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Van Rysselberghe

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(54) **EYEGLASS RETAINER**

(76) Inventor: **Pierre C. Van Rysselberghe**, 745 NW.
Culpepper Ter., Portland, OR (US)
97210

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.

This patent is subject to a terminal dis-
claimer.

(21) Appl. No.: **09/721,011**

(22) Filed: **Nov. 21, 2000**

Related U.S. Application Data

(63) Continuation-in-part of application No. PCT/US99/11270,
filed on May 21, 1999, which is a continuation-in-part of
application No. 09/114,784, filed on Jul. 13, 1998, now Pat.
No. 6,000,795.

(60) Provisional application No. 60/086,377, filed on May 22,
1998.

(51) **Int. Cl.**⁷ **G02C 5/14**

(52) **U.S. Cl.** **351/123; 351/157**

(58) **Field of Search** 351/122, 123,
351/157

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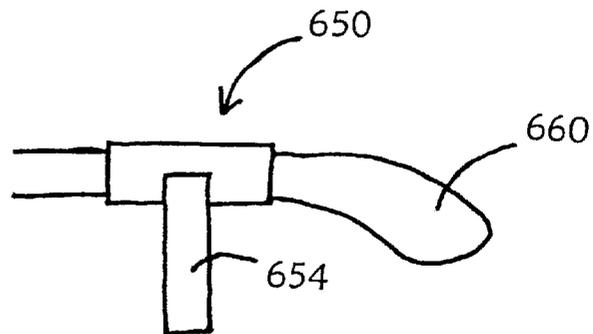
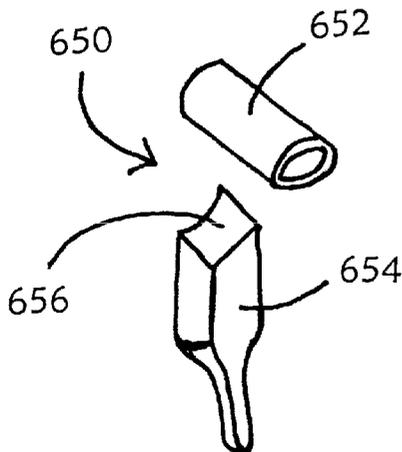
Primary Examiner—Huy Mai

(74) *Attorney, Agent, or Firm*—Kolisch Hartwell Dickinson
McCormack & Heuser

(57) **ABSTRACT**

A device for securing eyeglasses on a person's head. A pair
of elastomeric retainers are secured along temples of a pair
of eyeglasses for positioning behind a person's ears.

