

Eye Massaging Device

Field Of The Invention

[0001] The invention relates to an eye massaging device.

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Background Of The Invention

[0002] One way to provide relief to eye fatigue is through massaging the eyes.

[0003] Existing eye massaging devices focus mainly on relieving the physical aspect of eye fatigue through delivering a massage to the eyes. Such a massage is brought about by devices such as airbags inflating and deflating or a vibrating motor.

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[0004] It is one objective of the eye massaging device of the present invention to further improve the relaxation effects of eye massaging devices.

Summary Of The Invention

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[0005] According to one aspect of the invention, there is provided an eye massaging device including: a visor; a light source connected to the visor and configured to illuminate the visor; an audio module connected to the visor, the audio module adapted to produce a sound; a first massager connected to the visor, the first massager for massaging an eye; and a control module electrically coupled to the light source, the audio module and the first massager, wherein the control module is adapted to control the light source, the audio module and the first massager.

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[0006] In the context of various embodiments, the term "visor" means a device that, when worn, covers at least a user's eyes. In the context of various embodiments, the term "light source" means any device that is suitable for emitting light. In various embodiments, the light that is emitted is of different colours. The emitted light has a wavelength range selected from one or more ranges within a visible spectrum, so that the emitted light may have a wavelength range selected from one or more of red colour band, a green colour band or a blue colour band. The different colours of any one or more of red; green; or blue; have respective wavelength ranges are around 620nm to around 750nm; around 495nm to around 570 nm; and around 450nm to around 495 nm.

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[0007] In the context of various embodiments, the term “audio module” may mean a device that is adapted to process audio data and produce sound. An example of an audio module would include a system that has speakers. In the context of various embodiments, the term “massager” may mean a device that applies a varying degree of pressure on a user, when activated.

[0008] In the context of various embodiments, the term “control module” may mean a unit that is capable of controlling the light source, the audio module, the first massager and other components that the eye massaging device may have. The control module may execute instructions to perform a logic sequence, wherein the instructions may be embedded or programmable by a user. The logic sequence may refer to the implementation of flowcharts of instructions, the flowcharts looping at one or more portions, with the control module activating one or more components of the eye massaging device, such as the light source, the audio module and the first massager in accordance to one or more modes of operation. The modes of operation may be pre-programmed or programmed by a user and then stored into memory.

[0009] The control module may be further adapted to operate the at least one of the light source, the audio module and the first massager in accordance to a sequence stored in the control module.

[0010] The light source may be further adapted to emit light having a wavelength which falls into one or more different wavelength ranges and the control module may be adapted to select the one or more different wavelength ranges.

[0011] The control module may be further adapted to change the wavelength range of the emitted light during execution of the sequence stored in the control module. The control module may also be further adapted to select the wavelength range of the emitted light in dependence on a type of sound produced by the audio module. In addition, the control module may be further adapted to be connected to peripheral memory devices adapted to store music.

[0012] A memory module may be electrically coupled to the control module, the memory module adapted to store the sounds accessed by the audio module.

[0013] The different wavelength ranges may include the ranges of around 450nm to around 495 nm; around 495nm to around 570 nm; and around 620 nm to around 750 nm.

5 [0014] A light conducting arrangement may be configured to receive light from the light source, wherein the light conducting arrangement may be connected to the visor and further configured to transmit light to illuminate the visor.

[0015] The light conducting arrangement may include a light conducting element extending along a portion of a longitudinal axis of the visor to extend over a distance between a user's temples.

10 [0016] The light source may include at least one light emitting element, the at least one light emitting element positioned adjacent to one end of the light conducting element.

[0017] The light source may include two light emitting elements, wherein one of the two light emitting elements may be positioned adjacent to one end of the light conducting element and the other of the two light emitting elements may be positioned adjacent to another end of the light conducting element.

15 [0018] The light conducting arrangement may include two light conducting elements, one of the two light conducting elements is connected to a first portion of the visor, the other of the two light conducting elements is connected to a second portion of the visor, wherein the first portion of the visor is a portion of the visor from around a centrally located vertical axis of the visor to the left of the axis, and wherein the second portion of the visor is a portion of the visor from around a centrally located vertical axis of the visor to the right of the axis.

20 [0019] The light source may include at least one light emitting element, the at least one light emitting element may be adjacent to a respective end of each of the two light conducting elements in a way that light from the at least one light emitting element is coupled into both of the two light conducting elements.

25 [0020] The light source may include two light emitting elements, one of the two light emitting elements may be adjacent to a respective end of one of the two light conducting elements and the other of the two light emitting elements may be adjacent to a respective end of the other of the two light conducting elements.

- [0021] The light conducting arrangement may include at least one light conducting pipe.
- [0022] The visor may include a shell to which the light source is connected; and a diffuser connected to the shell. The shell may be made of translucent material, wherein the light source may be configured to illuminate a surface of the shell to which the light source is connected and a surface opposite to where the light source is connected. The light conducting arrangement may be connected to the shell.
- [0023] The first massager may include an airbag.
- [0024] The airbag may be disposed against the diffuser.
- [0025] The airbag may be adapted to provide a massage to an eye area extending from an orbit of an eye to an adjacent temple of the eye.
- [0026] A second massager may be connected to the visor, wherein the control module may be electrically coupled to the second massager and adapted to operate the second massager in accordance to a sequence stored in the control module.
- [0027] The second massager may include a vibration element connected between the diffuser and the airbag. The vibration element may be a flat coin motor.
- [0028] The light source may include at least one light emitting diode. The light source may be connected to an internal surface of the visor, wherein the first massager is received inside the visor to face the light source.
- [0029] The light source may be connected to an internal surface of the visor, wherein the eye massaging device may further include a diffuser received inside the visor. The diffuser may face the light source, and the first massager may be received inside the visor to face the diffuser.
- [0030] The visor may include a first frame part; a second frame part; and a pivot connecting the first frame part and the second frame part, the light conducting arrangement being connected to both the first frame part and the second frame part.
- [0031] The light conducting arrangement may include a lens disposed at each of the first frame part and the second frame part. A housing may be disposed along a portion of the perimeter of the lens, the housing accommodating the light source.
- [0032] The light source may include at least one light emitting diode.

[0033] A first cover may secure the light conducting arrangement to the first frame part; and a second cover may secure the light conducting arrangement to the second frame part.

[0034] The first massager may include an airbag.

