(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 130 525 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
09.12.2009 Bulletin 2009/50

(51) Int Cl.:
A61H 23/02 *(2006.01)*

(21) Application number: **08157725.6**

(22) Date of filing: **06.06.2008**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MT NL NO PL PT RO SE SI SK TR
Designated Extension States:
AL BA MK RS

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(54) **A massage device, a flexible skin covering said massage device and a method for reducing audible noise of a massage device**

(57) A massage device (10) comprises a massage housing (100) and a vibration generating source (160). The massage device is characterised in that the massage device further comprises a vibration filter (140, 150, 770). The vibration filter may comprise a suspension (140, 150) that is coupled between the massage housing (100) and the vibration generating source (160). The vibration filter may further comprises a flexible skin (770) covering the massage device (10). With the vibration filter a transfer of the vibration frequency components from the vibration generating source to the outside air is influenced in that vibrations that are not effective for the massage but are contributing to a noisy sound are dampened.

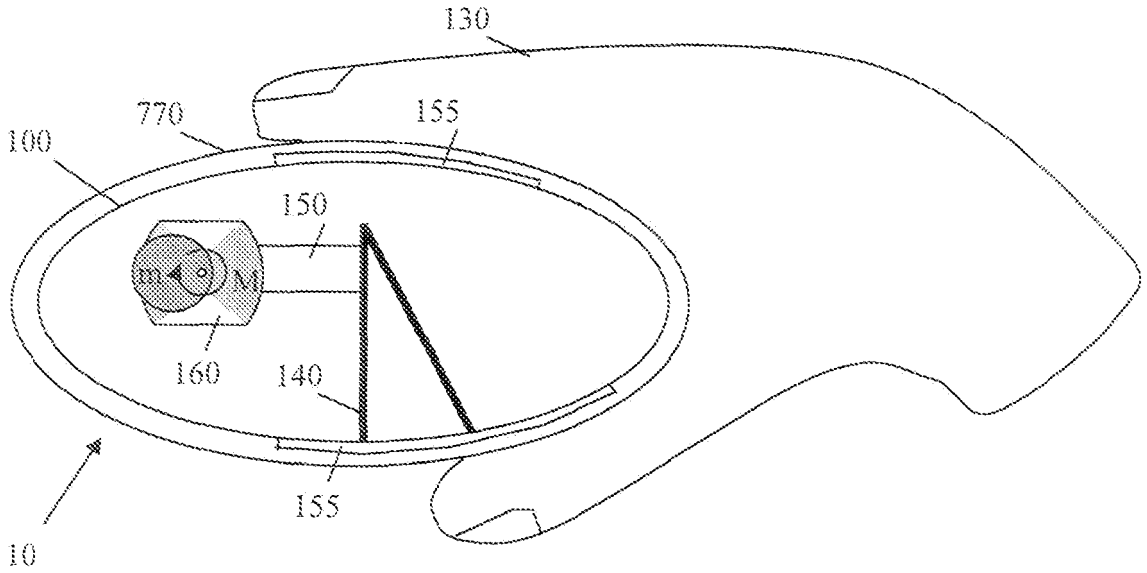

Fig. 1

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Description

FIELD OF THE INVENTION

[0001] This invention relates to a massage device and more particularly to a handheld massage device. The invention further relates to a flexible skin arranged to cover a massage housing of said massage device. The invention further relates to a method for reducing audible noise of a massage device.

BACKGROUND OF THE INVENTION

[0002] Massage devices known in the art have a massage housing to which a vibration source is fixed. The vibration source may be an electric motor having a rotating imbalance on its axle. For example US20070179412 discloses a massager that incorporates two motors positioned at opposite ends of the vibrating massager. Each motor is fitted with an offset weight attached axially whereby to impart vibrations to the massager.

[0003] The vibration source in the massage device causes its housing to vibrate, and when the housing is brought in contact with the body it provides massage such as for the neck, feet, etc.

[0004] A massage device may be used by people to relax when they feel stressed. Stress is a becoming more and more a common problem and consequently the need for massage devices that are helping in the reduction of stress is growing.

SUMMARY OF THE INVENTION

[0005] It is therefore an object of the invention to provide a massage device that helps better to relax.

[0006] According to the invention this object is realized in that the massage device further comprises a vibration filter that is arranged to attenuate the vibrations at the further vibration frequencies.

[0007] The invention is based on the insight that ambient conditions such as for example light, sound, and scent contribute to an atmosphere enabling people to relax. The massage device influences at least one of these ambient conditions in that it produces a noisy sound which is experienced by people using the massage device as disturbing in circumstances where they want to relax. The vibration generating source in the massage device produces vibrations with a plurality of frequencies of which some vibration frequencies are effective for massage when the massage device is brought in contact with the body while other vibration frequencies are not or less effective for massage but do contribute to the noisy sound that is produced by the massage device. With the vibration filter a transfer of the vibration frequency components from the vibration generating source to the air outside of the massage housing is influenced in that vibrations at the further vibration frequencies that are not effective for the massage but are contributing to the noisy sound are dampened, resulting in a reduced audible noise level outside the massage housing. The reduced audible noise level reduces the disturbance of the ambient conditions of people using the massage device, thereby achieving the object of the invention.

