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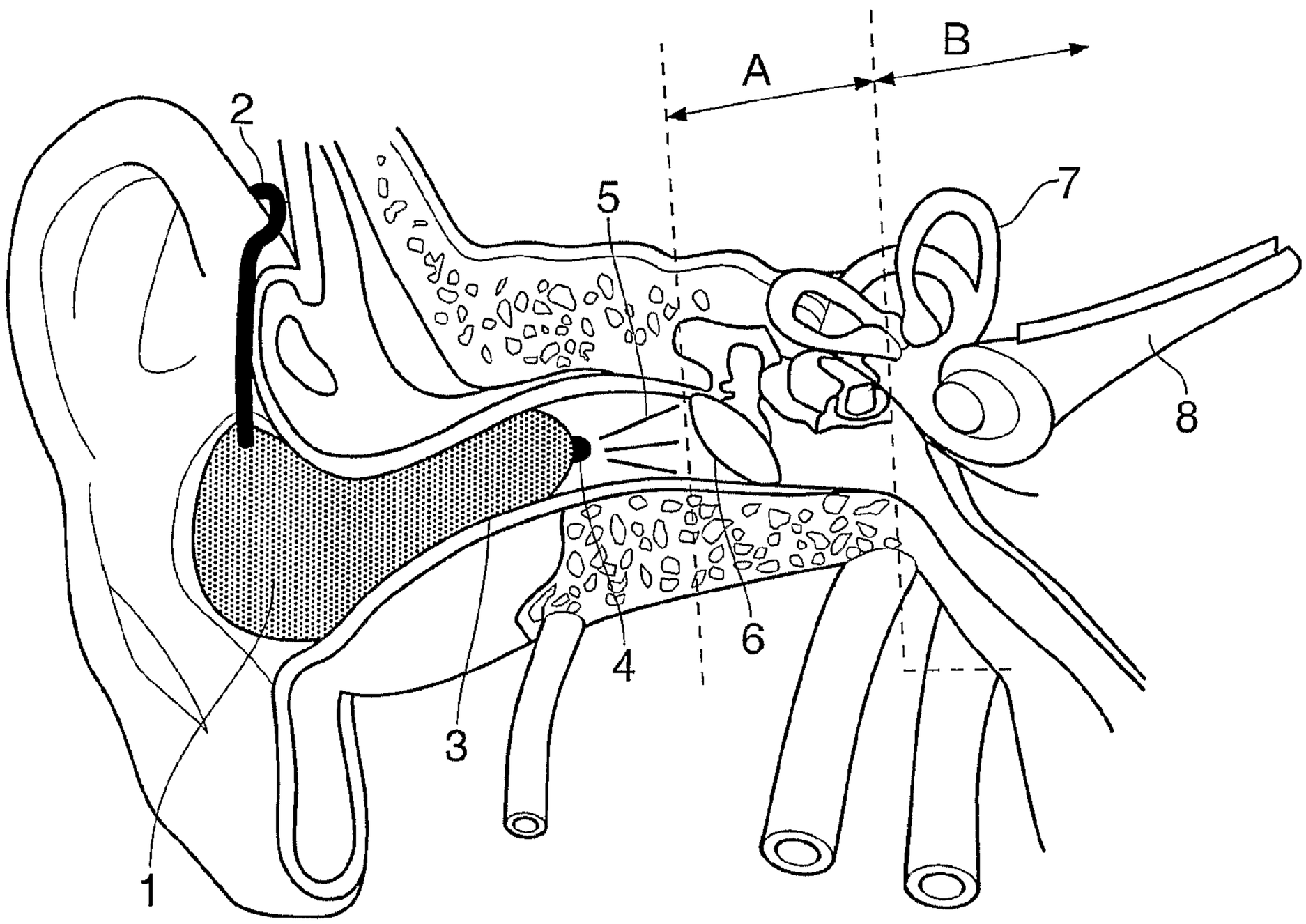
(54) Title: USE OF ELECTROMAGNETIC RADIATION IN THE TREATMENT OF SENSORY ORGANS



(57) Abrégé/Abstract:
A method of using and devices for delivering electromagnetic radiation of a selected wavelength for the treatment of conditions pertaining to cephalic sensory organs, in particular to treating conditions of the eye (ocular conditions) and conditions pertaining to the ear (otic conditions). The invention is in particular for the treatment of organelles associated with the acoustic and optic nerves and more particularly for the treatment of age related degeneration of such organelles. The invention also provides devices for treating ocular and otic conditions.

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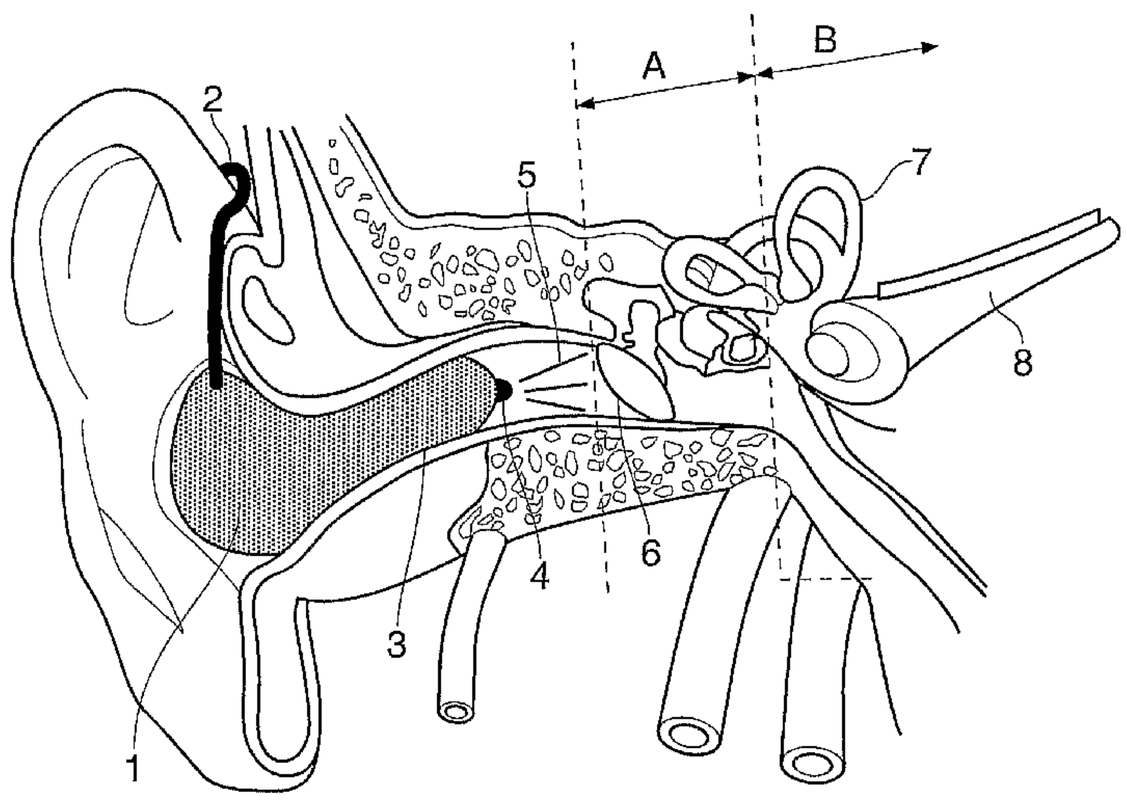

