A hinge connection for temple piece (2) of an eyeglass frame having a hinge pin (3) extending from a portion thereof. The temple piece includes a resilient portion (4) biased against the hinge pin so as to attach the temple piece to the eyeglass frame. The temple piece is rotatable about the hinge pin and compensates for wear between the hinge pin and temple piece over extended use of eyeglass frame.
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HINGE CONNECTION FOR EYEGLASS FRAME

FIELD OF THE INVENTION

The invention relates to a hinge connection for an eyeglass frame.

BACKGROUND OF THE INVENTION

It has been conventional to utilize small screws for attaching various eyeglass frame components together to form a completed frame. Screws have been used to attach temple pieces at the hinge to lens frames. They are also used to tension and anchor or lock lenses into lens frames allowing assembly and disassembly for replacement of lenses or damaged components or initial shipping of frames with demonstration lenses in place.

In normal use, eyeglass frames are subjected to stresses and strains in a cyclical manner that tend to loosen screws and wear the threads with which the screws are mated resulting in temple pieces becoming loose or detached and lenses falling out of their frames.

Various methods to minimize this problem have been tried with limited success. Examples are polymeric compounds often referred to as "locktite" intended to at least slow down the loosening process. This method requires individual coating of the screws which is expensive and provides only limited improvement over uncoated screws eventually succumbing to the same process of loosening. Another example of a method intended to "lock" the screws in place is the use of distorted threads on the screw to create a mechanical jamming action with the mating threads. This method offers only limited improvement and eventually will succumb to the loosening process as well. Both methods make any replacement or disassembly and reassembly process difficult or impossible and do not accommodate wear of the mated components even if loosening or backing out of the screws does not occur.

SUMMARY OF THE INVENTION

The invention provides a hinge connection for a temple piece of an eyeglass frame. The eyeglass frame includes a hinge pin extending from a
portion thereof and the temple piece includes a resilient portion biased against
the hinge pin so as to attach the temple piece to the eyeglass frame. The temple
piece is rotatable about the hinge pin and the resilient portion provides a tight
hinge connection with the hinge pin which compensates for wear between the
hinge pin and temple piece over extended use of the eyeglass frame.

According to one embodiment of the invention, the resilient portion
includes a fixed end and a moveable free end, the free end being adapted to
snap-fit over the hinge pin. The hinge pin can have any desirable cross-section.
For instance, the hinge pin can have a cylindrical or non-cylindrical cross-
section. The resilient portion can be of any suitable material such as stainless
steel, β-Ti, Be-Cu or superelastic NiTi material. The temple piece and resilient
portion include surfaces in contact with the hinge pin and the surfaces are
configured to mate with corresponding surfaces on the hinge pin. As an
example, the hinge pin can be cylindrical and the temple piece and resilient
portion can include cylindrical surfaces in contact with the hinge pin.
Alternatively, the hinge pin can have a square or hexagonal cross-section and
the temple piece and resilient portion can each include surfaces configured to
mate with the corresponding surfaces on the hinge pin.

According to another embodiment of the invention, the resilient portion
can comprise an elastically deformable element surrounding the temple piece.
The temple piece can be split so as to include first and second arms with the
hinge pin therebetween. The element can be arranged to surround the arms so
as to press the arms against the hinge pin. The arms can include deflectable
free ends adapted to snap-fit over the hinge pin. The element can be slidable
along the arms from a first position at which the arms can be spread apart and
fitted over the hinge pin to a second position at which the element resiliently
biases the arms against the hinge pin. As in the first embodiment, the arms can
include surfaces in contact with the hinge pin and the surfaces can be configured
to mate with corresponding surfaces on the hinge pin. For instance, the hinge
pin can have a cylindrical or non-cylindrical cross-section and the arms can
include surfaces which mate with the corresponding surfaces on the hinge pin.
BRIEF DESCRIPTION OF THE DRAWINGS

Figs. 1a-c show a first embodiment of the hinge connection according to the invention wherein Fig. 1a shows the complete assembly, Fig. 1b shows a top view of the resilient portion of the temple piece and Fig. 1c shows a side view of the resilient portion prior to being assembled on the temple piece;

Figs. 2a-b show alternative constructions of the hinge pin and mating surfaces of the temple piece and resilient portion;

Figs. 3a-b show another embodiment of the hinge connection according to the invention wherein the temple piece includes a pair of arms surrounding the hinge pin and an elastically deformable element surrounding the arms, Fig. 3a showing the completed assembly and Fig. 3b showing the elastically deformable element in a non-deformed condition and in an elastically deformed condition.

