



(43) International Publication Date
28 November 2013 (28.11.2013)

- (51) International Patent Classification:
G02C 11/06 (2006.01) G02C 11/00 (2006.01)
G02C 11/04 (2006.01)
- (21) International Application Number:
PCT/IB2013/054039
- (22) International Filing Date:
17 May 2013 (17.05.2013)
- (25) Filing Language:
Italian
- (26) Publication Language:
English
- (30) Priority Data:
GE2012A000054 21 May 2012 (21.05.2012) IT
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- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM,

AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

(54) Title: EYEGLASSES COMPRISING ELECTRICAL AND/OR ELECTRONIC ELEMENTS

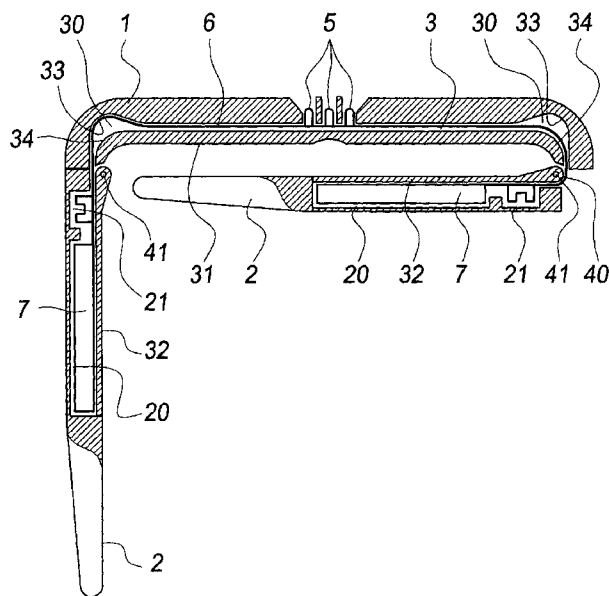


Fig. 1

(57) Abstract: Eyeglasses comprising a front frame to which two side arms are connected, said eyeglasses comprising electric and/or electronic elements connected to each other by means of an electric circuit, wherein the electric circuit is composed at least partially of at least one flexible printed circuit, which flexible printed circuit is housed into a seat formed at least partially inside said front frame and at least partially inside at least one arm.



EYEGLASSES COMPRISING ELECTRICAL AND/OR ELECTRONIC
ELEMENTS

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The present invention relates to eyeglasses comprising a front frame to which two side arms are connected, said eyeglasses comprising electric and/or electronic elements connected to each other by means of an electric circuit.

The use of electric and/or electronic elements mounted on eyeglasses or integrated inside the frame thereof is known and it is acquiring a more and more important role with the miniaturization of the components involved.

Eyeglasses, due to their function related to a sense of fundamental importance such as eyesight, due to their easy wearability and to their closeness to ears and mouth, are highly fit for being a technological instrument on which different systems can be integrated such as operating units, processing units, transmission units or the like.

Electric and/or electronic elements generally comprise one or more batteries for powering the additional electric and/or electronic elements, which are typically placed in the arms.

For the electric connection between batteries and electric and/or electronic elements generally electric wires are used, which are welded to said electric and/or electronic elements and to suitable connectors

for the batteries and they are left loose or they are housed in suitable seats formed in the thickness of the front frame and/or of the arms.

The use of welded electric wires has some
5 drawbacks such as a certain difficulty in the assembling and the possibility of breaking due to the wear by using the eyeglasses.

The present invention aims at overcoming said
10 prior art drawbacks by eyeglasses such as described hereinbefore, wherein in addition said electric circuit is composed at least partially of at least one flexible printed circuit, which flexible printed circuit is housed in a seat formed at least partially inside said front frame and at least partially inside at least one
15 arm.

According to one embodiment said electric and/or
electronic elements comprise one or more batteries housed into predetermined housing compartments formed inside said arms and/or said front frame, and wherein
20 said electric circuit is composed of a single flexible printed circuit said electric and/or electronic elements are connected thereto or are integrated thereon.

Thus the electric and/or electronic elements can
25 be placed in the front frame or in at least one arm and can be connected in a firm and resistant manner to the batteries, they being connected with a single flexible printed circuit or preferably they being integrated thereon.

30 As an alternative the batteries can be placed

outside the frame.

According to a preferred embodiment there are provided at least two batteries housed in at least two predetermined housing compartments formed inside each of said two arms, said flexible printed circuit being
5 housed in a seat formed inside said front frame and inside both said arms.