[0008] The vibrations provided by the vibration generating source comprise a plurality of frequency components among which the fundamental vibration frequency that is intended to provide the massage. In an embodiment the massage device comprises a vibration filter comprising a suspension, the suspension being coupled between the massage housing and the vibration generating source. The vibration filter comprising the suspension will attenuate the amplitudes of the vibrations of the massage housing at the further frequencies, resulting in a reduced transfer of the vibrations at the further vibration frequencies from the vibration generating source to the air outside of the massage housing.

[0009] In a further embodiment of the massage device the vibration filter comprising the suspension has a resonance frequency that is between 1.1 and 1.7 times the fundamental vibration frequency of the vibrations provided by the vibrating generating source. An advantage is that when the user firmly grips the massage housing the resonance frequency will drop and the reduced resonance frequency will approach the fundamental vibration frequency resulting in an amplification of the amplitude of the vibration at the fundamental vibration frequency. Thus the application of a suspension acting as a vibration filter with resonance frequency in the range of 1.1 and 1.7 times a fundamental vibration frequency reduces the effect of a decrease in vibration amplitude when the massage housing is hold by the user with a firm grip. This disadvantageous effect is observed in massage devices having the vibration generating source fixed without the vibration filter to the housing.

[0010] In a further embodiment the massage housing comprises at least two housing portions. The vibration generating source is coupled to a first housing portion of the massage housing and is further coupled via the suspension included in the vibration filter to a second housing portion of the massage housing. This provides the advantage that the first housing portion of the massage housing is vibrating whereas the second housing portion of the housing is relatively still. Thus the first housing portion of the massage housing is vibrating with a relatively large amplitude and may be used for massaging whereas the second housing portion of the massage housing is vibrating with a relatively small amplitude and may therefore be held comfortable in the hand without irritating the fingers. An advantage of having only the first housing portion vibrating with a relatively large amplitude is that the audible noise level is further reduced.

[0011] In a further embodiment the massage housing comprises three housing portions and the massage device comprises two vibration generating sources. The first vibration generating source is coupled to a first housing portion and is further coupled via a first vibration filter

to a second housing portion. The second vibration generating source is coupled to a third housing portion and via a second vibration filter to the second housing portion. The first and second vibration generating sources may provide vibrations at different fundamental vibration frequencies. This provides the advantage that the massage device may provide different massages dependent on whether the first or the third housing portion is making contact with the body. Further the amplitude of the vibrations provided by the first and second vibration generating source may be different providing the advantage that the intensity of the massage provided by the first and third housing portion may be different. The first and second vibration filter provide the advantage that the audible noise level caused by the first and second vibration generating sources is reduced. A further advantage is that with the first and second vibration filters the mutual influencing of the first and second vibration generating source is reduced. This mutual influencing may result in a further source of noise in massage devices having no vibration filter. Thus with the application or use of vibration filters the massage device may be equipped with a plurality of vibration generating sources while keeping the produced audible noise level at a minimum.

[0012] In a further embodiment the vibration filter comprises a flexible skin that covers the massage housing. The flexible skin included in the vibration filter is arranged to dampen the transfer of the vibrations at the further frequencies from the massage housing to the air outside of the massage housing resulting in a reduced audible noise level outside the massage housing.

[0013] The flexible skin may comprise a grip portion arranged to be held by a user. The grip portion may comprise means to further dampen the vibrations to increase the comfort for the user. For example the grip portion may comprise a first material that differs from a second material chosen for the flexible skin. For example the first material may be foam whereas the second material is rubber or elastomeric material. In a further embodiment the flexible skin is made of flexible material with a thickness at the location of the grip portion that is at least twice the amplitude of the vibration of the massage housing (at the fundamental vibration frequency). This results in a dampening of the transfer of vibrations from the vibration generating source to the user's hand, thereby enhancing the comfort of the massage device. For example the vibration (at the fundamental vibration frequency) of the massage housing may have an amplitude of 0.15mm. To dampen the transfer of this vibration to the fingers of the user the flexible skin may have at least at the location of the grip portion a thickness of at least 0.3mm. In yet a further embodiment the flexible skin has surface areas with different roughness, the roughness being chosen for improved grip of the fingers and/or for improved transfer of the fundamental vibration frequency from the vibrating generating source to the part of the body that is being massaged with the massage device. The different surface structure or roughness at the grip portion provides more grip to the fingers of the hand of a user which is advantageous when massage oil is used. In a further embodiment the flexible skin may have at the location of the grip portion a cavity comprising a viscous gel providing the advantage that with the choice of viscosity of the gel the dampening of the transfer of the vibrations to the fingers may be further optimized.

[0014] The invention further relates to the flexible skin for the attenuation of the amplitude of vibrations at the further vibration frequencies in order to reduce the audible noise level as discussed above. In a further embodiment the flexible skin is detachably coupled to the massage housing. This provides the advantage that the skin is user removable and disposable. After use the skin can simply be removed and disposed of making it unnecessary to clean the massage device for a next use. This enhances the hygiene when using the massage device. A further advantage is that with different skins different massage sensations may be provided as one massage device may be used with skins having different surface roughness and material composition.