DETAILED DESCRIPTION OF THE INVENTION

A primary objective of the invention is to overcome the tendency of existing eyeglass frame temple hinges to become sloppy and loose over time and to eliminate the loss of screws commonly associated with this loosening and sloppy hinge phenomenon.

A basic concept of the invention is to provide a spring biased member or members as part of a temple piece that grip a hinge pin so that as wear occurs the spring bias compensates and continues to provide an essentially constant force on the hinge pin. The hinge will therefore provide a uniform feel to the user over time and use without loosening or tightening. The hinge pin replaces the screw used in existing eyeglass frame hinges and will not loosen or fall out over extended use of the eyeglass frame.

The hinge connection of the invention can be designed to allow the temple piece to snap-on a hinge pin of an eyeglass frame. The hinge assembly thus eliminates the use of screws and avoids the loosening or loss of screws and spontaneous disassembly of eyeglass frames. The hinge connection can include positional biased stops to hold the temple pieces in open or closed positions.
For instance, such positional biased stops can be provided by the use of lobed hinge pins and mating spring bias elements. The hinge connection provides a simple arrangement for assembling or disassembling temple pieces to the eyeglass frame thus allowing the optician to easily replace temple pieces for purposes of replacing damaged temple pieces or for functional or aesthetic reasons. The hinge connection can incorporate one or more parts of suitable materials including β-titanium, BeCu, stainless steel, superelastic NiTi or plastic materials having suitable polymer properties.

Figs. 1-3 show various embodiments of the invention. Figs. 1a-c show an embodiment wherein the hinge pin has a cylindrical cross-section whereas as Figs. 2a-b show hinge pins having square and hexagonal cross-sections. Figs. 3a-b show another embodiment of the invention wherein the temple piece includes a pair of arms surrounding the hinge pin and a slidable resilient element holding the arms in contact with the hinge pin.

Fig. 1a shows a temple hinge connection for an eyeglass frame wherein a temple piece 2 is rotatable about a hinge pin 3 on the eyeglass frame. The temple piece 2 includes a resilient portion 4 biased against the hinge pin so as to attach the temple piece to the eyeglass frame. The resilient portion 4 includes a fixed end attached to the temple piece 2 by suitable means such as rivets 5. The resilient portion 4 also includes a movable free end which is adapted to snap-fit over the hinge pin. Fig. 1b shows a top view of the resilient portion 4 and Fig. 1c shows a side view of the resilient portion 4 prior to being attached to the temple piece. Thus, when the resilient portion 4 is attached to the temple piece, the free end of the resilient portion 4 is elastically deformed away from the temple piece 2 so as to provide a tight hinge connection with the hinge pin and compensate for wear between the hinge pin and the temple piece over extended use of the eyeglass frame.

In the embodiment shown in Figs. 1a-c, the hinge pin can have a diameter such as 0.10 inch or 0.053 inch and the width of the resilient portion 4 shown in Fig. 1b can be 0.20 inch. In the pre-assembled condition, the resilient portion 4 can include a free end which is elastically bent 20° when the resilient
portion is attached to the temple piece. The length of the resilient portion 4 can range from 1.0 to 1.5 inch.

Figs. 2a-b show alternative designs for the hinge pin. In Fig. 2a, the hinge pin 6 has a square cross-section whereas the hinge pin 7 in Fig. 2b has a hexagonal cross-section. The temple piece and resilient portion include mating surfaces which press against corresponding surfaces of the hinge pin 6 in Fig. 2a and against the hinge pin 7 in Fig. 2b. Thus, the hinge pin can have a cylindrical or non-cylindrical geometry. The non-cylindrical pin geometry provides specific positional "stops" for the temple/hinge combination. It should be understood, however, that the non-cylindrical hinge pin geometry can have a wide range of shapes such as rounded multi-lobed pin geometry in addition to the specific shapes shown in Figs. 2a-b.