5 Claims, 6 Drawing Sheets



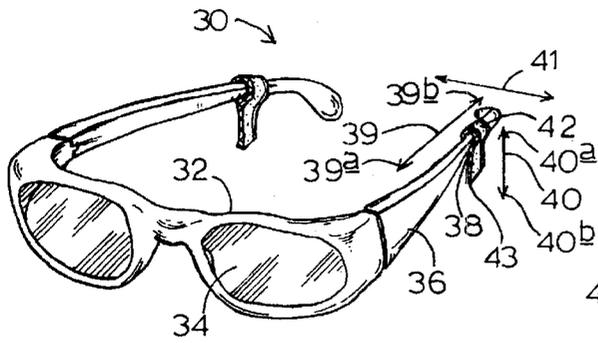


FIG. 1

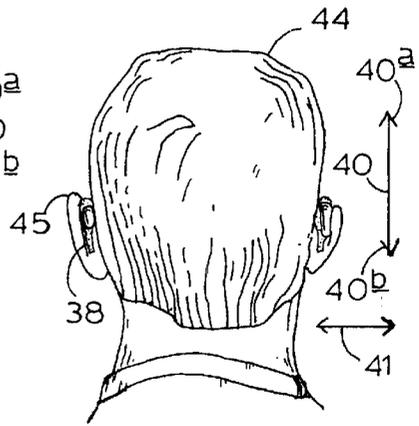


FIG. 2A

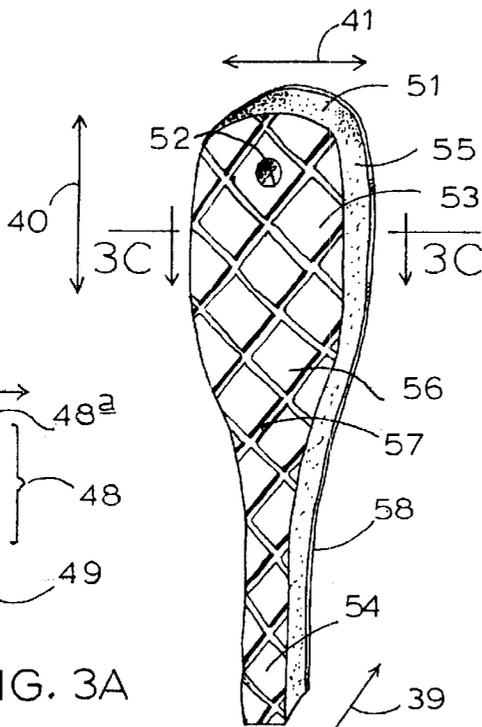


FIG. 3B

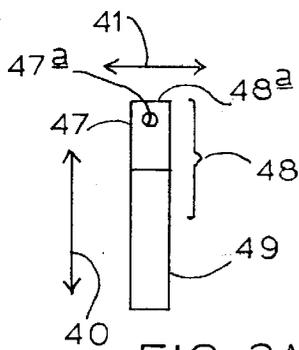


FIG. 3A

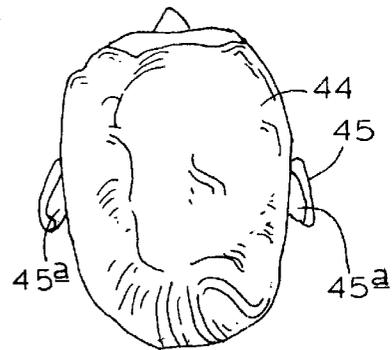


FIG. 2B

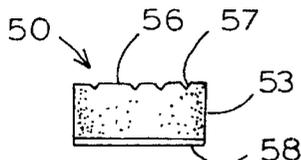


FIG. 3C



FIG. 3E

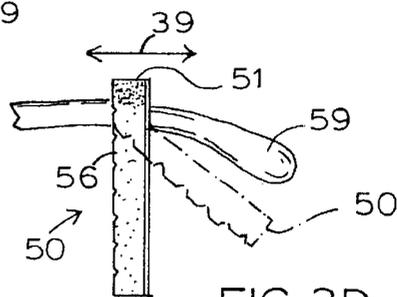


FIG. 3D

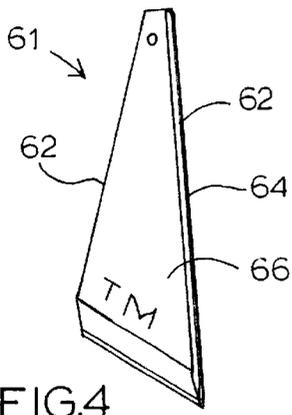


FIG. 4

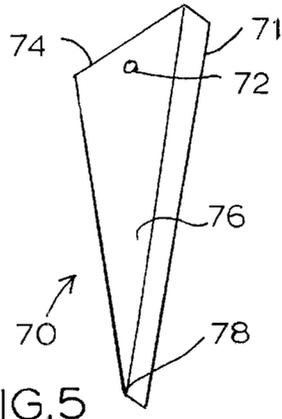


FIG. 5

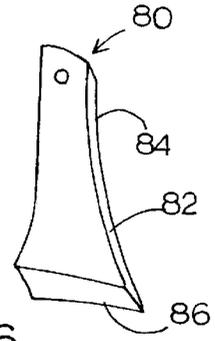


FIG. 6

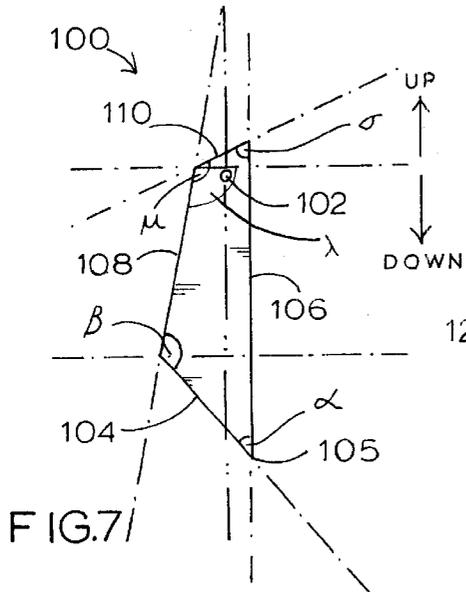


FIG. 7

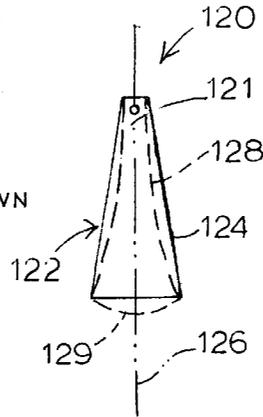


FIG. 8

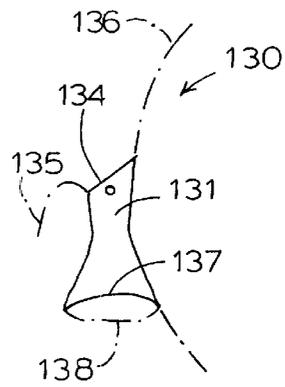


FIG. 9A

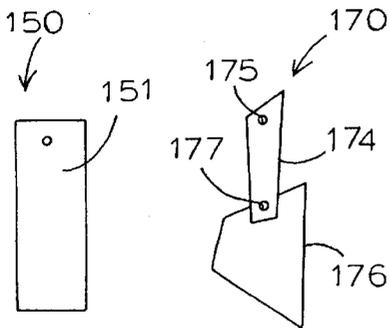


FIG. 10

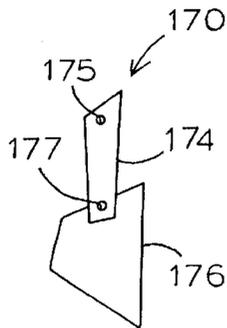


FIG. 11

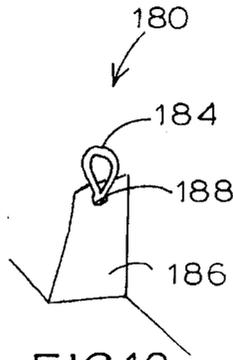


FIG. 12

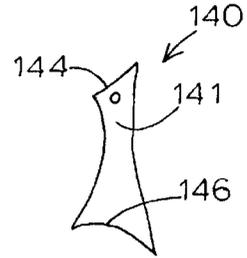
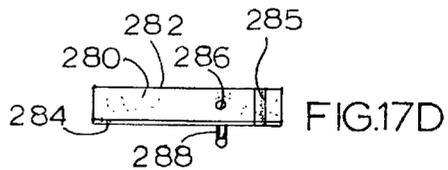
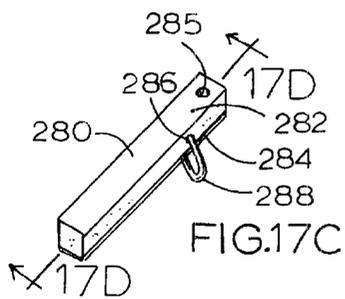
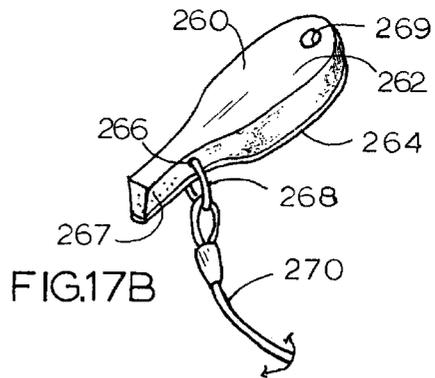
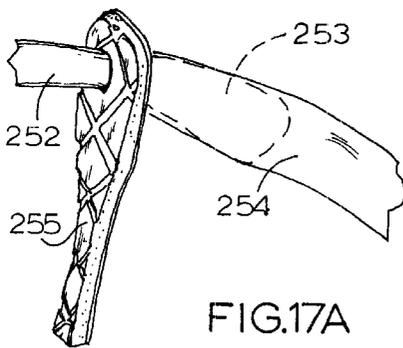
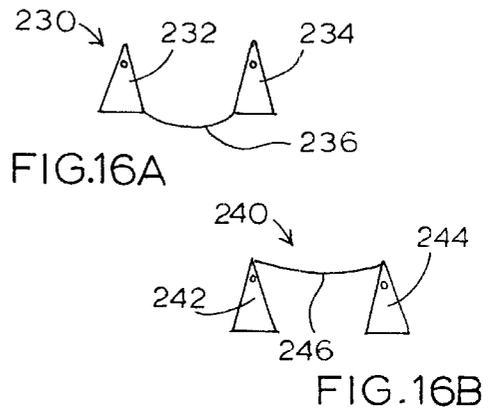
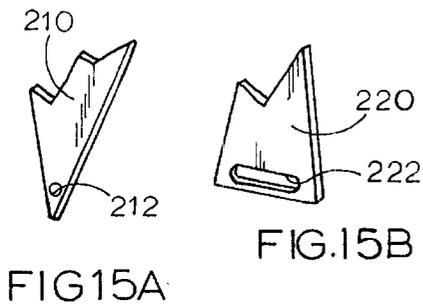
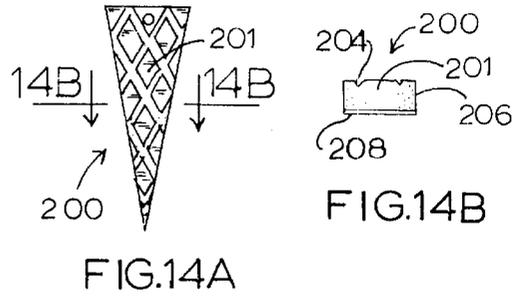
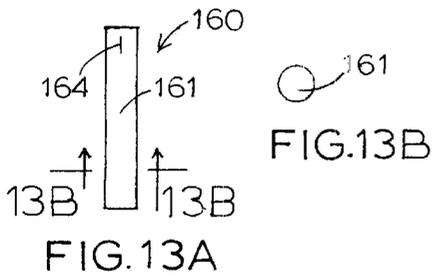


