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**Lindberg et al.**

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- [54] **EYEGLASSES HAVING SINGLE WIRE FRAMES**
- [75] Inventors: **Poul Jørn Lindberg**, Egaa; **Hans Dissing**, Copenhagen, both of Denmark
- [73] Assignee: **Poul J. Lindberg**, Copenhagen, Denmark
- [21] Appl. No.: **08/286,442**
- [22] Filed: **Aug. 4, 1994**

**Related U.S. Patent Documents**

Reissue of:

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- Issued: **Aug. 4, 1992**
- Appl. No.: **07/704,404**
- Filed: **May 23, 1991**

U.S. Applications:

- [63] Continuation of application No. 07/634,764, Dec. 27, 1990, Pat. No. 5,073,020, which is a continuation of application No. 07/533,814, Jun. 6, 1990, abandoned, which is a continuation of application No. 07/231,539, Aug. 12, 1988, abandoned.
- [51] **Int. Cl.<sup>7</sup>** ..... **G02C 1/04; G02C 5/00**
- [52] **U.S. Cl.** ..... **351/106; 351/103; 351/154**
- [58] **Field of Search** ..... **351/106, 103, 351/154, 112, 116, 149, 141, 121, 153, 131, 136, 87, 110, 108, 109, 178**

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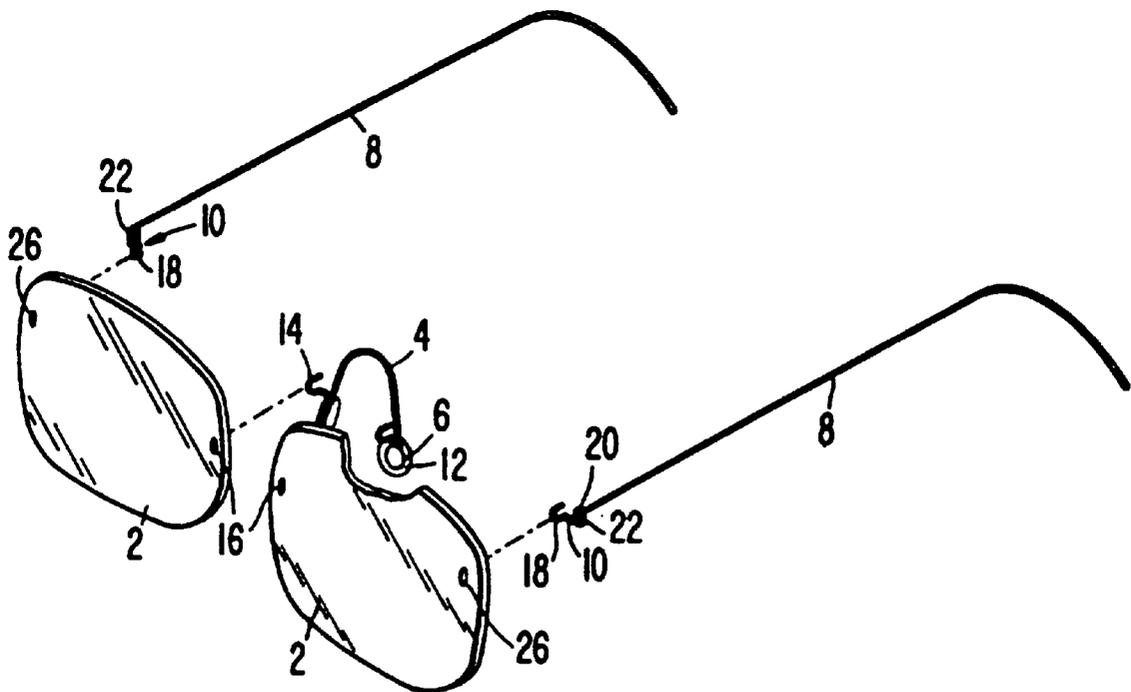
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*Primary Examiner*—Hung Xuan Dang  
*Attorney, Agent, or Firm*—Antonelli, Terry, Stout & Kraus, LLP