5 [0035] A second massager may be connected to the visor, wherein the control module may be electrically coupled to the second massager and adapted to operate the second massager in accordance to a sequence stored in the control module. The second massager may include a vibration motor housed within the pivot.

[0036] The first massager may be located within a pair of padding layers.

10 [0037] A fastening band may have one end secured to the first frame part of the visor and the other end secured to the second frame part of the visor.

[0038] A layer may span across an external surface of both the first frame part and the second frame part. The layer allows light transmission. The layer may be fabricated from any one or more of the following materials: fabric, textile or rubber.

15 The layer may be perforated.

Brief Description Of The Drawings

[0039] In the drawings, like reference characters generally refer to the same parts throughout the different views. The drawings are not necessarily to scale, emphasis instead generally being placed upon illustrating the principles of the invention. In the following description, various embodiments of the invention are described with reference to the following drawings, in which:

[0040] Figure 1A is a schematic representation of an eye massaging device according to one embodiment of the present invention.

25 [0041] Figure 1B is an exploded view of a portion of an eye massaging device according to one embodiment of the present invention.

[0042] Figure 2 is a perspective view of a shell of a visor with a light conducting arrangement according to one embodiment of the present invention.

30 [0043] Figure 3A is a perspective view of a shell of a visor with a light conducting arrangement according to one embodiment of the present invention.

[0044] Figure 3B is a perspective view of a shell of a visor with a light conducting arrangement according to one embodiment of the present invention.

[0045] Figure 4 is a perspective view of an airbag according to one embodiment of the present invention.

5 [0046] Figure 5 shows a block level representation of an eye massaging device according to one embodiment of the present invention.

[0047] Figures 6A and 6B are front and side views respectively of an eye massaging device according to one embodiment of the present invention.

10 [0048] Figures 6C and 6D are different perspective views of an eye massaging device according to one embodiment of the present invention.

[0049] Figure 7 is an exploded view of an eye massaging device according to one embodiment of the present invention.

[0050] Figures 8A and 8B show perspective views of the eye massaging device according to one embodiment of the present invention.

15 [0051] Figure 8C and 8D respectively show a perspective view and a top view of the eye massaging device according to one embodiment of the present invention, when not folded.

20 [0052] Figures 8E and 8F respectively show a perspective view and a top view of the eye massaging device according to one embodiment of the present invention, when folded.

[0053] Figure 8G shows a partial exploded view of the eye massaging device according to one embodiment of the present invention.

Detailed Description

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[0054] While embodiments of the invention will be shown and described with reference to specific embodiments, it should be understood by those skilled in the art that various changes in form and detail may be made therein without departing from the spirit and scope of the invention as defined by the appended claims. The scope of the invention is thus indicated by the appended claims and all changes which

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come within the meaning and range of equivalency of the claims are therefore intended to be embraced.

[0055] It will be appreciated that common numerals, used in the relevant drawings, refer to components that serve a similar or the same purpose.

5 [0056] Figure 1A is a schematic representation of an eye massaging device 100 according to one embodiment of the present invention.

[0057] The eye massaging device 100 includes a visor 102. A light source 104 is connected to the visor to illuminate the visor 102. The eye massaging device 100 includes an audio module 106, the audio module 106 being adapted to produce a
10 sound. The audio module 106 may be connected to the visor 102.

[0058] A first massager 108 is connected to the visor 102. The first massager 108 is adapted to provide a massage to an eye area or two eyes and an area around each of the two eyes.

[0059] A control module 110 is electrically coupled to the light source 104, the
15 audio module 106 and the first massager 108. The control module 110 is adapted to operate, when activated, at least one of the light source 104, the audio module 106 and the first massager 108. Means such as electrical wiring 152 may be used to connect the control module 110 to each of the light source 104, the audio module 106 and the first massager 108.

20 [0060] In having the control module 110 adapted to operate one of the light source 104, the audio module 106 and the first massager 108, the first massager 108 can operate in tandem with the light source 104 and the audio module 106. The combination of visual and audio stimuli from the light source 104 and the audio module 106 respectively, along with the physical massage from the first massager
25 108, enhances the overall therapeutic effect experienced by a user of the eye massaging device 100.

[0061] The control module 110 is adapted to operate the at least one of the light source 104, the audio module 106 and the first massager 108 in accordance to a sequence stored in the control module 110.

30 [0062] The light source 104 is adapted to emit light from one or more different wavelength ranges within a visible spectrum, so that the emitted light may have a

wavelength range selected from one or more of red colour band, a green colour band or a blue colour band. The different colours of any one or more of red; green; or blue; have respective wavelength ranges are around 620nm to around 750nm; around 495nm to around 570 nm; and around 450nm to around 495 nm. The light source 104 may have a plurality of light emitting elements. Each light emitting element may be a light emitting diode of any of the red, green or blue variety. Alternatively, each light emitting element may be a lamp or a bulb, provided with coloured filters (such as a red filter, a green filter or a blue filter) so that the light source 104 produces light of different colours. Thus, each light emitting element may emit light of a colour different than another light emitting element. The control module 110 is adapted to select the one or more different wavelength ranges at which the light source 104 emits light. For instance, an appropriate signal may be sent by the control module 110 to the light source 104 so that the light source 104 emits light of a selected wavelength range. The emitted light from the light source 104 may therefore be the result of a combination of a portion of the light emitting elements emitting light of a first colour (such as red) and another portion of the light emitting elements emitting light of a second colour (such as blue), resulting in emitted light having a wavelength spectrum made up of two discontinuous wavelength ranges (the emitted light being, in this example, purple in colour). Each light emitting element of the plurality of light emitting elements may also emit light having a same colour as another of the plurality of light emitting elements. Each light emitting element may also emit light of a frequency range different than another of the plurality of light emitting elements, the two different frequency ranges being close enough to be perceived as different shades of a same colour.

[0063] The control module 110 is adapted to change the wavelength range of the emitted light during execution of the sequence stored in the control module 110. For instance, at the beginning of the sequence stored in the control module 110, the light source 104 may emit light from a first wavelength range. As the sequence progresses, the control module 110 will send a signal to the light source 104 to emit light from a second wavelength range, wherein the second wavelength range is different from the first wavelength range.

