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(54) Title: PARTIALLY OCCLUDED CONTACT LENS FOR TREATING VISUAL AND/OR BRAIN DISORDER 		
(57) Abstract An auxiliary means provided for treatment of visual and/or brain disorder comprising an optical element suitable to be worn by a human being and having an occluded part, wherein said optical element comprises at least one contact lens (10) provided with orienting means (18) affording said optical element a substantially stable orientation with respect to an eye wearing said lens, said occluded part (12) being dimensioned in order to occlude at least 50 % of the visual input.		

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Partially occluded contact lens for treating visual and/or brain disorder

The invention relates to auxiliary means provided for treatment of visual and/or brain disorder comprising an optical element suitable to be worn by a human being and having an occluded part.

Such auxiliary means are known and are formed by glasses provided for restricting the initial input of visual information to either the right or left hemisphere of the brain. Those glasses have lenses that are opaque in a vertical portion. By restricting the initial input to one side of the brain, information crossover between the brain hemispheres is limited and processing of information in the brain of an individual who does not have a clear lateralization of function is improved.

Weak cerebral dominance has been proposed as an important factor in reading disability. From existing evidence, it appears that information gained, through reading, is processed by the dominant side of the brain, that is, mostly by the left side of the brain in right-handed people and mostly by the right side of the brain in left-handed people. Many individuals with reading disabilities are left-handed. Estimates are that as many as 70 % of left-handed individuals have some degree of reading disability. This has been taken by some investigators as an indication of possible mixed dominance in brain function.

Experiments applied on individuals having visual and/or brain disorder has shown that individuals without a clearly dominant brain hemisphere have what may

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be termed cross-talk between the two hemispheres which may interfere with the efficient processing of reading material. It is thus important to be able to diagnose and treat reading disabilities that involve the improper directing of visual information to the hemispheres of the brain.

It is well established that retinal processing of visual information is almost entirely laterilized. The left half of the retinal field from the left eye and the left half of the retinal field from the right eye project to the left brain. The right half of the retinal field from the right eye and the right half of the retinal field from the left eye project to the right brain.

A drawback of the use of glasses having an opaque portion is that the glass lenses do not follow the eye movement of the person wearing the glasses, thus allowing some visual input to reach the supposedly blocked portion of the retina. Experiments have further shown that, even if the person would keep his head fixed, some visual and/or brain disorder remained, the latter may have a bad psychological influence on the person.

It is an object of the present invention to provide an improved auxiliary means wherein the drawbacks of the known auxiliary means are mitigated.

An auxiliary means according to the present invention is therefore characterized in that said optical element comprises at least one contact lens provided with orienting means affording said optical element a substantially stable orientation with respect to an eye wearing said lens, said occluded part being dimensioned in order to occlude at least 50 % of the visual input. The use of contact lenses provided with orienting means enables to follow the eye movement of the person wearing the auxiliary means. The orienting means causes the contact lens to rotate on the wearer's eye putting the occluded

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part in proper orientation. Experiments have shown that visual information is processed in the back of the cortex and then transferred to the temporal lobe. The interpretation of the information is realized by the temporal lobe. Blocking the information transfer from the back of the cortex of the non-dominant hemisphere to the temporal lobe, enables to avoid "crosstalk" between the two hemispheres. The use of a lens enables a more precise occluding of the eye and thus strictly limits the information transfer to the appropriate part of the dominant hemisphere. In such a manner, interfering information will not be produced which would otherwise disturb the interpretation realized in the temporal lobe.

It has to be noted that contact lenses having automatic orientation means are known in the art, for example from US patent No. 3,431,327 and U.S. patent No. 3,279,878. The 3,431,327 patent discloses a bifocal contact lens that is formed with a small metal weight near one edge. The 3,279,878 patent discloses a lens that is thicker at one peripheral portion. The lens again rotates until the heavy thicker portion is at its lowest position, with the horizontally split field properly aligned. However none of these documents discloses the use of contact lenses with an occluded part and being suitable for the treatment of visual and/or brain disorder.

Tinting of contact lenses, both for cosmetic purposes or for lessening light input to sensitive eyes is also known, although no occlusion takes place, merely lowering of the light intensity. Of course, these lenses do not completely block visual input on any part of the lens and could not be used to selectively block input to vertical hemispheres.

Preferably said contact lens comprises an occluded and a transparent portion, said occluded portion covering between 70 % and 49 %, in particular

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between 55 % and 51 % of the lens surface. Covering more than 70 % is meaningless since it would occlude practically all information input, while covering less than 46 % would cause information to go to the unwanted hemisphere.

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A first preferred embodiment of an auxiliary means according to the present invention is characterized in that said optical element comprises a set of two contact lenses, the area covered by the occluded portion being substantially equal for each lens of said set. Since it is merely a brain problem which has to be solved, it is important that information is directed to the correct side of the brain. By covering a substantially equal part of both eyes, it is achieved that no information is directed towards a hemisphere of the brain where it should not go. Further it ensures that both lenses are equal so that the person who has to put them on, does not have to know what is left and what is right.

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A second preferred embodiment of an auxiliary means according to the present invention is characterized in that each of said lenses is provided for occluding a vertical portion of the eye. The internal eye structure is built up in such a manner as to have to be vertically divided into two substantially equal parts. The occluding of a vertical portion of the eye fits adequately with the internal eye structure.

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A third preferred embodiment of an auxiliary means according to the present invention is characterized in that said lens is provided for occluding a portion situated around a centre of the eye or in a centre of the eye. Such types of lenses are particularly suitable to be used in training methods involving a selective occlusion of a portion of the visual field.