FIG. 9B



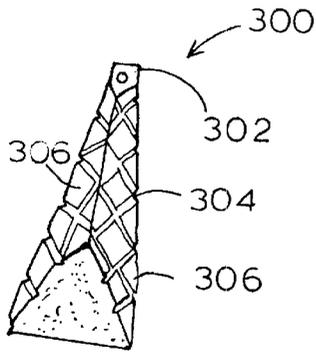


FIG. 18

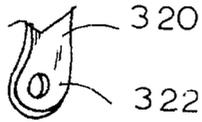


FIG. 19

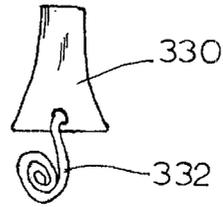


FIG. 20

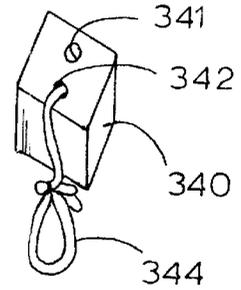


FIG. 21

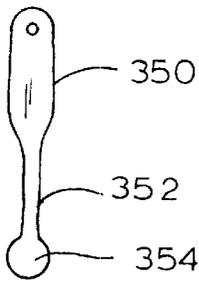


FIG. 22

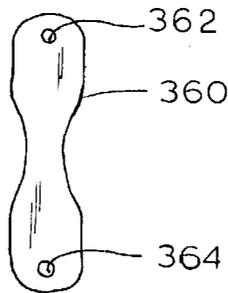


FIG. 23

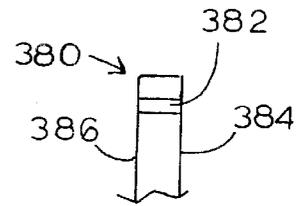


FIG. 24A

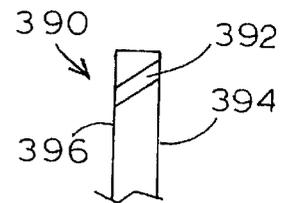


FIG. 24B

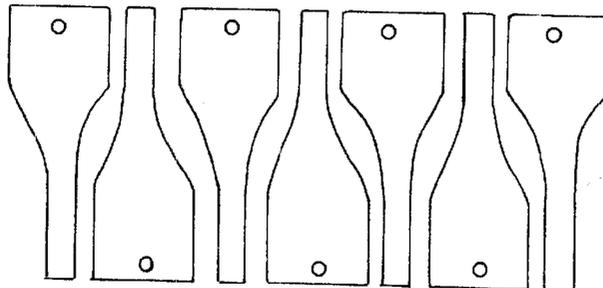


FIG. 25

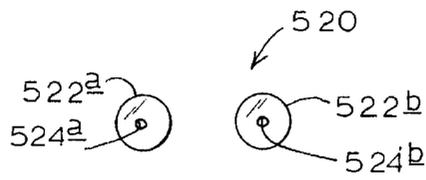
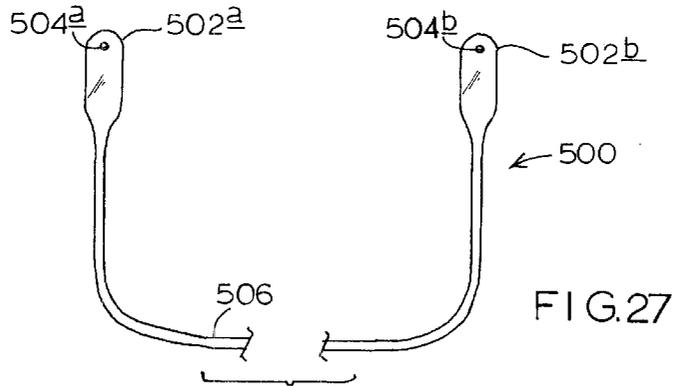
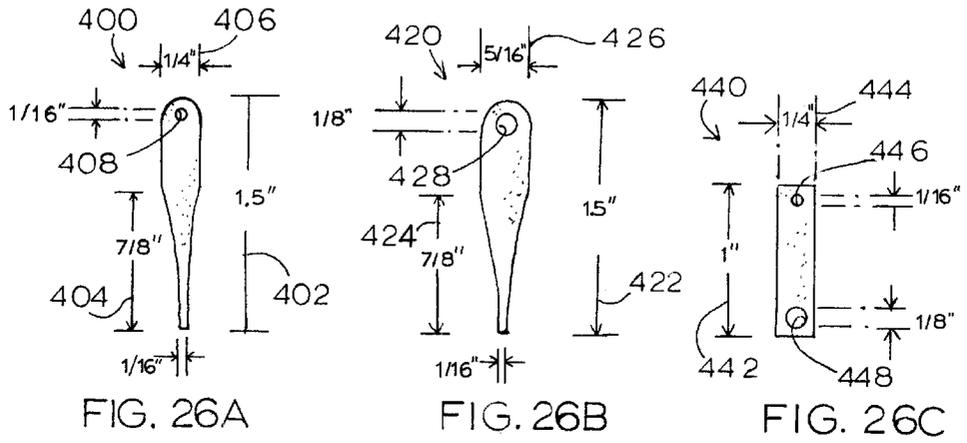


FIG. 28

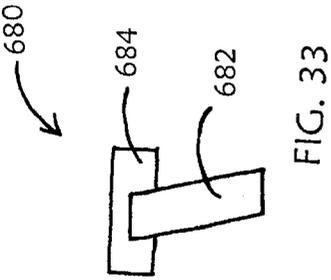


FIG. 33

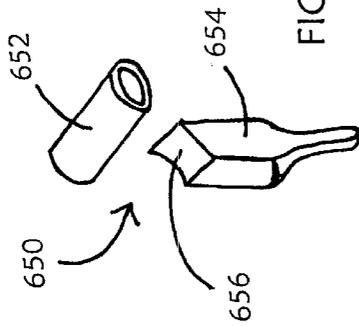


FIG. 30

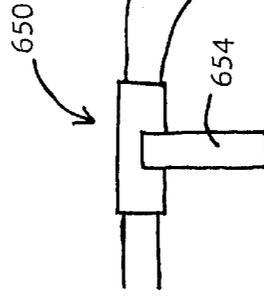


FIG. 31

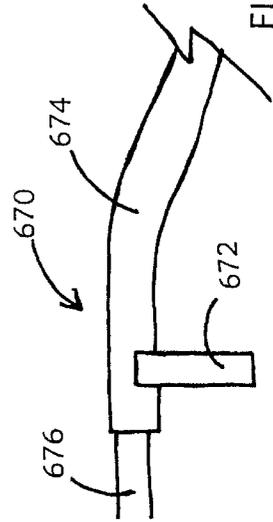


FIG. 32

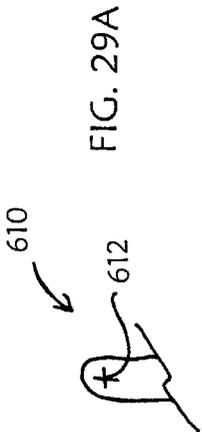


FIG. 29A

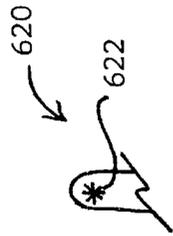


FIG. 29B

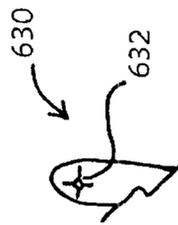


FIG. 29C

EYEGLASS RETAINER**CROSS-REFERENCE TO RELATED APPLICATIONS**

This application is a continuation-in-part of PCT patent application Ser. No. PCT/US99/11270, filed May 21, 1999, which claims priority from U.S. patent application Ser. No. 09/114,784, filed Jul. 13, 1998 now U.S. Pat. No. 6,000,795 and U.S. Provisional Application Serial No. 60/086,377, filed May 22, 1998. All of the above applications are each hereby incorporated by reference.