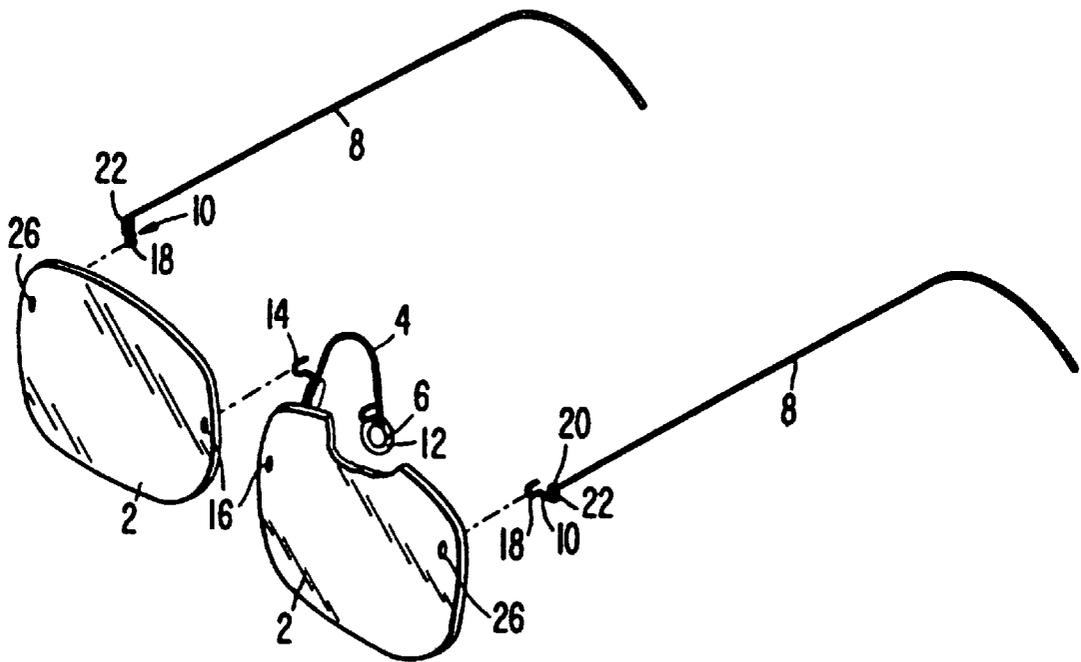
[57] **ABSTRACT**

Eyeglasses including lens and frame portions with a holder in holding engagement with the lens. The frame portions are shaped of a wire material with the holder including looped bent wire portions projecting forwardly of the frame portions. The lens include a mounting hole or recess for receiving the loop bent wire portions, with the hole or recess being of an oblong shape corresponding to a cross-sectional shape of the loop bent wire portions so as to be operable to receive the respective loop bent wire portions with the loop bent wire portions resiliently squeezed between opposed narrow end portions of the oblong holes or recesses thereby insuring a firm yet releasable fixation between the lens and the frame portions.