[0015] In a further embodiment the massage device is warmed or cooled by a base device. The base device is further used to charge the rechargeable battery that is included in the massage device. The base device may for example comprise a heater element on which the massage device is positioned. An example of a heater element is a resistance wire that is dissipating electrical energy. While charging the massage device the base device may also heat the massage device. This provides the advantage that the temperature of the massage device may be put at a comfortable temperature so that when the massage device is taken from the base device it has a charged battery and pleasant temperature and is ready for use. In a further embodiment the massage device is cooled by the base device, the base device comprising for example a Peltier element. The base device may comprise first electrical coupling means that are arranged to be coupled with the second electrical coupling means when the massage device is detachably coupled to the base device, the second electrical coupling means being included in the massage device. An example of a first and second electrical coupling means is a plug and a socket. A further example of a first and second electrical coupling means is a first and second inductive coupling coil. The base device and the massage device together form a massage system.

[0016] In a further embodiment the massage device comprises temperature indication means. The temperature indication means may provide the temperature of the massage device. In a further embodiment the temperature indication means may provide a 'ready signal', indicating that the temperature of the massage housing is at a predetermined temperature or in a predetermined temperature range. The 'ready signal' may be implemented by an optical signal such as for example provided by a LED, or may be implemented by an audible signal such as a pleasant sound. For example a relaxing sound or

music may be provided by when the temperature of the massage housing has reached the predetermined temperature or is in the predetermined temperature range. In a further embodiment the 'ready signal' may be further in dependence of a charging status of the battery, the 'ready signal' only being provided when the temperature of the massage housing is at the predetermined temperature (or in the predetermined temperature range) and the charging status is above a predetermined level. In a further embodiment the temperature indication means comprise thermochromic material. For example the massage housing may comprise paint that comprises thermochromic material. The colour of the massage housing changes when the temperature of the massage housing has reached the predetermined temperature (or is in the predetermined temperature range). The advantage of the use of thermochromic material for temperature indication means is that it uses no battery power of the massage device.

[0017] The invention further relates to a method for reducing audible noise of a massage device. The massage device comprises a vibration generating source providing vibrations at a fundamental vibration frequency (which is used for massage) and at further vibration frequencies. In the method a vibration filter is applied to attenuate the transfer of the vibrations at the further frequencies from the vibration generating source to the air outside the massage housing.

[0018] In a further embodiment of the method the vibration filter comprises a suspension coupled between the massage housing and the vibration generating source. In a further embodiment said suspension has a resonance frequency that is between 1.1 and 1.7 times the fundamental vibration frequency of the vibrations provided by the vibrating generating source. In a further embodiment of the method the vibration filter is coupled between the massage housing and the outside air. In this embodiment the vibration filter comprises a flexible skin covering the massage housing. The flexibility of the skin is chosen in relation to the further vibration frequencies.

BRIEF DESCRIPION OF THE DRAWINGS

[0019] Embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Fig. 1 shows an embodiment of a massage device,
Fig. 2 comprising Figs. 2a and 2b shows a further embodiment of a massage device,
Fig. 3 comprising Figs. 3a, 3b and 3c shows a further embodiment of a massage device,
Fig. 4 comprising Figs. 4a and 4b shows an embodiment of a massage system.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0020] Fig. 1 shows an embodiment of a handheld massage device 10 comprising a massage housing 100 and a vibration generating source 160. The vibrations provided by the vibration generating source 160 cause the massage housing to vibrate with an amplitude of for example 0.15mm and a fundamental frequency of for example 60Hz. The vibration generating source produces also vibrations with other frequencies than said fundamental frequency. For massaging the massage device is brought in contact with the body so that the vibrations of the massage housing are transferred to body. The fundamental frequency is chosen to provide a pleasant massage sensation. The massage device further comprises a vibration filter 140, 150, 770 to attenuate the transfer of the vibrations at the other vibration frequencies from the vibration generating source 160 to the outside air. (The outside air is the air outside of the massage housing.) By attenuating said transfer the audible noise produced by the vibration generating source 160 in the massage device 10 is reduced. A further advantage is that the user's hand 130 will experience vibrations with reduced amplitude when holding the massage device 10 giving more comfort to the hand when using the massage device. The vibration filter may comprise a flexible skin 770 that at least partially and preferably completely covers the massage housing 100. A grip portion may be located at the flexible skin arranged to be held a user's hand 130. The vibration filter may also comprise a suspension 140, 150 that is coupled between the massage housing 100 and the vibration generating source 160.

[0021] The vibration filter 140, 150, 770 is used to realize a desired transfer function for the vibration frequencies from the vibration generating source 160 to the outside air. By choice of materials for the suspension 140, 150 and the skin 770, for example foam, rubber or elastomeric material, and by choice of shapes of these materials for the suspension, for example the shape of a leaf spring (see Fig. 2b), a specific predetermined characteristic of said transfer function is obtained. In an embodiment of the invention the characteristic to be achieved by the vibration filter 140, 150, 770 is preferably that of a low pass filter. The low pass filter is arranged to attenuate the amplitude of vibrations with frequencies higher than said fundamental vibration frequency resulting in a reduced amplitude of said vibration frequencies at the massage housing. The attenuation of the amplitude of the vibrations having a frequency higher than the fundamental vibration frequency results in a reduced transfer of vibrations to the outside air leading to a reduced audible noise level.