(57) **Abstract:** A method of using and devices for delivering electromagnetic radiation of a selected wavelength for the treatment of conditions pertaining to cephalic sensory organs, in particular to treating conditions of the eye (ocular conditions) and conditions pertaining to the ear (otic conditions). The invention is in particular for the treatment of organelles associated with the acoustic and optic nerves and more particularly for the treatment of age related degeneration of such organelles. The invention also provides devices for treating ocular and otic conditions.

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Use of Electromagnetic Radiation in the treatment of Sensory Organs

The present invention relates to the use of electromagnetic radiation of a selected wavelength for the treatment of conditions pertaining to cephalic sensory organs, in particular to treating conditions of the eye (ocular conditions) and conditions pertaining to the ear (otic conditions). The invention is in particular for the treatment of organelles associated with the acoustic and optic nerves and more particularly for the treatment of age related degeneration of such organelles. The invention also provides devices for treating ocular and otic conditions.

BACKGROUND TO THE INVENTION

Macular degeneration is a medical condition where the light sensing cells in the macula malfunction and over time cease to work it is the leading cause of central vision loss (blindness) for those over the age of fifty. There are two basic types of the disease: Standard Macular Degeneration (MD) and Age Related Macular Degeneration (ARMD), with ARMD being the most common form of the condition. Macular degeneration that is not age related is most commonly caused by an inherited condition. These forms are sometimes called Juvenile macular degeneration (JMD). In macular degeneration the final form results in missing or blurred vision in the central, reading part of vision. The outer, peripheral part of the vision remains intact. The treatment for such conditions is by drug therapy such as pegaptanib (Macugen ™), ranibizumab (Lucentis ™), anecortave (Retaane ™), bevacizumab (Avastin™), squalamine (Evizon™) and statins, a family of drugs used for reducing cholesterol levels.

Age-related hearing loss (presbycusis) involves a progressive loss of hearing, beginning with high-frequency sounds such as speech. It is unknown whether a specific cause such as noise trauma leads to presbycusis, but there appears to be a genetic predisposition. Age-related hearing loss tends to occur in families. The disorder occurs in about 25% of people aged 65 to 75 and in 70% to 80% of those over age 75. There is no known cure for age-related hearing loss. Treatment is focused on functional improvement such as hearing aids, which provide amplification. Developing skills such as lip reading and using visual cues may aid communication, but these may be difficult skills for older people to learn.

It is known from the prior art that electromagnetic radiation centred around a wavelength of 1072nm is an effective treatment for cold sores and improves the immune response to many infections (WO 9919024). It is also known from the prior art that 1072nm light is also effective at reducing wrinkles and improving the elasticity of skin.

In the present invention we have found that electromagnetic radiation of a selected wavelength is also effective at treating ocular and otic conditions and provides an alternative therapy for such conditions.

BRIEF SUMMARY OF THE DISCLOSURE

According to a first aspect of the invention there is provided a method of treating ocular and/or otic conditions and/or organelles associated with the optic and acoustic nerves and associated organelles, the method comprising exposing the affected organ or organelle to divergent electromagnetic radiation of wavelength between 900nm and 1300nm.

Throughout the description and claims of this specification, the words “comprise” and “contain” and variations of the words, for example “comprising” and “comprises”, means “including but not limited to”, and is not intended to (and does not) exclude other moieties, additives, components, integers or steps.

Throughout the description and claims of this specification, the singular encompasses the plural unless the context otherwise requires. In particular, where the indefinite article is used, the specification is to be understood as contemplating plurality as well as singularity, unless the context requires otherwise.

Features, integers, characteristics, compounds, chemical moieties or groups described in conjunction with a particular aspect, embodiment or example of the invention are to be understood to be applicable to any other aspect, embodiment or example described herein unless incompatible therewith.

Reference herein to "organelles associated with the optic and acoustic nerves and associated organelles" includes the pigment layer, photoreceptors and ganglion cells of the retina, in addition, includes the external auditory meatus, tympanic membrane, middle ear, semi-circular canals, cochlea and VIIIth cranial nerve.

Preferably, the method of treatment of the present invention is for the treatment of any one or more of the following conditions selected from the group comprising ARMD, poor visual acuity, optic nerve disorders, posterior uveitis, presbycusis, tinnitus, vertigo, conditions affecting the physiological characteristics of the organ of corti in the cochlea, ear and acoustic nerves and associated organelles.

The use of divergent electromagnetic radiation of wavelength between 900nm and 1300nm is as a therapy for the treatment of organelles associated with the optic and acoustic nerves. We have found using the method of the present invention that hearing was significantly improved. We have also found that the method of the present invention improves cell viability.

According to a second aspect of the invention there is provided use of divergent electromagnetic radiation of wavelength between 900nm and 1300nm for the treatment of otic and/or ocular conditions and organelles associated with the optic and acoustic nerves.

In the present invention we have been able to establish that low intensity electromagnetic radiation of small bandwidth (around 10nm to 120nm) is effective in treating conditions such as ARMD, posterior uveitis, presbycusis and tinnitus.

Preferably, the divergent light is between 10 to 50°. By divergent it meant that the electromagnetic radiation emitted from the electromagnetic source has a divergent half angle of at least 5°.