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The invention also relates to a method for manufacturing such an auxiliary means. The method is characterized in that the location of the occluded part

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of each lens is determined on the basis of data resulting from an analysis in order to determine the dominant hemisphere of the brain.

5 The foregoing and other objects and advantages of this invention will become apparent to those skilled in the art upon reading the detailed description of a preferred embodiment in conjunction with a review of the appended drawings. In the drawings :

10 Figure 1 shows a plan view of a pair of contact lenses according to the invention having occlusion in the left portion of the visual field.

Figure 2 shows a pair of contact lenses wherein a right portion is occluded.

15 Figure 3 shows a pair of eyes wearing contact lenses wherein a majority of the pupil and iris are occluded.

Figure 4 shows a pair of eyes wearing contact lenses wherein the lateral portions of the pupil are occluded.

20 Figure 5 is a schematic diagram showing operation of the auxiliary means according to the invention.

25 Figure 6 is a side cross-sectional view of a contact lens according to an alternate embodiment of the invention.

Figure 7a respectively b shows a left respectively a right hemisphere of the brain of a person which does not have visual and/or brain disorder problems.

30 Figure 8a respectively b shows a left respectively a right hemisphere of the brain of a person having dyslexia.

35 Figure 9a respectively b shows a left respectively a right hemisphere of the brain of a person wearing an auxiliary means according to the invention of which the right part is occluded.

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Figure 10a respectively b shows a left respectively a right hemisphere of the brain of a person wearing an auxiliary means according to the invention of which the left part is occluded.

5 In the drawings a same reference sign has been assigned to the same or analogous elements.

Visual and/or brain disorder has been a research subject for several years. One of these disorders is dyslexia which causes the mixing up of
10 letters. So, for example, a "b" respectively a "g" is mixed up with a "d" respectively a "p". Dyslexic people further suffer from uncontrollable disappearance and reappearance of whole lines in a text while reading. Dyslexia is caused by an interference between the non-
15 dominant hemisphere of the brain and the dominant one. By occluding a portion of the visual input, it is possible to block information directed to the non-dominant hemisphere in order to avoid crosstalk.

Dyslexia is a reading disability which is
20 defined as "being unable to translate visual symbols into articular language, and to be unable to process visual information". In reality, it means that the individual is unable to decode written language and give it back orally, and that he cannot make sense of any reading
25 material that the brain received through the eyes. Letters jump in and out of words, whole lines just disappear while a person attempts to read a text. A dyslexic cannot remember what a word looks like and has to decode it each time it reappears. A dyslexic cannot
30 recall the spelling of a word by looking at it and often misspells the simplest words.

This reading difficulty occurs in 5 % of the world population. It interferes with school performance and with social and work related activities in
35 otherwise normal individuals.

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Before entering into a detailed description on how crosstalk is avoided when use is made of the auxiliary means according to the present invention, these auxiliary means will first be described in detail. In the description, reference will be made to a set of contact lenses. The word "contact lenses" should be understood in a large sense, i.e. not necessarily restricted to an optical member modifying the direction of the incident light, but also to an optical member wherein the outgoing light has the same direction as the incoming. Further, only a single lens instead of a set of two lenses could be used, depending on the disease to be treated or the purpose of the use of such a lens.

Referring to the drawings, a preferred field restrictive contact lens 10 according to the invention is illustrated in Figure 1. The lens material is preferably an acrylamide, although any known contact lens material will work. Generally, a portion 12 of the lens is occluded to restrict visual input to the retina. The portion is preferably defined by a vertical separation line 14 which is offset from the vertical centre-line 16 of the lens 10. The occluding method and precise positioning of the vertical separation line 14 is discussed in greater detail below. In Figures 1-4, the relative position of the pupil is shown by circle 13.

To maintain the vertical orientation of the occluded portion with respect to the eye, the lens preferably includes an orienting mass 18. It should be noted that such orientation mass is for example utilized in bifocal contact lenses. Any orientation means are suitable if they generally retain the rotational orientation of the lens 10. Preferably, the lens 10 includes a weight 18 embedded within the bottom portion of the lens 10. The weight 18 is preferably an arc-shaped piece of flexible material that does not interfere with either the visual field of the wearer or his comfort. The orienting

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mass can be any material denser than the lens material, or it can be an additional layer of the same lens material. With this weight 18, the lens 10 will always maintain its rotational positioning with respect to the eye so that an occluded portion of the lens always covers the same area of the eye.

On an occluded portion 12 of the lens 10, there is an impairment of the visual characteristic of the lens 10. This may be accomplished in a number of ways including the use of dyes, the inclusion of material such as titanium in the matrix of the lens body, or the addition of other substances to the surface or the matrix of the lens 10. It is contemplated that dyes restricting certain colours more than others could be employed. The occluding material is only used on the desired portion 12 of the lens, the other portion remains transparent.

Another method of producing the light restricting portion 12 is to add optical disparities 17 (see Figure 6) to the matrix or surface of the lens 10 which distort its optical transmission in a manner to prevent focused vision in the occluded area. One example of this method is to cast small diameter (e.g. 0.5 mm) spherical convexities 17 clustered over the desired restricting portion 12. In Figure 6, the convexities 17 are shown exaggerated in size. While light may pass through the area created by the convexities, the random lens characteristics of the individual convexities produce randomly dispersed rays of light which reach the eye and make it impossible for the brain to distinguish any visual features, thus essentially blocking useful input to the corresponding portion of the retina.

One known method of producing the light restriction on the lens is by a proprietary "custom tinting" process of the Narcissus Foundation in Daly City, California. Another method involves composite lenses that are formed of hard lens material in their

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central portion and soft lens material in an annular skirt around the central portion. With these lenses, the central portion is easily opaqued with know dyes.