[0022] In a further embodiment of the invention the vibration filter is realized by a suspension 140, 150 having a low pass filter characteristic that is further characterised by having a resonance frequency. The resonance frequency has preferably a larger value than the fundamental frequency, preferably a value between 1.1 and 1.7 times the fundamental vibration frequency. For example with a fundamental vibration frequency of 60Hz the resonance frequency may be chosen 1.5 times the funda-

mental vibration frequency to have a value of approximately 90Hz. Positive effect is that with a firmer grip of the massage housing 100 the resonance frequency will drop, closing down to the fundamental vibration frequency, creating an amplification of the vibration at said fundamental vibration frequency.

[0023] In a further embodiment of the invention the vibration filter is realized by a flexible skin 770 having a low pass filter characteristic. The device facing side of the flexible skin follows the contours of the massage device. The flexible skin may be of rubber or elastomeric material having a predetermined flexibility that relates to a desired transfer function of the amplitudes at the vibration frequencies from the vibration generating source 160 to the outside air. The material of the skin may for example be of elastomeric material, soft thermoplastic material, elastomer, thermoplastic elastomer, liquid silicone rubber (LSR). In a further embodiment the flexible skin comprises cellasto foam (see for example http://www.basf.com/cellasto/).

[0024] In yet a further embodiment the flexible skin further comprises visco elastic memory foam (see for example http://www.healco.com/faq.html). This provides the advantage that the shape of the skin covering the massage device may be adapted to the body contours that are being massaged. In yet a further embodiment the flexible skin comprises gel, the viscosity of the gel being in dependence of the vibration frequencies to be attenuated. The viscosity of the gel may be adapted by alternating a cross-link density or by adding additives. The flexible skin may for example have double walls, enclosing the gel between said walls.

[0025] The flexible skin may have localized portions having an increased surface roughness to create a grip portion (at its non-device facing surface) with increased grip. The grip portion may be of a different material than the flexible skin. For example the material chosen for the grip portion may be flexible (for example foam) as to dampen further the transfer of vibrations from the vibration generating source to the user's hand 130.

[0026] In a further embodiment the flexible skin has at the location of the grip portion an increased thickness to allow the dampening of the vibrations in the transfer of vibrations from the vibration generating source to the user's hand 130. For example the vibration (at the fundamental vibration frequency) of the massage housing may have an amplitude of 0.15mm. To dampen the transfer of this amplitude of vibration to the fingers of the user the flexible material of the flexible skin may have at the location of the grip portion a thickness of at least 0.3mm.

[0027] In a further embodiment the flexible skin comprises at the location of the grip portion a cavity 155 that includes a visco-elastic material. With the cavity 155 comprising the visco-elastic material the transfer of the vibrations provided by the vibration generating source 160 to the fingers of the user's hand 130 may be further attenuated.

[0028] The skin may further comprise surface modifying coatings to reduce susceptibility to dust and dirt, or an antimicrobial coating to provide hygiene. The skin may further comprise a coating to provide additional protection to external media such as lubricants.

[0029] In yet a further embodiment the flexible skin is detachably coupled to the massage housing. This provides the advantage that the skin is user removable and disposable. After use the skin can simply be removed and disposed of making it unnecessary to clean the massage device for a next use. This enhances the hygiene when using the massage device. A further advantage is that with different skins different massage sensations may be provided because one massage device may be used with skins having different surface roughness and material compositions. Thus the use of a flexible detachable skin provides the user the possibility to personalize his massage device.

[0030] Fig. 2a shows a further embodiment of a massage device wherein the vibration generating source 160 is coupled via a vibration filter comprising a suspension to the massage housing 100, the suspension comprising of a first filter 200 and a second filter 210. The vibration generating source may produce vibrations in the direction of the x-axis and in the direction of the y-axis. Therefore the suspension comprises a first filter 200 for the attenuation of the transfer of the vibrations in the y direction and a second filter 210 for the attenuation of the transfer of the vibrations in the x direction. With the first and second filter the amplitude of the vibration of the massage housing in the x and y direction is determined providing the advantage that the massage device may provide a massage with different intensities dependent on the orientation of the massage device. For example as a result of the first and second filter 200, 210 the amplitude of the vibration (at the fundamental vibration frequency) may be larger in the x direction than in the y direction. A further advantage of a suspension comprising a first and a second filter 200, 210 is that the first and second filter may for example be of different materials having different characteristics. For example the first filter 200 may be a leaf spring made of plastic whereas the second filter 210 may be made of foam. As an example in Fig. 2a the vibration generating source 160 comprises an electric motor 230, an axis and an eccentric weight 240 coupled to said axis, wherein the electric motor is configured for rotating the eccentric weight around the axis. Other examples of vibration generating sources are shown in Fig. 3 and will be discussed later.

[0031] Fig. 2b shows an embodiment of vibration filter comprising a suspension. Fig. 2b (a) shows the electric motor 230 mounted on a frame. The electric motor is part of a vibration generating source. The electric motor is arranged to rotate an eccentric weight around its axis. The frame shown in Fig. 2b (b) is made of plastic and comprises the suspension that acts as a vibration filter. The suspension included in the vibration filter has been realized by three leaf springs 200 which are arranged to attenuate the vibration frequencies (other than the fun-

damental vibration frequency) in the y and z direction.