Preferably divergence of the electromagnetic radiation is in the range 15 to 25° half angled divergent.

The present invention is concerned with a method of treating the optic and acoustic nerve and associated organelles with divergent electromagnetic radiation having a wavelength in the range from visible to infra red.

Preferably, the wavelength is centred around 940nm, 950nm, 1040nm, 1060nm, 1072nmand 1267nm or more preferably is a combined wavelength of 1072nm and

1267nm with the optical intensity of the wavelengths in the same ratio as the peaks in the transmission spectrum of the water molecule.

The water molecule that has a range of electromagnetic radiation wavelengths passed through it will produce several transmission peaks. These transmission peaks are a associated with the preferred therapeutic electromagnetic radiation wavelength range of the invention and thus implies a role for the water molecule in the general mechanism of action.

Our studies have shown that wavelengths centred around those wavelengths specified above and especially around 940nm, 950nm, 1040nm, 1060nm, 1072 nm or 1267nm are particularly effective in improving visual acuity in patients with ARMD and improve hearing in patients with presbycusis. In particular our evidence suggests that wavelengths of 1072nm and 1267nm are particularly effective and it is of note that these two wavelengths correspond to the peak emission wavelengths of a water molecule's light transmission profile and thus we believe that the mechanism of action is related to water and possibly cell membranes and the peak spectral emission of singlet oxygen.

Preferably, the electromagnetic radiation is continuous or pulsed.

Preferably, when the electromagnetic radiation is continuous the intensity is at least 500 μWatts/cm^2 and up to 500mWatts/cm^2.

Preferably, when the combined electromagnetic radiation is pulsed the intensity is at least 500 μWatts/cm^2 peak power and the average power is up to 500 mWatts/cm^2. The average power is the peak power multiplied by the proportion of the total time that the radiation is applied. For instance if the peak power is 500 μWatts/cm^2 and is pulsed for 10 μseconds at a frequency of 600 Hz then the average power is 30μ Watts/ cm^2.

Due to the proximity of the light sources to delicate neural/nerve tissue thermal heating of the target tissue should be avoided. Preferably when the electromagnetic radiation is pulsed the average power of the intensity is in the region of 50-100μ Watts/cm^2. We have found that the power may suitably range from 500 pWatts/cm^2 peak to 500 mWatts/cm^2 continuous or peak power when applied to the eye/ear. Typically 20 mWatts/cm^2 are used on skin but this value is dependent on how fat or muscular the subject is.

Preferably when the electromagnetic radiation is pulsed it is applied for periods of at least 10-15 μseconds and more preferably is applied at a frequency/repetition rate in the range 100-1000 Hz more preferably still the frequency/repetition rate is at, or about, 600 Hz. Our studies have shown that the electromagnetic radiation can be either coherent or non-coherent the clinical outcomes are not affected by this parameter.

Preferably the electromagnetic radiation is applied to the affected area for at least 30 seconds and up to a few minutes. A typical exposure time is in the region of 3 minutes however this time is increased according to the individual's requirements and exposure could be up to 10 minutes.

It should be appreciated that the power source emitting the electromagnetic radiation will have to produce more than the required intensity for the clinical effect since we have shown that approximately 95% of the applied therapeutic amount of light is lost during treatment. Thus the intensity of applied radiation is typically corrected for when carrying out a treatment.

From the foregoing it is understood that the electromagnetic radiation may be directed to the target site either continuously or in a switched (pulsed) manner. The main benefit of switching enables power conservation and facilities much higher peak power output, thereby improving therapeutic response.

Preferably, the electromagnetic radiation therapy source includes means for reducing the amount of ambient radiation, which impinges on the treatment site.

Preferably, the electromagnetic radiation source comprises light emitting diodes or laser diodes. The radiation from such devices can be electrically operated or the radiation can be delivered to an applicator via a fibre-optic delivery system.

Preferably, the radiation source emitter includes PN junctions arranged to emit radiation with a wavelength centring at or about the previously mentioned specified wavelengths in the defined ratio of light output. A single light diode assembly may include a plurality of orientated junctions. Infrared emitting diodes may be arranged not only to emit radiation at a specific frequency but also to emit a high intensity divergent beam. The divergent light may also be derived from light emitting polymers.

The electromagnetic radiation is applied at a low intensity such that no thermal damage or heating is caused to the tissue, nerve or organ around the treatment area. In this way, the method of the present invention differs from the prior art use of electromagnetic radiation as the effects are non-thermal and avoid thermolysis. In addition the present invention is counter-intuitive to bio-stimulation since the concept of enhanced replication and synthesis is positively avoided.

According to a third aspect of the invention there is provided a portable light emitting device for the treatment of the ear, acoustic nerve and associated organelles, the device comprising:

(i) a moulded portion for insertion into an ear canal, the moulded portion having an opening at one end, which when inserted into the ear canal is adjacent an external aspect of the tympanic membrane and through which electromagnetic radiation can pass and a receiving portion positioned in the same anatomical plane as a pinna for receiving power from a power source,

(ii) at least one light emitting means that produces divergent electromagnetic radiation of wavelength from 900nm to 1300nm, and

(iii) a power means for providing power to the power source.

Preferably, the device further includes any one or more of the following features:

(i) an optical monitoring sensor for ensuring the light output is correct;

(ii) a thermal sensor for ensuring the temperature of the device does not exceed safe limits;

(iii) a frequency modulator for changing the frequency of a pulsed exposure or for switching to continuous exposure;

(iv) a timing means for ensuring that the period of treatment is regulated;

(v) a safety cut-out means optionally in the form of an alarm or cut-off switch which is operable when operational limits are exceeded or when the therapy period has expired.

Preferably, the power source to the light emitting means is electrical or is a fibre-optic.

Preferably, the power means is a battery or is mains electricity.

Preferably, the light emitting means is a LED or more preferably a plurality of LEDs. It will be appreciated that the light emitting means of the present invention may also be a laser light source.

Preferably, the light emitting means are positioned approximately centrally at the end of the moulded portion. An approximate central position ensures accurate irradiation of the middle and inner ear when in use. The light emitting means may be embedded in the moulded portion or maybe housed with and allowed to protrude. The light emitting means are suitably sized so they may be accommodated into a mould similar to that made for hearing aides.

Preferably, the electromagnetic radiation impacts directly onto the tympanic membrane.