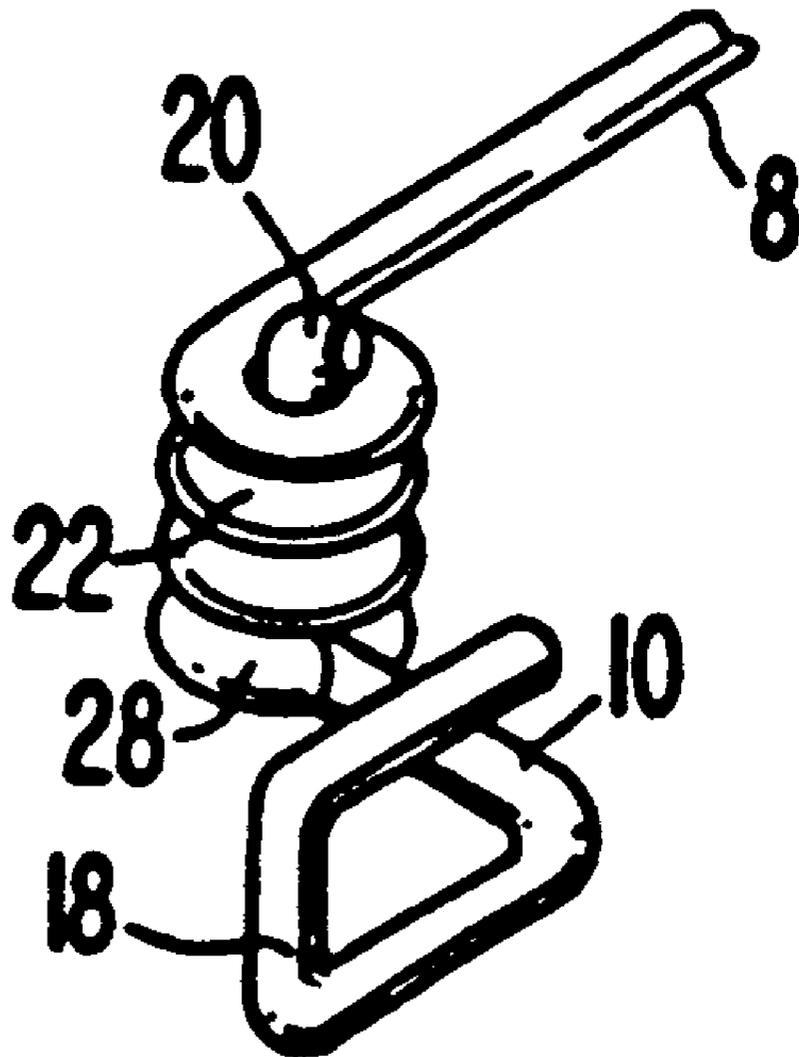
**22 Claims, 11 Drawing Sheets**



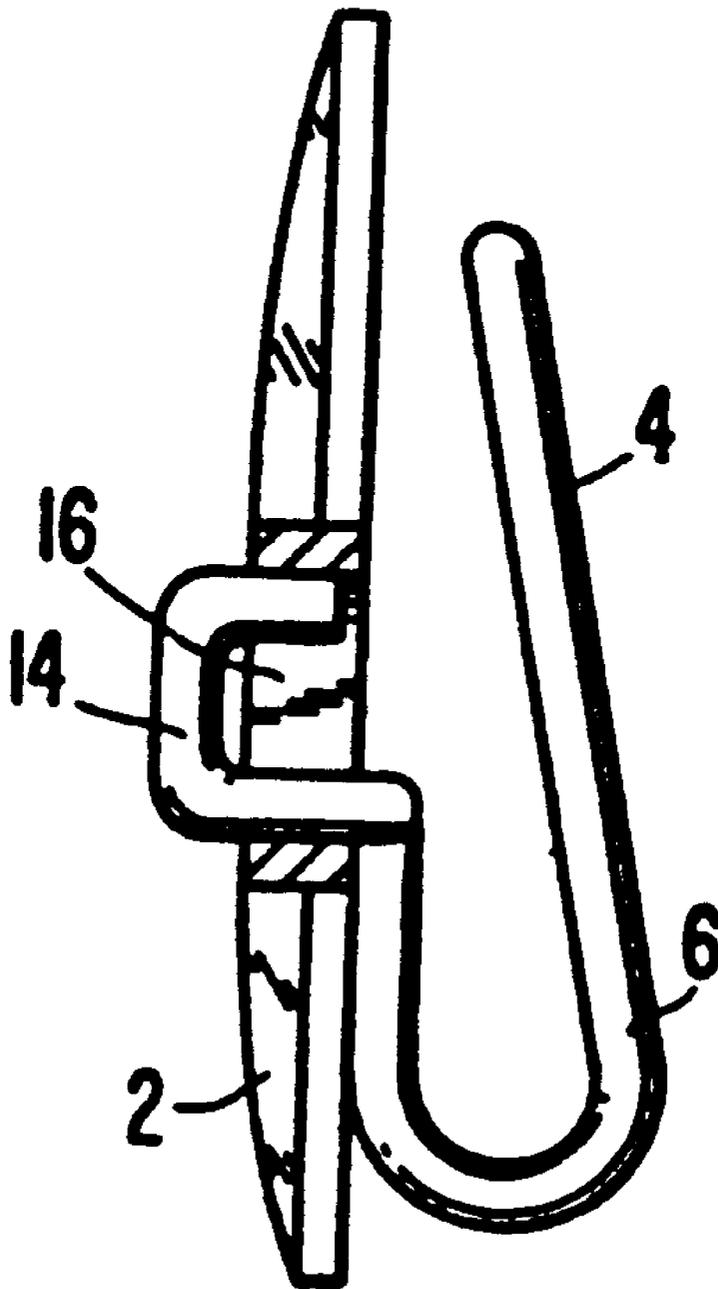
**FIG. 1**



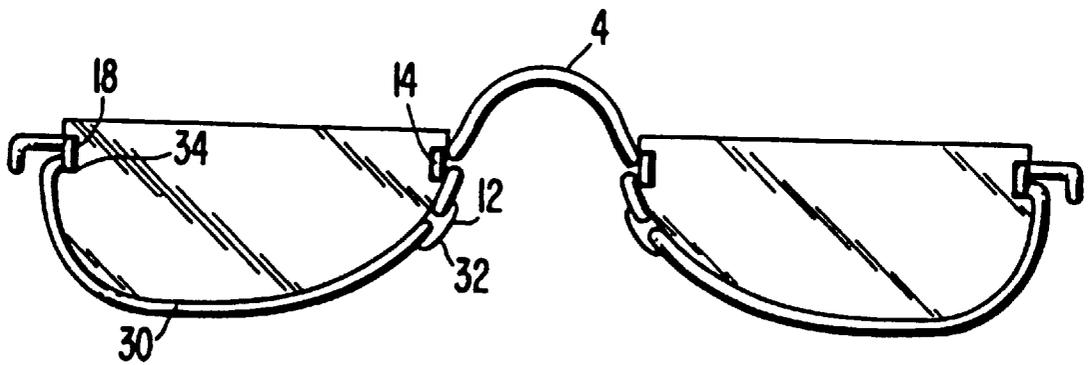
# FIG. 2



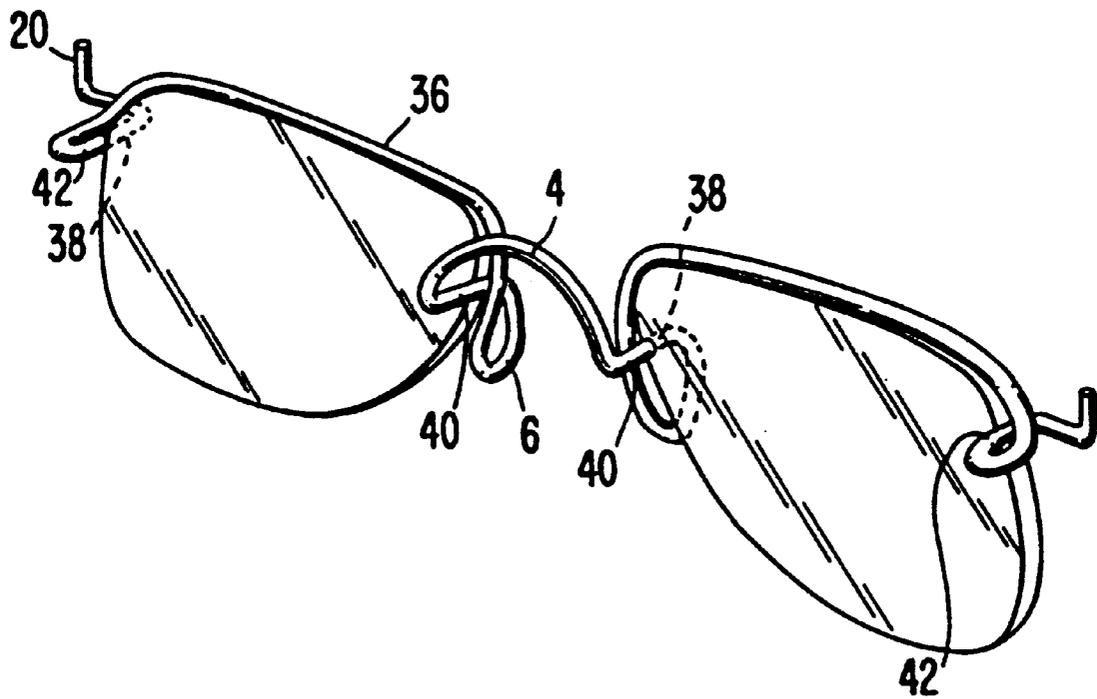
**FIG. 3**



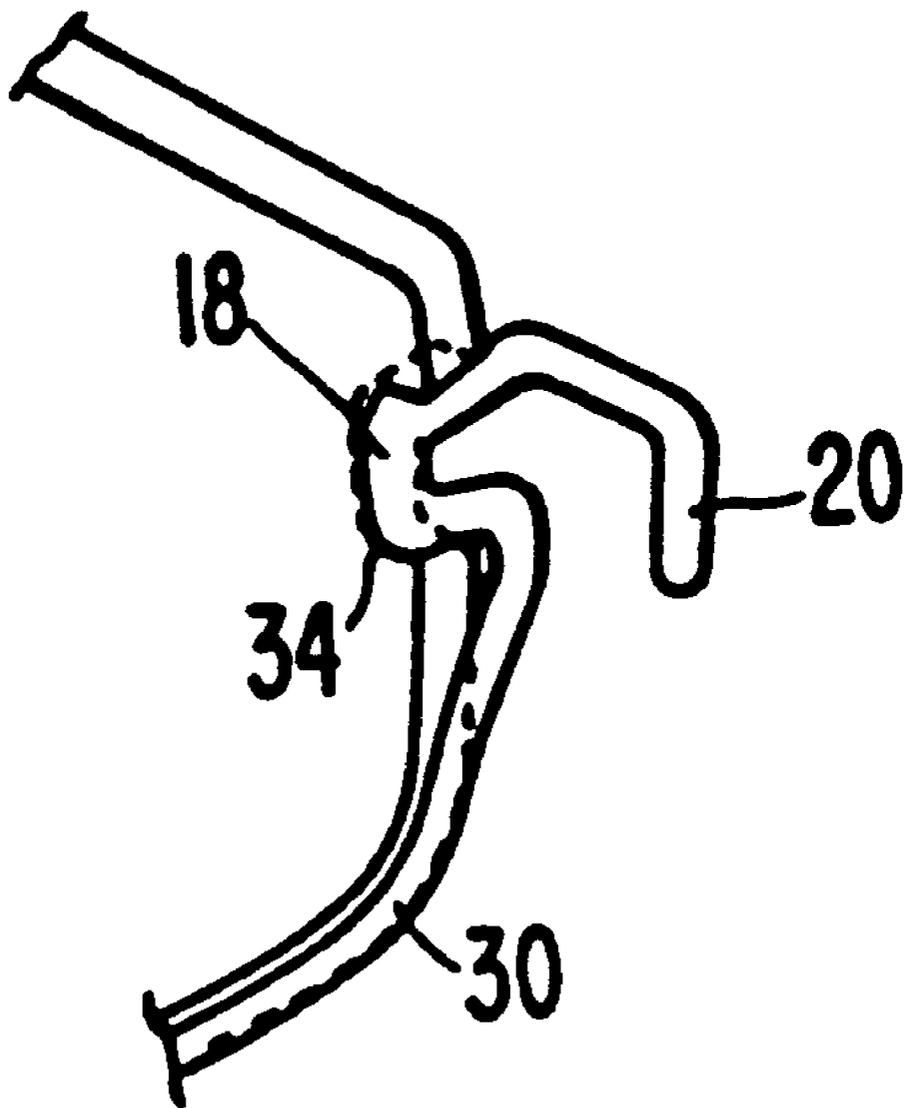
**FIG. 4**



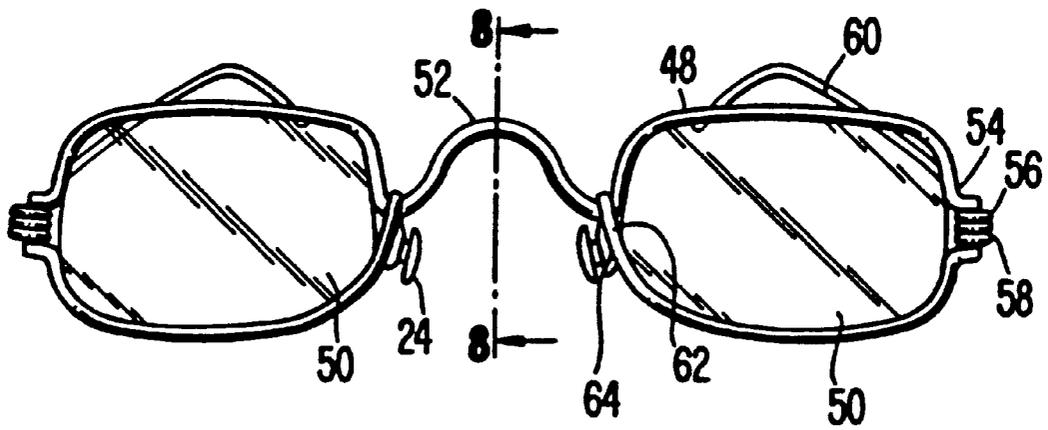
**FIG. 5**



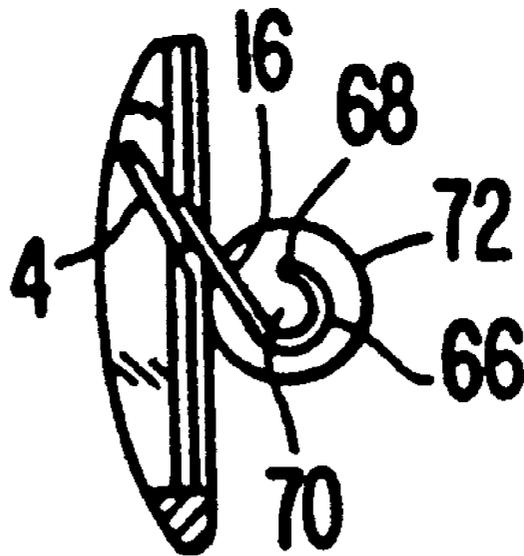
# FIG. 6



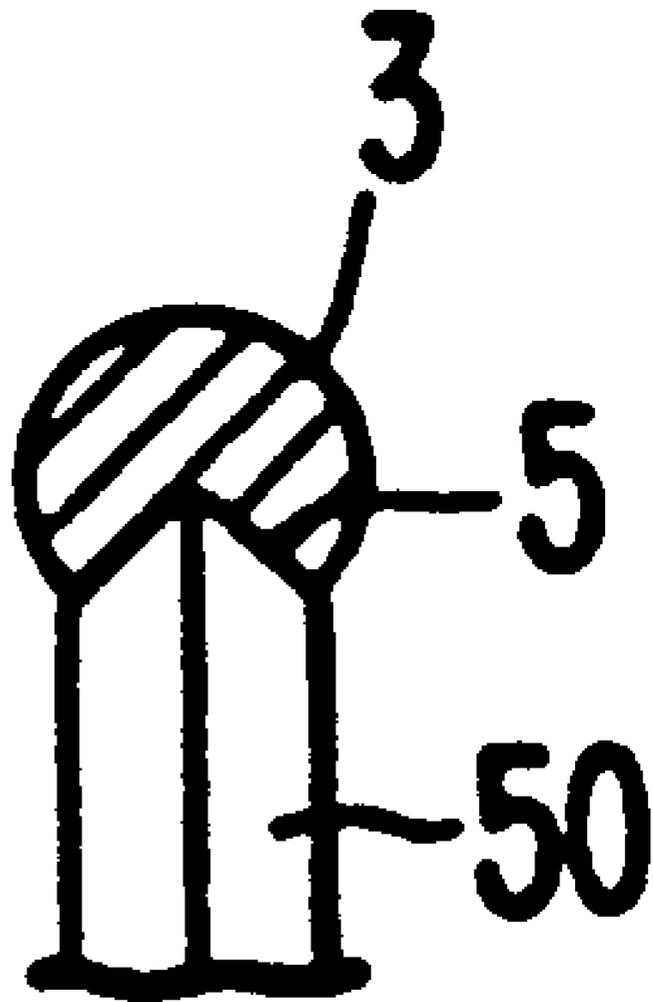
**FIG. 7**



# ***FIG. 8***



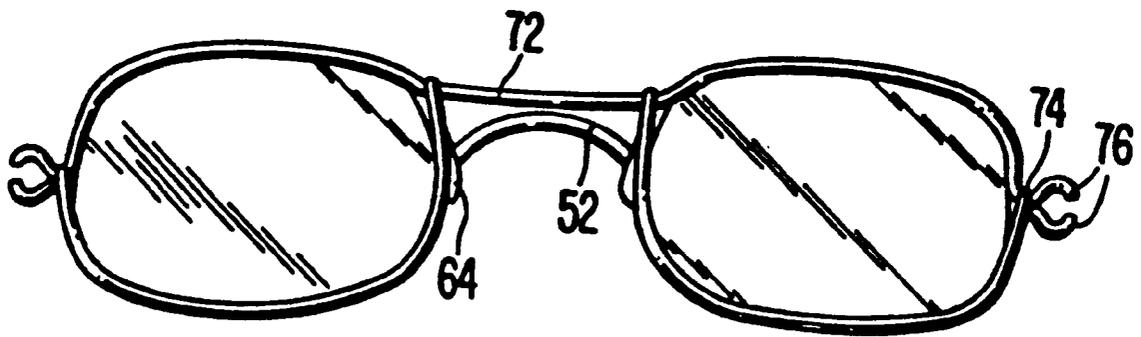
# FIG. 9



**FIG. 10**



**FIG. 11**



## EYEGLASSES HAVING SINGLE WIRE FRAMES

**Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.**

This is a continuation of application Ser. No. 07/634,764, filed Dec. 27, 1990, now U.S. Pat. No. 5,073,020 which is a continuation of Ser. No. 07/533,814, filed Jun. 6, 1990 now abandoned, which is a continuation application of application Ser. No. 231,539, filed Aug. 12, 1988, now abandoned.

### BACKGROUND OF THE INVENTION

The present invention relates to eyeglasses, especially rimless eyeglasses, the lenses of which are fastened to the frames of the glasses by holding portions which are received in holes or recesses in the lenses. As examples of such an eyeglass type reference is made to the French patent specifications no. 62.079 and 1.087.904. By these and other corresponding known eyeglasses rimless or semi-rimless glasses may be secured without using an encircling rim. Hereby, however, both the lens mounting and the frame design are relatively complicated.