[0032] Fig. 3 comprising Figs. 3a, 3b and 3c shows a further embodiment of a massage device 10, wherein the massage housing 100 comprises a first housing portion 400 and a second housing portion 410. The vibration generating source 160 is coupled to said first housing portion and via said vibration filter 140, 150 to the second housing portion. The second housing portion 410 is separated from the first housing portion 400. The first and second housing portion may be coupled with flexible material to provide an air tight and fluid tight enclosure for the massage device. The second housing portion 410 is referred to as 'hot spot' as it is being driven by the vibration generating source to provide massage when brought in contact with the body. The amplitude of the vibration of the first housing portion 400 is relative small with respect to the amplitude of the vibration of the hot spot 410. This provides the advantage that the audible noise level is further reduced in comparison with the embodiments of Figs. 1 and 2. A further advantage is that the user may hold the massage device 10 close to the hotspot without irritating the fingers. In yet a further embodiment the massage device is further covered by the flexible skin 770 as previously discussed. The flexible skin provides a further attenuation of the audible noise level and provides comfort for the user in that it provides improved grip. The vibration generating sources shown in Fig. 3 comprise a moving portion and a further portion. The moving portion is coupled to the first housing portion 410 and the further portion is coupled via the vibration filter 140, 150 to the second housing portion 400. Fig. 3a shows an embodiment of a massage device wherein the vibration generating source 160 comprises an electric motor 230, an axis and an eccentric weight 240 coupled to said axis, wherein the electric motor is configured for rotating the eccentric weight around the axis, the eccentric weight being included in the moving portion and the electric motor being included in the further portion. Fig. 3b shows a further embodiment of a massage device wherein the vibration generating source 160 comprises a solenoid 420 and a piston 430, wherein the piston is arranged to be excited by the solenoid, the piston being included in the moving portion and the solenoid being included the further portion. Fig. 3c shows yet a further embodiment of a massage device wherein the vibration generating source 160 comprises an electric motor 230 and an axis that is coupled via a hinge 165 and a further axis 440 to the second housing portion 410, the axis being included in the moving portion and the electric motor being included in the further portion.

[0033] A massage device 10 as shown in Fig. 1, 2 and 3 may comprise a further hotspot that is driven by a further vibration generating source. A massage device having more than one vibration generating source may suffer from mutual coupling between the vibration generating sources causing a disturbing rattling noise. In an embodiment of a massage device comprising more than one vibration generating source each one of the vibration generating sources may be coupled via its vibration filter to the massage housing. An advantage is that due to the use of a vibration filter the mutual mechanical coupling between the vibration generating sources is attenuated, thereby reducing the audible noise level. A further advantage is that the reduced mutual mechanical coupling enables the application of vibration generating sources in different mechanical orientations.

[0034] Fig. 4a shows a massage system 20 comprising the massage device 10 according to the invention and a base device 30. The base device is arranged to condition the massage device by bringing its massage housing 100 and/or the skin 770 covering the massage housing to a predetermined temperature. The base device comprises temperature conditioning means 730 that are coupled to a power connector 710 of the base device. In an embodiment of the massage system the temperature conditioning means included in the base device are arranged to warm the massage housing 100 and/or the skin 770. For example the base device may comprise a resistance wire that acts as a heat source by dissipating electrical energy that is provided via the power connector. Preferably the coupling of the resistance to the power connector is in dependence of a detachably coupling of the massage device to the base device. When the massage device is detachably coupled to the base device the presence of the massage device on the base device may for example be detected by a sensor such as a switch that is pushed when the massage device is positioned on the base device. In a further embodiment the temperature conditioning means are arranged to cool the massage housing, or a specific location of the massage device or skin covering said massage device such as for example the grip portion. In a further embodiment the temperature conditioning means are arranged to warm a hotspot of the massage device and to cool the grip portion of skin covering the massage device. For cooling the base device may for example comprise a Peltier element that is coupled to the power connector 710. Also the coupling of the Peltier element to the power connector may be dependent on the detected presence of the massage device. The base device may further comprise a control system 720 that is arranged for controlling the heating and/or cooling of the temperature conditioning means 730 in order to achieve a predetermined temperature of the massage housing 100 and/or the skin 770. The control system 720 comprises the sensor that detects the presence of the massage device on the base device. In a further embodiment the predetermined temperature may be user selectable. The skin may further comprise materials that act as a local heating or cooling buffer, e.g. phase change materials. This provides the advantage of enhanced comfort. Examples of phase change materials are Climsel C48 and Climsel C58, both by Climator AG. Other examples are paraffin wax or micro encapsulated wax balls.

[0035] The massage device included in the massage system may further comprise a rechargeable battery 760

to provide electrical energy to the vibration generating source 160. To charge the battery the massage device further comprises a first electrical coupling means 750 that is arranged to be coupled with a second electrical coupling means 740 which is included in the base device. The coupling of the second coupling means to the power connector may be controlled by the control system 720, e.g. said coupling may be dependent on the detected presence of the massage device. An example of a first and second coupling means is a plug and a socket. In a further example the first and second coupling means comprise a coil arranged for inductive coupling when the massage device is placed on or near the base device. The massage device may further comprise a further control system 775 that is arranged for controlling the charging process of the rechargeable battery. The further control system may further control the vibration generation source 160, e.g. the frequency and/or amplitude of the produced vibrations.