FIELD OF THE INVENTION

The invention relates to devices and methods for holding a pair of glasses on a person's head. The invention applies to many types of glasses including sunglasses, reading glasses, driving glasses, safety glasses and sport glasses.

BACKGROUND OF THE INVENTION

For centuries people have worked to solve the problem of securing eyeglasses comfortably on a wearer's head. There is a natural tendency for glasses to slip down the wearer's nose and face, from their optimal location with the lenses positioned in front of the wearer's eyes. The problem is exacerbated when glasses are worn during vigorous activities such as running or cycling, or when the wearer has fluid such as sweat, make-up, or lotion around the eyes and upper part of the nose where glasses typically rest.

The most common device used today to secure eyeglasses on a person's head is a strap worn behind the wearer's head, connecting distal tips of the two eyeglass temples. However, eyeglass straps are not always preferred or appropriate. Some people do not want the visibility of a strap. At work or formal events, an eyeglass strap may be distracting or may appear too casual. Other times a strap may be undesirable because of the effect it has on the wearer's hair. Another problem with eyeglass straps is that they usually require two hands to remove. Eyeglasses with straps also can be difficult to fit into an eyeglass case. Thus, there is a need for alternatives to an eyeglass strap for retaining eyeglasses on a person's head.

A number of eyeglass retainers have been designed that use a narrow semi-rigid hook mechanism behind the ear to resist forward movement of the temple. For example, some eyeglasses have "wrap-around" temples with end portions that are thin wire gauge extenders curved to wrap around the back of the wearer's ear. The wrap-around temple is designed to fit in the crease where the ear and head connect. However, temples with permanent wrap around tips rarely fit in the right spot because the eyeglass frames are usually not customized. If the wrap-around portion is too far back then the glasses slide forward before the hook meets the ear. If the wrap-around portion is too far forward then the spring-like wire exerts excessive pressure behind the ear causing discomfort.

Modifications of traditional wrap-around temples are disclosed in U.S. Pat. No. 2,626,538 and U.S. Pat. No. 5,002,381, each of which discloses an add-on accessory for an eyeglass temple including a tube portion that slides over the distal tip of a temple for placement along the temple in relation to the wearer's ear. A hook member extends down from the tube portion presenting a concave surface for positioning in the crease behind the wearer's ear and resisting forward movement of the eyeglasses.

An inherent problem with hook-shaped eyeglass retainers is that functionally they rely on direct forward pressure

applied behind the ear in a relatively small and highly sensitive area where the ear meets the head. The hook-shaped retainer must be relatively stiff in the front-to-back direction, otherwise, the retainers fail to hold the eyeglasses in place. Some hook-shaped retainers may function acceptably for the purpose of securing eyeglasses, but over time they cause irritation behind the ear, which is probably why such retainers are not more widely used today.

Another problem with accessory retainers such as the ones disclosed in Pat. Nos. 2,626,538 and 5,002,381 is that the tube portions are insufficiently flexible to fit over a wide range of temple dimensions. The thickness and shape of eyeglass temples vary dramatically. Eyeglass temples may be small gauge wire extensions with a round cross-section, as in aviator glasses, or they may be large plastic braces such as the temples of a RAY BAN WAYFARER®. The tube portions of prior accessory retainers such as those mentioned above are not versatile enough to fit on temples that vary over a wide range of cross-sectional dimensions.

Another approach to retaining eyeglasses is to use temples that clamp the head. This design may work satisfactorily for extremely lightweight eyewear on some head sizes. However, the clamping force required to secure most glasses for extended periods will eventually cause discomfort. It is also difficult to pre-set a clamping force that will achieve the retention goal comfortably on a wide range of head sizes. This is a significant limitation because most eyeglass frames are not customized for a particular person.

Even though the problem of securing eyeglasses has been worked on diligently by many people for many years, a need still exists for a comfortable, flexible, inexpensive, universal eyeglass retainer that is unobtrusive and does not necessarily require an around-the-head tensioning strap.

SUMMARY OF THE INVENTION

The invention provides a simple mechanism for retaining eyeglasses on a person's head. The retention device is simpler to use, easier to make, more adaptable to varying individual anatomies, more comfortable to wear, more versatile for use on different shapes and sizes of eyeglasses, and more aesthetically acceptable than eyeglass retention devices used in the past.

A pair of eyeglass tethers are provided for securing eyeglasses on a person's head. Each tether has an elastomeric attachment mechanism providing a hole for receiving an eyeglass temple. A traction portion descends from the attachment mechanism, and is freely bendable in a front-to-back direction so that the traction portion can grip a person's back ear region without concentrating significant forward pressure in the crease where the ear meets the head.

Eyewear includes a pair of lenses supported in a front frame member. A pair of temples are connected to opposite ends of the frame member. The temples extend rearward for bracing the eyeglasses on a wearer's head. Each of a pair of retainers has an elastomeric traction portion descending from one of the temples. The traction portion is freely yielding in a front-to-back direction, and has a surface that grips a wearer's back ear region.

An eyeglass retention device includes a pair of retainers. Each retainer has an upper edge, and an attachment mechanism near the upper edge including a hole for receiving a temple on a pair of eyeglasses. Each retainer has an elastomeric traction portion descending from the temple. Each traction portion has a width and a thickness, the width being substantially equal to or greater than the thickness.

Another eyeglass retention device includes a pair of retainers, each retainer has an upper edge, an attachment

mechanism near the upper edge including a hole for receiving a temple on a pair of eyeglasses, and a resiliently flexible traction portion having a front face descending from the hole, wherein the front face is substantially planar.

The invention also provides an eyeglass retention device including an elongate member having a long axis running between top and bottom opposite ends. A hole is provided near the top end for receiving an eyeglass temple. A handle is located near the bottom end. The member has a surface that tends to grip on skin, and is resiliently stretchable along the long axis so that when the member is stretched from an eyeglass temple into a wearer's back ear region by pulling on the handle, the member grips and maintains a partially stretched orientation causing a front-to-back pulling force to be exerted on the temple without concentrating significant forward pressure behind a wearer's ear when used to secure eyeglasses on a wearer's face.