This allows all the electric and/or electronic elements to be connected to the batteries provided in
10 the arm by a single printed circuit that is in contact with both the batteries it passing inside a portion of the arms and in the front frame, it being housed in said suitable seat.

According to one embodiment, said seat has, for
15 most of its extension, a thickness corresponding to the thickness of said flexible printed circuit.

This guarantees that the printed circuit is held firm as much as possible into the seat, and it is not subjected to movements that can lead to deformations or
20 breaking over time.

According to a further embodiment said arms are at least partially made of a rigid material.

Such rigid material can be of any type currently used for eyeglasses, particularly a plastic material
25 that substantially is not subjected to elastic deformations.

According to a preferred embodiment, the material is composed of a polyamide based technopolymer 12. In a further embodiment, at the areas of connection between
30 said arms and the front frame there are provided hinges

for articulating said arms, such that each arm is pivotally movable about a pivot axis substantially perpendicular to the longitudinal axis of the arm and to the interpupillary line when the eyeglasses are worn, from an extreme folding position wherein said arm is oriented collapsed against the rear side of the front frame to an extreme deployment position wherein it is moved away from the opposite arm and it is substantially transverse to the extension of the front frame, and in which eyeglasses at least one of said hinges is shaped such to be provided, at the extrados side, with a first, curved and seamless resting surface, such that, when pivoting the arm from said extreme deployment position to said extreme folding position, said resting surface contacts a more and more large portion of said printed circuit, pulling out a predetermined portion of said printed circuit from said front frame and/or from said arm by dragging it.

This allows the arms to be folded when the eyeglasses is not in the worn condition, as in conventional eyeglasses, and therefore more compact dimensions can be obtained for putting the eyeglasses away.

Since the flexible printed circuit cannot be either extended or folded below a limit radius of curvature, otherwise it is irreversibly folded, it is pulled out for a predetermined length portion from the front frame and/or from the arm when pivoting the arm up to the extreme folding position.

According to a further embodiment said seat

housing said flexible printed circuit in said front
frame and/or in at least one arm has at least one
widening intended to house said predetermined portion
of said printed circuit when the arm is in the
5 deployment position.

The widening is preferably placed at least at one
hinge.

Said widening advantageously acts as a storage for
recovering the abundance of the extension of the
10 printed circuit which is created when pivoting the arm
up to the extreme deployment position, said abundance
corresponding to said predetermined portion of the
printed circuit.

The widening is preferably provided in the front
15 frame.

In this case, when the arm is in the extreme
deployment position said portion of printed circuit is
in said front frame, and it is pulled out from such
front frame by dragging it by said first resting
20 surface when pivoting the arm in the direction of the
extreme folding position.

As an alternative or in combination the widening
can be provided into the arm, and in a way completely
similar to what described above, said predetermined
25 portion of printed circuit is pulled out or inserted in
the arm when pivoting it in the two extreme positions
respectively.

The fact of providing a widening is particularly
advantageous when the arms are rigid and the seat
30 housing the printed circuit for most of its extension

has a thickness corresponding to the thickness of the flexible printed circuit.

In this case the printed circuit is held firm into the seat except for the area of the hinge, in the widening area, and in the part between such two areas, thus reducing at the greatest extent the movements of the flexible printed circuit and avoiding wear, breaking or bending.

In a further embodiment said widening is provided with at least a second curved and seamless resting surface such that with the arm in the extreme deployment position said predetermined portion of the flexible printed circuit is inserted into said widening causing said flexible printed circuit to bend, such that the convex side of said flexible printed circuit contacts at least partially said second resting surface.

In still a further embodiment said widening is provided with a third curved and seamless resting surface such that with the arm in the extreme folding position said predetermined portion of the flexible printed circuit is pulled out from said widening causing said flexible printed circuit to extend, such that the concave side of said flexible printed circuit contacts at least partially said third resting surface.

The provision of a second and a third resting surface inside said widening guarantees stability in the position of the printed circuit when the arms are in the extreme deployment or folding positions.

In a preferred embodiment said first resting

surface and/or said second resting surface and/or said third resting surface has such radii of curvature to prevent said flexible printed circuit from being subjected to permanent bending when resting on said
5 first resting surface and/or said second resting surface and/or said third resting surface.

This expedient has the advantage of allowing the arms to fold while preventing each movable part of the flexible printed circuit from being bent too much which
10 could led to irreversible deformations and then to breaking.

Said electric and/or electronic elements can be of any type, provided that they are intended for being mounted on eyeglasses.

15 Particularly, according to a first embodiment, said electric and/or electronic elements comprise one or more LEDs.

According to a further embodiment said electric and/or electronic elements comprise sensor means and/or
20 processing means and/or remote communication means and/or displaying and sound speaker means.