According to the invention a substantial simplification is obtained by the lenses being mounted on carrier member portions protruding straight forwardly from the frame and squeezed with a good holding effect in the holes or recesses. This conditions a simple frame construction, whereby the frame may even be constituted entirely by a wire material. The lenses are very easy to mount, and if . . . the holder members are embodied with an increased length, so that they protrude in front of the front face of the lenses, they may even be used for holding additional glass members such as sun shades, when these are provided with the required holes or recesses. The user may easily mount and demount the additional glasses.

By the invention it is furthermore realized that it is advantageous that the holes or recesses be embodied with an oblong shape for receiving holder members of a correspondingly oblong cross sectional shape, i.e., a shape which deviates from a circular or square form, as the glasses may hereby, in a simple manner, be held in a non-rotatable manner relative the holder members. This embodiment is particularly appropriate for entirely rimless eyeglasses, where a good stability of the glasses will be obtained by the holder members being nonrotatable relative the lenses at the central bridge and the outer temple hinges, respectively. Another essential circumstance is that the oblong shape of the holes or recesses provides for the possibility of the holder portions in a simple manner consisting of a folded together loop portion of a stiff wire material appropriate for the relevant purpose, whereby it is possible to construct the eyeglass frame exclusively from bent, stiff wire material with no use of soldered or welded portions, which conditions a substantially simplified production process.

When the frame portions generally consist of wire material it is extremely appropriate that also the temple hinges and the associated temples of the eyeglasses are made of wire material, and according to the invention this is made possible by each of the temple hinges being constituted by a pintle wire portion and a surrounding screw coiled wire portion, which wire portions continue in a temple and in a lens-carrying wire portion, respectively. Hereby the frame as a whole, i.e. including the temples and the hinges, may be embodied exclusively of a bent wire material, whereby the whole frame may be produced automatically at quite low costs.