In general, the lens 10 should be a comfortably fitting corneal lens. It may also include corrective prescription properties as needed by the individual subject or may be uncorrecting independent of the addition of restricting properties detailed in this application. If a subject requires corrective lenses, but only uncorrecting lenses are available, the subject can wear corrective glasses in addition to the lenses of the invention. Alternatively, any object shown to the subject who is wearing the lens can be adjusted in size and position so that the subject can focus on and distinguish the objects.

The occluding portion of the lens covers between 70 % and 46 %, in particular between 56 % and 54 % of the lens surface. Indeed the occlusion must cover slightly more than half of the pupil. This results in the maximum diversion of information to the desired side of the retina and minimal amount of light leakage around the occlusion. Leakage would allow light to impinge on a side that should be blocked, and is, therefore, undesirable. The optimal occlusion for successful screening of visual input to one hemisphere should occlude the pupil of at least 1.5° beyond the centre-line 16. The use of computerized EEG has confirmed that occlusion of the pupil by a lens with an opaque or semi-opaque area that covers 190° of the pupillary circle produces a significant increase in information to the desired side relative to the blocked side. The occluded portion 12 is considered sufficiently occluded when light provided by a 100 watt light bulb at a distance of 90 cm above and in front of the subject produces a 50 % reduction of the brain's response, as

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compared to a clear lens, when measured by a computerized EEG.

Figure 3 illustrates a set of contact lenses 10 according to the present invention applied on the pupil and iris area of the eyes 20 of a person. As is shown in the figure 3, the contact lenses cover a substantial part of the pupil and iris area.

Figure 5 illustrates schematically the operation of the field restrictive contact lens according to the present invention. Two eyes 20 are shown with contact lenses 10 having an occluded portion 21 on the surface covering the right vertical portion. The occluded portion is oriented in a vertical direction since this fits with the brain structure showing a comparable vertical division. The relative scale of this figure is exaggerated so that the occluding material 21 can be seen. In actuality, the material would be a microscopic layer, or absorbed into the lens material. The visual field represented by the bar 32 is shown with its corresponding impact on the retinal fields 34, 36 of each eye 20.

The right retinal field 34 and left retinal field 36 of each eye 20 are shown schematically with corresponding optic nerves 38, 40 to transmit visual information to the right and left hemispheres 42, 44 of the brain. The shaded portion 46 within each eye 20 shows the portion of the visual field 32 that is prevented from reaching the left retinal field 36 by the occluding material 21 on the contact lenses 10. In this case, the right portion of the visual field 32 is "unseen" by the left retinal fields 36. The left retinal fields 36 and nerves 40 are also shaded to illustrate that restricted or reduced visual information is being transmitted to the left hemisphere 44 of the brain. The restriction of information depends on the coverage of the occluding material and may not always be total restric-

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tion since it is known that the fovea of the retina can still transmit some signals to both hemispheres when other retinal portions are occluded. The right retinal fields 34 have an unimpaired view of the left portion of the visual field 32 and send appropriate nerve impulses to the right hemisphere 42 of the brain. It should be noted that a pair of contact lenses 10 having occluding material 21 on the opposite portions could be similarly used, substantially only allowing visual information to be transmitted to the left hemisphere 44 of the brain.

Some of the visual information processing disorders include, but are not limited to disabilities involving the retina, optic nerve, optic chiasm, optic tract, primary visual cortex or visual association cortex. Reading disabilities like dyslexia include, but are not limited to, those involving visual pattern discrimination and visual object recognition.

A common problem seen in people with dyslexia is weak brain dominance ; that is normal individuals have a dominant hemisphere that governs functions like speech and reading. By right-handed individuals, it is the left hemisphere of the brain ; by left-handed, it is the right hemisphere. Usually, the dominant side can be determined from handedness, for example by testing with which hand or foot a person throws or kicks a ball. Dyslexics, however, are often ambidextrous or at least do not strongly favour one hand. Through the use of computerized EEG methods, the dominant hemisphere of the brain can be determined even in ambidextrous individuals. It is the purpose of the lens according to the invention to enhance information flow to the dominant side of the brain which is the side involved in processing reading. This is done by blocking information to the non-dominant side through the use of partly occluded lenses.

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As illustrated in Figure 5, the retina of the eye is organized so that information impinging on its lateral side goes to the cortex 45 on the same side, whereas information impinging on medial side crosses over to the cortex 47 on the opposite side.

Experiments have shown that visual information is processed in the back of the cortex 45 and then transferred to the temporal lobe 35 wherein the interpretation of the information is realized. Those experiments make use of standard EEG tests to monitor the visual evoked potential (VEP) in the hemispheres of the brain, in particular in the cortex. The currently preferred system for collection and presentation of VEP is the NeuroScience Brain Imager High Performance System, which is a 32 channel EEG and evoked potential system.

Figures 7a and respectively 7b show the left, respectively the right, brain hemisphere of a person A with no visual and/or brain disorder. The person A did not wear a set of contact lenses according to the present invention. The person A had to read a text during the test. The person A was able to read 168 words a minute without errors.

As is shown in these figures, there is brain activity in both hemispheres. However, there is a heavier activity in the cortex of the left hemisphere. The latter being illustrated by the shaded area 48 in the cortex 45 of the left hemisphere. The person thus clearly has a right brain dominance.

The Figures 8a, respectively 8b, show the left, respectively the right, brain hemisphere of a person B having visual and/or brain disorder. The person also did not wear a set of contact lenses according to the present invention. The person B was asked to read the same text. He was able to read 112 words a minute without errors, which is substantially less than the 168 words of person A. The Figures 8a and b clearly show a

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comparable activity in the left and right hemispheres so that no clear dominance is present.

