Invention

The above and other problems in the art are solved and an advance in the art is made in accordance with this invention. A first advantage of a hinge assembly in accordance with an embodiment of this invention is that the hinge assembly allows for the arm to be securely attached to the temple when the eyeglass is in an unfolded position. This is ideal because when the eyeglass is worn, the eyeglass is in an unfolded position. The second advantage of a hinge assembly in accordance with an embodiment of this invention is that the hinge assembly allows the arm to be easily detached from the temple when the eyeglass is in a folded position. When the eyeglass is in a folded position, the frictional engagement between a barrel and a socket of the hinge assembly is minimized while when the eyeglass is in an unfolded position, the frictional engagement between the barrel and the socket is maximized. This variation in the frictional engagement between the barrel and the socket is advantageous because it ensures that the arm is attached firmly to the temple and/or frame when in use. It also ensures that the arms may be easily detached from the temple when not in use, which is when the eyeglass is in a folded position without the need

for excessive separating forces to be applied. A third advantage of a hinge assembly in accordance with an embodiment of this invention is that this hinge system allows the arm to be attached to the temple without the use of screws thereby simplifying the construction of the hinge assembly and reducing the time taken to fully assemble a pair of eyeglasses.

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Brief Description of the Drawings

The above advantages and features of an apparatus in accordance with this invention are described in the following detailed description and are shown in the drawings:

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Figure 1 illustrating an isometric view of an eyeglass assembly in accordance with an embodiment of this invention;

Figure 2 illustrating a side view of a barrel in accordance with an embodiment of this invention from angle A as illustrated in Figure 1;

15 Figure 3a illustrating a socket for receiving a barrel in accordance with an embodiment of this invention;

Figure 3b illustrating a top view of a barrel in accordance with an embodiment of this invention;

20 Figure 4 illustrating an isometric view of a barrel and a socket in accordance with an embodiment of this invention;

Figure 5a illustrating a cross sectional side view of a barrel and a socket in accordance with an embodiment of this invention;

25 Figure 5b illustrating a cross sectional side view of a barrel and a socket in accordance with an embodiment of this invention when these two components are aligned to be attached;

Figure 5c illustrating a cross sectional side view of a barrel and a socket in accordance with an embodiment of this invention when these two components are attached;

Figure 6a illustrating a cross sectional plan view of a barrel and a socket in accordance with an embodiment of this invention; and

30 Figure 6b illustrating a cross sectional plan view of a barrel and a socket in accordance with an embodiment of this invention when these two components are attached.

Detailed Description

This invention relates to an eyewear system that allows the temples and frames designed in accordance with this eyewear system to be easily and conveniently interchanged with other temples or other frames. More particularly, this invention relates to a hinge assembly for an eyewear system that allows users to interchange between frames and/or temples having different colours, designs, shapes and/or sizes using any frames and/or temples that are designed in accordance with an embodiment of this invention.

A hinge assembly in accordance with an embodiment of this invention allows for an arm of the eyeglass to be securely attached to the temple when the eyeglass is in an unfolded position. This is ideal because when the eyeglass is worn, the eyeglass is in an unfolded position. The hinge assembly also allows the arm to be easily detached from the temple when the eyeglass is in a folded position. When the eyeglass is in a folded position, the frictional engagement between a barrel and a socket of the hinge assembly is minimized while when the eyeglass is in an unfolded position, the frictional engagement between the barrel and the socket is maximized. This variation in the frictional engagement between the barrel and the socket is advantageous because it ensures that the arm is attached firmly to the temple and/or frame when in use. It also ensures that the arms may be easily detached from the temple when not in use, which is when the eyeglass is in a folded position without the need for excessive separating forces to be applied. Further, this hinge system also allows the arm to be attached to the temple without the use of screws thereby simplifying the construction of the hinge assembly and reducing the time taken to fully assemble a pair of eyeglasses.

Figure 1 illustrates an isometric view of eyeglass 100 in accordance with an embodiment of this invention. Eyeglass 100 comprise arms 110, temple 120 and frame 105. Frame 105 is adapted to hold lenses 115 such that when a user wears eyeglass 100, lenses 115 will be positioned in front of the wearer's eyes. Temple 120, which is disposed at a side of frame 105, is pivotally attached to arm 110 using hinge 125. One skilled in the art will recognize that eyeglasses comprise a pair temples that are disposed at opposing sides of the frame whereby each of these temples are connected to a corresponding arm through the use of a hinge. Throughout the description, for brevity, reference will be made to only one arm and one temple. However, one skilled in the art will recognize that the teachings and disclosures made in the following description may be applied to any number of temples and/or arms.