Such means can for example comprise a remote wireless communication unit,

a microphone, one or more sound speakers, a video
25 camera, a luxmeter, a display, a GPS device, a compass, one or more accelerometers and/or inclinometers, or the like.

These and other characteristics and advantages of the present invention will be more clear from the
30 following description of some embodiments shown in the

annexed drawings wherein:

Fig. 1 is a section view of an embodiment of the eyeglasses of the present invention.

Fig.2 is a view of a part of the front frame and
5 of one arm;

Figs. 3 and 4 are different views of an exploded view of the hinge;

Fig. 5 is an overview of one embodiment of the eyeglasses according to the present invention.

10 Figure 1 shows a section view of one embodiment of the eyeglasses of the present invention, comprising a front frame 1 with two adjacent seats for mounting the lenses 10, which frame 1 is the front portion of the eyeglasses and two side arms 2 are connected thereto.

15 However it is possible for the eyeglasses to be provided with a single lens, or even to be composed only of the frame and without any lenses.

The section of figure 1 is obtained along a plane substantially parallel to the horizontal plane when the
20 eyeglasses are worn.

The eyeglasses comprise electric and/or electronic elements connected to one or more batteries 7 by an electric circuit 6.

In the embodiment shown in the figures, there are
25 provided two batteries 7 housed in two predetermined housing compartments 20 formed in each of said two arms.

However it is possible to provide several compartments formed in one or both the arms, or in
30 suitable seats for mounting the batteries 7 outside the

arms 2.

The flexible printed circuit 6 is housed into a seat 3 formed into said front frame 1 and into both the arms 2.

5 The flexible printed circuit 6, in the preferred embodiment shown in the figures, is the only circuit to which or on which all the electric and/or electronic elements are connected or integrated, including batteries 7.

10 However it is possible to provide further circuits, composed for example of electric wires or tracks of conductive material, preferably embedded in the material composing the frame, for the connection with further electric and/or electronic elements.

15 In the example in the figure, the seat 3 is composed of a groove obtained in the front frame 1 and in the arms 2 at the side faced towards the eyes when the eyeglasses are worn.

When the flexible printed circuit 6 is placed into
20 the suitable seat, said seat can be closed with a corresponding front cover 31 for the portion of the front frame 1 and with a side cover 32 for the portion of the arm 2.

This arrangement is the one that guarantees a
25 higher aesthetical value to the eyeglasses when they are worn, but it is possible to provide other arrangements such as for example a groove obtained at the side opposite to the one faced towards the eyes when the eyeglasses are worn.

30 In one alternative embodiment the seat is formed

only in a portion of the front frame 1 and in a portion of only one arm 2.

In the areas connecting the arms 2 and the front frame 1 there are provided hinges 4 for articulating said arms, such that each arm is pivotally movable from said extreme folding position to said extreme deployment position.

Hinges 4 are shaped such to allow the arms 2 to be articulated, each arm being pivotally movable about a pivot axis 41 substantially perpendicular to the longitudinal axis of the arm 2 and to the interpupillary line when the eyeglasses are worn.

In figure 1 the arms 2 are shown in the two extreme positions, the right arm in the extreme folding position and the left arm in the extreme deployment position respectively.

Hinges can be composed of rigid elements articulated to each other, such as in the example shown in the figures, or they can comprise deformable elements.

The hinge 4 is shaped such to be provided, on the extrados side, with a first curved and seamless resting surface 40.

When pivoting the arm 2 from the extreme deployment position to the extreme folding position, the resting surface 40 contacts a more and more large portion of said printed circuit 6, pulling out a predetermined portion of said printed circuit 6 from said front frame 1 by dragging it.

In the embodiment shown in the figures the

predetermined portion of the flexible printed circuit 6 is pulled out when pivoting the arm 2 towards the extreme folding position from the front frame 1.

However it is possible, as said above, to provide
5 the predetermined portion of the flexible printed circuit 6 to be pulled out as an alternative or in combination from the arm 2.

The housing seat 3 of the flexible printed circuit 6 in said front frame 1, at the hinge 4, has a widening
10 30 intended to house said predetermined portion of the printed circuit 6 when the arm 2 is in the extreme deployment position.

Said widening 30 is provided with a second resting surface 33 and with a third resting surface 34, curved
15 and seamless and placed facing each other.

In the extreme deployment position of the arm 2 said predetermined portion of the flexible printed circuit 6 is inserted into the widening 30 causing said flexible printed circuit 6 to bend, such that the
20 convex side of said flexible printed circuit 6 contacts at least partially the second resting surface 33.