5 The Figures 9a, respectively 9b, show the left, respectively the right, brain hemisphere of the same person B wearing a set of lenses wherein the occluded portion 21 is on the right side of the lens 10. As is shown in Figure 5, this signifies that information input to left hemisphere is blocked. The person B again has to read a comparable text. The test showed that
10 person B was able to read 89 words a minute without error. Compared to the 112 words without glasses, this clearly proves that it was not the correct portion of the lens which was occluded. Figure 9a shows that in the left brain hemisphere there is no clear concentration of
15 activity. There is some activity but it is only weak and randomly distributed over the brain hemisphere. In the right hemisphere (figure 9b) where information is input, there is some activity in the cortex illustrated by the shaded area 49, but the activity is too weak to enable an
20 adequate processing.

Figure 10a, respectively 10b, shows the left, respectively the right, brain hemisphere of the same person B wearing a set of contact lenses wherein the occluded portion 21 is on the left side of the lens.
25 Now, the input to the right hemisphere is blocked. The person B was now able to read a similar type of text and to reach 129 words a minute without errors. With respect to the 112 words reached without the contact lenses, this is a clear improvement. Figure 10a shows a clear
30 concentrated activity, illustrated by 50, in the cortex of the left hemisphere, while only some rather weak activity occurs in the right hemisphere. The test thus clearly shows that the lenses with the occluded left
35 portion are the correct one to be used by the person B in order to improve his reading ability.

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The Figures 8-10 clearly illustrate the problem of a dyslexic person having no clear brain dominance. Since there is activity in both hemispheres, as illustrated by Figure 8 (a + b) crosstalk will occur between the cortex of both hemispheres. The information of the one cortex will thus interfere with the one of the other cortex. This interfering information will perturb the information transfer towards the temporal lobe (Figure 5) and the interpretation therein. By occluding a portion of the visual input, the brain activity in the undesired non-dominant hemisphere is substantially reduced as is illustrated by comparing Figure 8b with Figure 10b, thus leading to practically eliminating crosstalk.

In order to avoid crosstalk, it is thus important to reduce as much as possible the brain activity in the undesired hemisphere of the brain. It is the insight into this phenomena that has led to the use of contact lenses as an auxiliary means according to the present invention for treatment of visual and/or brain disorder. Due to the fact that the contact lenses according to the present invention are placed in direct contact with the eyes and that they are kept in the correct position by the orientation means, an adequate occluding of the visual input is obtained regardless of the eye movement of the person wearing them. This adequate occluding now enables to correctly direct the information to the desired hemisphere. The latter cannot be obtained with glasses since, due to the distance between the glass and the eye, the movement of the eye will always lead to an information input in the undesired hemisphere, which will then automatically lead to crosstalk.

To determine the proper degree of occlusion of the pupil in a given subject by using computerized EEG, one will generally start with occlusion of one side

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of 49 %. Increasing degrees of obstruction can be tested, up to 55 %. At some point between 49 % and 55 % a maximum shift of information will occur away from the undesired side. This will be reflected by a loss of EEG activation in the undesired side and increasing asymmetry, favouring the desired side. Once optimum occlusion occurs, no further asymmetry will develop. For example, if maximum loss of activity in the undesired side occurs at 51 % occlusion of the pupil, increasing the occlusion further would begin to block information flow to the desired side.

The EEG test is of course the most suitable manner to determine which part of the contact lens should be occluded. Nevertheless, other alternatives are also applicable. One could use the already described ball test in order to determine whether the person is left or right dominant. A microscope or telescope test could then be used to determine the dominant eye. Of course a trial and error method could also be used.

It is contemplated that one eye could be tested independently. In this case, the untested eye would be fully occluded. Full occlusion can be accomplished easily, for example, by closing the untested eye, covering it with an eye patch, or with a contact lens similar to the present invention, except the occluded portion covers approximately the entire lens.

The present invention can also be used for training obstruction of a portion of the visual field. For non-limiting example, there could be applications, such as for example the training of pilots, where it is desirable to train a subject to be more attentive to a certain portion of his field of view, such as a portion of a cockpit instrument panel. Lenses such as those shown in Figure 4 would allow the subject to see objects in the centre of his field of view, essentially blocking his peripheral vision. This is accomplished by creating

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two occluded portions 22 and the lateral edges of the visual field. This could enhance focused vision or help eliminate distractions in the periphery. Conversely, if only the centre of the pupil 13 were blocked, the subject
5 could receive training in enhancing awareness of the peripheral vision. For those lenses the occluded portion may go up to 70 % of the lens' surface.

Thus, it can be seen that the contact lens of the present invention can effectively block or
10 restrict visual input to a selected area of the retina and thus the brain. The lens can also be used for diagnosis and treatment of various disorders by accurately, completely and selectively blocking visual input to a portion of the retina and the brain, regardless of eye
15 movement or movement of the object.

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CLAIMS

1. An auxiliary means provided for treatment of visual and/or brain disorder comprising an optical element suitable to be worn by a human being and
5 having an occluded part, characterized in that said optical element comprises at least one contact lens provided with orienting means affording said optical element a substantially stable orientation with respect to an eye wearing said lens, said occluded part being
10 dimensioned in order to occlude at least 50 % of the visual input.

2. An auxiliary means as claimed in claim 1, characterized in that said contact lens comprises an occluded and a transparent portion, said occluded
15 portion covering between 70 % and 49 %, in particular between 55 % and 51 % of the lens surface.

3. An auxiliary means as claimed in claim 2, characterized in that said optical element comprises a set of two contact lenses, the area covered by the
20 occluded portion being substantially equal for each lens of said set.