Preferably, in the instance of a plurality of light emitting means they are focused centrally. For example, a series of a 3 by 3 row of LEDS of fibre optics are arrange so that the central LED or fibre optic emits directly in a straight line towards the eardrum whereas the surrounding eight LEDs or fibre optics are focused towards the central one.

Preferably, the device may also comprise at least one or more PN junctions arranged to emit radiation with a wavelength centring at 1072nm or 1267nm and may be a laser device.

Preferably, the moulded portion is partially constructed of a resiliently deformable material or is coated or covered in such a material to ensure both a close fit within the ear canal and comfort to a user. A suitable material is rubber or foam. It will be appreciated that the moulded portion is transparent and is of a suitable size and shape to not only accommodate component parts but to fit within an ear canal.

Preferably, the device further includes a securing means for securing the device to a user's ear. The securing means may take the form of a loop or U shaped portion which can be attached to the pinna.

Preferably the device further includes any one or more of the features hereinbefore described with reference to the first and second aspects of the invention.

According to a fourth aspect of the invention there is provided a portable light emitting device for the treatment of the eye, optic nerve and associated organelles, the device comprising:

i) a housing comprising a cut-out portion or notch for accommodating a nasal bridge when in position on a user, the housing also comprises a first projecting portion for contacting a user's inferior orbital ridge and second projecting portion for contacting a user's superior orbital ridge when in position on a user,

ii) at least one visible light emitting means positioned approximately centrally within the housing so that when light is emitted to a user's eye the visible is in the same axis as the user's pupil;

iii) at least two light emitting means that produces divergent electromagnetic radiation of wavelength from 900nm to 1300nm, and being positioned within the housing either side of the central visible light emitting means, the at least two light emitting means that produce electromagnetic radiation being angled with respect to a user's eye so that they are not in the same axis as the pupil; and

iv) a power means for providing power to the power source.

It will be appreciated that the device for treating the eye when in position and in use effectively surrounds the eye and nests within the eye socket so that all light can be directed efficiently to the sclera and eye ball surface.

Preferably, the second projecting portion which rests or is in contact with a user's superior orbital ridge is resilient, that is to say it may be spring loaded so as to facilitate lifting or stretching of loose skin on the upper thus exposing a greater area of sclera to the divergent invisible infrared light. By supporting the loose skin above the eye the surface area of the sclera is increased through which the therapeutic infrared light can penetrate to globe.

Preferably, the visible light emitting means is positioned so that in use the visible light irradiates the cornea, causing the pupil to constrict and hence improve the safety of irradiating the eye with invisible infrared electromagnetic radiation.

Preferably, the electromagnetic radiation light emitting means are orientated within the housing so that they are defocused and are not in the optic axis of the pupil, this is a safety feature preventing possible optical damage to the macula.

Preferably, the device comprises a plurality of electromagnetic radiation light emitting means in cluster form each side of the central visible light emitting means.

Preferably, in use the visible light is pulsed out of phase to the infrared light so as not affect the clinical efficacy of the infrared light.

Preferably, the device further includes any one or more features hereinbefore described with reference to the first, second or third aspects of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows a through section of a device of the present invention when inserted into a human ear.

Figure 2 shows a side view of the device of Figure 1.

Figure 3 shows a cut through section of the device of Figure 2.

Figure 4 shows a front end view of the device of Figure 1.

Figure 5 shows an exploded diagram of the central portion of Figure 4.

Figure 6 shows a top plan view of a device of the present invention to treat the eyes.

Figure 7 shows a front view of the device of Figure 6.

Figure 8 shows an underneath view of the device of Figure 6.

Figure 9 shows an internal view of Figure 6.

DETAILED DESCRIPTION

Referring to Figure 1 in one embodiment of the invention the device (1) is for insertion into an ear canal (3). The device is a portable electromagnetic radiation emitting device which can be either battery or mains operated. An electrical or fibre optic power source (2) provides power to the end (4) which comprises a plurality of light emitting means in the form of LEDs or laser lights which irradiate outwards (5) and towards the ear drum or tympanic membrane (6) to the middle (A) and inner (B) ear. The electromagnetic radiation passes towards the semicircular canals (7) or balance centre and also to the acoustic nerve (8). The light emitting means (4) of the device are small enough to be moulded into a mould similar to that made for hearing aides. When in use the electromagnetic radiation is this irradiated on primarily the tympanic membrane but also can pass to other organelles in the middle and inner ear. The device (4) within the moulded body also includes optical monitoring sensors ensuring the light output is correct together with thermal sensors ensuring the temperature of the device does not exceed safe limits.

With regard to Figure 2 there is shown the device (1) stripped of its coating or surface layer, end (10) is the portion adjacent an external aspect of the tympanic membrane and is the portion, in use, resting in the external auditory canal. The end (11) is the portion in the same anatomical plane as the pinna and comprises a number of light emitting devices (9) each provided with individual transparent safety caps (12). In section (Figure 3) electrical conducting wires or fibre optics (13) feed power from the light emitting devices (9) to irradiate the tympanic membrane and hence other organelles of the ear.

A front end on view of end 4 (Figure 4) shows an arrangement of LEDs or laser lights (9) that are arranged so that the central LED or fibre optic light (14) is centrally focussed

whereas surrounding LEDs or fibre optics are angled so that their emissions are directed centrally towards (14) so as to concentrate the emission.

The device (16) of the invention for treating the eye is shown in Figure 6. Housing (18) is provided with a notch suitable shaped for accommodating a user's nasal bridge. The device also includes a first projection portion (20) which in use rests on the inferior orbital ridge, and a second projection portion (19) which in use rests on a the superior orbital ridge. The part that rests on the superior orbital ridge (19) is spring loaded which facilitates the loose skin of the upper lid being lifted thus exposing a greater area of sclera to the divergent invisible infrared light. Forming part of the housing are portions (21 and 22) which house the off-centre electromagnetic radiation light emitting means. Figure 7 shows a front view of the device. In the view of Figure 8, an underneath view and opposite to that of Figure 6, there is shown the centrally positioned visible light emitting means (23) which emits visible light in to a user's pupil, it being in the same axis as the pupil. Positioned either side in portions (20 and 21) are a plurality of infrared LEDs (26) which being off-set direct the infrared light towards the sclera. The device is so arranged in order to causing the pupil to constrict (by direct visible light irradiation) and hence improve the safety of irradiating the eye whilst defocusing the invisible infrared electromagnetic radiation to prevent possible optical damage to the macula and other organelles.