When on the contrary the arm 2 is in the extreme folding position, said predetermined portion of the flexible printed circuit 6 is pulled out from the
25 widening 30 causing said flexible printed circuit 6 to extend, such that the concave side of said flexible printed circuit 6 contacts at least partially the third resting surface 34.

In the example shown in the figures the resting
30 surface is obtained on the front cover 31, particularly

on the wall of said front cover 31 faced towards the bottom of the groove forming the seat 3.

The side cover 32 acts as a closure both for the housing seat 3 in the arm 2 and for the housing
5 compartment for the battery 20.

Figure 2 shows a detail of the region of the hinge 4, and the several inner parts of the arms 2 and of the front frame 1 are shown in phantom.

Particularly the hinge 4 is composed of two
10 partially cylindrical shaped ends made as one piece with the front frame 1 at one side end, two ends with a substantially equal shape being fitted therebetween made as one piece with the arm 2 at one end thereof.

The first resting surface 40 is obtained on an
15 enlarged terminal 41 of the side cover 32, shaped in such a manner that when the side cover 32 is in the condition mounted on the arm 2, said enlarged terminal 41 is fitted between the articulated components of the arm 2 and of the front frame 1 composing the hinge 4,
20 and it puts said first resting surface 40 in the operating position.

The ends of the front frame 1 and of the arm 2 are hinged to each other they being provided with central holes, that with the arm 2 in a position engaged in the
25 front frame 1, are arranged along the pivot axis 41 such that the arm 2 and the front frame 1 are pivotally coupled to each other by means of two pins.

The partially cylindrical shaped ends of the arm 2 are spaced such to define a gap therebetween intended
30 to house said enlarged terminal 41 of the side cover

32.

Other arrangements of the hinge are possible.

In figure 2 the arm 2 is partially folded towards the front frame, and the first resting surface 40
5 obtained on the enlarged terminal 41 is clearly visible.

As it can be clearly seen, in the embodiment shown in the figures the seat 3 is placed on the upper part of the lenses 10 when the eyeglasses are worn, but in
10 combination or as an alternative it is possible to provide a seat placed at least partially below a lens 10.

In figures 3 and 4, the side cover 32 and the front cover 31 are shown as separated from the arm 2
15 such to show a detail of the area of the hinge 4 and of the inner parts of the arm 2 and of the front frame 1.

As it can be clearly seen, the second resting surface 33 and the third resting surface 34 are shaped such to be connected to the first resting surface 40
20 with the side cover 32 in the mounted condition substantially without interruption.

The first resting surface 40, the second resting surface 33 and the third resting surface 34 have such radii of curvature to prevent the flexible printed
25 circuit from permanently bending in the different positions taken when pivoting the arm 2.

Said electric and/or electronic elements can be of any type, provided that they are intended for being mounted on eyeglasses.

30 Figure 4 shows a view taken from the free end of

the arm 2 and in the direction of the front frame 1, with the arm 2 in the extreme deployment position.

The separated cover 32 allows the housing compartment 20 of the battery 7 not shown in the figure and the housing compartments 21 of additional electric and/or electronic elements to be seen.

In the embodiment shown in figure 5, the electric and/or electronic elements comprise one or more LEDs 5.

Such LEDs are placed at the front between the lenses and they radiate light on the front side of the front frame 1, that is the side opposite to the one faced towards the eyes with the eyeglasses worn, by means of suitable cut-outs obtained in the front side of the front frame 1.

According to such example there are further provided electronic components for switching on and off said LEDs 5, for recharging the batteries 7, and for managing the supply of electric current from batteries 7 to LEDs 5.

Such components are integrated on the printed circuit and are housed into two suitable housing compartments 21 provided in the arms 2, for example visible in figure 1.

According to a further embodiment not shown in the figure the eyeglasses are provided with additional electric and/or electronic elements, described above.

Such devices can be arranged in the arms 2 or in the front frame 1 and can be put in electrical communication with each other and can be powered by the batteries 7 by means of said flexible printed circuit

6.

Said flexible printed circuit 6 can be further at least partially embedded into the material composing the eyeglasses during the step manufacturing it.

5

CLAIMS

1. Eyeglasses comprising a front frame (1) to
5 which two side arms (2) are connected, said eyeglasses
comprising electric and/or electronic elements (5)
connected to each other by means of an electric circuit
(6)

characterized in that

10 said electric circuit is composed at least
partially of at least one flexible printed circuit (6),
which flexible printed circuit (6) is housed into a
seat (3) formed at least partially inside said front
frame (1) and at least partially inside at least one
15 arm (2).