Hinge 125 allows arm 110 to rotate relative to temple 120. When eyeglass 100 is to be worn, arm 110 will be unfolded, extending away from the frame and when eyeglass 100 is to be kept, arm 110 will be folded inwards, towards frame 105 and lenses 115. The maximum positions that arms 110 may be unfolded are determined by certain rotational barriers (not shown) that may be positioned at either hinge 125, temple 120, or arm 110. The positions of these rotational barriers are left as a design choice to one skilled in the art.

In accordance with embodiments of this invention, arm 110 may be detached from temple 120 through the use of hinge 125 and may be attached to temple 120 through hinge 125. This means that, arm 110 may be changed with other arms thereby changing the overall appearance of eyeglass 100. Hinge 125 is also designed such that when arms 110 are unfolded, or when eyeglass 100 is being worn, arm 110 may not be removed from temple 120. This is to ensure that eyeglass 100 will not drop from a wearer's face when the eyeglass is being worn.

Figure 2 illustrates a view of barrel 200 of hinge 125 in accordance with an embodiment of this invention from the angle of arrow A as illustrated in Figure 1. In this illustration, barrel 200 is illustrated as being disposed at an end of temple 120. Barrel 200 comprises protrusion 205 that has one end connected to temple 105 and another end connected to ball 206. Although it is illustrated in the drawings that ball 206 is spherical in shape, one skilled in the art will recognize that ball 206 may comprise of various other shapes without departing from this invention. As illustrated in Figure 2, ball 206 has opening 215 and rounded sections 210 and 211. Ball 206 can be made from a resilient thermoplastic material such as TR90. Other materials such as hardened rubber, polycarbonate, suitable plastics, titanium, nickel, aluminium, carbon fibre or any suitable metal alloys may be used provided that these materials are able to compress and expand as set out below. Therefore, when sufficient force is applied to compress ball 206 thereby bringing sections 210 and 211 closer, the gap at opening 215 may be made smaller and when sufficient force is applied in an opposing direction bringing sections 210 and 211 further apart, the gap at opening 215 may be made wider. In other words, the gap 220 at opening 215 may be narrowed or widened, depending on the nature of the force applied to ball 206. Further, the channel formed at opening 215 gradually becomes narrower as the channel approaches the centre of ball 206.

Figure 3a illustrates a view of socket 300 of hinge 125 in accordance with an embodiment of this invention from the angle of arrow A as illustrated in Figure 1. In this illustration, socket 300 is illustrated as being disposed at a front of arm 110. Socket 300

comprises channel 301 having a width 315 and connector 310. Channel 301 further comprises socket inner walls 305 and 306. In this embodiment, socket 300 is made from a hard resilient material such as tr90, polycarbonate, thermo plastics, plastic, metal, nickel, titanium, aluminium alloy, carbon fibre, rubber or any suitable metal alloys. Frame 105,
5 temple 120 and arm 110 may also be made from these materials.

Figure 3b illustrates another view of barrel 200. In accordance with this embodiment of the invention, the width of ball 206 is slightly smaller than the largest width of a section of channel 301. In other words, the width of 220 is smaller than a width of a section of width
10 315. Further, in this embodiment of the invention, the width of connector 310 is smaller than the widest section of the channel at opening 215 but bigger than the narrowest end of the channel at opening 215. Simply put, when connector 310 is inserted into the channel at opening 215, connector 310 would be able to easily pass through the wider sections of opening 215 until connector 310 reaches the narrower sections. Once the narrower sections
15 are contacted, more pressure would have to be applied to force connector 310 into the narrower sections. In accordance with an embodiment of the invention, width 220 is about 4 mm while width 315 is about 4.2 mm. In this embodiment of the invention, the width of the widest section of the channel at opening 215 is about 1.5 mm while the depth of channel 301 is about 5.9 mm. This implies that that the width of connector 310 should be less than 1.5
20 mm. Further, in this embodiment, the width of protrusion 205 is about 3.4 mm.

One skilled in the art will recognize that although it is illustrated in Figures 2, 3a and 3b that barrel 200 is disposed at temple 105 while socket 300 is illustrated as being disposed at arm 110, it is also possible for the positions of these two components to be interchanged.
25 In other words, this means that barrel 200 may also be disposed at arm 110 while socket 300 may be disposed at temple 105 without departing from this invention.

Figure 4 illustrates an isometric view of temple 105 and arm 110 when these two components are aligned. In this embodiment, length 401, which is the length of barrel 200,
30 is about 5.72 mm and width 405, which is the width of the front of socket 300, is about 5.26 mm.

Figure 5a illustrates a cross sectional side view of barrel 200 and socket 300. As previously mentioned, the channel formed at opening 215 gradually becomes narrower as the channel approaches the centre of ball 206. From the cross sectional side view illustrated
35 in Figure 5a, it is shown that the inner walls of the channel, formed at opening 215, becomes thicker at the lower half of ball 206. In other words, inner wall 502, which is positioned at the

upper half of the channel of opening 215, is actually thinner than inner wall 501, which is positioned at the lower half of the channel of opening 215. Therefore, the channel at opening 215 is wider at the section of inner wall 502 and opening 215 is narrower at the section of inner wall 501. The function performed by the width differences of inner walls 501 and 502 will be discussed in greater detail in the later sections.