[0064] The control module 110 is adapted to select the wavelength range of the emitted light in dependence on the type of sound produced by the audio module 106. Sound arrangements emitted by the audio module 106 are preferable music compositions having a melodic, harmonic, and rhythmic structure. However, sound arrangements are not limited to just music compositions, but could also be a mix of layers of different types of sounds, such as the music compositions, sounds of nature and primordial sounds like womb sounds, human body sounds and sounds from outer space. For instance, the light source 104 may emit light from a first wavelength range when the audio module 106 is emitting a first type of sound. The control module 110 will send a signal to the light source 104 to emit light from a second wavelength range when the audio module 106 emits a second type of sound. The first type of sound may be a music category such as classical music, while the second type of sound may be a different music category such as sounds of nature. Thus, the first type of sound may be different from the second type of sound. The first wavelength range may be different from the second wavelength range.

[0065] In addition to selecting the wavelength range of the emitted light in dependence on the type of sound produced by the audio module 106, the control module 110 may also select the wavelength range of the emitted light in dependence on the intensity of pressure applied by the first massager 108. For instance, the light source 104 may emit blue light when the first massager 108 applies a low pressure while the light source 104 may emit orange light when the first massager 108 applies a high pressure. Thus, the control module 110 may be adapted to synchronise operation of the light source 104, the audio module 106 and the first massager 108.

[0066] Through cyclically pulsing light of different intensity and/or color from the light source 104, the pulsed light being accompanied with a suitable sound arrangement from the audio module 106 and a massage from the first massager 108, a therapeutic effect is provided. Through using the eye massaging device 100 desirable and beneficial behavioral and psychological benefits are induced in users in a non-invasive manner and without the use of ingested chemicals.

[0067] It has been found that many fundamental biological phenomena are related to frequencies in the range of 0.01Hz and 100Hz, where photic brainwave

entrainment studies show that when one is exposed to light pulsations within the frequency range of typical brainwaves (approximately 2Hz to 30Hz), the brain has a tendency to eventually fall in synchronism with the light pulsations. Since different brainwave frequencies are associated to different mind states, it follows that light pulsations can have an influence on mood and state of mind. Further, psychophysiological research shows that various colors are associated with arousing, relaxing, awareness sharpening, or pacifying behavioral effects. It is well established that cool colors (in the green-blue spectrum) have a tendency to stimulate the parasympathetic portion of the autonomous nervous system (ANS), leading to reduced pulse rate and relaxation. Conversely, warm colors (in the red-orange-yellow spectrum) have a tendency to stimulate the sympathetic portion of the ANS, leading to increased pulse rate and arousal. Intermediate colors (lime and magenta) have a tendency to bring balance and equilibrium between both portions of the ANS. Through facilitating the induction of a state of deep relaxation, they can also prove particularly effective in reducing stress levels. With the eye massaging device 100 combining the cyclical pulsing light of different intensity and/or color with a suitable sound arrangement and massage, an enhanced therapeutic experience is provided.

[0068] The control module 110 may execute instructions to perform a logic sequence, in which one or more components (such as the light source 104, the first massager 108 and the audio module 106) of the eye massaging device 100 is activated, in accordance to one or more modes of operation. The modes of operation may be pre-programmed or programmed by a user and then stored into a memory.

[0069] For each of the operation modes, there may be a plurality of patterns of coloured light emitted by the light source 104. The patterns may be generated in a random manner, so that an emitted light pattern for a first instance of operation of the light source 104 would unlikely be the same as an emitted light pattern for a second instance of operation of the light source 104, the first instance being of a same or different duration as the second instance. Thus, patterns of light emitted by the light source 104 may be non-monotonous. The speed at which the colour of emitted light changes (i.e. the speed at which each colour, in a light emission pattern, changes; or the duration to which each colour, in a light emission pattern, is displayed) may be

dependent on the attributes of a respective one of the plurality of sound arrangements emitted by the audio module 106, meaning that the pattern of colour of emitted light is determined or conditioned by attributes associated with each sound arrangement. Examples of attributes include, but are not limited to, a tempo range, timbre and tone of each sound arrangement. Tempo range may mean the speed or pace of the sound arrangement, usually indicated in beats per minute (bpm). Timbre refers to tone quality or tone color of each of the sound arrangements. Tone refers to the pitch of the respective one of the plurality of sound arrangements. The dependency may be such that, within each sequence, a different pattern of emitted light is associated to each particular set of attributes. For instance, during execution of a sequence, a first pattern of coloured light may be emitted by the light source 104 for a first segment of a sound arrangement, while a second pattern of coloured light (emitted at a speed that is different than the first pattern of coloured light) may display for a second segment of the sound arrangement. The first segment may have a first tempo, while the second segment may have a second tempo. The second tempo may be the same as the first tempo, but the speed at which the second pattern of coloured light is emitted may be different from the speed at which the first pattern of coloured light is emitted due to, for instance, the timbre of the second segment of the sound arrangement being different from the timbre of the first segment of the sound arrangement.

[0070] In various embodiments, the speed at which the light source 104 changes the colour of emitted light may have a direct relationship with the tempo range of the respective one of the plurality of sound arrangements emitted by the audio module 106, meaning that the speed at which the light source 104 changes the colour of emitted light varies in the same manner as the tempo range of a sound arrangement. The slower the tempo range of a respective one of the plurality of sound arrangements, the slower the colour of emitted light is changed. Similarly, the faster the tempo range of the respective one of the plurality of sound arrangements, the faster the colour of emitted light is changed.

[0071] The tempo range of the plurality of sound arrangements includes a first tempo range associated to activate any one of a group of alpha, beta and gamma

brainwaves; a second tempo range associated to activate any one of a group of theta, delta and epsilon brainwaves; or a third tempo range associated to activate any one of delta and epsilon brainwaves. Each of the plurality of sound arrangements may have a specific tempo, rather than a tempo range. Alpha, beta, gamma, theta, delta and epsilon brainwaves are electromagnetic oscillations in the following frequency ranges: alpha: 7-13 Hz; beta: 13 – 30 Hz; gamma: 40 – 80 Hz; theta: 3.5 – 7 Hz, delta: 0.5 - 3.5 Hz and epsilon: below 0.5 Hz. It has been found, from electroencephalography (EEG) studies, that in various states of consciousness, brainwave entrainment pulses will exhibit relevant components of alpha, beta, gamma, theta, delta and epsilon brainwaves. It has also been found that alpha, beta, gamma, theta, delta and epsilon brainwaves are responsive to sound arrangement and coloured light that a subject is exposed to. Thus by carefully blending appropriate sounds into a sound arrangement and by emitting a carefully selected pattern of coloured light, various state of consciousness in a user are created.