2. Eyeglasses according to claim 1, wherein said
electric and/or electronic elements comprise one or
more batteries (7) housed into predetermined housing
compartments (20) formed into said arms (2) and/or said
20 front frame (1), and said electric circuit is composed
of a single flexible printed circuit (6) said electric
and/or electronic elements are connected thereto or are
integrated thereon.

3. Eyeglasses according to claim 2, wherein there
25 are provided at least two batteries (7) housed into at
least two predetermined housing compartments (20)
formed into each one of said two arms (2), said
flexible printed circuit (6) being housed into a seat
(3) formed into said front frame (1) and into both said
30 arms (2).

4. Eyeglasses according to claim 3, wherein said seat has a thickness corresponding to the thickness of said flexible printed circuit.

5. Eyeglasses according to one or more of the preceding claims, wherein said arms are at least partially made of rigid material.

6. Eyeglasses according to one or more of the preceding claims, wherein at the areas connecting said arms (2) and the front frame (1) there are provided hinges (4) for articulating said arms (2), such that each arm (2) is pivotally movable about a pivot axis (41) substantially perpendicular to the longitudinal axis of the arm (2) and to the interpupillary line when the eyeglasses are worn, from an extreme folding position wherein said arm (2) is oriented collapsed against the rear side of the front frame (1) to an extreme deployment position wherein it is moved away from the opposite arm (2) and it is substantially transverse to the extension of the front frame (1), and in which eyeglasses at least one of said hinges (4) is shaped such to be provided, at the extrados side, with a first, curved and seamless resting surface (40), such that, when pivoting the arm (2) from said extreme deployment position to said extreme folding position, said resting surface (40) contacts a more and more large portion of said printed circuit (6), pulling out a predetermined portion of said printed circuit (6) from said front frame (1) and/or from said arm (2) by dragging it.

7. Eyeglasses according to claim 6, wherein said

seat (3) housing said flexible printed circuit (6) in said front frame (1) and/or in at least one arm (2), has at least a widening (30) intended to house said predetermined portion of said flexible printed circuit
5 (6) when the arm (2) is in the deployment position.

8. Eyeglasses according to claim 7, wherein said widening (30) is provided with a second curved and seamless resting surface (33) such that in the extreme deployment position of the arm (2) said predetermined
10 portion of the flexible printed circuit (6) is fitted into said widening (30) causing said flexible printed circuit (6) to bend, such that the convex side of said flexible printed circuit (6) contacts at least partially said second resting surface (33).

15 9. Eyeglasses according to claim 7 or 8, wherein said widening (30) is provided with a third curved and seamless resting surface (34) such that in the extreme folding position of the arm (2) said predetermined portion of the flexible printed circuit (6) is pulled
20 out from said widening (30) causing said flexible printed circuit to extend, such that the concave side of said flexible printed circuit (6) contacts at least partially said third resting surface (34).

10. Eyeglasses according to claim 8 or 9, wherein
25 said first resting surface (40) and/or said second resting surface (33) and/or said third resting surface (34) have such radii of curvature that said flexible printed circuit (6) is prevented from being permanently bent in the resting condition on said first resting
30 surface (40) and/or said second resting surface (33)

and/or said third resting surface (34).

11. Eyeglasses according to one or more of the preceding claims, wherein said electric and/or electronic elements comprise one or more LEDs (5).

5 12. Eyeglasses according to one or more of the preceding claims, wherein said electric and/or electronic elements comprise sensor means and/or processing means and/or remote communication means and/or displaying and sound speaker means.