When the device is viewed in direction A-A (Figure 9), the series of LEDs (25 and 26) can be seen to be positioned either side of the visible light emitting means and off-set for the reasons above.

As with the earlier above described embodiments of the device, this embodiment of the invention includes control electronics to limit the time of the application of the radiation and to monitor the ambient radiation and provide an alarm when the threshold value of the ambient radiation is exceeded.

EXAMPLE 1

We have evaluated the effect of 1072nm light applied to the tympanic membrane and its effect on in improving hearing. Light sources were 1070nm LED, directed into a large core fibre optic, which was encapsulated in an external auditory canal mould. The fibres were arranged so that they directed the 1072nm light at the tympanic membrane and

thence to the inner ear.

12 volunteers were selected with bilateral, largely symmetrical hearing loss. Audiometry was carried out twice to ensure accuracy of the results. Any patient with a result greater than 10dB difference between the Audiometry was excluded.

The volunteers were then randomised to either receive an active light source in either the right or left ears and a placebo light source in the other ear.

The volunteers were then required to insert the applicator into their ears twice a day for a treatment period of 6 minutes. After 2 months the Audiogram was repeated.

Table 1 below shows the average improvement in hearing in db ("-" sign indicates a deterioration)

Frequency	500Hz	1Khz	2Khz	3Khz	4Khz	6Khz	8Khz
Control ear (dB)	0	2	3	1	0	4	-6
Active Ear (dB)	5	12	9	13	5	6	0

It was noticed that the average improvement in hearing decreased with increasing frequency and this is thought to be related to the anatomy of the cochlea – less penetration of the light at the narrow high frequency end.

These results show that 1072nm light is an effective method of reversing age related hearing loss when applied directly to the tympanic membrane.

EXAMPLE 2

We have evaluated of 1072nm light applied to the retina to improve age related macula degeneration. A method was derived, using the device of the present invention, of constricting the pupil with visible light whilst shining the 1072nm light through the sclera onto the retina thus removing any risk of optical eye injury.

Light sources were 1070nm LED, directed obliquely to the optical axis of the eye. The visible light was switched "on" only when the pulsed 1072nm light was "off", thus the two wavelengths of light would not interfere with each other. The repetition rate was high enough for the eye to perceive the lights as "on" continually.

12 volunteers were selected with bilateral, largely symmetrical age related macula degeneration. Visual acuity was carried out twice. The volunteers were then randomised to either receive an active light source in either the right or left eye and a placebo light source in the other eye.

The volunteers were then required to apply the applicator into their eyes twice a day for a treatment period of 6 minutes. After 2 months the Visual acuity was repeated.

Table 2 below shows the results on average improvement in vision, we have concluded that 1072nm light is an effective method of reversing age related macula degeneration.

	Snellen chart
Control eye	0
Active eye	1.2 lines

WE CLAIM:

1. A portable light emitting device for the treatment of the eye, optic nerve and associated organelles, the device comprising:

(i) a housing comprising a cut-out portion or notch for accommodating a nasal bridge when in position on a user, the housing also comprises a first projecting portion for contacting a user's inferior orbital ridge and second projecting portion for contacting a user's superior orbital ridge when in position on a user,

(ii) at least one visible light emitting means positioned approximately centrally within the housing so that when light is emitted to a user's eye the visible is in the same axis as the user's pupil;

(iii) at least two light emitting means that produces divergent electromagnetic radiation of wavelength from 900nm to 1300nm, and being positioned within the housing either side of the central visible light emitting means, the at least two light emitting means that produce electromagnetic radiation being angled with respect to a user's eye so that they are not in the same axis as the pupil; and

(iv) a power means for providing power to the power source.

2. A device according to claim 1 wherein the second projecting portion which rests or is in contact with a user's superior orbital ridge is resilient or is spring loaded.

3. A device according to either claim 1 or 2 wherein the visible light emitting means is positioned so that it is in the optical axis of the pupil so that, in use, visible light irradiates the cornea.

4. A device according to any one of claims 1 to 3 wherein the electromagnetic radiation light emitting means are orientated within the housing so that they are defocused and are not in the optic axis of the pupil.

5. A device according to any one of claims 1 to 4 wherein the device comprises a plurality of electromagnetic radiation light emitting means in cluster form positioned each side of the central visible light emitting means.

6. A device according to any one of claims 1 to 5 wherein the visible light emitting means emits visible light that is pulsed and in the instance of the electromagnetic radiation light being pulsed, it is pulsed out of phase with it.

7. A device according to any one of claims 1 to 6 further including any one or more of the following features:

(i) an optical monitoring sensor for ensuring the light output is correct;

(ii) (ii) a thermal sensor for ensuring the temperature of the device does not exceed safe limits;

(iii) a frequency modulator for changing the frequency of a pulsed exposure or for switching to continuous exposure;

(iv) a timing means for ensuring that the period of treatment is regulated;

(v) a safety cut-out means optionally in the form of an alarm or cut-off switch which is operable when operational limits are exceeded or when the therapy period has expired.

8. A device according to any one of claims 1 to 7 wherein the power source to the light emitting means is electrical or is a fibre-optic.

9. A device according to any one of claims 1 to 8 wherein the light emitting means is an LED or a laser light source.

10. A device according to claim 9 comprising a plurality of LEDs or laser light sources.

11. A device according to any one of claims 1 to 10 comprising at least one or more PN junctions arranged to emit radiation with a wavelength centring at 1072nm and/or 1267nm.

12. A device according to any one of claims 1 to 11 wherein the light is divergent light and optionally is between 10 to 50°.

13. A device according to claim 12 wherein the divergence of the electromagnetic radiation is in the range 15 to 25° half angled divergent.

14. A device according to any one of claims 1 to 13 wherein the wavelength is a combined wavelength centred around 1072nm and 1267nm.

15. A device according to claim 14 wherein the combined wavelength of 1072nm and 1267nm has an optical intensity of the wavelengths in the same ratio as peaks in the transmission spectrum of a water molecule

16. A device according to any one of claims 1 to 15 wherein the electromagnetic radiation is continuous or pulsed.

17. A device according to any one of claims 1 to 16 wherein when the electromagnetic radiation is continuous and the intensity is at least 500 Watts/cm2 and up to 500 μWatts/cm^2.