In another embodiment, eyewear includes a pair of eyeglasses which have two temples, and a pair of foam rubber sheet members. Each sheet member is defined between substantially planar and parallel front and back sides. Each sheet member has a hole connecting the front side to the back side. Each of the temples is inserted through the hole of one of the sheet members so that the front sides of the sheet members face generally forward when the eyeglasses are worn.

Another eyeglass retention system includes a pair of tethers. Each tether has an upper edge and an attachment mechanism providing a hole near the upper edge for receiving an eyeglass temple. Each tether has an elastomeric traction portion below the attachment mechanism. The hole of each tether defines a front-to-back direction. The traction portion of each tether lacks significant stiffness in the respective front-to-back direction.

Retainers employ a pair of tethers, each tether having an upper edge, and an attachment mechanism including a hole near the upper edge for receiving an eyeglass temple. Each tether has an elastomeric traction portion descending from the hole of the attachment mechanism. The traction portion is made of a flat elastomeric sheet. The sheet has a thickness, oriented in a front-to-back direction, of less than about $\frac{3}{8}$ inch, and width equal to or greater than the thickness.

The invention also provides a method of manufacturing an eyeglass retention device. Eyeglass retention members are cut out of a sheet of elastomeric material. A hole is cut in each retention member. The dimension of each retention member is limited so that it can substantially entirely fit behind a wearer's ear.

DESCRIPTION OF THE FIGURES

FIG. 1 is a perspective view of a pair of eyeglasses with retainers according to an embodiment of the present invention.

FIG. 2A is a view of the back of a person's head showing retainers positioned behind the person's ears.

FIG. 2B is a view of the top of a person's head showing the person's back ear regions.

FIG. 3A is a schematic view of a retainer according to the present invention.

FIG. 3B is a perspective view of a preferred embodiment of the present invention.

FIG. 3C is a cross-sectional view through the retainer shown in FIG. 3B.

FIG. 3D is a side view of a retainer mounted on an eyeglass temple.

FIG. 3E is a front view of a retainer having a modified peripheral shape.

FIGS. 4-6 are perspective views of other embodiments of the invention.

FIG. 7 is a back view of an embodiment of the invention.

FIG. 8 is a front view of another retainer embodiment.

FIGS. 9A, 9B and 10 illustrate alternative retainer shapes.

FIGS. 11 and 12 are front views of eyeglass retainers employing different temple attachment mechanisms.

FIG. 13A is a front view of another retainer.

FIG. 13B is a cross-sectional view through the retainer shown in FIG. 13.

FIG. 14A is a front view of another retainer embodiment.

FIG. 14B is a cross-sectional view through the retainer shown in FIG. 14.

FIGS. 15A and 15B are partial front views of retainers employing handle-like accessories.

FIGS. 16A and 16B are schematic views of retainer strap devices in accordance with the present invention.

FIGS. 17A-D are perspective views of retainers in accordance with the present invention, being used with a strap on an eyeglass temple.

FIGS. 18-23 show alternate retainer embodiments of the invention.

FIG. 24A is a cross-sectional side view through a hole in a retainer according to a preferred embodiment of the invention.

FIG. 24B is a cross-sectional view through a retainer having a modified hole configuration.

FIG. 25 is a schematic view of a die-cut pattern for producing retainers.

FIGS. 26A-C are front views of alternative retainer designs.

FIG. 27 is a front view of an alternate strap retainer system.

FIG. 28 is a front view of another embodiment of the invention.

FIGS. 29A, 29B, and 29C are partial front views of different aperture designs for eyeglass retainers.

FIGS. 30-33 illustrate another embodiment of the invention.

DESCRIPTION OF THE INVENTION

The invention provides a soft, flexible retainer member for suspension from an eyeglass temple. The retainer is versatile for use on eyeglass temples of varying dimensions. The retainer employs static friction to maintain its position behind a person's ear, rather than relying primarily on a forward pressuring member to hook rigidly behind the ear. Consequently, the retainer can be worn for long periods of time without discomfort. The retainer is particularly useful for eyeglass retention during sporting events, such as running or biking in which eyeglasses are especially prone to being dislodged from their optimal position. The retention device is also well-suited for use on prescription glasses that often contain relatively heavy glass lenses, and are worn for long periods of time. There are many embodiments of the invention, as exemplified in the FIGS. and description below.

FIG. 1 illustrates a pair of eyeglasses 30 with retainers for securing the glasses on a person's head. Eyeglass frame 32 holds lenses 34. Temples 36 extend rearward for mounting on the sides of a person's head and resting on the bridge

between a person's ear and head. Retainer **38** is mounted on temple **36** at an appropriate location along the length of temple **36** so that retainer **38** nestles behind the person's ear in a comfortable manner while anchoring, or even pulling to some extent, the lens portion of the glasses against the person's face in the desired wearing position. Retainers of the present invention may also be referred to as "tethers" because, unlike prior retention devices, the invented retainers act like flexible leashes binding each temple to an ear.

Arrows in FIG. 1 show relative directions that are referred to throughout the specification and claims. Line **39** defines a "front-to-back" direction substantially parallel to temple **36**. Arrow **39a** points to the front, and arrow **39b** points to the back. Line **40** defines the gravitational direction sometimes referred to as up **40a** and down **40b**. Line **41** defines a lateral direction perpendicular to up-down direction **40** and substantially parallel to the plane of lenses **34**. Lateral direction **41** is also referred to as a side-to-side direction. One way of thinking about the defined directions is that they relate to a person's head, as shown in FIG. 2, who is wearing eyeglasses **30**. Throughout the specification and claims, terms are used to describe various retainer embodiments relative to the defined directions. For example, edge **42** of retainer **38** may be referred to as an "upper edge." Similarly, edge **43** may be referred to as a "lower edge." A portion of retainer **38** that is below upper edge **42** may be referred to as "descending" from upper edge **42**.

FIG. 2A shows the back of a person's head who is wearing glasses with retainers such as the ones shown in FIG. 1. Retainer **38** is wedged or nestled between the back of ear **45** and the side of head **44** also referred to as the "back ear region." Top views of back ear regions **45a** are shown in FIG. 2B.

FIG. 3A shows components of a retainer embodiment of the invention relative to up-down direction **40** and side-to-side direction **41**. Retainer **46** includes an attachment mechanism **47** providing a hole **47a** for receiving an eyeglass temple. Attachment mechanism **47** is preferably made of an elastomeric material such as neoprene that is sufficiently stretchable so that hole **47a** can be enlarged to accommodate eyeglass temples of varying dimensions, however, small enough, in combination with the frictional characteristics of attachment mechanism **47**, to remain stationary along a temple during normal eyeglass use. In a preferred embodiment, hole **47a** has an area of about 0.0031 in² when it is unstretched, and an ability to stretch over a temple portion cross-sectional area of about 0.0047 in². By selecting an appropriate elastomer and dimension, the hole can stretch resiliently around a temple portion having a cross-sectional area of at least about five times the unstretched area of the hole.