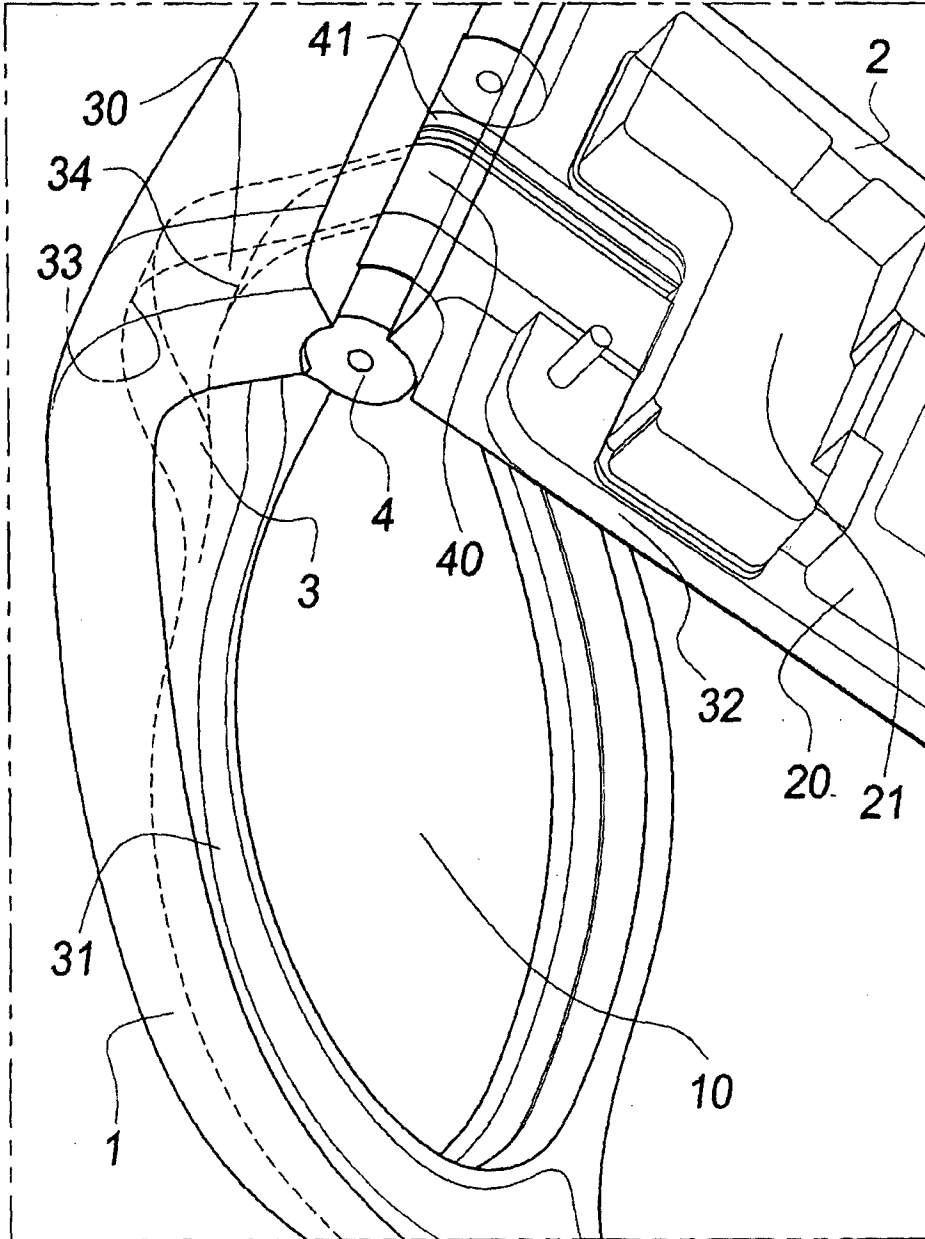


Fig. 2