[0072] As such, each sound arrangement may be made up of a collection of continuous segments, each having a tempo that may be the same or different from another segment. For each segment, a same colour or different light colours will be emitted. When different light colours are emitted, a range of time intervals between two succeeding or successive light colour changes may be identical or may vary, thereby leading to the speed of light colour change that is constant or varying respectively. Exemplary values for time intervals are a first range of around 0.05s to around 5s; a second range of around 0.5s to around 10s; and a third range of around 3s to around 60s. As an example, in one embodiment, where a plurality of light emitting elements is used for the light source 104, a segment of a sound arrangement emitted by the audio module 106 may be accompanied by a first number of the light emitting elements emitting light where the range of time interval between two successive light colour changes is around 15s; while a second number of the light emitting elements emits light where the range of time intervals between two successive light colour changes is around 2s. It will be appreciated that the range of time intervals between two successive light colour changes for the first number of the light emitting elements falls within the exemplary third range of time intervals of

around 3s to around 60s, while the time interval between two successive light colour changes for the second number of the light emitting elements falls within either the exemplary first range of time intervals of around 0.05s to around 5s or the exemplary second range of time intervals of around 0.5s to around 10s.

5 [0073] The control module 110 may be adapted to be connected to peripheral memory devices adapted to store music. The eye massaging device 100 may further include a memory module 150 electrically coupled to the control module 110, the memory module 150 adapted to store the sounds accessed by the audio module 106. The memory module 150 may be adapted to further store sequences for the colour of
10 light emitted by the light source 104, the intensity of pressure applied by the first massager 108 and the sounds produced by the audio module 106.

[0074] Figure 1B is an exploded view of a portion of the eye massaging device 100 schematically represented in Figure 1A. Comparing Figure 1B with Figure 1A, it will be appreciated that (for the sake of simplicity) the audio module 106, the
15 control module 110 and the memory module 150 are not shown in Figure 1B.

[0075] From Figure 1B, it can be seen that the light source 104 is connected to an internal surface 118i of the visor 102. A diffuser 114 is also received within the visor 102, wherein the diffuser 114 is disposed between the light source 104 and the first massager 108. The diffuser 114 faces the light source 104, while the first
20 massager 108 is received inside the visor 102 to face the diffuser 114. By having the first massager 108 and the diffuser 114 received inside the visor 102, a compact device is achieved.

[0076] In an alternative arrangement (not shown), where the eye massaging device 100 does not have a diffuser 114, the light source 104 is connected to an
25 internal surface 118i of the visor 102. The first massager 108 is received inside the visor 102 to face the light source 104.

[0077] The light source 104 may be adapted to emit the colours red, green and blue. Thus, the different wavelength ranges, at which the light source 104 may operate, are the ranges of around 450nm to around 495 nm; around 495nm to around
30 570 nm; and around 620 nm to around 750 nm. At least one light emitting diode

(LEDs) is preferably used for the light source 104, where Figure 1B shows the case where two LEDs are used.

[0078] The LEDs may have one or more light emitting elements, where each element is designed to emit light in one of the ranges of around 450nm to around 495 nm; around 495nm to around 570 nm; and around 620 nm to around 750 nm. Thus, when two or more of these light emitting elements are in operation, each LED will emit coloured light resulting from a combination of the emitted colours from the operating light emitting elements. In this manner, the light source 104 may emit light spanning the entire visible light range.

[0079] The eye massaging device 100 includes a light conducting arrangement 112 to receive light from the light source 104. The light conducting arrangement 112 is connected to the visor 102 to transmit light to illuminate the visor 102. From Figure 1B, it can be seen that the light conducting arrangement 112 is connected to the internal surface 118i of the visor 102. The light conducting arrangement 112 faces the first massager 108.

[0080] The light conducting arrangement 112 provides a means for more uniform illumination of the visor 102. Thus, the light conducting arrangement 112 is an optional feature because illumination of the visor 102 is still possible by suitably positioning the light source 104 to directly illuminate the visor 102. However, direct illumination results in a bright spot at the position of the visor 102 in the direct path of the emitted light. The intensity of the illumination decreases away from the spot. Thus, without the light conducting arrangement 112, the visor 102 would not be uniformly illuminated.

[0081] In Figure 1B, the light conducting arrangement 112 is implemented as two light conducting elements 112a and 112b.

[0082] The two light conducting elements 112a and 112b are positioned around the centre 118c of the centrally located vertical axis 140 of the visor 102. One (112a) of the two light conducting elements (112a and 112b) is connected to a first portion 102a of the visor 102. The other (112b) of the two light conducting elements (112a and 112b) is connected to a second portion 102b of the visor 102. The first portion 102a of the visor 102 is a portion of the visor from around a centrally located

vertical axis 140 of the visor 102 to the left of the axis 140. The second portion 102b of the visor 102 is a portion of the visor 102 from around the centrally located vertical axis 140 of the visor to the right of the axis 140. The centrally located vertical axis 140 is located midway along the distance of a curvature 102c of the visor 102, so that the area of the first portion 102a of the visor 102 is about the same as the area of the second portion 102b of the visor 102.

[0083] The light source 104 includes two light emitting elements 104a and 104b. A first (104a) of the two light emitting elements (104a and 104b) is adjacent to a respective end 112ae of a first (112a) of the two light conducting elements (112a and 112b). A second (104b) of the two light emitting elements (104a and 104b) is adjacent to a respective end 112be of a second (112b) of the two light conducting elements (112a and 112b). Each of the two light emitting elements (104a and 104b) is respectively mounted onto a PCB (printed circuit board) 120. The PCB 120 provides the electronic circuitry to operate the mounted light emitting element (104a or 104b). Thus, the two light conducting elements 112a and 112b, and the light emitting elements 104a form an illuminating unit that is arranged symmetrical to the centrally located vertical axis 140.

[0084] Each of the two light conducting elements 112a and 112b has an arc shape. With reference to the first light conducting element 112a, the arc shape starts from the end 112ae adjacent to the respective light emitting element 104a. From the end 112ae, the first light conducting element 112a extends to be generally parallel to the centrally located vertical axis 140 and subsequently ends as a curve 112ac extending away from the centrally located vertical axis 140. Similarly, for the second light conducting element 112b, the arc shape starts from the end 112be adjacent to the respective light emitting element 104b. From the end 112be, the second light conducting element 112b extends to be generally parallel to the centrally located vertical axis 140 and subsequently ends as a curve 112bc extending away from the centrally located vertical axis 140.