4. An auxiliary means as claimed in claim 3, characterized in that each of said lenses is provided for occluding a vertical portion of the eye.

25 5. An auxiliary means as claimed in claim 4, characterized in that said lenses are provided for occluding each time a vertical portion situated on a same part of said eye.

6. An auxiliary means as claimed in anyone
30 of the claims 1-3, characterized in that said lens is provided for occluding a portion situated around a center of the eye.

7. An auxiliary means as claimed in anyone
35 of the claims 1-3, characterized in that said lens is provided for occluding a portion situated in a center of the eye.

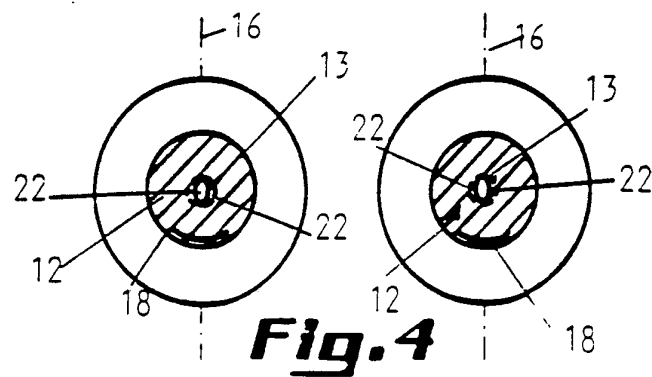
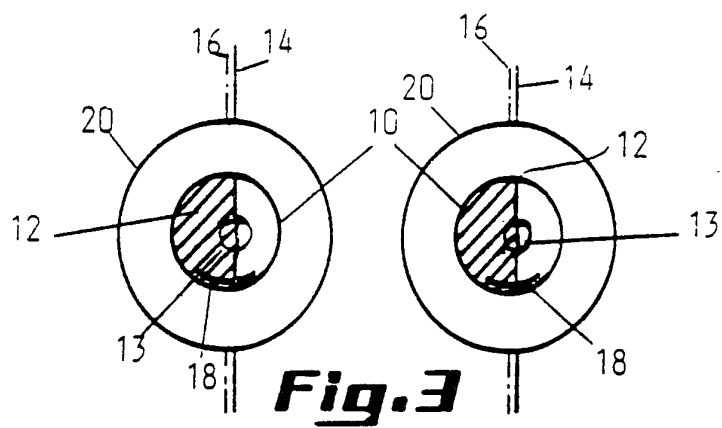
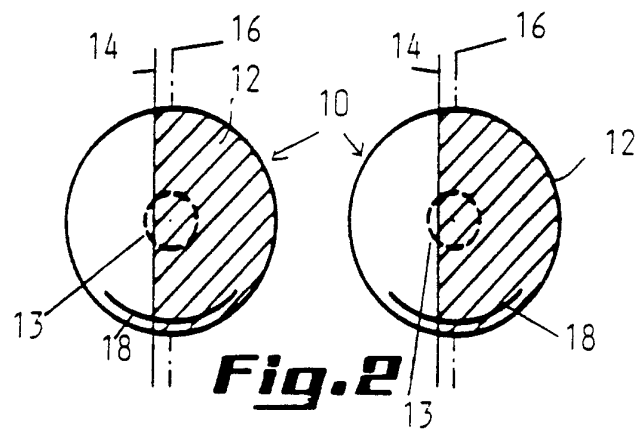
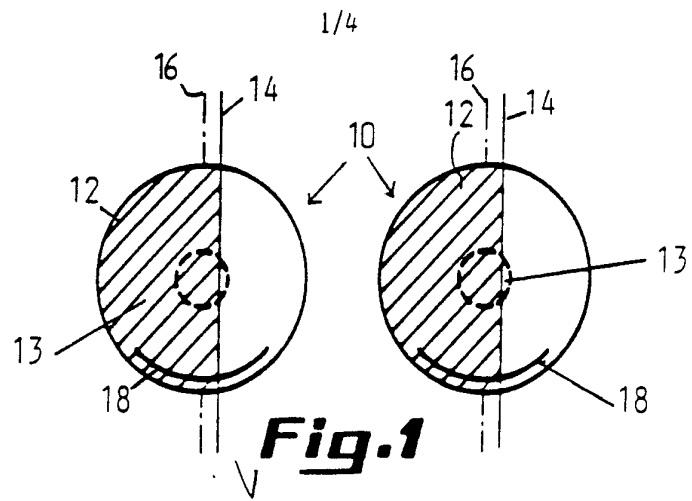
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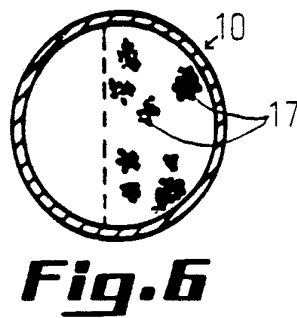
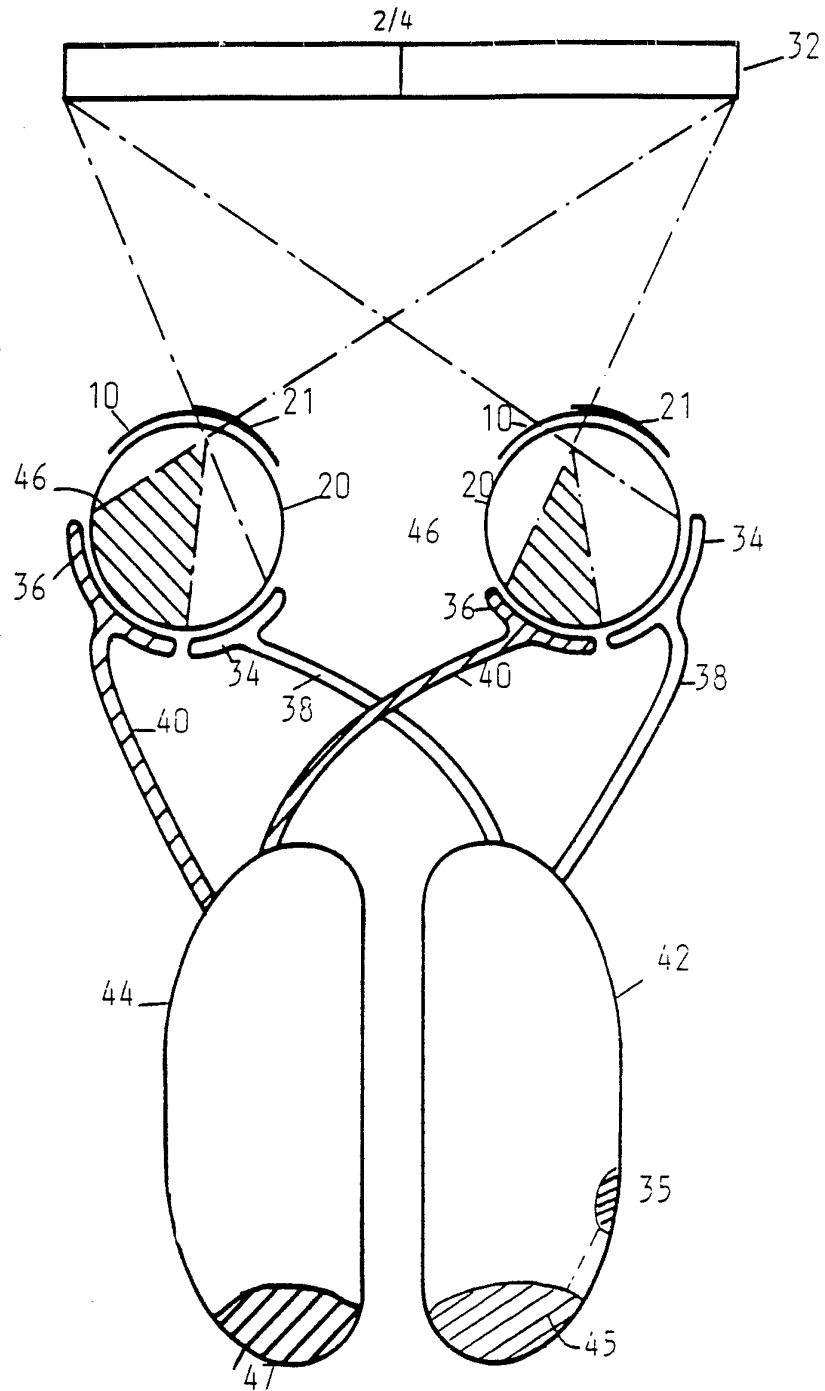
8. A method for manufacturing an auxiliary means as claimed in anyone of the claims 1-7, characterized in that the location of the occluded part of the lens is determined on the basis of data resulting from an analysis in order to determine the dominant hemisphere of the brain.