Figs. 3a-b show another embodiment of the hinge connection according to the invention. In this embodiment, the temple piece 2 is longitudinally split so as to include a pair of arms 8,9 which surround the hinge pin 3. Although a cylindrical hinge pin 3 is shown in Fig. 3a, the hinge pin can have any suitable geometry such as those shown in Figs. 2a-b. As shown in Fig. 3a, the resilient portion comprises an elastically deformable element 10 surrounding the arms of the temple piece. The element 10 can be slidably arranged on the temple piece 2 such that the element 10 can be moved away from the hinge pin 3 to allow the arms 8,9 to snap-fit over the hinge pin 3. The element can then be slid towards the hinge pin 3 to provide the desired biasing force between the arms 8,9 and the hinge pin 3. The element 10 can comprise a sleeve or band made from helically wrapped ribbon or wire of material such as stainless steel, BeCu, β-titanium or other suitable material exhibiting reasonable springiness. As shown in Fig. 3b, the element 10 can have the shape shown to the left of Fig. 3b in the non-assembled condition and have the shape shown to the right of Fig. 3b when elastically expanded and mounted over the arms 8,9. The temple piece 2 can be of any suitable material such as stainless steel, BeCu, or any other variety of standard metal eyeglass frame materials.
In order to assemble or disassemble the hinge connection according to the invention, the resilient portion 4 can be pried open with a suitable hand tool and positioned over the hinge pin after which the tool is removed to release the resilient portion. In the embodiment shown in Figs. 3a-b, the resilient portion 10 is slid to a position away from the hinge pin 3 to allow the arms to be spread apart and slipped over the hinge pin. The element 10 is then slid forward to clamp the arms around the hinge pin.

The foregoing has described the principles, preferred embodiments and modes of operation of the present invention. However, the invention should not be construed as being limited to the particular embodiments discussed. Thus, the above-described embodiments should be regarded as illustrative rather than restrictive, and it should be appreciated that variations may be made in those embodiments by workers skilled in the art without departing from the scope of the present invention as defined by the following claims.
WHAT IS CLAIMED IS:

1. A hinge connection for a temple piece of an eyeglass frame, comprising:
   an eyeglass frame having a hinge pin extending from a portion thereof; and
   a temple piece having a resilient portion thereof biased against the hinge pin as to attach the temple piece to the eyeglass frame, the temple piece being rotatable about the hinge pin and the resilient portion providing a tight hinge connection with the hinge pin and compensating for wear between the hinge pin and temple piece over extended use of the eyeglass frame.

2. The hinge connection of Claim 1, wherein the resilient portion includes a fixed end and a moveable free end, the free end being adapted to snap-fit over the hinge pin.

3. The hinge connection of Claim 1, wherein the hinge pin is cylindrical, or non-cylindrical in cross-section.

4. The hinge connection of Claim 1, wherein the resilient portion is of stainless steel, β-Ti, Be-Cu or superelastic NiTi material.

5. The hinge connection of Claim 1, wherein the temple piece and resilient portion include surfaces in contact with the hinge pin, the surfaces being configured to mate with corresponding surfaces on the hinge pin.

6. The hinge connection of Claim 1, wherein the resilient portion comprises an elastically deformable element surrounding the temple piece, the temple piece including first and second arms with the hinge pin therebetween and the element surrounding the arms so as to press the arms against the hinge pin.
7. The hinge connection of Claim 6, wherein the arms include free ends adapted to snap-fit over the hinge pin.

8. The hinge connection of Claim 6, wherein the element is slidable along the arms from a first position at which the arms can be spread apart and fitted over the hinge pin to a second position and which the element resiliently biases the arms against the hinge pin.

9. The hinge connection of Claim 6, wherein the arms include surfaces in contact with the hinge pin, the surfaces being configured to mate with corresponding surfaces on the hinge pin.

10. The hinge connection of Claim 6, wherein the hinge pin is cylindrical or non-cylindrical in cross-section.
INTERNATIONAL SEARCH REPORT

International application No.
PCT/US96/19427

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) : G02C 5/16, 5/00, 5/22
US CL : 351/111, 113, 114, 140, 150, 153; 16/228

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 351/111, 113, 114, 140, 150, 153; 16/228

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
NONE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<td>US 5,418,581 A (CONWAY) 23 MAY 1995, see entire reference.</td>
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Further documents are listed in the continuation of Box C. See patent family annex.

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Date of the actual completion of the international search
22 FEBRUARY 1997

Date of mailing of the international search report
13 MAR 1997

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