[0085] The arrangement of the two light emitting elements (104a and 104b) and the two light conducting elements (112a and 112b) provides several advantages. For instance, the visor 102 will be evenly illuminated, as each half (the first portion 102a

or the second portion 102b) of the visor 102 has its own arrangement of a single light emitting element and a single light conducting element.

5 [0086] The visor 102 includes a shell 118 and a diffuser 114. The light source 104 is connected to the shell 118. The diffuser 114 is connected to the shell 118. The diffuser 114, in conjunction with the light conducting arrangement 112, provides for a uniform illumination of the visor 102.

10 [0087] The shell 118 may be made of translucent material, so that both a surface 118i of the shell 118 to which the light source 104 is connected and a surface 118e of the shell 118 opposite to where the light source 104 is connected are illuminated by the light source 104. The surface 118e is a portion of an exterior of the eye massaging device 100, the exterior being visible. In this manner, a portion of the exterior of the eye massaging device 100 is also illuminated during operation of the light source 104. Allowing illumination of the exterior of the eye massaging device 100 has the advantage of indicating that the eye massaging device 100 is in use. 15 Further, illuminating the exterior of the eye massaging device 100 increases the aesthetic appeal of the eye massaging device 100.

[0088] The light conducting arrangement 112 is connected to the shell 118. The first massager 108 may be an airbag 130. The airbag 130 is disposed against the diffuser 114. An air pump (schematically shown as reference numeral 510 in Figure 20 5) is used to supply air, through a tubing 128, to inflate the airbag 130 through a nozzle 126. The tubing 128 is placed between the shell 118 and the diffuser 114. The tubing 128 connects to the airbag nozzle 126, which protrudes from a hole 160 in the diffuser 114.

25 [0089] The eye massaging device 100 includes a second massager 116. The second massager 116 is connected to the visor 102. The control module 110 is electrically coupled to the second massager 116 and adapted to operate the second massager 116 in accordance to a sequence stored in the control module 110.

30 [0090] The second massager 116 may be a vibration element connected between the diffuser 114 and the airbag 130. Using a flat coin motor 158 as the vibration element allows for the second massager 116 to be compact.

[0091] To make the eye massaging device 100 even more compact, an opening 162 may be provided on the diffuser 114, wherein the second massager 116 either partially or completely sits within the opening 162. This allows the second massager 116 to be connected between the diffuser 114 and the airbag 130, whereby the second massager 116 is positioned on the side of the diffuser 114 that is facing the airbag 130. Positioning the second massager 116 on the side of the diffuser 114 that is facing the airbag 130 also brings the second massager 116 closer towards one or both of a user's eyes and an area around one or both of the user's eyes. The closer placement enhances the massage experienced by the user.

[0092] Figures 2 and 3A to 3B show particular implementations of the light conducting arrangement 112.

[0093] Figure 2 is a perspective view 200 of a portion of a visor. The portion of the visor 218 that is shown has the shape of a shell 248, wherein the shell 248 is part of an eye massaging device according to one embodiment of the present invention.

[0094] In the embodiment shown in Figure 2, the light conducting arrangement 112 has a light conducting element 212 extending along a portion of a longitudinal axis 202 of the visor 218 to cover a distance between a user's temples. In the embodiment shown in Figure 2, it will be appreciated that the longitudinal axis 202 runs parallel to a curvature 206c of the visor 218 and the light conducting element 212 lies along the curvature 206c interior of the visor 218.

[0095] The light conducting element 212 extends over a distance starting from around a user's left eye 230 and ending around a user's right eye 232.

[0096] In the embodiment shown in Figure 2, the light source 104 includes at least one light emitting element 204. The at least one light emitting element 204 is positioned adjacent to one end 212e of the light conducting element 212. Further, the at least one light emitting element 204 is mounted onto a PCB board 220, the PCB board 220 providing the electronic circuitry to operate the at least one light emitting element 104.

[0097] Figure 3A shows an alternative arrangement for the light source 104.

[0098] Figure 3A is a perspective view 300 of a portion of a visor 318. The portion of the visor 318 that is shown has the shape of a shell 348, wherein the shell

348 is part of an eye massaging device according to one embodiment of the present invention.

5 [0099] The light source 104 has two light emitting elements 304a and 304b. One (304a) of the two light emitting elements (304a and 304b) is positioned adjacent to one end 312f of the light conducting element 312. The other (304b) of the two light emitting elements (304a and 304b) is positioned adjacent to another end 312s of the light conducting element 312. Each of the two light emitting elements (304a and 304b) is respectively mounted onto a PCB (420a and 420b). Each PCB (420a and 420b) provides the electronic circuitry to operate the mounted light emitting element
10 (304a or 304b).

[00100] Using two light emitting elements more uniformly illuminates the visor 318 compared to Figure 2, where only one light emitting element is used. Compared to the light source 104 arrangement of Figure 2, the light source 104 arrangement of Figure 3A reduces production and maintenance costs.

15 [00101] In addition, the embodiment shown in Figure 2 eliminates undesired colour interference. Undesired colour interference occurs when the visor is illuminated by an undesired colour. Undesired colour interference does not occur in the visor 218 of Figure 2, as there is only one light emitting element 104 that controls the colour to which the visor 218 is illuminated. In Figure 3A, the colour to which
20 the visor 318 is illuminated is controlled by two light emitting elements 304a and 304b. An undesired colour of illumination may result in the visor 318 if the two light emitting elements 304a and 304b are not properly synchronised to emit the desired colour of illumination. On the other hand, colour gradients may be better accomplished using the device of Figure 3A.

25 [00102] The light conducting element 312 of Figure 3A extends along a portion of a longitudinal axis 302 of a visor to cover a distance between a user's temples. The light conducting element 312 also extends over a distance starting from around a user's left eye 330 and ending around to a user's right eye 332.

30 [00103] Using only a single element (as shown in Figures 2 and 3A) for the light conducting arrangement 112 (i.e. the light conducting element 212 and 312) means that the eye massaging device is easy to maintain.