The invention may well comprise semi-rimless glasses, in which the lens holding frame portions are mutually connected through frame portions, e.g. wire portions, which extend along either the upper or the lower rim of the lenses between the bridge and hinge areas. As each of the lenses is hereby connected to the frame at both sides there are no special requirements of the lenses being connected to the frame in a non-rotatable manner at the single areas of engagement with the frame, as the frame in itself will secure the glasses against relative rotation, and, for the same reason, it is thus not necessary that the holes or recesses in the lenses be of an oblong shape, i.e. in these cases they may well have a circular shape, regardless of this not being visually and use-wise attractive compared to a narrow, oblong shape.

### BRIEF DESCRIPTION OF THE DRAWINGS

In the following the invention is described in more detail with reference to the accompanying drawing wherein:

FIG. 1 is a perspective exploded view of a pair of eyeglasses according to the invention,

FIG. 2 is a perspective view of an eyeglass hinge thereof,

FIG. 3 is a cross sectional view of a joint area thereof,

FIG. 4 is a front view of a pair of semi-rimless eyeglasses according to the invention, and

FIG. 5 is a corresponding view of another pair of semi-rimless eyeglasses according to the invention.

FIG. 6 is a perspective view of a detail of FIG. 6,

FIG. 7 is a front view of a pair of full-rimmed eyeglasses according to the invention,

FIG. 8 is a sectional view seen along line VII—VII of FIG. 6,

FIGS. 9 and 10 are cross sectional views of a preferred frame wire, and

FIG. 11 is a front view of a modified part of full-rimmed eyeglasses according to the invention.

### DETAILED DESCRIPTION

The pair of eyeglasses shown in FIGS. 1-3 comprises two lenses 2, a bridge 4 with pad arms 6, and two temples 8, each having a hinge part 10 for mounting on the lens 2.

The bridge is made of a rather stiff, but pronouncedly resilient wire material, preferably titanium wire, and is bent for forming the pad arms 6, which constitute downwardly projecting U-shaped loops, into which is inserted a holding base portion for a nose pad 12, which may consist of e.g. semi-soft plastic. From these loops the wire ends extend slightly laterally outwards and then forwards, upwards, and backwards through a forwardly projecting loop portion 14, in which the horizontal wire portions run parallelwise.

The loop portions 14 are designed for insertion into or through oblong holes 16 in the lens 2, with these holes 16 being provided with great accuracy for achieving a good securing.

The hinge parts 10 are likewise made of wire and show corresponding loop portions, 18, wherefrom the wire continues slightly outwards to the side and therefrom upwards for forming a hinge pintle 20.

About this wire is placed the foremost, screw coiled end portion 22 of the associated temple 8, which is also made of the wire material. After placing the screw coil on the pintle 20, the upper end thereof is bent out for axial locking of the screw coil, whereafter this is only turnable about the pintle 20, preferably with a certain friction. The rear, bent ear

portions of the temples may of course if desired be coated with an appropriate coating material.

The loop portion **18** is designed for insertion into or through oblong holes **26** in the lenses **2**, corresponding to the holes **16**.

From the parts shown in FIG. **1** the eyeglasses may thus be assembled solely by inserting the loop portions **14** and **18** into the holes **16** and **26**. Because of the oblong shape of the holes **16,26** and the loop portions **14,18** no rotation may occur between the assembled parts.

The screw coil in each of the hinge parts **10** extends downwards from the front end of the temple **8** and ends in a lower end portion **28** (FIG. **2**), which, by outward rotation of the temple, will abut the wire portion extending laterally from the loop portion **18**, such that the rotation stop which is normal for eyeglasses or temples is formed in a simple manner.

The loop portions **14** and **18** should extend all the way to the front face of the lenses **2** for optimizing the fastening, but as shown in FIG. **3** the loop portion **14, 18** preferably protrude somewhat in front of the front face of the lenses **2**, whereby it may optionally apply that a resilient expansion effect of the outer ends of the loop portions **14,18** may be expanded for the fastening. However, another and more essential effect of the protruding loop portions **14,18** will be that they will be able to fasten additional glasses in an easily releasable manner, when these glasses are provided with appropriate holes corresponding to the holes **16** and **26** in the lenses **2**. These additional glasses may be extra lens glasses, e.g. half lenses for reading, or they may be sun shade glasses or other special glasses which may be mounted in an extremely discreet manner.

The user will even in a simple manner be able to make use of one and the same frame for different sets of lenses, though in practice this will hardly be decisive as the wire frame is quite inexpensive to produce.

It should be mentioned that the preferred wire material, i.e. titanium wire, has the quality that it can be given different colors by a tempering technique based on electric heating, whereby it is possible to obtain a surface colouring with several different colors along the temples, and such a coloring or multi-coloring of the temples will be comprised by the invention, as it is widely known that cosmetic factors in connection with eyeglasses may have a very great significance for production and sales.

In connection with the invention it is particularly appropriate that the frame and herein the protruding holder loops **14** and **18** may consist of bent wire material, but it is to be emphasized that to obtain the primary advantages it is no condition that the holder members should consist just of wire. These holding portions may well be embodied of other materials, e.g. plastic, which may even be cast onto frame portions of the wire material. Regardless of whether the holder members of metal or plastic are to be used, it may, however, be an advantage that these bodies be shaped with a grooving which provides a resilient fastening of the portions in the oblong holes **16,26**.

As far as the special hinges according to the invention are concerned, see FIG. **2**, the rotation stop as established between an end portion of the screw coil **22** and a radial wire portion **10** of the other hinge part is indeed an operative stop which in practical use hinders the temple from being swung further than the swung-out position of use, but which, however, has a possibility for allowing the temple to be swung further outwards in case of pronounced overload, without the hinge being broken or the connected wire

portions being durably deformed. The screw coil **22** may in itself be slightly resiliently compressible, such that at the overload the stop end **28** may pass above the blocking wire **10** without any breaking or durable deformation of the hinge parts. This is a great advantage compared to usual eyeglass hinges, which are normally durably damaged if overloaded.