Neoprene with fabric backing on one side works well for manufacturing the invented retainers. Suitable neoprene materials can be obtained from Rubitex Corp. under the product numbers 931, G-231n and R-1400n. Neoprene thicknesses that have been tried successfully range from 1/8 inch to 3/8 inch. For these neoprene materials a thickness of less than 1/8 inch results in insufficient gripping capacity. Whereas, a thickness of more than 3/8 inch renders the retainer insufficiently yielding in the front-to-back direction causing a less comfortable fit.

Traction portion **48** descends from upper edge **48a** and is dimensioned to grip a person's back ear region. Traction portion **48** may include, and be integrated with, attachment mechanism **47**, or may be a separate piece. Handle **49** descends from traction portion **48** to provide a handle to pull

on when the glasses are initially put on. Retainer **46** can be made of a single elastomeric unit that frictionally engages a person's back ear region without applying forward pressure in the crease where the head meets the ear. When the glasses are put on, handle **49** is pulled on and then released. The pulling step stretches retainer **46** before it grips so that the retainer ends up gently pulling the glasses toward the person's face, resulting in a snug, comfortable fit.

FIG. 3B shows a preferred embodiment of the invention. Retainer **50** has an upper edge **51**. An attachment mechanism including hole **52** located near upper edge **51** is provided for receiving an eyeglass temple. Traction portion **53** descends from upper edge **51** and hole **52**. Handle **54** descends from traction portion **53**. Lateral sides or edges **55** of traction portion **53** have a surface texture that tends to grip and resist slipping when pressed against skin. For example, traction portion **53** may be made of a highly compressible, soft, foam rubber. Lateral edges **55** are created by cutting the foam rubber so that an open-cell surface texture is exposed, resulting in a good gripping capability. The open-cell surface also has the advantage of absorbing moisture such as sweat while maintaining its capacity to grip on skin. Front face **56** of retainer **50** has an array of criss-cross grooves **57** which increase surface area and may enhance the traction or gripping characteristics of the front side of traction portion **53**. Many other types of treads or texturing features may be similarly employed to improve the gripping capacity of traction portion **53**. For example, front face **56**, which is designed to face forward toward the eyeglass lens, in contact with a person's back ear region, may use a tread design such as those used on automobile tires, or may also use a tread similar to a hiking or running shoe sole, for example a nob or "waffle" pattern. Fabric backing **58** is affixed to the back side of retainer **50** to provide stability.

FIG. 3C shows a cross-sectional view through retainer **50**. Traction portion **53** has front face **56**. Grooves **57** are created in front face **56** for enhancing gripping.

FIG. 3D shows a side view of retainer **50** mounted on temple **59** with front face **56** directed toward eyeglass lenses (not shown). In solid lines retainer **50** descends substantially perpendicular to the long portion of temple **59**. Retainer **50** is also shown in dashed lines bent in a front-to-back direction parallel to temple **59**, which is a typical orientation for retainer **50** when temple **59** is placed behind the user's ear, and retainer **50** is pulled into position in a person's back ear region. Upper edge **51** is placed above, or slightly forward of the crest of the connection between the ear and the head. This results in an added benefit of cushioning and/or lightening the load of the temple on the ear.

In a preferred embodiment, the side-to-side width of traction portion **53** is approximately 3/8 inch. It is important that the side-to-side width of traction portion **53** be sufficient to exert lateral opposing pressures against the user's head on one side, and the back of the ear on other side. However, the width should be limited so that it does not noticeably push the ear outward from its usual position.

The length of retainer **50** from upper edge **51** to the opposite tip of handle **54**, is approximately 1 5/8 inches. Increased length of handle **54** makes retainer **50** easier to manipulate. However, it is important for the length of handle **54** to be short enough so that it substantially hides behind the ear, i.e., does not extend appreciably beyond the perimeter of the ear. The narrow taper of handle **54** minimizes its visibility while increasing its longitudinal elasticity. When retainer **50** is used, handle **54** substantially hides under the distal tip of temple **59**, and remains easily accessible for tightening the fit.

Front face **56** of traction portion **53** is planar which helps to prevent retainer **50** from focusing forward pressure in the sensitive crease area behind the user's ear. The same objective of avoiding concentrated direct forward pressure, is achieved by selecting a soft resiliently compressible foam rubber material that freely bends in a front-to-back direction, as illustrated in FIG. 3D.

FIG. 3E shows a retainer **60** similar to retainer **50**, except with a smoothly curved peripheral shape.

FIG. 4 illustrates another embodiment of the invention. Retainer **61** has an outer edge **62** that is shorter than inner edge **64**. Retainer **60** is designed so that inner edge **64** will rest against the user's head while outer edge **62** rests against the back of the user's ear. This design increases the amount of friction created between the retainer and the user's ear and head while tapering the shape in order to minimize its visibility, i.e., preventing the retainer from visibly protruding beyond the circumference of the user's ear. Trademark logo **66** may be placed on the back side of sheet member **61** so that it is visible from a viewpoint behind the user's head.

In FIG. 5, retainer **70** has an isosceles triangular shape. Hole **72** is positioned near upper edge **74**. Sheet member **71** has a maximum width at upper edge **74** and tapers with a narrowing width through handle **76** to the tip of lower edge **78**.

FIG. 6 shows a variation of the retainers described so far. Retainer **80** has curved edges **82** resulting in a bell-shaped design. The bell-shaped design allows some increase in the elasticity of upper portion **84**, while maintaining a fairly wide handle **82**. One can appreciate that there are many different ways of contouring the edges of a foam rubber sheet member to follow the contours of the back of a person's ear while achieving the desired friction, comfort and retention goals.

FIG. 7 shows another embodiment of the invention. The view is taken toward the back of retainer **100**, i.e., toward the back of the wearer's head (not shown), the retainer being designed for use on the left temple of a pair of eyeglasses for positioning behind the wearer's left ear. Retainer **100** has a hole **102** for receiving the distal tip of the left temple of the eyeglasses (not shown). Lower edge **104** tapers toward tip **105** which is adjacent the wearer's head. Inner lateral edge **106** is adjacent the wearer's head when worn and is the longest of the four sides of the retainer. Outer lateral edge **108** is shorter than edge **106** and is positioned adjacent the backside of the wearer's left ear. Lateral edge **108** is short enough so that it does not extend beyond the periphery of the wearer's ear. Upper edge **110** of retainer **100** is close to hole **102**, the shortest side of the retainer. Upper edge **110** should be sufficiently short so that the retainer does not noticeably push out the upper portion of the wearer's ear.

Dimensions and ranges for the design shown in FIG. 7 are as follows. Hole **102** has a diameter in the range of $\frac{1}{32}$ inch to $\frac{3}{16}$ inch, preferably about $\frac{1}{16}$ inch. Edge **104** has a length in the range of $\frac{1}{2}$ inch to $1\frac{1}{8}$ inches, preferably about $\frac{15}{16}$ inch. Side **106** has a length in the range of $1\frac{1}{2}$ inches to $2\frac{1}{2}$ inches, preferably about $2\frac{1}{16}$ inches. Side **108** has a length in the range of $\frac{3}{4}$ inch to $1\frac{1}{2}$ inches, preferably about $1\frac{3}{4}$ inches. Upper edge **110** has a length in the range of $\frac{3}{16}$ inch to $\frac{7}{16}$ inch, preferably about $\frac{7}{16}$ inch. Angle α is approximately 40-degrees. Angle σ is approximately 67-degrees. Angle β is approximately 127-degrees. Angle μ is approximately 125-degrees. Angle λ is in the range of 95-degrees to 110-degrees, preferably about 101-degrees. The thickness of retainer **100** is in the range of $\frac{1}{8}$ inch to $\frac{3}{8}$ inch, preferably about $\frac{3}{16}$ inch.