5 [00104] Figure 3B is a perspective view 350 of the case where only one light emitting element 354 (compare two light emitting elements [104a and 104b] used in Figure 1B) is used for the light source 104. The at least one light emitting element 354 is adjacent to a respective end (112ae and 112be) of each of two light conducting elements (112a and 112b) in a way that light from the at least one light emitting element 354 is coupled into both of the two light conducting elements. One advantage of using a single light emitting element, compared to two light emitting elements is that it is cheaper. Also, comparing the light conducting arrangement 112 of Figure 1B with the light conducting arrangement 112 of Figure 3B, the two light conducting elements (112a and 112b) of Figure 3B are placed in closer proximity to each other than the two light conducting elements (112a and 112b) of Figure 1B. The closer proximity of the two light conducting elements (112a and 112b) of Figure 3B allows both of the two light conducting elements (112a and 112b) of Figure 3B to be illuminated by the same light emitting element 354.

10 [00105] In the embodiments shown in Figures 1A to 3B, the light conducting elements (112a and 112b; 212; and 312) of the light conducting arrangement 112 may be realised using one or more light conducting pipes made of material such as transparent plastic.

15 [00106] Figure 4 is a perspective view of the airbag 130 according to one embodiment of the present invention. The airbag 130 is designed to extend an area between a user's temples and to cover both the user's eyes. The airbag 130 has a first portion 404 and a second portion 406. The first portion 404 is adapted to massage the eye orbits, while the second portion 406 is adapted to massage the temples adjacent to the respective eye. Thus, the airbag 130 is adapted to provide a massage to an area from an orbit of an eye to an adjacent temple. The airbag 130 also has openings 402 for an unobstructed view of the diffuser 114 (see Figure 1B) and therefore allowing the user's eyes to see the diffuser 114 being illuminated by light from the light source 104 (see Figure 1B).

20 [00107] Figure 5 shows a block level representation of the eye massaging device 100.

[00108] Figure 5 illustrates that the control module 110 is implemented within a handheld controller 502. The handheld controller 502 includes a twisted nematic (TN) screen 506, for example a LCD screen, a battery compartment 508, a pump motor 510 and valves 512. The pump motor 510 is coupled to the valves 512 via a respective air tube 514. The valves 512 are in turn connected by an air tube connection 530 to both the first portion 404 and the second portion 406 of the airbag 130. It will be appreciated that each of the components 510, 512, 106, 116, 104 and 130 may be independently controlled by the control module 110.

[00109] The control module 110 further includes a micro-controller (MCU) unit 504 and sub-modules 516, 518, 520, 522, 524, 526 and 528.

[00110] The speaker sub-module 516 is electrically coupled to the audio module 106 to allow the MCU 504 to control the operation of the audio module 106. The vibration motor control sub-module 518 is electrically coupled to the second massager 116 to allow the MCU 504 to control the operation of the second massager 116. The LED driver sub-module 520 is electrically coupled to the light source 104 to allow the MCU 504 to control the operation of the light source 104. The TN screen 506 is electrically coupled to a TN screen control sub-module 528. The battery compartment 508 is electrically coupled to a battery control 526, which powers the control module 110. The valves 512 are controlled by a solenoid air valve control 522, while the pump 510 is controlled by a motor control 524.

[00111] Figures 6A and 6B are front and side views respectively of an embodiment of an eye massaging device 600, schematically represented in Figure 1A, while Figures 6C and 6D provide different perspective views.

[00112] Figure 7 is an exploded view of the eye massaging device 600.

[00113] Comparing Figure 7 with Figure 1A, it will be appreciated that (for the sake of simplicity) the control module 110 and the memory module 150 are not shown in Figure 7.

[00114] The visor 102 of the eye massaging device 600 has two frame parts, a first frame part 702a and a second frame part 702b. A pivot 740 connects the first frame part 702a and the second frame part 702b. In the embodiment shown in Figure 7, the pivot 740 is a centre bridge to which the first frame part 702a and the second frame

part 702b are connected via respective hinges 742. The respective hinges 742 allow the first frame part 702a and the second frame part 702b to pivot about the centre bridge so that the massage device 600 is foldable for ease of carrying and also to ensure that the frame parts 702a and 702b conform to the shape of a user's face. In one embodiment, the angle of pivot for each frame part 702a and 702b is around 30°, although any other folding angle that allows the frame parts 702a and 702b to span across the user's ears. The curvature of each of the two frame parts 702a and 702b also further facilitate conformity of the eye massaging device 600 to a user's face.

[00115] A light conducting arrangement 712, receiving light from the light source 104, is connected to the visor 102 to transmit light to illuminate the visor 102. The light conducting arrangement 712 is connected to both the first frame part 702a and the second frame part 702b of the visor 102. In the embodiment shown in Figure 7, the light conducting arrangement 712 is provided as a first lens 712a and a second lens 712b, each lens 712a and 712b disposed at each of the first frame part 702a and the second frame part 702b. Each of the lens (712a and 712b) has a surface with projections (744a and 744b) that are shaped to be accommodated within a correspondingly sized hole (747a and 747b) formed on an interior surface of the frame part (702a and 702b) of the visor 102, to facilitate connection of the lens (712a and 712b) to the respective frame part (702a and 702b). In addition, the holes 747 extend the entire thickness of each of the frame parts (702a and 702b) of the visor 102, so that when the first lens 712a and the second lens 712b are illuminated, the illumination can be externally observed from light exiting out of the projections 744 through the holes 747.

[00116] Each of the lenses (712a and 712b) has a surface area that covers an orbit of the eye and is positioned to be in the field of vision when the eye massaging device 600 is worn by a user. Each lens (712a and 712b) may be made of transparent or translucent material, such as polycarbonate or acrylic plastic. To reflect light, a surface is preferably polished, while to have an even uniform illumination, the surface is preferably diffused. Thus, for the lens (712a and 712b) to be evenly illuminated with light introduced along any point along the perimeter of the lens (712a and 712b), they may have diffused or irregular surfaces. To further

facilitate the even illumination, each lens (712a and 712b) is also curved, as shown in Figure 7.

[00117] A housing (748a and 748b) is disposed along a portion of the perimeter of each lens (712a and 712b) to accommodate the light source 104. The housing (748a and 748b) ensures that the light source 104, provided in this embodiment as at least one light emitting diode (704a and 704b), is secured at an optimum location where the lens (712a and 712b) is most evenly illuminated from light of the respective light emitting diode (704a and 704b), so that the user sees an even illumination when wearing the eye massaging device 600.