[0036] The massage device may further comprise temperature indication means arranged to indicate a temperature of the massage housing 100 and/or the skin 770 covering said massage housing. In an embodiment the temperature indication means for example comprises a temperature sensor and a LED to indicate when the temperature of the massage housing and/or the skin is within a predetermined temperature range to indicate that the massage device is ready for use. In a further embodiment the temperature indication means comprises a sound reproducing device, such as for an MP3 player having memory comprising music. When the temperature of the housing and/or the skin is within a predetermined range the MP3 player comprised in the massage device will provide a sound, such as a relaxing sound or melody, to indicate that the massage device is ready for use. In a further embodiment the temperature indication provided by the temperature indication means is further in dependence of the battery charge status which is controlled and monitored by the further control system. The indication that the temperature of the housing and/or skin is within a predetermined range will only be given when the battery charge status is above a predetermined value, for example only when the battery is more than 'half full'. In a further embodiment the massage housing and/or skin comprises thermochromic material that changes colour when the temperature of the housing and/or the skin is within a predetermined temperature range. This provides the advantage that no battery power is used for the temperature indication. The thermochromic material may be additives in a bulk material such as for example plastic or ceramic. In a further embodiment the thermochromic material may be additives in a coating material which is applied on top of the bulk material.

[0037] Fig. 4b shows an example of the massage system 20 comprising the massage device 10 and the base device 30. The shape of the massage housing 100 is adapted to the anatomical shape of the portions of the body that are intended to be massaged. The shape of the base housing 700 is adapted to receive the massage device.

Claims

1. A massage device (10) comprising a massage housing (100) and a vibration generating source (160) arranged for providing vibrations at a fundamental vibration frequency and further vibration frequencies, the massage device being **characterised in that** the massage device further comprises a vibration filter (140, 150, 770) arranged to attenuate the vibrations at the further vibration frequencies.

2. A massage device (10) as claimed in claim 1 wherein the vibration filter comprises a suspension (140, 150) coupled between the massage housing (100) and the vibration generating source (160).

3. A massage device (10) as claimed in claim 2 wherein the suspension (140, 150) has a resonance frequency that is between 1.1 and 1.7 times a fundamental vibration frequency of the vibrations provided by the vibrating generating source (160).

4. A massage device (10) as claimed in claims 2 or 3 wherein the suspension (140, 150) comprises an elastic element made of foam, rubber or elastomeric material.

5. A massage device (10) as claimed in any one of claims 2 to 4, wherein the massage housing (100) comprises at least a first housing portion (400) and a second housing portion (410) and wherein the vibration generating source (160) is coupled to said first housing portion and via said suspension (140, 150) to the second housing portion.

6. A massage device (10) as claimed in any one of claims 1 to 5 wherein the vibration filter further comprises a flexible skin (770) that covers the massage housing (100), the flexible skin comprising a grip portion (110) arranged to be held by a user (130).

7. A massage device (10) as claimed in claim 6 wherein the flexible skin (770) comprises a cavity (155) arranged to include a visco-elastic material.

8. A massage device (10) as claimed in any one of claims 1-7 further comprising temperature indication means, arranged to indicate a temperature of the massage housing (100).

9. A massage system (20) comprising the massage device (10) as claimed in any one of claims 1 to 8 and a base device (30), the massage device (10) further comprising:

- a rechargeable battery (760) contained within the massage housing (100) and coupled to the vibrating generating source (160);
- first electrical coupling means (750) coupled to said rechargeable battery; the base device (30) comprising:

  - a base housing (700) arranged for being detachably coupled to said massage housing (100);
  - a second electrical coupling means (740) arranged for charging the rechargeable battery (760), said second electrical coupling means being arranged to be detachably coupled to said first electrical coupling means (750) when the massage housing is detachably coupled to said base housing;
  - temperature conditioning means (730) being arranged to bring the massage housing to a predetermined temperature when the massage housing is detachably coupled to said base housing.

10. A massage system as claimed in claim 9 wherein said temperature conditioning means (730) comprise at least one of a heating element and a cooling element.

11. A detachable flexible skin (770) being arranged to cover the massage housing (100) of a massage device, the massage device comprising a vibration generating source (160) arranged for providing vibrations at a fundamental vibration frequency and further vibration frequencies, the detachable flexible skin being arranged to attenuate the vibrations at the further vibration frequencies,.

12. A detachable flexible skin (770) according to claim 11 wherein the flexible skin comprises a cavity (155) arranged to include a visco-elastic material, the visco-elastic material being an at least partially cross-linked silicone rubber, a polyurethane gel, or a SEBS gel.

13. A detachable flexible skin (770) according to claim 11 or 12 wherein the flexible skin is made from a material selected from a group comprising silicone rubber, a thermoplastic elastomer and a polyurethane polymer.

