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US 5865839 A **US 4551149 A**
US 20030181957 A1

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INT CL^7 **A61F**
Other: **EPODOC, JAPIO, WPI**

(54) Abstract Title: **Artificial eye with light sensitive LDRs**

(57) An artificial eye comprise a disc 4 upon which three LDRs are mounted. Each LDR is sensitive to light of a particular intensity, e.g. red light, blue light and green light. A processing circuit [Figure 9] is used to transmit outputs from the LDRs into electrical signals which are then transmitted, via a coupling 12, to the optic nerve 13 of a patient. A battery 10 is located within the prosthetic eye to power the electronic components.

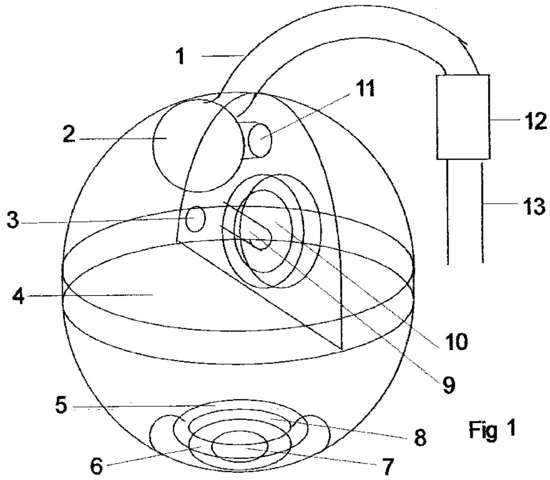

Fig 1

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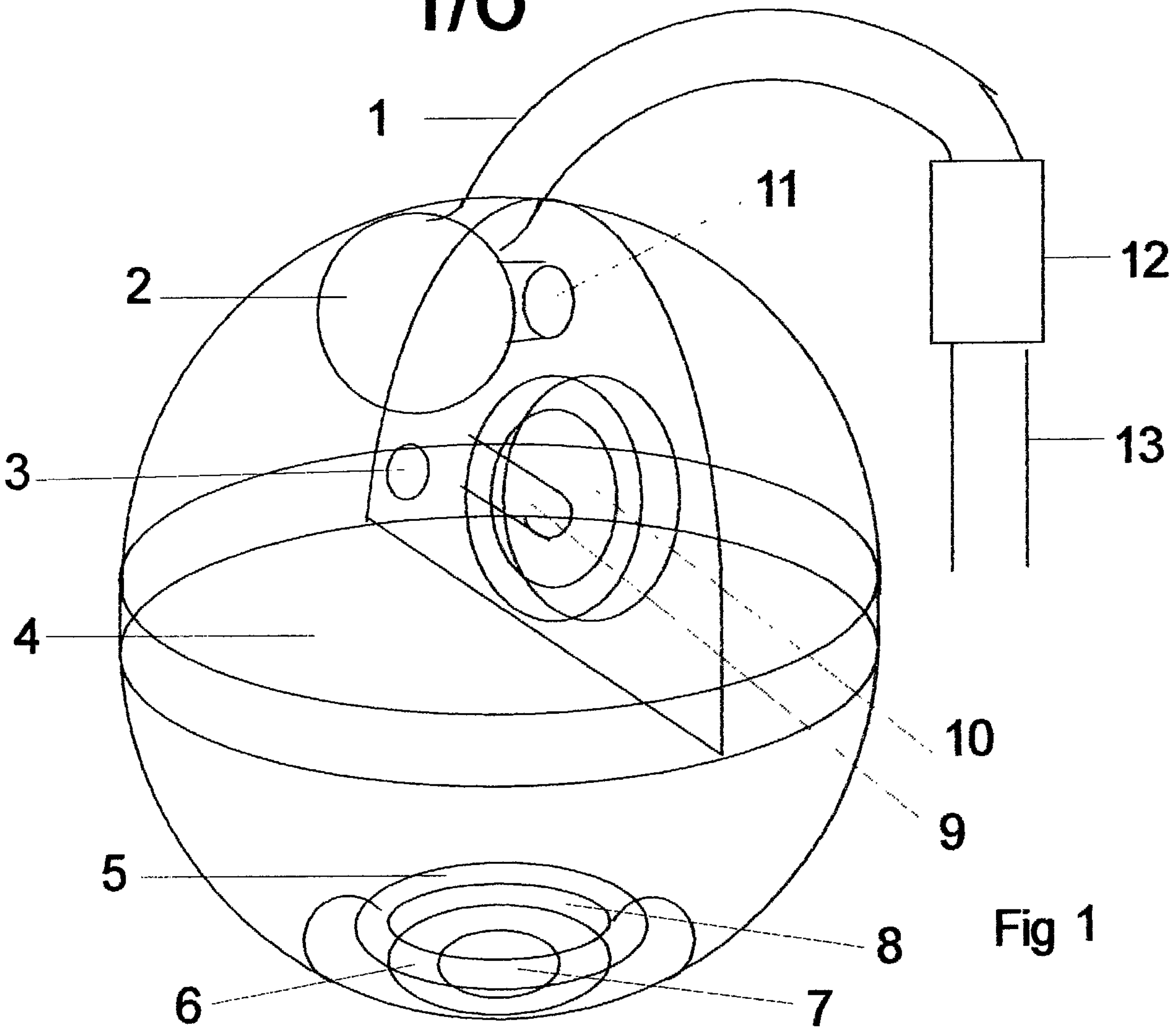