[00118] A first cover 760a secures the light conducting arrangement 104 (being the lens 712a) to the first frame part 702a and a second cover 760b secures the light conducting arrangement 104 (being the lens 712b) to the second frame part 702b.

[00119] In the embodiment shown in Figure 7, the first massager 108 is located between a pair of padding layers 764a and 764b. The first massager 108 may be an airbag 708. An air pump (not shown) is used to supply air, through a nozzle 728, to inflate the airbag 708. The airbag 708 has a first portion 708f and two second portions 708s. The first portion 708f is adapted to massage the eye orbits, while the second portion 708s is adapted to massage the temples adjacent to the respective eye. With such an arrangement, the airbag 708 is designed to provide more massage variations to an area extending between a user's temples, including the eyes, according to a sequence stored in the control module 110.

[00120] A pair of hole ring structures (766a and 766b) serves to align the padding layers (764a and 764b), the airbag 708 and the covers (760a and 760b) to the first frame part 702a and the second frame part 702b of the visor 102. The hole ring structures (766a and 766b) have sufficient depth that goes through respective openings (764bh, 708h, 764ah and 760h) of the padding layer 764a, the airbag 708, the padding layer 764b and the covers (760a and 760b). In this manner, the openings (764bh, 708h, 764ah and 760h) are aligned with the lens (712a and 712b) so that the lens (712a and 712b) is in the field of vision when the eye massaging device 600 is worn by a user. One end of the pair of hole ring structures (766a and 766b) is

flanged to extend past the perimeter of the outermost opening, i.e. the opening 764bh of the padding layer 764b.

[00121] A second massager 716 is connected to the visor 102. The control module 110 is electrically coupled to the second massager 716 and adapted to operate the second massager 716 in accordance to a sequence stored in the control module 110. In the embodiment shown in Figure 7, the second massager 716 may be a vibration motor housed within the pivot 740. The pivot 740 may also house a heater.

[00122] A fastening band 768 having one end 768a secured to the first frame part 702a of the visor 102 and the other end 768b secured to the second frame part 702b of the visor 102. In the embodiment shown in Figure 7, the audio module 106 is implemented as a pair of speakers 706a and 706b that is connected to a respective first frame part 702a and the second frame part 702b of the visor 102.

[00123] Figure 8A provides a perspective view of the eye massaging device 600. As shown in Figure 8A, a layer 802 is wrapped around an external surface at the front of the visor 102. The layer 802 may be made of any one or more of the following materials: fabric, textile or rubber. In the embodiment shown in Figure 8A, the layer 802 spans across an external surface of both the first frame part 702a and the second frame part 702b. In addition to improving the aesthetics of the eye massaging device 600, the layer 802 (being in one embodiment fabricated from soft fabric) also protects the eye massaging device 600, especially the visor 102, from impact and scratches. The layer 802 may also be perforated or made of translucent material to allow for light transmission from (see Figure 7) the projections (744a and 744b) of the lens (712a and 712b) to seep through, thereby allowing illumination of the visor 102 to be externally noticeable.

[00124] Figure 8B provides another perspective view of the eye massaging device 600 with the fabric 802 wrapped around an external surface at the front of the visor 102.

[00125] Figures 8C to 8F show perspective views of the eye massaging device 600. For the sake of simplicity (compare Figure 7), the padding layers 764a and 764b, the airbag 708 and the fastening band 768 are omitted in Figures 8C to 8F.

[00126] Figures 8C and 8D respectively show a perspective view and a top view of the eye massaging device 600 when not folded.

[00127] Figures 8E and 8F respectively show a perspective view and a top view of the eye massaging device 600. Compared to the eye massaging device 600 shown in Figures 8C and 8D, Figures 8E and 8F show the eye massaging device 600 when folded. As mentioned above, the folding of the eye massaging device 600 is facilitated by the pivot 740.

[00128] Figure 8G shows a partial exploded view of the eye massaging device 600, when compared to the exploded view shown in Figure 7. Comparing Figure 8G with Figures 8C to 8F, it will be appreciated that the padding layers 764a and 764b, the airbag 708 and the fastening band 768 are made of flexible material so that they allow for the eye massaging device 600 to be folded, as shown in Figures 8E and 8F.

[00129] The following paragraphs provide further detail on the structural arrangement and materials used for the massaging device as shown from Figures 1A to 8G.

[00130] Referring to Figures 1A to 8G, the light source 104 includes at least one light emitting diode (LED). Thus, the light emitting elements (104a and 104b; 304a and 304b; 704a and 704b) may be implemented using LEDs.

[00131] Turning to Figures 2 to 3A and 3B, the light source 104 is connected to the shell 248/348/358. The shell 248/348/358 may be made of translucent material. This allows both a surface 218i/318i/358i of the shell 248/348/358 to which the light source 104 is connected and a surface 218e/318e/358e of the shell 248/348/358 opposite to where the light source 104 is connected to be illuminated by the light source 104. Further, the light conducting arrangement 112 is connected to the shell 248/348/358. The audio module 106 may be a pair of earphones or a set of speakers.

[00132] Although not shown in Figures 2 to 3A, the following features may be included:

- i) a diffuser for connection to the shell 248/348/358.
- ii) a first massager for connection to the diffuser, the first massager being an airbag; and

iii) a second massager placed between the diffuser and the first massager, the second massager being a flat coin motor.

5 [00133] Rigid plastic can be used to manufacture the shell 118/248/348/358. Similarly, rigid plastic can also be used for the diffuser 114, where the diffuser 114 may be made from the same translucent material used for the shell 118/248/348/358. Fabric may be used to cover a portion of the eye massaging device 100, but leaving at least a substantial portion of the surface 118e/218e/318e/358e of the shell 118/248/348/358 uncovered. The audio module 106 may be attached to the fabric covering the eye massaging device 100.

10 [00134] Turning to Figures 6A to 8G, rigid plastic can also be used to manufacture the first frame part 702a, the second frame part 702b, the first cover 760a and the second cover 760b. Fabric may be used for the padding layers 764a and 764b. Elastic material may be used for the fastening band 768.