By the eyeglasses shown in FIG. **4**, the rigid hinge parts are shaped just as in FIG. **2**, but the wire loop **18** is continued in a wire **30** which extends downwards and inwards along the rim of the lens **2**, to a rearwardly bent loop portion **32** for fastening the pad **12**, and further on to connection to the loop portion **14** also indicated in FIG. **1**, i.e. the wire continues in this loop portion and extends therefrom further upwards to and through the bridge **4**, whereafter the wire extends in a symmetrical manner out along the other lens. Thus, a single through-going frame wire will be concerned, the free ends of which are located at the opposite outer hinge areas, and the hinges may hereby be shaped principally or even precisely as indicated in FIG. **2**. The frame production as well as the mounting will be facilitated by the frame thus consisting of but a single wire member. The holder loops **14** and **18** are protruding as in FIG. **3**, and they are shown received in edge recesses **34** in the lenses, being held in this engagement by a resilient tension in the frame.

When a through-going wire is used, as in FIG. **4**, the holes or recesses **16,26,34** need not be of an oblong shape, as the frame wire in itself will secure a non-rotatable connection with the lenses. Hereby the holes **16** and **26** in FIG. **1** may thus be embodied with a circular shape.

In FIG. **5** is shown an example where a through-going frame wire **36** which extends along the upper edge of the lenses secures the lenses by single-wire portions, which are received in semi-circular recesses **38** in the lenses. Such wire portions, designated **40** and **42**, extend forwards from the lenses and continue in the frame in the manner indicated, to the bridge **4** and the hinge parts, respectively.

The frames shown are entirely made from wire, but it will be appreciated that the projecting portions **14,18, 40,42**, may well be provided in another manner, e.g. as cast portions of silicon rubber on a frame which may otherwise be of any suitable type and shape.

It should be noted that the disclosed special wire eyeglasses excel as eyeglass structures also in case of the holder members do not protrude from the front face of the lenses, i.e. even if the possibility for additional glass holding hereby disappears.

The pair of eyeglasses shown in FIG. **7** is of the entirely rimmed type, where both the lens holding front frame and the temples are constituted by wire material. The front frame is made of a single wire **48**, preferably a titanium wire, which extends along the lens rims and may be received in an edge groove thereof, which is shown in FIG. **7**. The glasses are designated **50**, and the wire extends symmetrically from a nose bridge **52** upwards and outwards along the upper rim of the lenses **50**, by the outer sides of which the wire continues downwards to a hinge area, where the wire is provided with a loop or eyelet **54**, which has an outermost, vertical wire portion **56** functioning as a pivot pintle for a screw coiled end portion **58** of the connected, equally wire-shaped temple **60**. From the loop **54** the wire continues downwards and inwards along the lower edge of the lens **50**, and therefrom upwards in a wire portion **62** which is closed about the lower transition area between the nose bridge **52** and the therefrom upwardly and outwardly extending wire portion, such that hereby the wire encircles the lens **50** in a tight manner. The wire portion **62** continues after the bend

in a downwardly extending portion 64, see also FIG. 8, which continues in a bent eye portion 66, in which the wire ends at 68. The eye portion 66 is used for receiving a foot portion 70 of a nose pad 72 consisting of semi-soft plastic material.

It will be appreciated that the hinge 54,56,58 may widely correspond to the hinge shown in FIG. 2, i.e. such that a free end portion 28 of the screw winding 58 will cooperate with one of the horizontal wire portions of the loop or eyelet 54 to form a stop for the swinging out of the associated temple 60.

It will be appreciated, however, that the invention is not restricted to the hinge parts having to be made of wire material, as the screw winding 58 could be replaced by another cylindrical member provided e.g. by casting onto the temple 60.

In FIG. 9 the frame wire designated 3 may be profiled so as to have a segment recess 5 of some 90°, whereby it can receive and hold an edge sharpened lens 50, i.e. without the lens having to be provided with an edge groove as shown in FIG. 8. The wire 3 is easily produced with such a groove 5, but generally the groove will be undesirable at such places where the wire has no lens holding purpose, i.e. in the nose bridge and in the hinge portion 54,56.

According to the invention, however, it is possible to effect a circumferential compression of the wire along selected length portions thereof, such that the wire outside the lens holding portion thereof is deformed as illustrated in FIG. 10, i.e. compressed into a compact, practically circular cross sectional shape, in which the recess 5 is practically entirely closed. Thus, both in the nose bridge portion and in the temple hinge portion the frame wire may occur as a smooth round wire even if the same wire as extending along the lens edges is provided with a groove 5 for receiving the sharpened edges of the lens.

In FIG. 11 is shown an entirely rimmed pair of eyeglasses, the frame of which consists of two wires, whereof one extends along the upper rims of the lenses and forms an upper bridge portion 72 between these, while the other forms the nose bridge 52 and the pad arm eyelets 64. The wires are assembled by bends 74 at the hinge areas and continue therefrom in hinge pintles facing each other.

We claim:

1. Eyeglasses including a single wire extending continuously along a top side of a pair of adjacently disposed lens means, down along an uppermost portion of respective innermost vertical edges of the lens means, being bent upwardly in a central area thereof so as to form a central nose bridge means between the adjacent lens means, and extending downwardly along outermost vertical edge portions of the lens means so as to form bent out hinge connections for respective temple hinge parts, said single wire extending therefrom further downwardly and inwardly along the innermost vertical edges of the respective lens means and being bent over the wire and respective sides of the central nose bridge means so as to effect an overall clamping of the lens means, and wherein the wire continues therefrom and terminates in loop bent wire end portions for holding respective base portions of opposed nose pad members.