When barrel 200 is to be attached to socket 300, the two components are first aligned as illustrated in Figure 5b. The two components are then brought together in the direction shown by arrow 510, until barrel 300 engages with socket 200. As mentioned above, width 220 of ball 206 is slightly smaller than width 315 of channel 301 of socket 200. Therefore, as these two components are brought together, ball 206 will be able to pass through the recess within channel 301 easily. As ball 200 further engages with socket 300, connector 310 will gradually come into contact with the narrower inner portions of rounded sections 210 and 211 (see Figure 2), that is inner wall 502. As the force applied to engage barrel 200 with socket 300 gradually increases, connector 310 will apply a pressure against inner wall 502, causing inner wall 502 and sections 210, 211 to expand. When this happens, rounded sections 210 and 211 will expand outwards, thereby increasing the width of ball 206, which is width 220. As width 220 is only slightly smaller than the width of channel 301, this expansion of width 220 or the expansion of ball 206 causes the outer walls of rounded sections 210 and 211 to frictionally engage with socket inner walls 305 and 306. This frictional engagement causes barrel 200 to attach firmly with socket 300.

When arm 110 is to be attached to temple 120, as illustrated in Figure 5b, arm 110 is first placed in a folded position relative to eyeglass 100. This means that when arm 110 is to be attached to temple 120, the axis of socket 300 should be approximately perpendicular to the axis of barrel 200. Even though Figure 5b illustrates that the two components are perpendicularly aligned, one skilled in the art will recognize that in other embodiments of the invention, these two components may be aligned using various other angles without departing from this invention. When arm 110 is unfolded to be worn, the frictional engagement between barrel 200 and socket 300 increases as ball 206 expands even further. This increase in the frictional engagement between these two components is explained with reference to Figure 5c.

Connector 310 will rotate in a clockwise direction, moving from inner wall 502 to inner wall 501 when arm 110 moves from a folded position to an unfolded position. The movement of connector 310 from a wider recess to a narrower recess within opening 215 causes inner wall 501 to further expand. This further expansion of inner wall 501 in turn

causes sections 210 and 211 to fully expand. The expansion of ball 206 within socket 300 increases the friction between barrel 200 and socket 300 creating a firm grip between arm 110 and temple 120. The increase in the grip pressure between barrel 200 and socket 300 ensures that arm 110 will not accidentally fall off or disengage from temple 120 when a user wears eyeglass 100. Therefore, when arm 110 is in an unfolded position, arm 110 is attached firmly to temple 120 due to the frictional engagement between connector 310 and inner wall 501 and due to the frictional engagement between the outer walls of expanded ball 206 and inner socket walls 305 and 306.

When the wearer intends to detach arm 110 from temple 120, the wearer just has to fold arm 110 inwards, towards frame 105. With reference to Figures 5a-5c, this counter clockwise rotation causes connector 310 to move from the narrower recess to the wider recess within opening 215. This movement reduces the pressure applied to inner wall 501, which in turn causes ball 206 to contract, thereby reducing the frictional engagement between the external walls of ball 206 with inner socket walls 305 and 306. When connector 310 has moved from inner wall 501 to inner wall 502, the frictional engagement between barrel 200 and socket 300 is greatly reduced. Therefore, when a separating force is applied to arm 110 and temple 120, arm 110 may be detached from temple 120. One skilled in the art will recognize that in other embodiments of the invention, barrel 200 may be disposed at arm 110 and socket 300 may be disposed at temple 120 instead without departing from this invention.

Figure 6a illustrates a cross sectional plan view of barrel 200 and socket 300 when these two components are aligned, prior to being attached. As illustrated in Figure 6a, barrel 200 fits into opening 301 of socket 300. Figure 6b illustrates a cross sectional plan view of barrel 200 and socket 300 when these two components have completely engaged. Arrows 601 show the directions in which ball 206 expands as ball 206 deforms. This shows that once barrel 200 has completely engaged with socket 300, the pressure applied by connector 310 to inner wall 502 will cause sections 210 and 211 to frictionally engage with inner socket walls 305 and 306.

The above is a description of a hinge assembly for an eyeglass with cross compatible and fully interchangeable arms and/ or temples regardless of shape, design, size, colours and applications. It is foreseen that those skilled in the art can and will design alternative embodiments of this invention as set forth in the following claims.

CLAIMS:

1. An eyeglass hinge comprising:

a barrel disposed at an end of a temple;

a socket disposed at an end of an arm;

wherein the barrel is detachably connected to the socket.