Fig 1

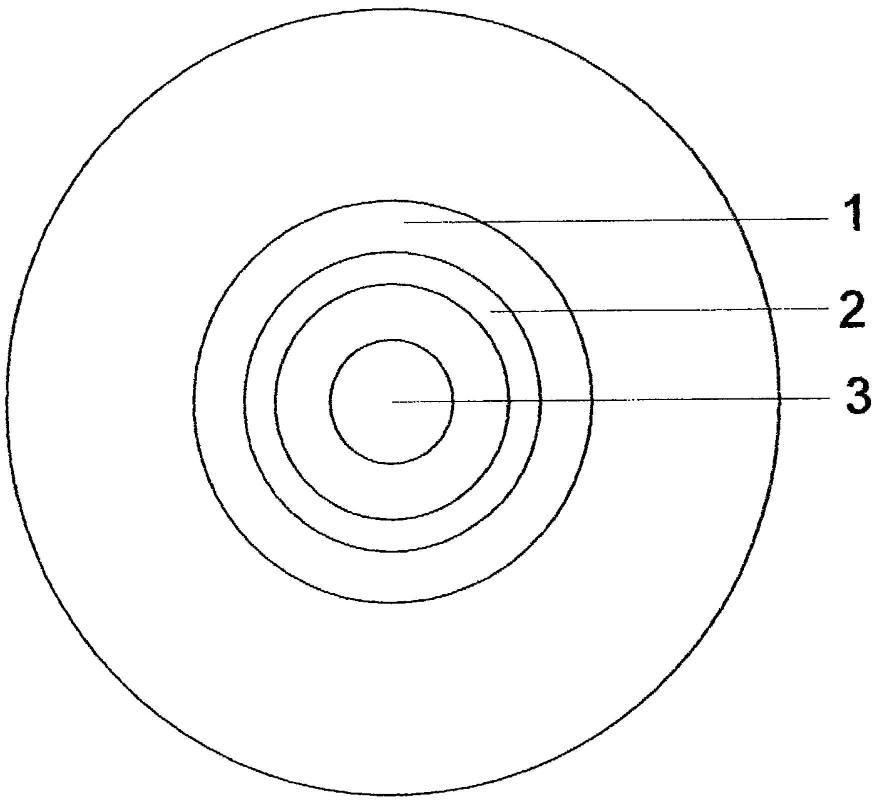

Fig 2

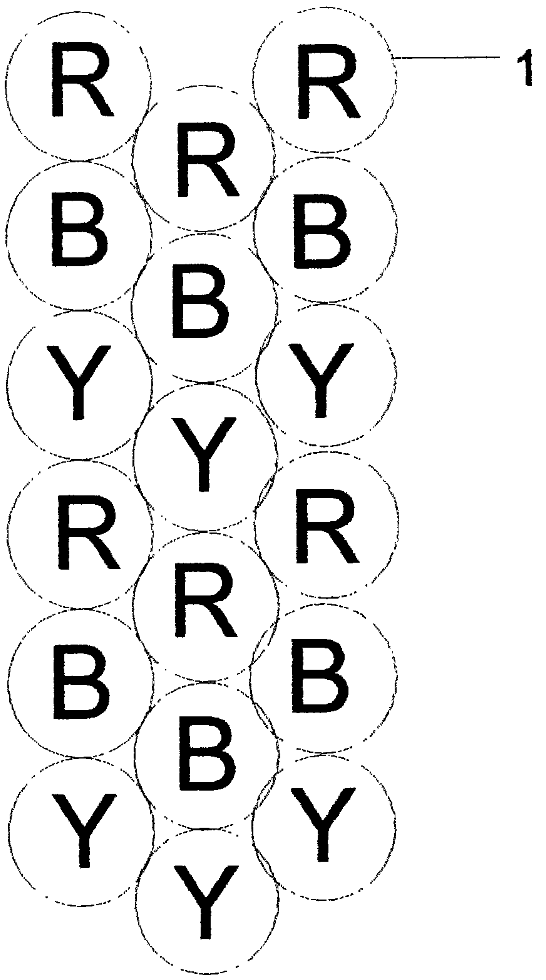

Fig 3

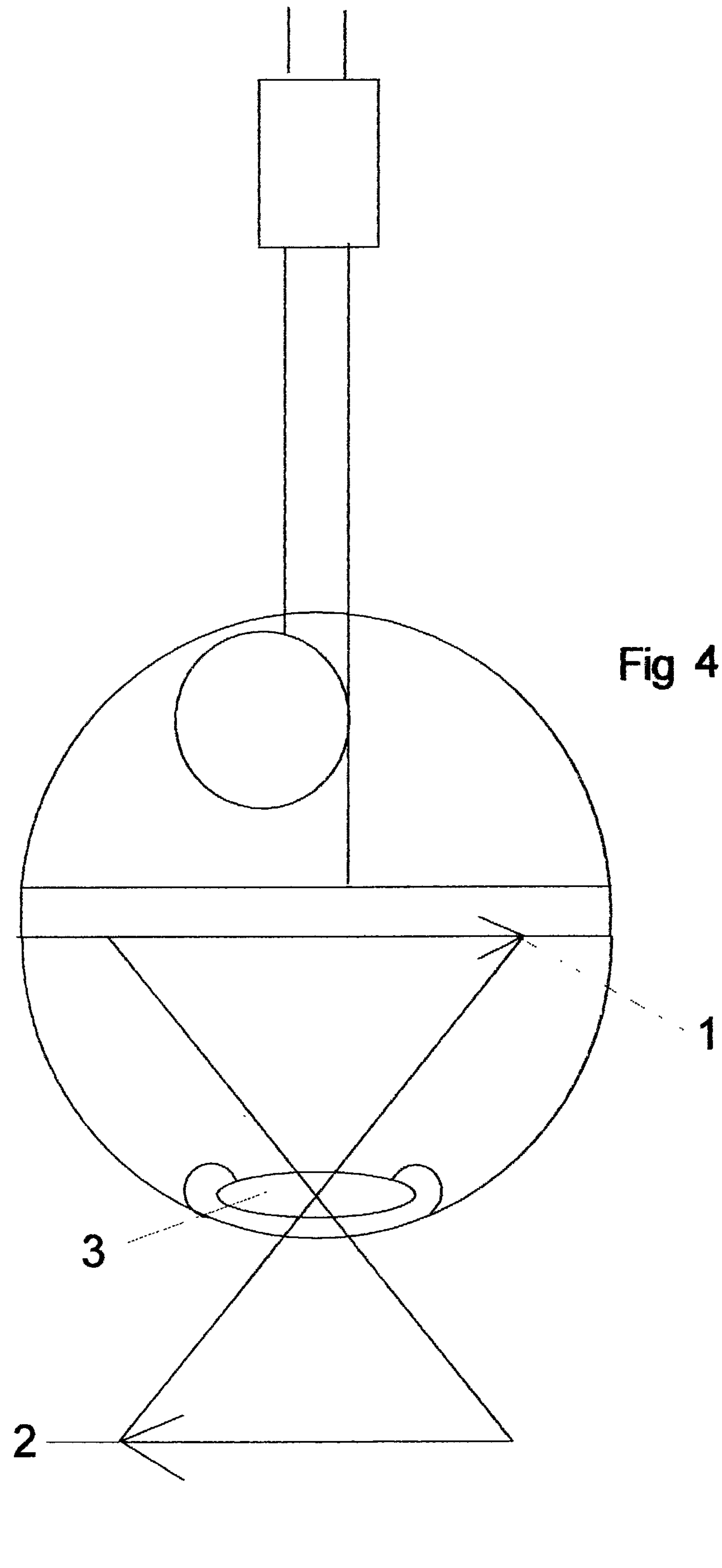

Fig 4

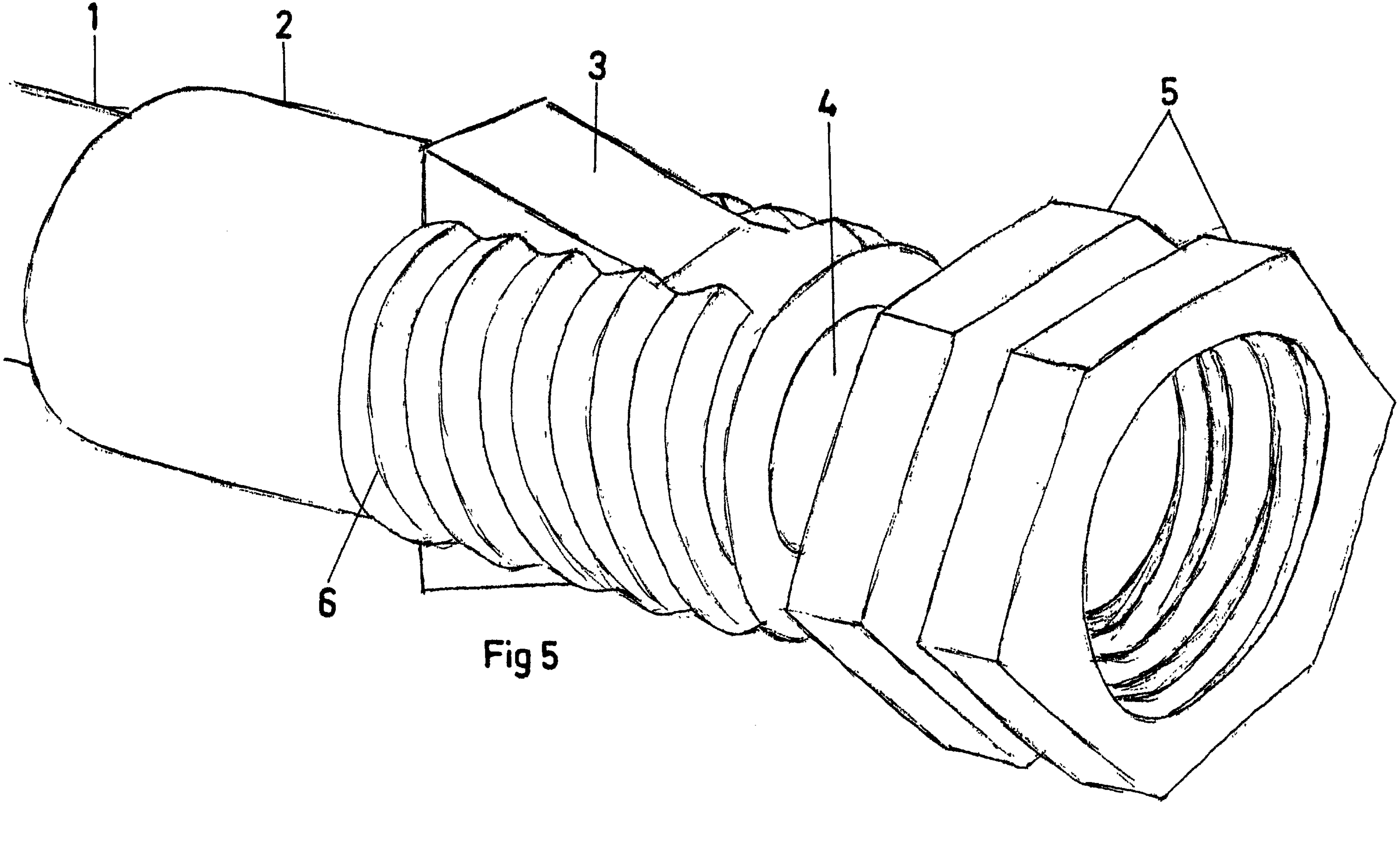

Fig 5

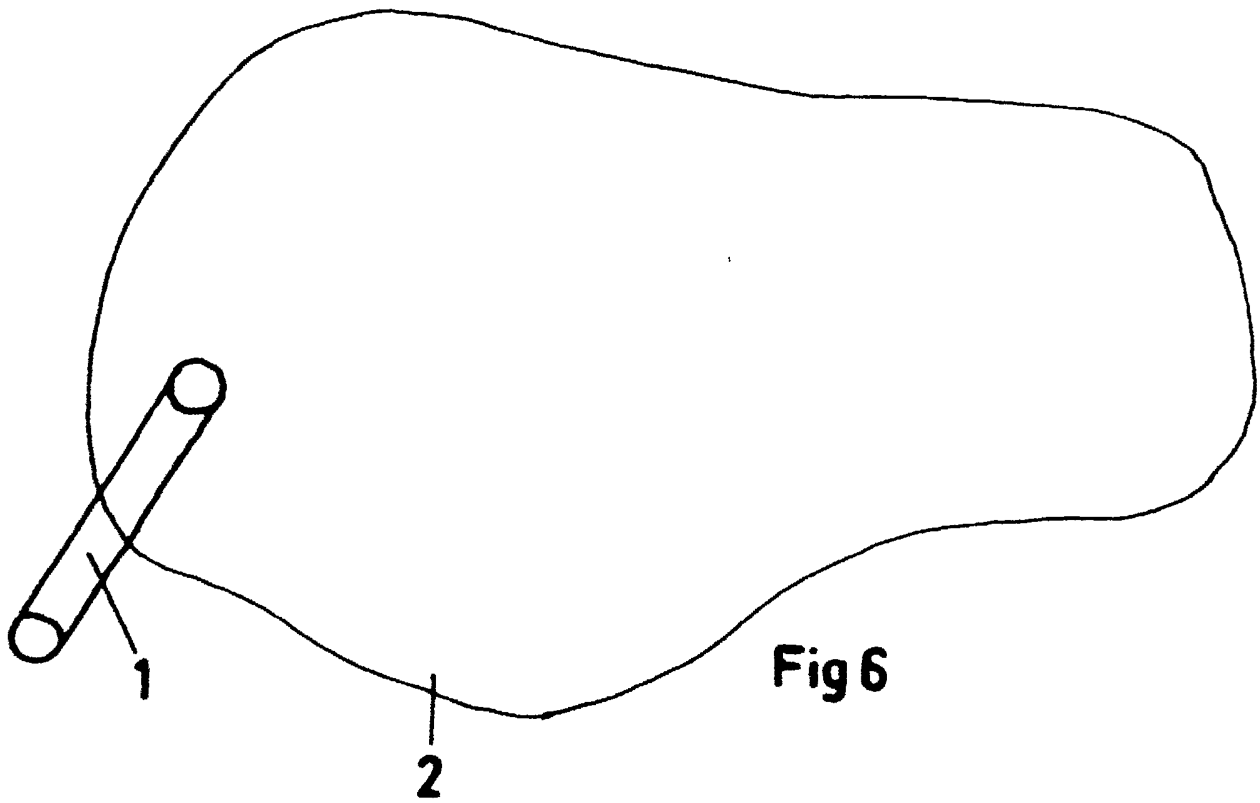

Fig 6

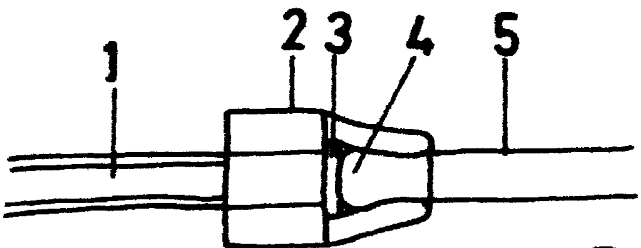

Fig 7

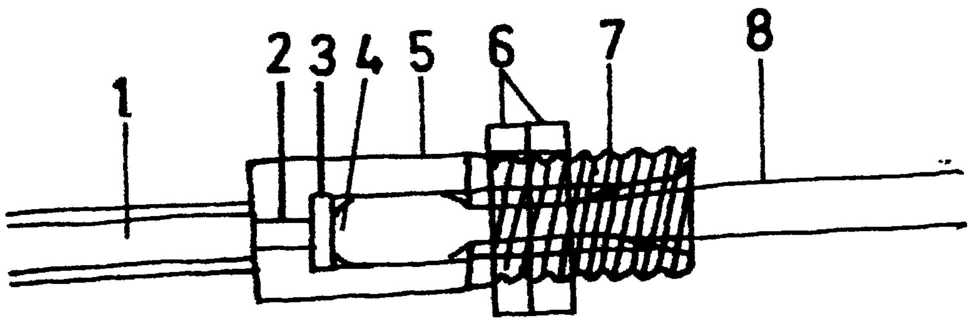

Fig 8

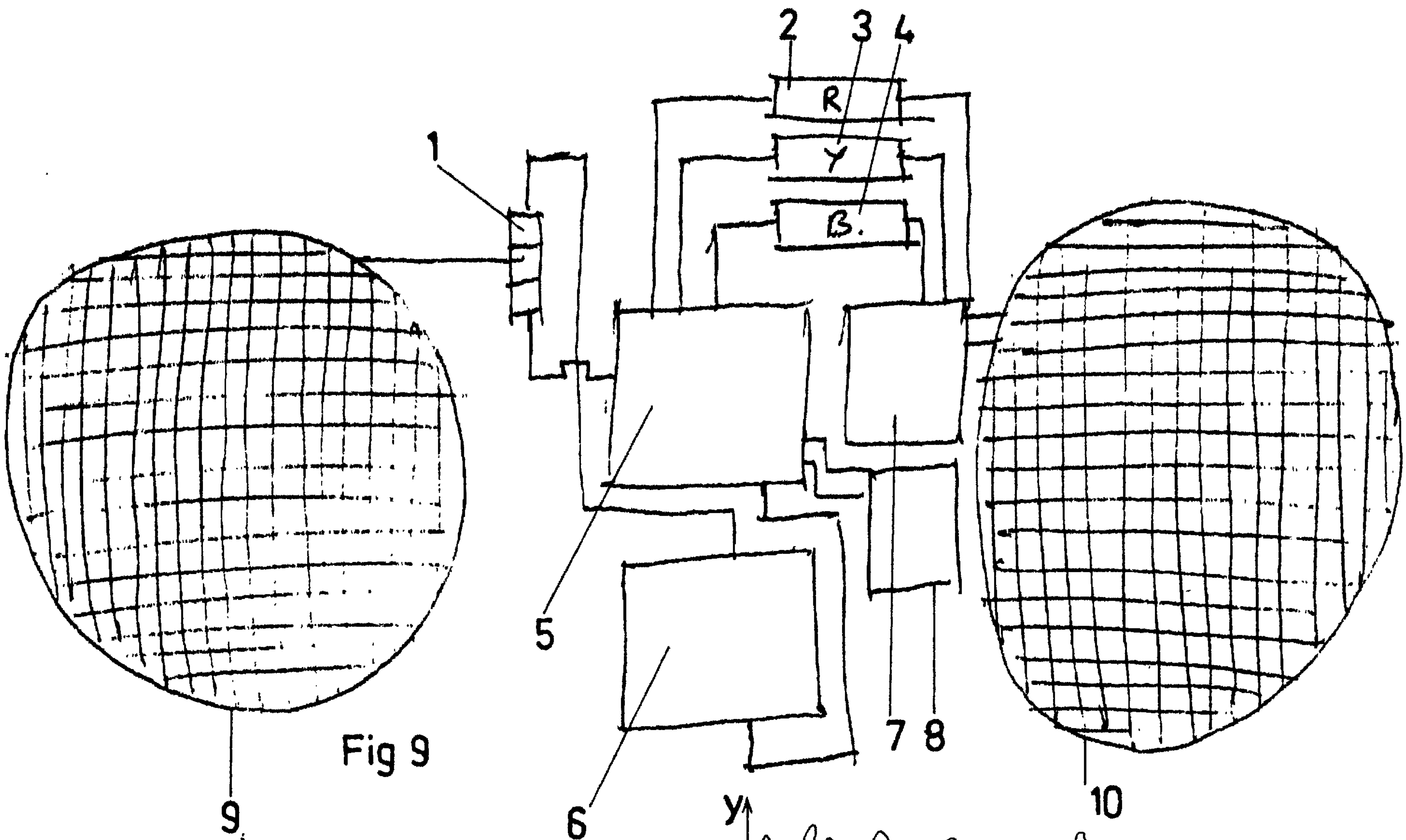

Fig 9

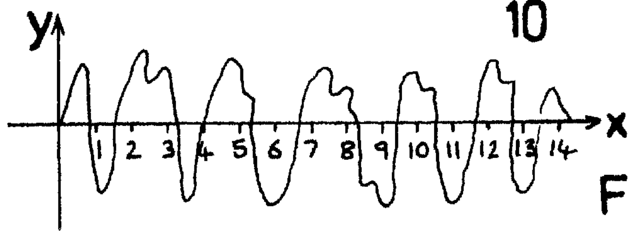

Fig 10

Artificial Eyes Using LDRS Description

Artificial Eyes Using LDRs can transmit images to the brain and all the colours are attainable.