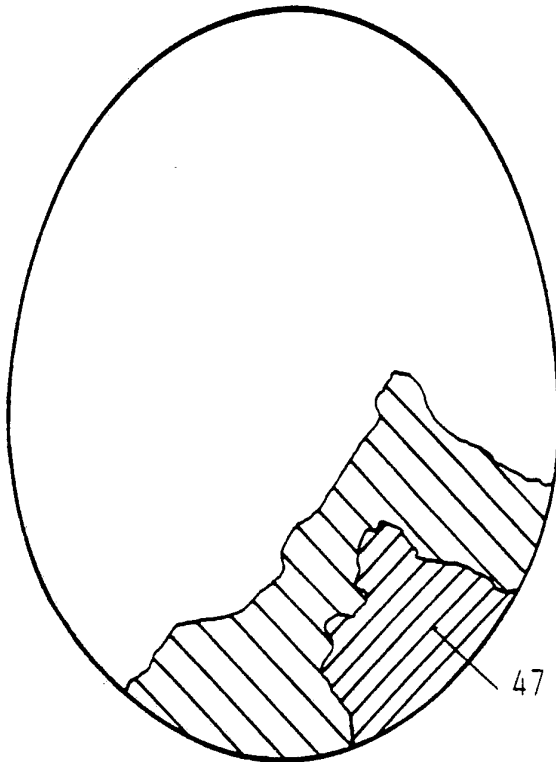
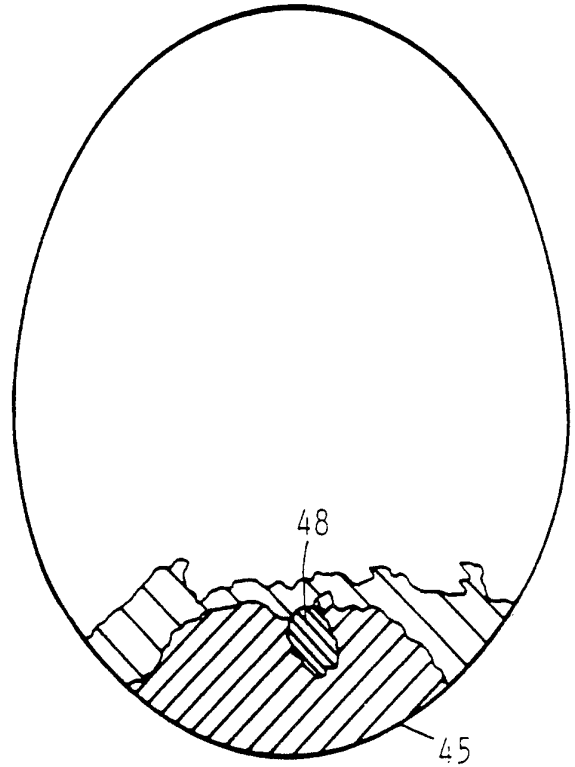
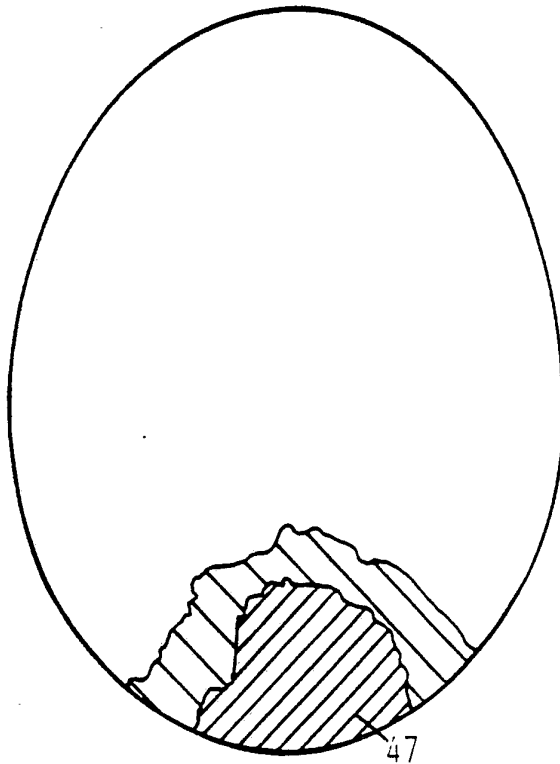
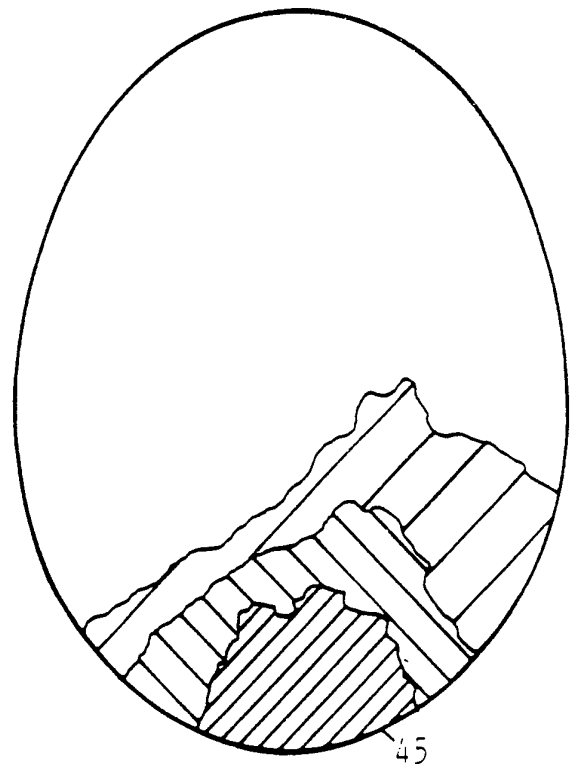
9. A method as claimed in claim 8, characterized in that it is established whether there is a discordance between the dominant hemisphere of the brain and the dominant hand or foot and wherein, in case of said discordance, the part of the lens which directs information to the non-dominant hemisphere of the brain is occluded.