18. A device according to any one of claims 1 to 16 wherein the combined electromagnetic radiation is pulsed and the intensity is at least 500 μWatts/cm^2 peak power and the average power is up to 500 μWatts/cm^2.

19. A device according to claim 18 wherein when the electromagnetic radiation is pulsed and the average power of the intensity is in the region of 50-100μ Watts/cm^2.

20. A device according to any one of claims 1-16, 18 or 19 wherein the repetition rate in the range 100-1000 Hz or optionally is at, or about, 600 Hz.

21. A device according to any one of claims 1 to 20 wherein the electromagnetic radiation therapy source includes means for reducing the amount of ambient radiation, which impinges on the treatment site.

22. Use of the device according to any one of claims 1 to 21 for the treatment of an ocular condition selected from the group comprising ARMD, poor visual acuty and optic nerve disorders.

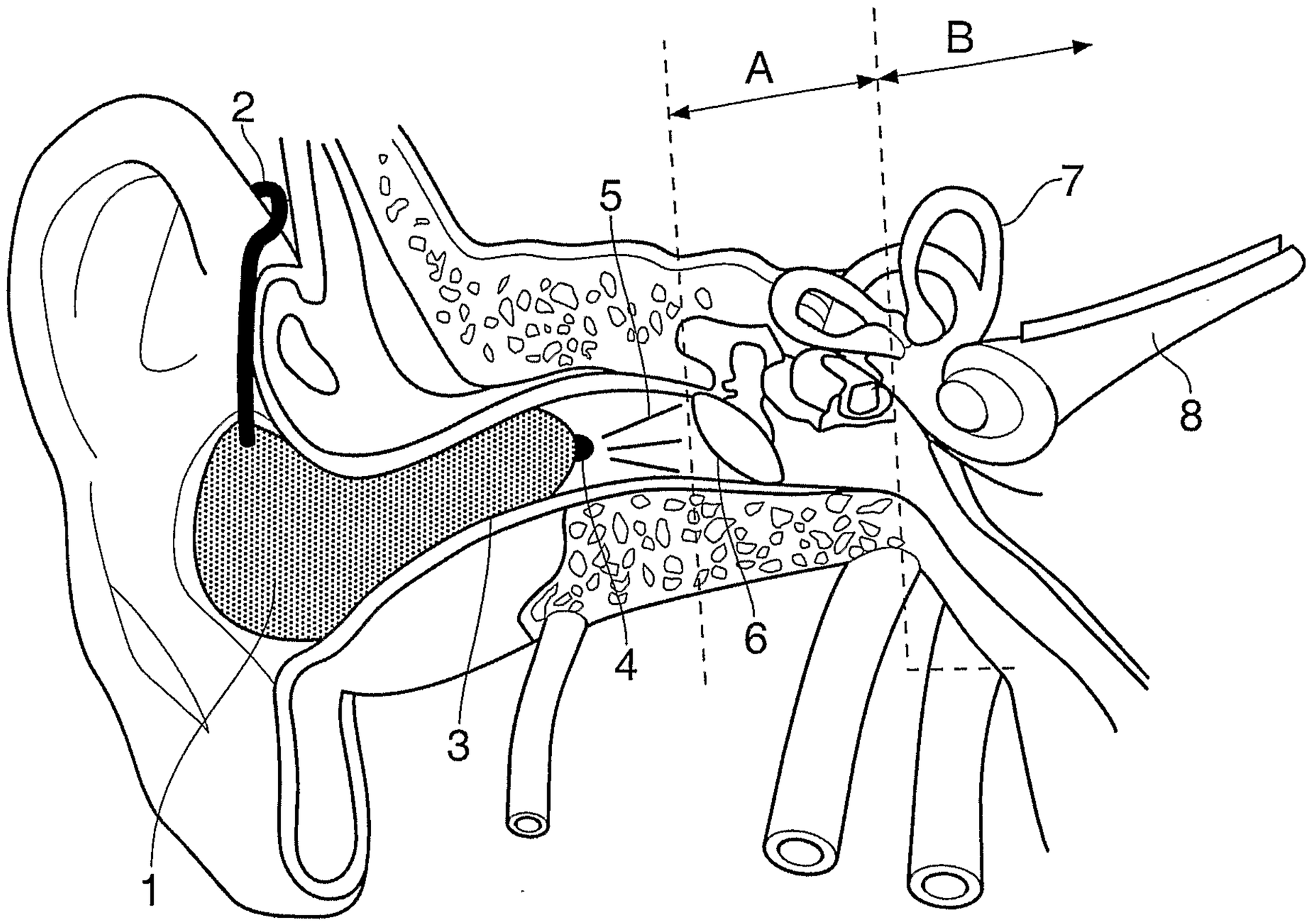


Fig. 1

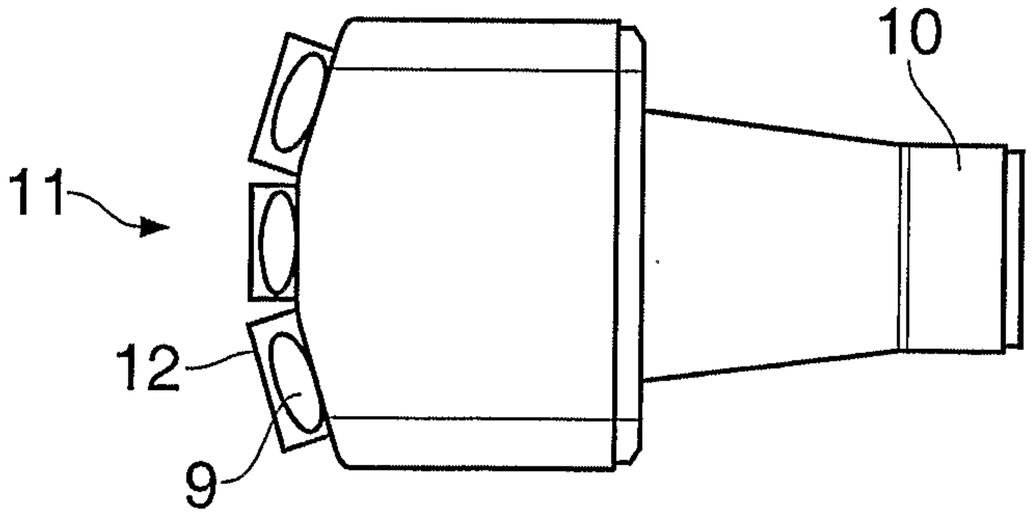


Fig. 2

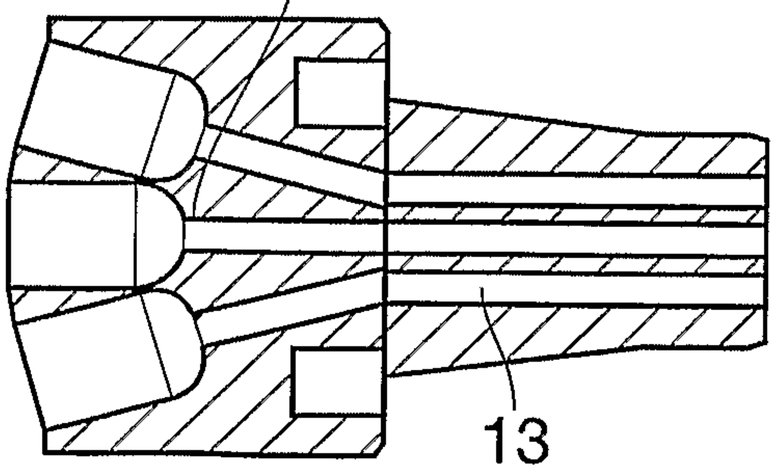


Fig. 3

SUBSTITUTE SHEET (RULE 26)