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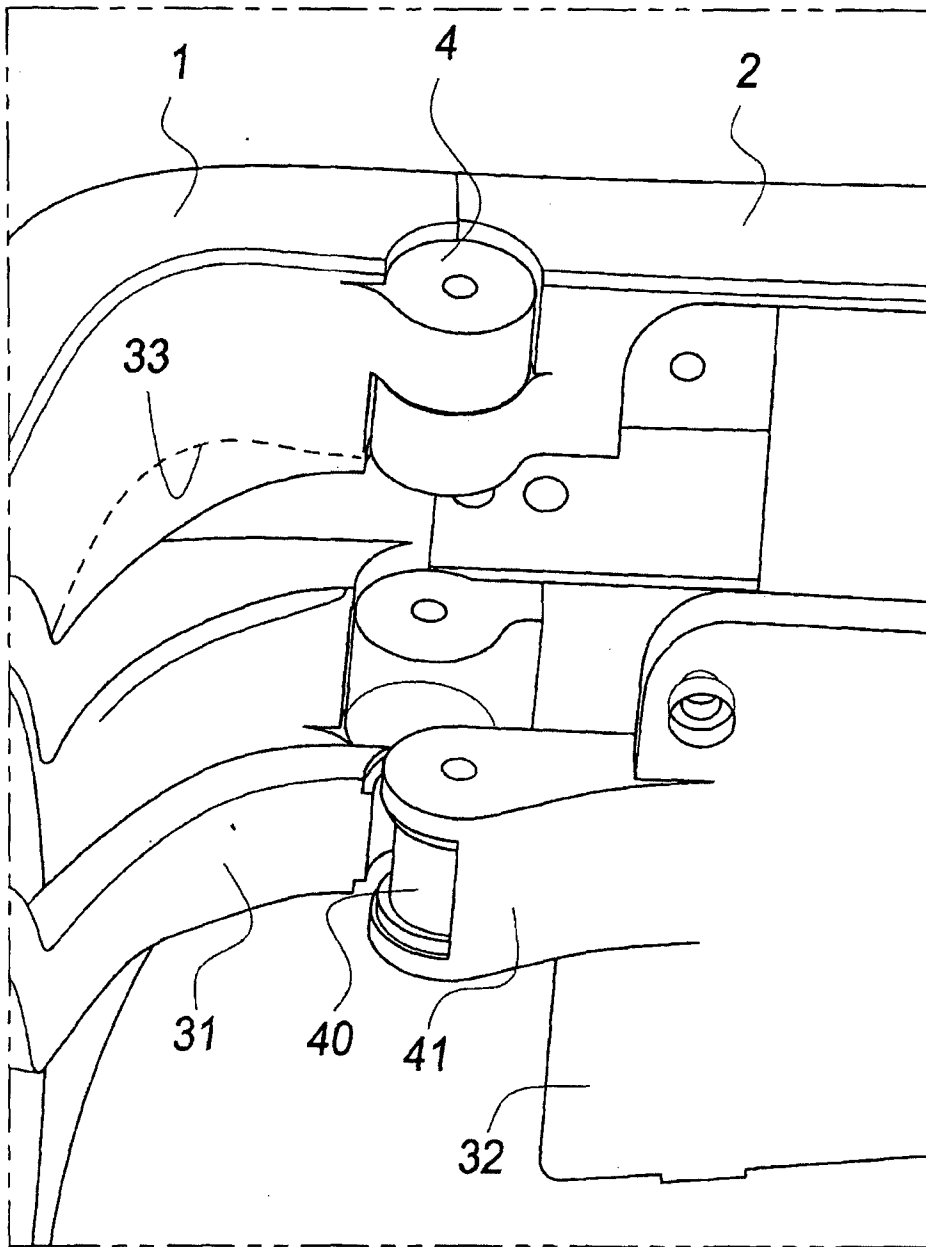