10. A method for manufacturing an auxiliary means as claimed in anyone of the claims 1-7, characterized in that the location of the occluded part of the lens is determined on the basis of data resulting from an EEG analysis in order to determine the dominant hemisphere of the brain.

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***Fig. 7a******Fig. 7b******Fig. 8a******Fig. 8b***

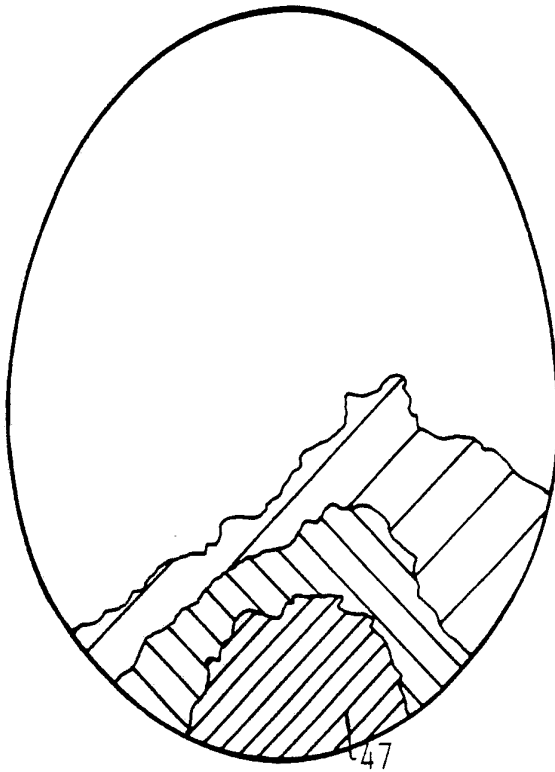


Fig. 9a

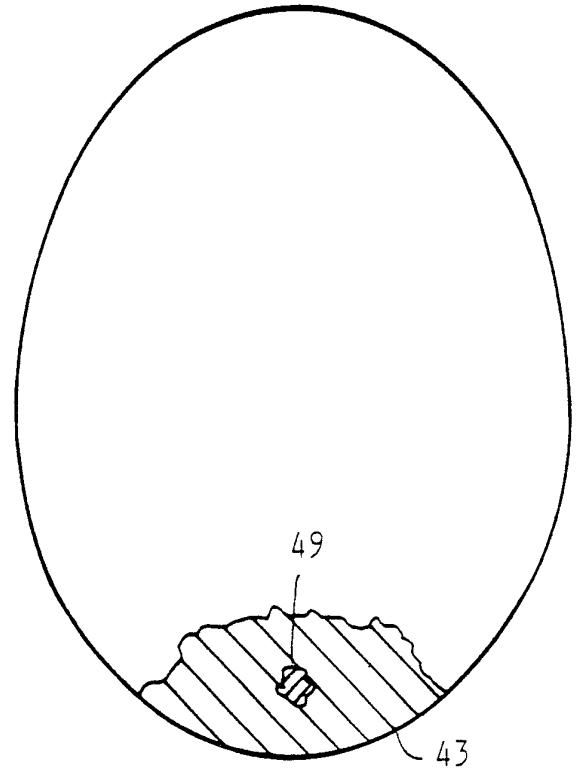


Fig. 9b

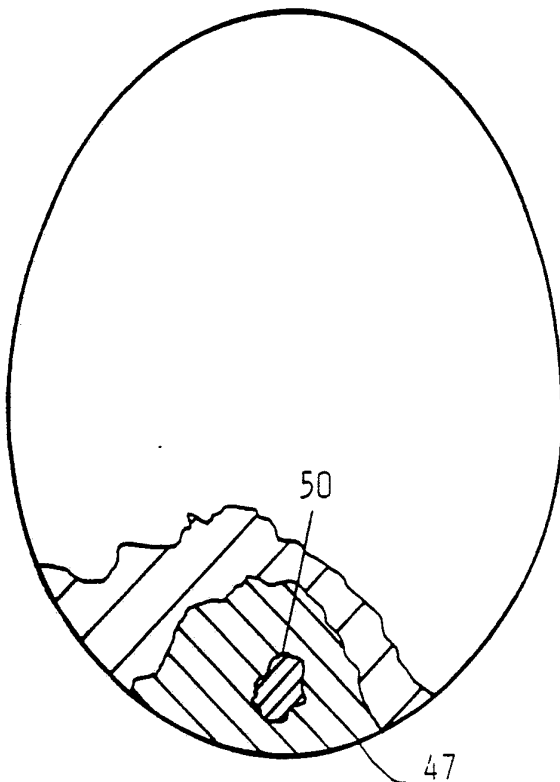


Fig. 10a

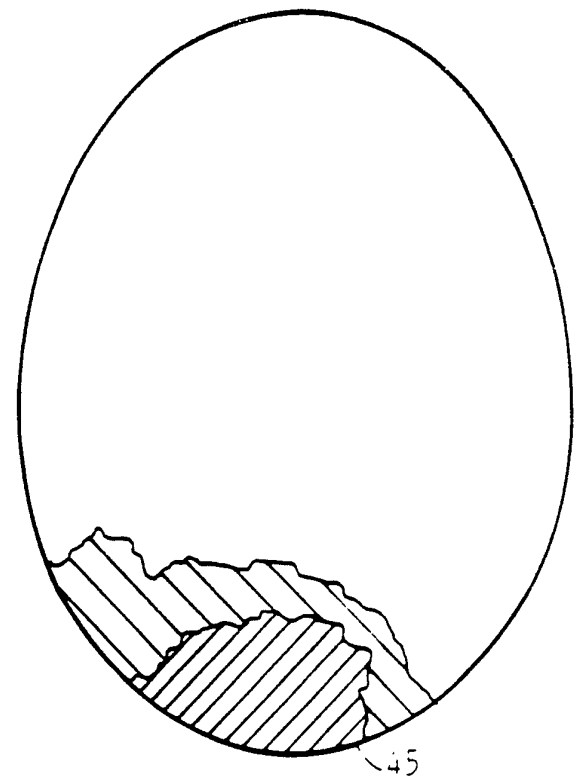


Fig. 10b

INTERNATIONAL SEARCH REPORT

International Application No

PCT/BE 92/00049

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) ⁶		
According to International Patent Classification (IPC) or to both National Classification and IPC		
Int.Cl. 5 A61H5/00; G02C7/04		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁷		
Classification System	Classification Symbols	
Int.Cl. 5	A61H ; G02C	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸		
III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹		
Category ¹⁰	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
A	FR,A,2 074 870 (THE PLASTIC CONTACT LENS COMPANY) 8 October 1971 see page 4, line 38 - page 5, line 12; figure 2 ---	1
A	US,A,3 279 878 (LONG) 18 October 1966 see column 3, line 60 - line 75; figures 8,9 ---	1
A	WO,A,9 110 393 (SCHILLO) 25 July 1991 see abstract; figures ---	1
A	US,A,5 056 909 (BROWN ET AL.) 15 October 1991 see abstract; figures ---	1
		-/--
¹⁰ Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. "&" document member of the same patent family		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search 11 FEBRUARY 1993		Date of Mailing of this International Search Report 02.03.93
International Searching Authority EUROPEAN PATENT OFFICE		Signature of Authorized Officer Mark Jones

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category °	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
A	US,A,3 603 305 (OPPENHEIMER) 7 September 1971 see column 1, line 11 - line 33 see column 3, line 3 - line 33 -----	1

**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO.**

BE 9200049
SA 66435

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

11/02/93

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		DE-A- 2063175	29-07-71
		GB-A- 1340877	19-12-73

US-A-3279878		None	

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		US-A- 5052794	01-10-91

US-A-3603305	07-09-71	None	