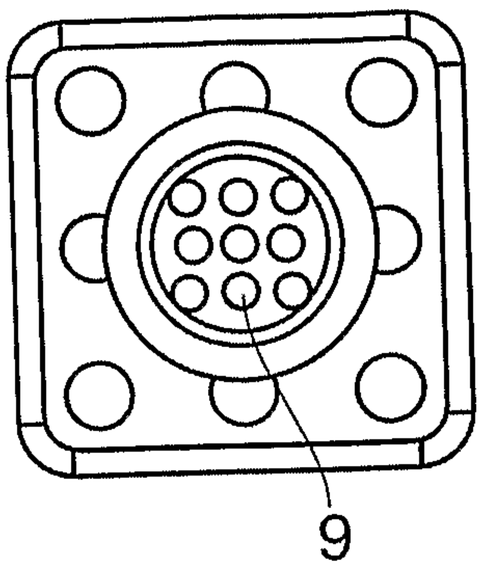


Fig. 4

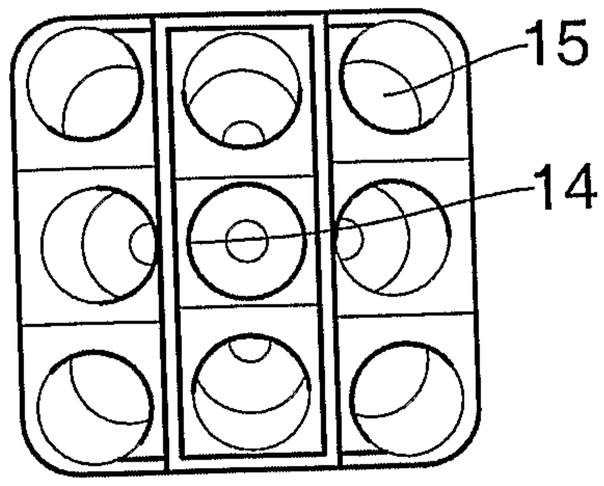


Fig. 5

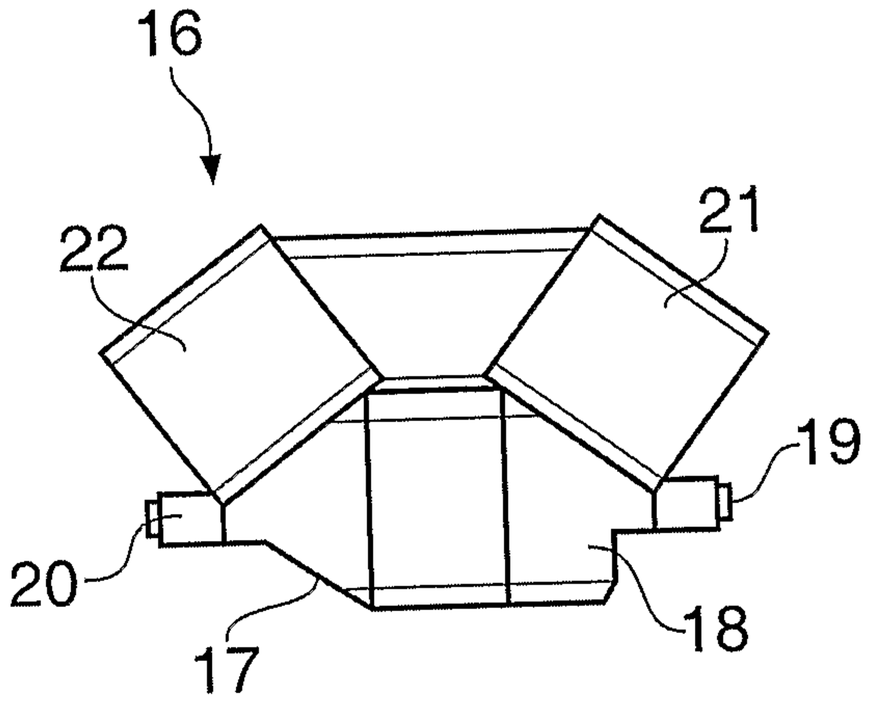


Fig. 6

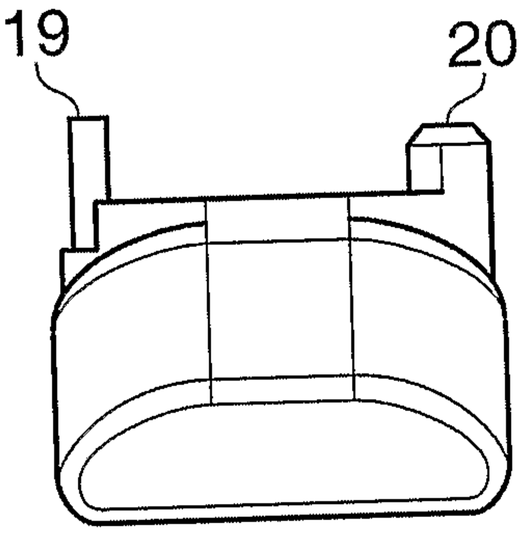