2. Eyeglasses according to claim 1, wherein the wire portions bent over the central bridge means includes further loop wire portions for enabling a holding of the nose pad means in several positions.

3. Eyeglasses according to claim 1, wherein the bent out portions forming the hinge connections are formed as coil-wound sleeves.

4. Eyeglasses according to claim 1, wherein the single wire forms a central framework for the eyeglasses, and wherein additional materials are fastened to said central framework.

5. Eyeglasses, including a single wire for encircling a pair of adjacently disposed lens means, said wire being in holding engagement with outer edges of the respective lens means and being bent in a central area thereof so as to form a central nose bridge means between the adjacent lens means, and being bent at respective ends thereof so as to form a connection between the outermost sides of the lens means and a hinge connection with respective temple hinge parts near the outermost side of the respective lens means, wherein the single wire extends continually along the top sides of the pair of lens means, down along an upper part of the respective innermost vertical edges of the lens means and is upwardly bent to form the central nose bridge means between the lens means, said single wire continues therefrom down along outermost vertical edge parts of the lens means and forms bent out portions forming the hinge connection for the temple hinge parts, said single wire extending therefrom further downwardly and inwardly along lower edges of the lens means and partially upwardly along the innermost vertical edges thereof and being bent over the wire and respective sides of the central nose bridge means so as to effect an overall edge clamping of the lens means, and wherein the wire continues therefrom and terminates in loop bent wire end portions for holding respective base portions of opposed nose pad members.

6. Eyeglasses according to one of claims 1 or 2, wherein the wire further comprises an additional material.

7. Eyeglasses according to one of claims 1 or 2, wherein the temple hinge parts are partly or entirely formed by a material added to the central framework.

8. Eyeglasses including wire extending along a top side of a pair of adjacently disposed lens, down along an uppermost portion of respective innermost vertical edges of the lens, said wire being bent upwardly in a central area thereof so as to form a central nose bridge between the adjacent lens, extending downwardly along outermost vertical edge portions of the lens so as to form bent out hinge connections for respective temple hinge parts, said wire extending therefrom further downwardly and inwardly along the innermost vertical edges of the respective lens and being bent over the wire and respective sides of the central nose bridge so as to effect an overall clamping of the lens, and wherein the wire terminates in loop bent wire end portions of opposed nose pad members.

9. Eyeglasses according to claim 1, wherein the wire comprises a plurality of wire sections, said sections being connected in a continuous manner.

10. An eyeglass frame having frame portions for holding eyeglass lenses, the frame portions including outermost hinges associated with pivotal side bars, said hinges being fashioned of wire material so as to comprise as one hinge part a central straight pintle wire portion and as the other hinge part a coil wound wire portion surrounding the pintle wire portion, wherein the two hinge parts are materially separated such that they are freely mutually rotatable within normal limits, without the coil portion acting as a torsion spring, the coil portion being axially held between wire portions bent out from the respective opposed ends of the pintle wire portion, and a rotation stop for the pivotal side bars being swung outwardly beyond their positions of use being provided by a free wire end at one end of the coil portions, said free wire end, by the swinging of the side bar abutting one of said bent-out portions of the pintle wire.

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11. An eyeglass frame according to claim 10, wherein the rotation stop is provided in such a manner that by excessive overloading by an outward pivoting of a side bar the rotation stop will yield resiliently and allow the side bar to be swung out beyond a normal position of use without causing any durable deformation of the hinge parts. 5

12. An eyeglass frame according to claim 11, wherein a first of said bent-out portions of the pintle wire continues into lens holding means and serves as one part of said rotation stop, engageable by said free wire end of the coil portion, the opposite end of the coil portion continuing into the associated side bar and being held axially by the second of said bent-out portions of the pintle wire, this portion terminating immediately adjacent the said opposite end of the coil portion. 10 15

13. An eyeglass frame according to claim 12, wherein the wire material is of titanium treated by tempering so as to be colored.

14. A hinge made of wire, comprising:

a first part including a straight pintle and a blocking wire portion bent out therefrom; and 20

a second part having a first portion extending outward from a first end of screw coil, said screw coil surrounding said straight pintle and said screw coil terminating in a free second end opposite said first end, said free second end constituting a stop preventing rotation of said screw coil about said straight pintle beyond a predetermined position at which said free end abuts said blocking wire portion. 25

15. A hinge according to claim 14, wherein said screw coil is resiliently compressible such that when the hinge is overloaded, said free end may pass said blocking wire portion. 30

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16. A hinge according to claim 14, wherein said hinge is made completely of tempered colored titanium wire.

17. A hinge according to claim 14, wherein said wire comprises titanium.

18. An eyeglass frame, comprising:

means for holding a pair of eyeglass lenses; a pair of temples; and

a pair of hinges, each hinge connecting each of said temples to said means for holding a pair of eyeglass lenses, each hinge comprising:

a first part including a straight pintle and a blocking wire portion bent out therefrom; and

a second part having a first portion extending outward from a first end of screw coil, said screw coil surrounding said straight pintle and said screw coil terminating in a free second end opposite said first end, said free second end constituting a stop preventing rotation of said screw coil about said straight pintle beyond a predetermined position at which said free end abuts said blocking wire portion.

19. An eyeglass frame according to claim 18, wherein each of said temples is formed by said first portion of said second part of said hinge extending outwardly from said screw coil.

20. An eyeglass frame according to claim 18, wherein said screw coil is resiliently compressible such that when the hinge is overloaded, said free end may pass said blocking wire portion.

21. A eyeglass frame according to claim 18, wherein said hinge is made completely of tempered colored titanium wire.

22. A eyeglass frame according to claim 18, wherein said wire comprises titanium.

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