Fig 1 is a view of an Artificial Eyes Using LDRs showing the arrangement of components. Fig 1.1 is the cable of the device along which electrical signals are passed. Fig 1.2 is a knot in the cable so that the cable is not pulled out of the circuitry of the device. Fig 1.3 is an input socket along which data is transferred between the device and a computer for optimising picture received by the brain from the device. Fig 1.4 is a disc upon which the LDRs are arranged. Fig 1.5 is a lens holder. Fig 1.6 is an iris that is painted onto the device so that the device when implanted looks like a real eye any colour could be chosen by the user the rest of the eye looks white except for the pupil which as it is clear will look black because inside the device it is black. Fig 1.7 is the pupil of the device. Fig 1.8 is the lens of the device. Fig 1.9 is a battery contact. Fig 1.10 is the battery of the device which could be a lithium cell. Fig 1.11 is the cable of the device going into the circuitry of the device. Fig 1.12 is a connector for connection of the cable of the device containing wiring to the optic nerve.

Fig 2 is a front on view of the device. Fig 2.1 is the lens holder. Fig 2.2 is the lens of the device. Fig 2.3 is the pupil of the device.

Fig 3 is a view of the arrangement of the LDRs of the device. These LDRs come in three types. There is one for taking in red light. There is one for taking blue light. There is one for taking in yellow light. The LDRs can all take in light of differing intensities so this can be relayed to the circuitry and they all respond to image change received by them and which can be passed on as it is of the appropriate hue. Fig 3.1 is one of the LDRs a red one which can respond to the wavelength of red light.

Fig 4 shows the inversion and reversion that occurs in the device of an image which is passed to the LDRs via the lens. Fig 4.1 shows the inverted and reversed image. Fig 4.2 shows the original image. Fig 4.3 is the lens of the device which is bi-convex.

Fig 4 is a three dimensional view of the connector of the device which connects the cable from the circuit to an optic nerve. Fig 4.1 is the cable of the device. Fig 4.2 is a cylinder into which the optic nerve is pushed and makes contact with a disc which has an array of contact points so that connection to the cable is facilitated. Fig 4.3 is a clamp which is pushed down when the nuts are tightened down so that the optic nerve is gripped by the connector, the clamp can bend down. Fig 4.4 is a hollow opening in the connector which receives the optic nerve. Fig 4.5 are nuts of the connector which are screwed down for connection purposes of the connector and hence the cable from the circuitry of the device to the optic nerve. Fig 4.6 is a thread of the connector.