Fig. 7

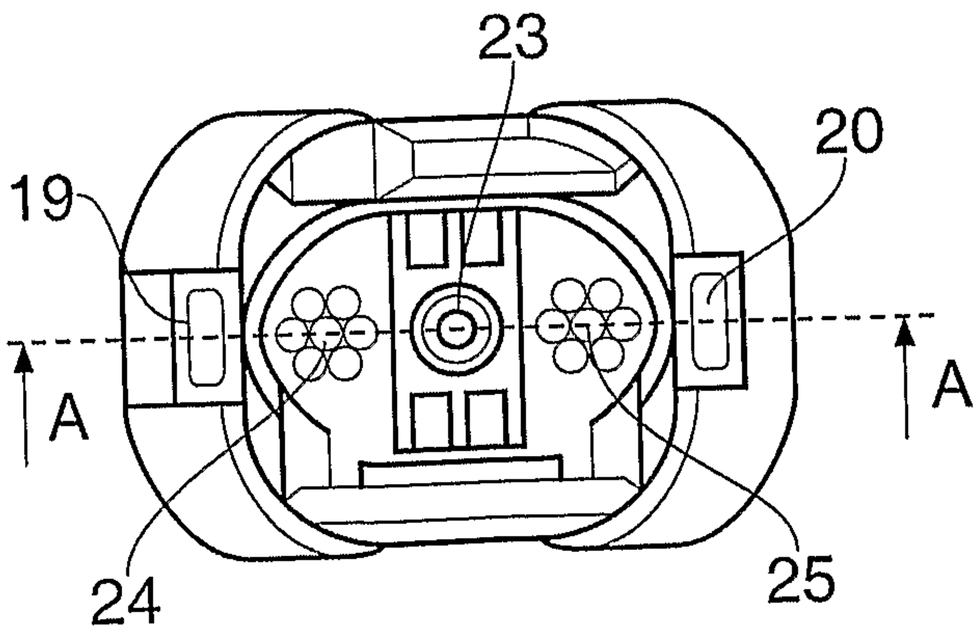
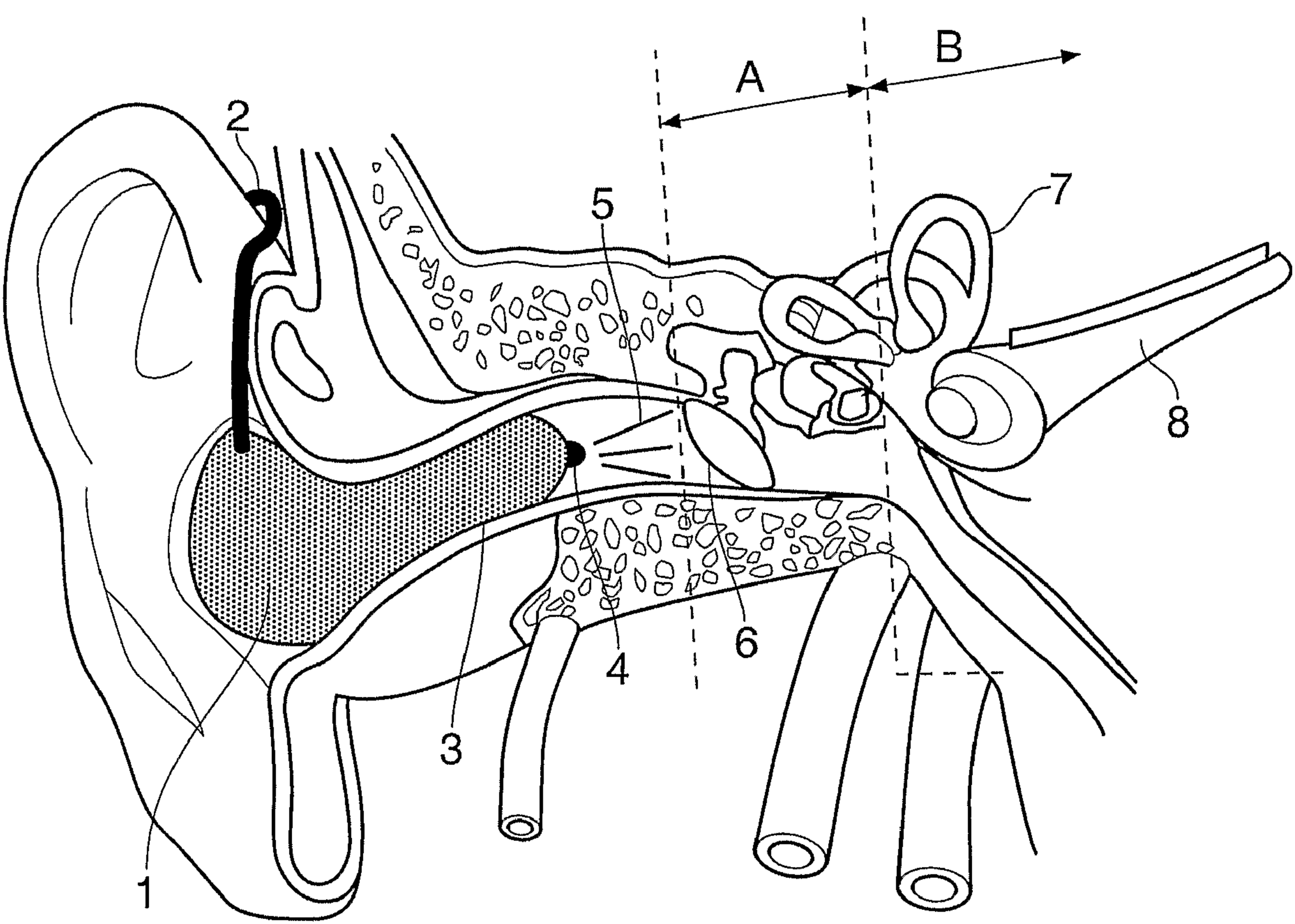


Fig. 9

Fig. 8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