In FIG. 8, retainer **120** includes sheet member **121** which has side **122** that is equal in length to opposite side **124**. Sheet member **121** has side-to-side symmetry relative to axis **126**. The symmetry feature of retainer **120** is advantageous for at least the following two reasons. First, retainer **120** can be used on the left temple or the right temple of a pair of eyeglasses. In other words, each of a pair of retainers are identical to each other. Accordingly, they are easier to manufacture because only one piece configuration has to be manufactured instead of two. Second, the retainers are easier to use because the vendor does not have to educate the user about which retainer goes on which side.

FIG. 8 also shows a variation of symmetrical sheet member **121**, in dashed line **128**. Modified sheet member **128** is more elastic in its upper portion because of its narrowed width. Sheet member **128** also has a curved lower edge **129** for enhancing the manipulation function of the lower portion.

FIGS. 9A and 9B illustrate different retainer shapes. In FIG. 9A, retainer **130** includes sheet member **131**. Upper edge **134** is tapered so that it has a lower profile next to ear **135** and extends higher adjacent head **136**. Again, the objective is to substantially conceal the retainer from view, at least when the wearer is being viewed from the front, while maximizing static friction between the retainer and the wearer's ear and head. Also shown in FIG. 9A is a possible curved lower edge **138** similar to the variation already shown and described in FIG. 8. In FIG. 9B, retainer **140** includes sheet member **141** with upper edge **144** similar to edge **134** in retainer **130**. Retainer **140** is substantially the same as retainer **130** except that lower edge **146** is tapered so that it is shorter next to the wearer's ear, while extending slightly further down the side of the wearer's head. Both of retainer's **130** and **140** are designed for use behind the wearer's left ear, assuming that the retainer design shown in FIGS. 9A and 9B are rear views.

FIG. 10 shows retainer **150** including sheet member **151** which is substantially rectangular. Sheet member **151** is symmetrical, similar to retainer **120** of FIG. 8, but it is less conforming to the anatomical topography behind a person's ear.

FIGS. 13A and 13B show different views of another embodiment of the invention in which retainer **160** includes cylindrically-shaped elastomeric cord member **161**. Retainer **160** also employs slit **164**, instead of a hole as shown in previously described embodiments. FIG. 13A shows a cross-section through cord member **161** illustrating its cylindrical shape.

FIGS. 11 and 12 illustrate embodiments of the invention in which different materials and dimensions are used for the temple attachment portion versus the anchoring portion. In FIG. 11, retainer **170** includes an upper link **174** including hole **175** for receiving the left temple of a pair of eyeglasses. Link **174** is attached to anchor portion **176** by rivet **177**. The material for link **174** can be selected for the primary purpose of the desired elastomeric and friction properties relative to the expected range of eyeglass temples that retainer **170** could be used on. At the same time, the material and dimensions for anchor portion **176** can be selected primarily for the purpose of achieving the desired comfort and static friction properties relative to the user's back ear region.

Similarly, in FIG. 12, retainer **180** includes a rubber ring member **184** connected to anchor portion **186** via rivet **188**. The same material and dimension selection advantages discussed above with respect to retainer **170**, also apply to retainer **180**.

FIG. 14A shows retainer 200 which is similar in shape to retainer 170 already described in relation to FIG. 5. However, sheet member 201 has a criss-cross array of grooves 204, creating a texture for increasing the desired friction characteristics of retainer 200. A cross-section of retainer 200 is shown in FIG. 14B. The thickness of retainer 200 is $\frac{3}{16}$ inch and consists of two layers, a thicker foam rubber layer 206 bonded to a relatively thin fabric layer 208 on the side opposite from texturing grooves 204. Some times it is desirable to place a fabric layer against the skin for comfort or sweat-absorption purposes. Other times, it may be preferable to place the textured surface 204 against the skin to provide higher friction, therefore better retention in certain situations.

FIGS. 15A and 15B illustrate accessories that can be employed either for better manipulation of the handle of the retainer and/or for decorative purposes. Retainer 210 has a hard bead or button 212 that can be gripped and pulled on when the glasses and retainers are being positioned on a person's head. Similarly, in FIG. 15B, retainer 220 has an elongated miniature handle 222.

FIGS. 16A and 16B illustrate schematically the concept of connecting a pair of retainers by a strap so that when the glasses are not being worn they can easily be suspended from a person's neck. In FIG. 16A, retainer system 230 includes retainer 232 and retainer 234 which are connected by strap 236. Strap 236 connects to each retainer near the lower part of its handle, i.e., opposite from the upper edge and hole. In contrast, FIG. 16B shows retainer system 240 including retainer 242 and retainer 244 connected by strap 246. Strap 246 is connected to each retainer near the upper edge and hole of the retainer.

FIGS. 17A–D show how retainers of the present invention can be combined conveniently with eyeglass straps. In FIG. 17A, retainer 250 is similar to ones previously described, and is attached to eyeglass temple 252. Distal tip 253 (shown in dashed lines) of temple 252 is inserted in one end of eyeglass strap 254. The end of strap 254 meets or at least approaches retainer 250. When the eyeglasses are worn, retainer 250 is tethered behind the user's ear, thereby securing the eyeglasses in wearing position. When the person wants to take the glasses off, he can simply pull the glasses off with one hand so that the glasses suspend from the person's neck. This retention system is advantageous over prior strap devices because it does not rely on a cinch mechanism behind the head to secure the glasses, which can be more difficult to release, requiring two hands and more complex manipulation.

FIG. 17B shows another way of combining a strap with a retainer of the invention. Retainer 260 has front face 262 and back face 264. Hole 266 is formed through handle 267. Ring 268 is attached to hole 266. Hole 266 is transverse to hole 269. Strap 270 is attached to ring 268. Linking strap 270 to the back of retainer 260 keeps the strap away from the ear which is more comfortable to wear.

FIG. 17C shows a variation of the retainer shown in FIG. 17B. Retainer 280 is substantially rectangular. Retainer 280 has a front side 282 and a back side 284. Hole 285 is located near the upper edge of retainer 280 for receiving an eyeglass temple. A second hole 286 is transverse to hole 285 for receiving ring 288. Ring 288 permits suspension of a strap from the back side of retainer 280.

FIG. 17D shows a cross-section through retainer 280.

FIGS. 18–23 illustrate further variations of eyeglass retainers of the present invention. In FIG. 18, retainer 300 has a triangular cross-section. Attachment mechanism 302

has a hole for receiving an eyeglass temple. Traction portion 304 has three sides. Two of the sides 306 have a surface configured for contacting the back ear region, one of the sides contacts the head while the other side contacts the back of the ear.

FIG. 19 shows a partial view of a retainer including handle 320 having a hole 322 which is large enough to make handle 320 easier to manipulate.