Fig 6 is a view of the side view of the brain. Fig 6.1 is an optic nerve. Fig 6.2 is the brain.

Fig 7 is a view of a connector showing gripping by the connector to the optic nerve by the clamp. Fig 7.1 is the cable from the circuitry of the device. Fig 7.2 is the connector body. Fig 7.3 is the disc which has connection points from the cable which connect with those of the optic nerve for the transmission of electrical signals to the brain. Fig 7.4 is the optic nerve shown pushed up against the transmission disc. Fig 7.5 is the optic nerve.

Fig 8 shows a connector, the chosen solution for the connection of the optic nerve to the cable from the circuitry of the device. Fig 8.1 is the cable of the device from the circuitry of the device. Fig 8.2 is the wires from the cable of the device and hence from the circuitry of the device. Fig 8.3 is the intermediary disc for transmission of the electrical signals from the circuitry of the device to the optic nerve. Fig 8.4 is the optic nerve shown pushed up against the transmission disc. Fig 8.5 is the body of the connector. Fig 8.6 are the nuts which secure the connector to the optic nerve. Fig 8.7 is the thread of the connector. Fig 8.8 is the optic nerve.

Fig 9 is the circuit of the device. Fig 9.1 is a transistor. Fig 9.2 is a circuit for transmission of red light to the final stage circuit with output to the optic nerve. Fig 9.3 is a circuit for transmission of yellow light to the final stage circuit with output to the optic nerve. Fig 9.4 is a circuit for transmission of blue light to the final stage circuit with out put to the optic nerve. Fig 9.5 is a microprocessor which is used to convert the data received by the LDRs into a form which can be transmitted to the brain. Fig 9.6 is a voltage limiter circuit so that too much energy is not received by the brain. Fig 9.7 is the final stage circuit of the device. Fig 9.8 is the battery of the device. Fig 9.9 is the array of LDRs inside the device. Fig 9.10 is the final output such that what is received by the LDRs is what is received by the brain. The device operates in real time. An oscilloscope is used to tie input to output measuring the change in electrode potential to view shapes colours etc this is done interrogative with the patient for tuning of the circuit. Microelectrodes are used at the transmission disc to the optic nerve. Threshold pickup by the brain could be related to different colours received by the brain from the sensory neurone and to light pickup in general.

Feedback from receptors could be via circuit to central nervous system. As brain puts image inverted reversed correct this must be considered in circuit dynamics. Electrical stimulus optic nerve may just take this image brain does the rest. LDRs that are specific to wavelength of light and hence colour respond relative to light intensity though for variable light intensity dark to light shade. The LDRs are parsed left to right up to down repeatedly then relayed to optic nerve via circuit. Light intensity relay is used. Placement relative of LDR to nerve fibre element circuit to facilitate best fit dynamic circuit facilitates best fit by relation to computer picture, thus a comparison is compared of the wave patterns such as Fig 10 for the computer and of the device and an algorithm is used to produce best fit. Best fit optimiser is quantified in real time via computer program there is an input terminal in the device for this to occur for correspondence to be formulated. Circuit to produce latency affect of the microprocessor. Automatic infinite to near image transference to optic nerve. It may be feasible to affix the motor muscles of the eye to the artificial eye to produce movements and affixation in a position of the eye.

Artificial Eyes Using LDRs Claims

1. Artificial Eyes Using LDRs transmit light energy via LDRs which are of three types for red light. yellow light and blue light and which is of varying intensity to the optic nerve via circuitry, Artificial Eyes Using LDRs are substantially as described herein with reference to the accompanying description and drawings.

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Application No:	GB0414977.9	**Examiner:**	Barnaby Wright
Claims searched:	1	**Date of search:**	18 January 2005

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
A	-	US 4551149 A (SCIARRA)
A	-	US 2003/181957 A1 (GREENBERG)
A	-	US 5865839 A (DOORISH)

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art
Y	Document indicating lack of inventive step if combined with one or more other documents of same category	P	Document published on or after the declared priority date but before the filing date of this invention
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^{X} :

A5R

Worldwide search of patent documents classified in the following areas of the IPC^{07}

A61F

The following online and other databases have been used in the preparation of this search report

EPODOC, JAPIO, WPI