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CLAIMS

1. An eye massaging device comprising:
 - a visor;
 - 5 a light source connected to the visor and configured to illuminate the visor;
 - an audio module, the audio module adapted to produce a sound;
 - a first massager connected to the visor, the first massager for massaging an eye area;
 - a control module electrically coupled to the light source, the audio module and the
 - 10 first massager, wherein the control module is adapted to control the light source, the audio module and the first massager; and
 - a light conducting arrangement configured to receive light from the light source, wherein the light conducting arrangement extends along a portion of the visor and is further configured to provide uniform illumination of the visor.
- 15 2. The eye massaging device of claim 1, wherein the control module is further adapted to operate the at least one of the light source, the audio module and the first massager in accordance to a sequence stored in the control module.
- 20 3. The eye massaging device of claims 1 or 2, wherein the light source is further adapted to emit light having a wavelength which falls into one or more different wavelength ranges and wherein the control module is adapted to select the one or more different wavelength ranges.
- 25 4. The eye massaging device of claim 3, wherein the control module is further adapted to change the wavelength range of the emitted light during execution of the sequence stored in the control module.
- 30 5. The eye massaging device of claims 3 or 4, wherein the control module is further adapted to select the wavelength range of the emitted light in dependence on a type of sound produced by the audio module.

6. The eye massaging device of any one of the preceding claims, wherein the control module is further adapted to be connected to peripheral memory devices adapted to store music.

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7. The eye massaging device of any one of the preceding claims, further comprising a memory module electrically coupled to the control module, the memory module adapted to store the sounds accessed by the audio module.

10 8. The eye massaging device of claims 3 to 7, wherein the different wavelength ranges comprise the ranges of around 450nm to around 495 nm; around 495nm to around 570 nm; and around 620 nm to around 750 nm.

15 9. The eye massaging device of any one of the preceding claims, wherein the light conducting arrangement comprises a light conducting element extending along a portion of a longitudinal axis of the visor to extend over a distance between a user's temples.

20 10. The eye massaging device of claim 9, wherein the light source comprises at least one light emitting element, the at least one light emitting element positioned adjacent to one end of the light conducting element.

25 11. The eye massaging device of claim 9, wherein the light source comprises two light emitting elements, wherein one of the two light emitting elements is positioned adjacent to one end of the light conducting element and the other of the two light emitting elements is positioned adjacent to another end of the light conducting element.

30 12. The eye massaging device of claims 1 to 8, wherein the light conducting arrangement comprises two light conducting elements, one of the two light conducting elements is connected to a first portion of the visor, the other of the two light conducting elements is connected to a second portion of the visor, wherein the first portion of the visor is a portion of the visor from around a centrally located vertical axis of the visor to

the left of the axis, and wherein the second portion of the visor is a portion of the visor from around a centrally located vertical axis of the visor to the right of the axis.

13. The eye massaging device of claim 12, wherein the light source comprises at least one light emitting element, the at least one light emitting element is adjacent to a
5 respective end of each of the two light conducting elements in a way that light from the at least one light emitting element is coupled into both of the two light conducting elements.

14. The eye massaging device of claim 12, wherein the light source comprises two
10 light emitting elements, one of the two light emitting elements is adjacent to a respective end of one of the two light conducting elements and the other of the two light emitting elements is adjacent to a respective end of the other of the two light conducting elements.

15. The eye massaging device of any one of the preceding claims, wherein the light
15 conducting arrangement comprises at least one light conducting pipe.

16. The eye massaging device of any one of the preceding claims, wherein the visor
comprises a shell to which the light source is connected; and a diffuser connected to the
shell.

17. The eye massaging device of claim 16, wherein the shell is made of translucent
20 material, wherein the light source is configured to illuminate a surface of the shell to which the light source is connected and a surface opposite to where the light source is connected.

18. The eye massaging device of claim 16 or 17, wherein the light conducting
25 arrangement is connected to the shell.

19. The eye massaging device of claims 16 to 18, wherein the first massager is
30 disposed against the diffuser.

20. The eye massaging device of any one of the preceding claims, wherein the first massager is adapted to provide a massage to an eye area extending from an orbit of an eye to an adjacent temple of the eye.

21. The eye massaging device of claim 16, further comprising a second massager connected to the visor, wherein the control module is electrically coupled to the second massager and adapted to operate the second massager in accordance to a sequence stored in the control module.

22. The eye massaging device of claim 21, wherein the second massager comprises a vibration element connected between the diffuser and the airbag.

23. The eye massaging device of claim 22, wherein the vibration element is a flat coin motor.

24. The eye massaging device of any one of the preceding claims, wherein the light source is connected to an internal surface of the visor, and wherein the first massager is received inside the visor to face the light source.

25. The eye massaging device of claims 1 to 15,
wherein the light source is connected to an internal surface of the visor,
wherein the eye massaging device further comprises a diffuser received inside the visor, the diffuser facing the light source, and
wherein the first massager is received inside the visor to face the diffuser.

26. The eye massaging device of claims 1 to 8, wherein the visor comprises
a first frame part;
a second frame part; and
a pivot connecting the first frame part and the second frame part, the light
conducting arrangement being connected to both the first frame part and the second frame part.

27. The eye massaging device of claim 26, wherein the light conducting arrangement comprises a lens disposed at each of the first frame part and the second frame part.

28. The eye massaging device of claim 27, further comprising a housing disposed along a portion of the perimeter of the lens, the housing accommodating the light source.

29. The eye massaging device of claims 26 to 28, further comprising
a first cover securing the light conducting arrangement to the first frame part; and
a second cover securing the light conducting arrangement to the second frame
part.

30. The eye massaging device of claims 26 to 29, further comprising a second
massager connected to the visor, wherein the control module is electrically coupled to the
second massager and adapted to operate the second massager in accordance to a sequence
stored in the control module.

31. The eye massaging device of claim 30, wherein the second massager comprises a
vibration motor housed within the pivot.

32. The eye massaging device of claims 26 to 31, further comprising a pair of padding
layers, between which the first massager is located.

33. The eye massaging device of claims 26 to 32, further comprising a fastening band
having one end secured to the first frame part of the visor and the other end secured to the
second frame part of the visor.

34. The eye massaging device of claims 26 to 33, further comprising a layer spanning
across an external surface of both the first frame part and the second frame part.

35. The eye massaging device of claim 34, wherein the layer allows light transmission.

36. The eye massaging device of claims 34 or 35, wherein the layer is fabricated from
5 any one or more of the following materials: fabric, textile or rubber.

37. The eye massaging device of claims 34 to 36, wherein the layer is perforated.

38. The eye massaging device of any one of the preceding claims, wherein the first
10 massager comprises an airbag.

39. The eye massaging device of any one of the preceding claims, wherein the light source comprises at least one light emitting diode.