In FIG. 20, traction portion 330 is connected to a retractable handle 332 which helps to hide the entire retainer behind the ear when handle 332 is not in use.

In FIG. 21, traction portion 340 has a first hole 341 for securing a piece of string or some other type of looped handle 344.

In FIG. 22, traction portion 350 is connected to a relatively narrow handle 352. The distal tip of handle 352 has a widened tab member 354 for making handle 352 easier to manipulate.

In FIG. 23, retainer 360 has holes of different sizes 362 and 364 located at opposite ends so that different holes can be used for different eyeglass temple dimensions. The design shown in FIG. 23 further increases the versatility of the retainer to be used on different types of glasses.

FIGS. 24A and 24B are side cross-sectional views through retainers, each having a different hole configuration. In FIG. 24A, retainer 380 has a hole 382 connecting planar front and back faces 384 and 386. Hole 382 is perpendicular to faces 384 and 386. In contrast, retainer 390 in FIG. 24B has hole 392 connecting front and back planar faces 394 and 396. Hole 392 is obliquely angled relative to faces 394 and 396. Angled hole 392 causes retainer 390 to hang in a rearward direction which may be advantageous for some applications.

Most of the retainers described above are manufactured, preferably, by die-cutting retainers out of a neoprene sheet. For example, FIG. 25 shows a die-cut pattern for generating retainers out of a foam rubber sheet. Alternatively the retainers can also be produced by conventional molding processes.

FIGS. 26A–C show some preferred embodiments of the invention. In FIG. 26A, retainer 400 has a length 402 of $1\frac{1}{2}$ inches. The tapering handle portion has a length 404 of $\frac{7}{8}$ inch. The upper traction portion of retainer 400 has a width 406 of $\frac{1}{4}$ inch. Hole 408 has a diameter of $\frac{1}{16}$ inch. The material used to make retainer 400 is neoprene, with fabric on one side, $\frac{1}{4}$ inch thick, 931 knobby, R 1400n, from Rubatex Corp.

FIG. 26B shows a different design. Retainer 420 has a length 422 of $1\frac{1}{2}$ inches. The tapering handle portion has a length 424 of $\frac{7}{8}$ inch. The upper traction portion of retainer 420 has a width 426 of $\frac{5}{16}$ inch. Hole 428 has a diameter of $\frac{1}{8}$ inch. The material used to make retainer 420 is neoprene, with fabric on one side, 931 knobby, G-231-N from Rubatex Corp.

FIG. 26C shows another embodiment. Retainer 440 has a length 442 of 1 inch and a width 444 of $\frac{1}{4}$ inch. Holes of different sizes are provided at opposing ends so that the retainer can be used on a wide range of temple dimensions. Hole 446 has a diameter of $\frac{1}{16}$ inch. Hole 448 has a diameter of $\frac{1}{8}$ inch.

FIG. 27 shows a retainer strap for securing a pair of glasses either in a wearing position on a person's face, or in a non-use position suspended around a person's neck. Retainer strap 500 is preferably made of a single piece of

neoprene, approximately ¼ inch thick, with fabric bound on one side, cut out in the shape shown in FIG. 27. Ear portions 502a and 502b on opposing ends of retainer strap 500 are configured in accordance with the various embodiments described above. Holes 504a and 504b are dimensioned to receive the ends of eyeglass temples, and then to frictionally stay in the proper location along the temple so that the ear portion can be tugged behind a person's ear and thereby retain the eyeglasses in the desired wearing position on a person's face. Ear portions 502a and 502b taper into a strap portion 506 so that when the glasses are not being worn, they may be suspended from the person's neck.

FIG. 28 shows another retention system 520 including retainer members 522a and 522b. Each retainer member is cut out of a sheet of elastomeric material to form a substantially circular traction portion with a concentric hole 524a and 524b.

FIGS. 29A, 29B, and 29C illustrate different aperture designs that may be used to provide adaptability and advantageous gripping capability on an eyeglass temple. In FIG. 29A retainer 610 has aperture 612 which is created by two intersecting die-cuts. The two die-cuts may be made simultaneously by a single die pattern. Similarly, in FIG. 29B retainer 620 has aperture 622 which is created by four intersecting die-cuts. In FIG. 29C retainer 630 has four linear die-cuts radially extending from a circular hole. The apertures in retainers 610, 620, and 630 are essentially formed between flaps that may resist reversal of a sliding direction along a temple. For example, the retainer may slide on to the end of a temple to a desired location. The flaps drag slightly behind the retainer. Extra force is then required to reverse the sliding direction of the retainer toward the end of the temple. This feature may be used to provide increased security of the retainer in an optimal wearing position.

FIGS. 30-33 show another retainer design. In FIG. 30 retainer 650 is exploded showing two components, tube portion 652 and traction portion 654. Traction portion 654 has an upper concave face 656 that is dimensioned to conform to an outer surface of tube portion 652. Traction portion 656 is glued or bonded to tube portion 652. Tube portion 652 is made of a material and dimensioned to exhibit desired adaptability and gripping capability along an eyeglass temple. Traction portion 654 is configured in accordance with previously described embodiments. FIG. 31 shows retainer 650 mounted on eyeglass temple 660.

FIG. 32 shows a variation of retainer 650 in a strap system. Retainer 650 includes traction portion 672 bound to an external surface near an end of strap 674, which is

mounted on eyeglass temple 676. The other end of strap 674 (not shown) is similarly equipped with a traction portion and configured to receive the other eyeglass temple.

In FIG. 33 retainer 680 includes traction portion 682 mounted on tube member 684. Traction portion 682 is cut so that when it is bound to tube member 684 it extends in a slightly diagonal direction relative to tube member 684.

Tube members for retainers 650, 670, and 680 may be cut from conventional rubber tubing or may be sewn or glued along seams formed from sheet material such as neoprene. The traction portions may be die-cut from neoprene in the shape shown in FIG. 30.

Many useful modifications of the invention, as described above, are possible. For example, a product that will be helpful in optometry includes a set of neoprene sheets that are partially pre-cut, and finally cut with scissors to custom-fit a particular person and frame dimension. The pre-cut sheets could look like retainer 150 in FIG. 10. Retainer 150 would then be trimmed to meet the specific needs of a particular person.

I claim:

1. A device for retaining eyeglasses comprising:
 - an elastomeric elongate sheet member having first and second end portions, each end portion having an aperture for receiving an end of an eyeglass temple, each aperture being oriented so that the respective end portion can be mounted on an eyeglass temple and descend behind a person's ear.
2. An eyeglass retention device comprising:
 - a pair of retainers, each retainer having an upper edge, an attachment mechanism near the upper edge including an aperture formed by at least one substantially linear die-cut for receiving a temple on a pair of eyeglasses, and each retainer having an elastomeric traction portion that descends from the temple.
3. The device of claim 2, wherein the aperture has two intersecting die-cuts.
4. An eyeglass retention device comprising:
 - a pair of retainers, each retainer having a tube portion and a traction portion, the traction portion being bonded to the tube portion in a descending orientation and configured to freely yield in a front-to-back direction when contacting the back of a person's ear.
5. The device of claim 4, wherein the retainers are connected by a strap portion.

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