Fig. 3

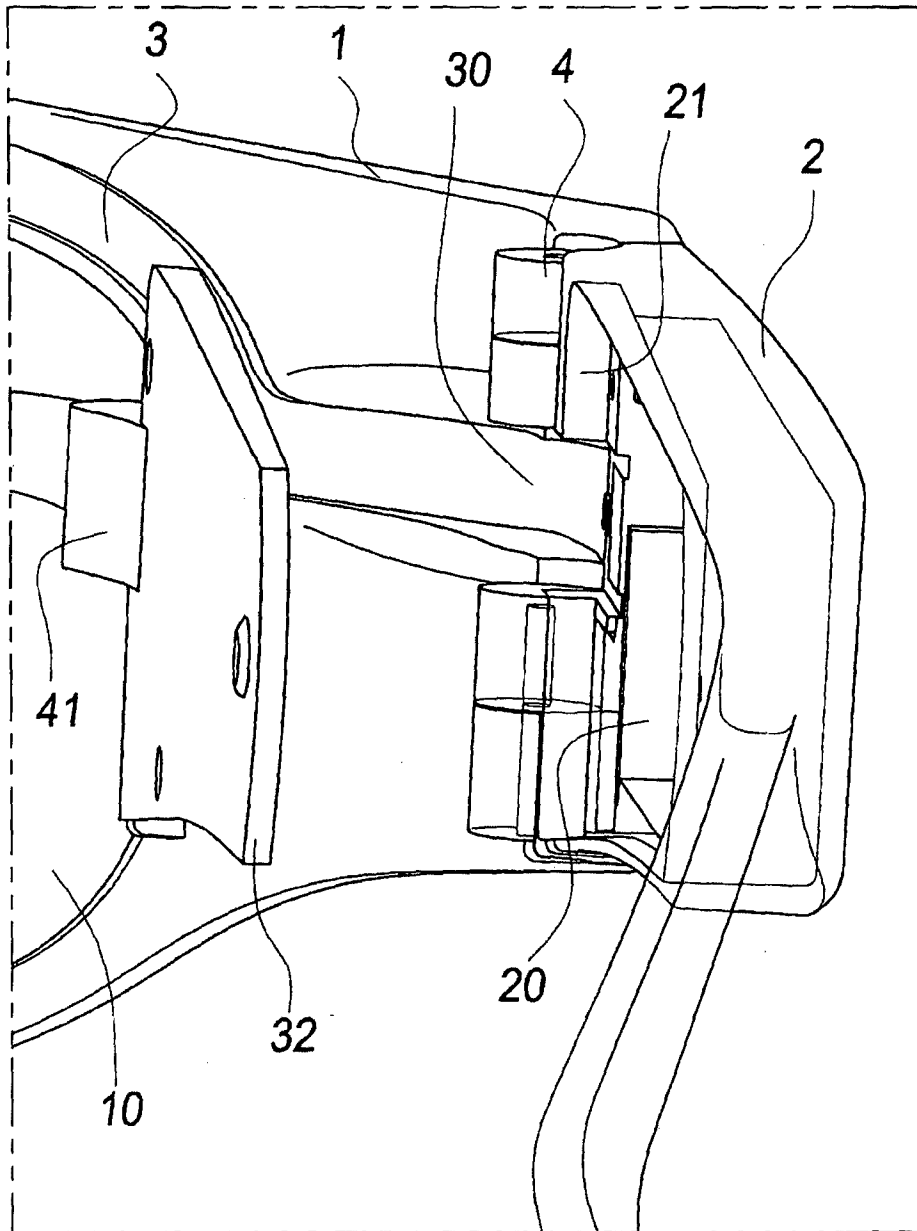


Fig. 4

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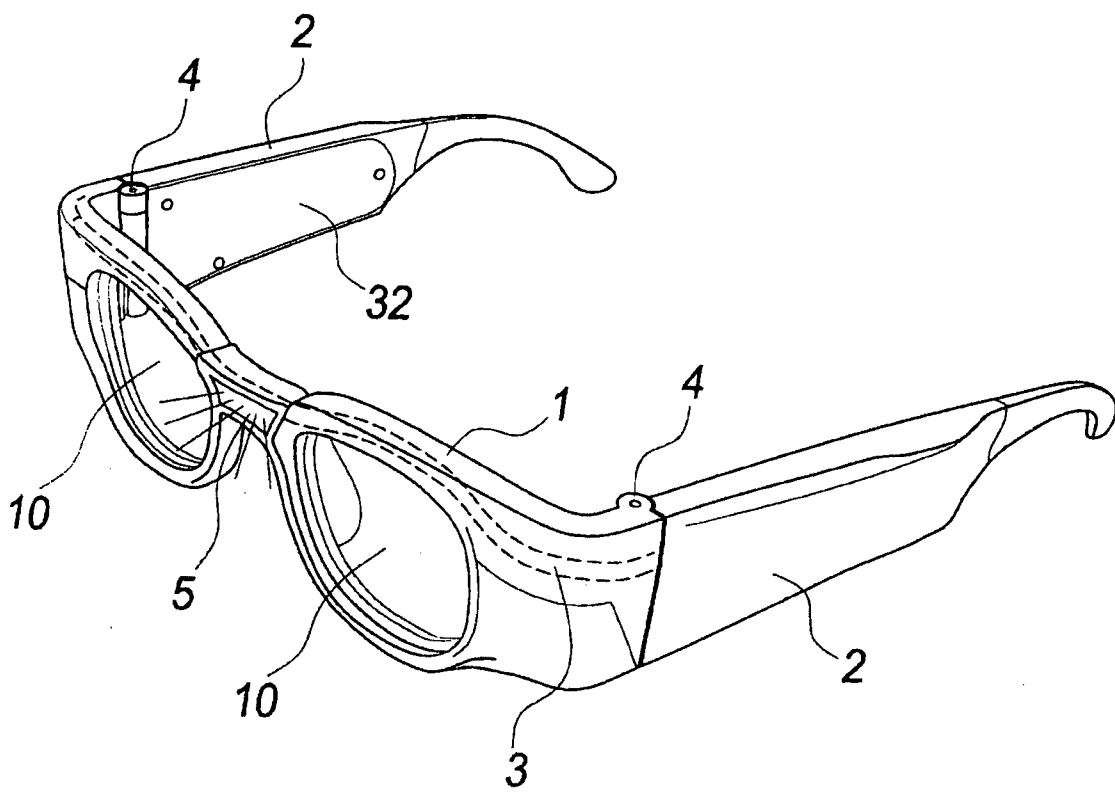


Fig. 5

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2013/054039

A. CLASSIFICATION OF SUBJECT MATTER
INV. G02C11/06 G02C11/04 G02C11/00
ADD.
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)
G02C H04M G06F H01R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
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Date of the actual completion of the international search 30 July 2013	Date of mailing of the international search report 08/08/2013
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Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Bratfisch, Knut
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INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2013/054039

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