14. A method for reducing audible noise of a massage device (10), the massage device comprising a vibration generating source (160) providing vibrations at a fundamental vibration frequency and further vibration frequencies, the method being **characterised in** applying a vibration filter (140, 150, 770) to attenuate the vibrations at the further frequencies.

15. A method according to claim 14 wherein the vibration filter comprises a suspension, the method comprising coupling the suspension (140, 150) between the massage housing (100) and the vibration generating source (160), the suspension (140, 150) having a resonance frequency that is between 1.1 and 1.7 times the fundamental vibration frequency of the vibrations provided by the vibrating generating source (160).

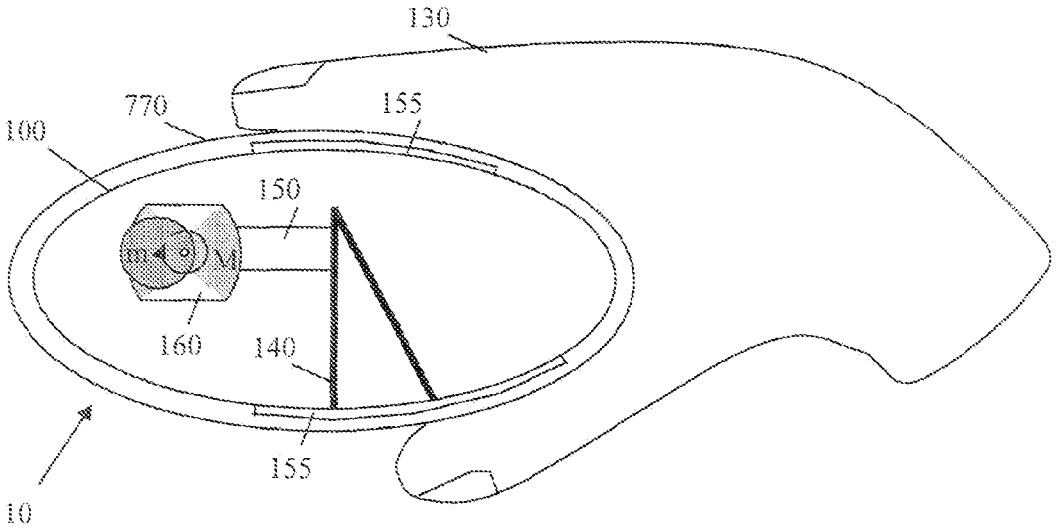

Fig. 1

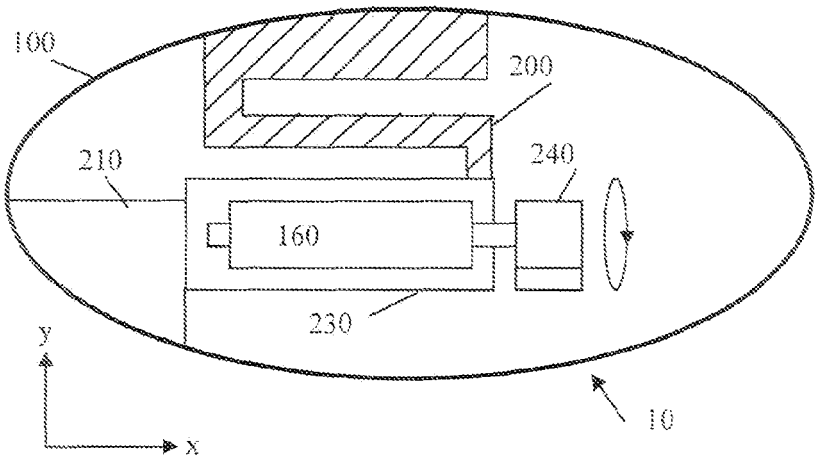

Fig. 2a

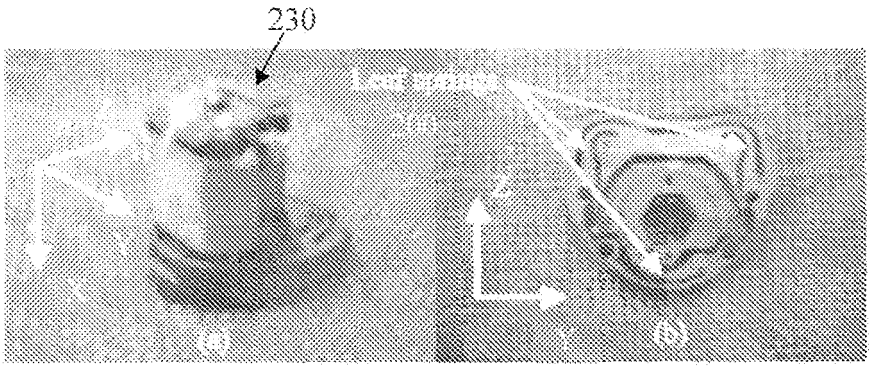

Fig. 2b

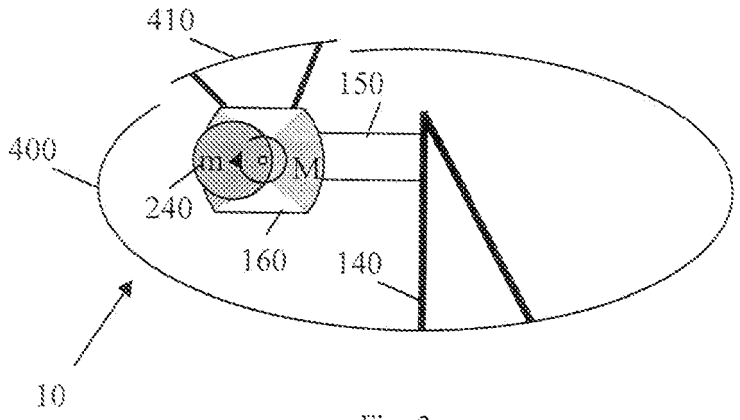

Fig. 3a

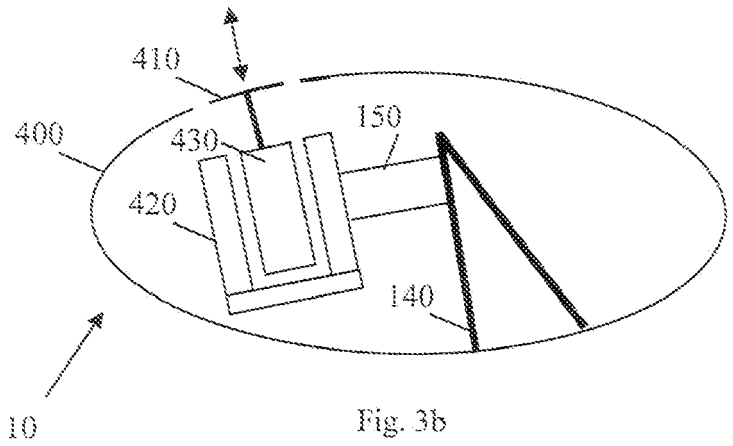

Fig. 3b

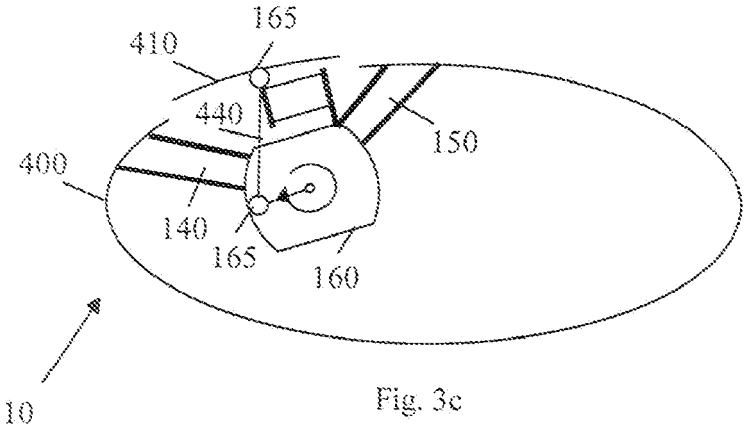

Fig. 3c

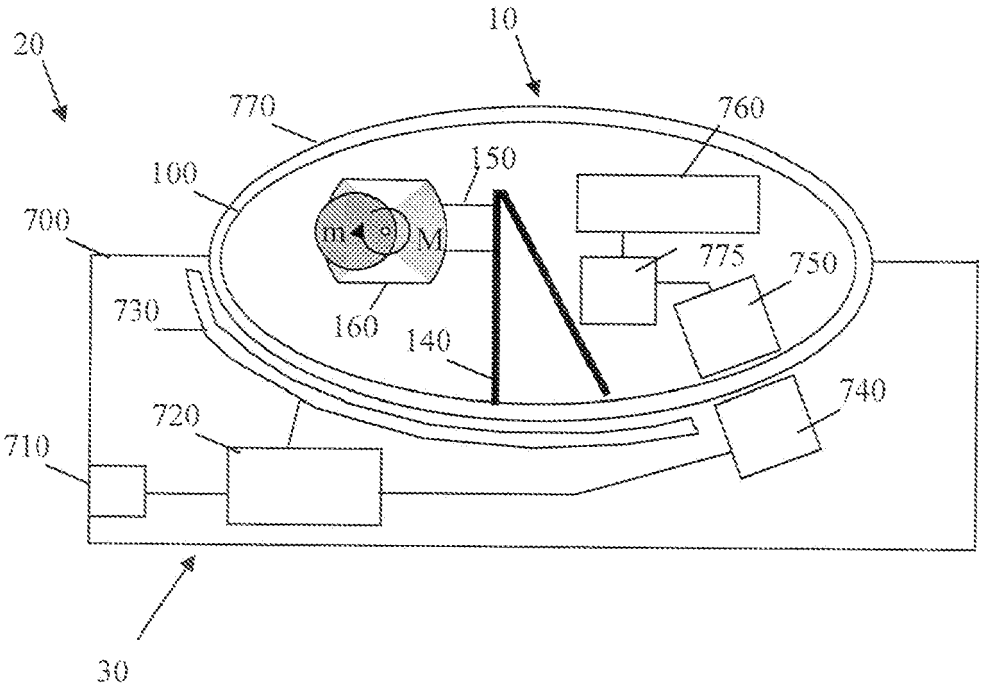
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Fig. 4a

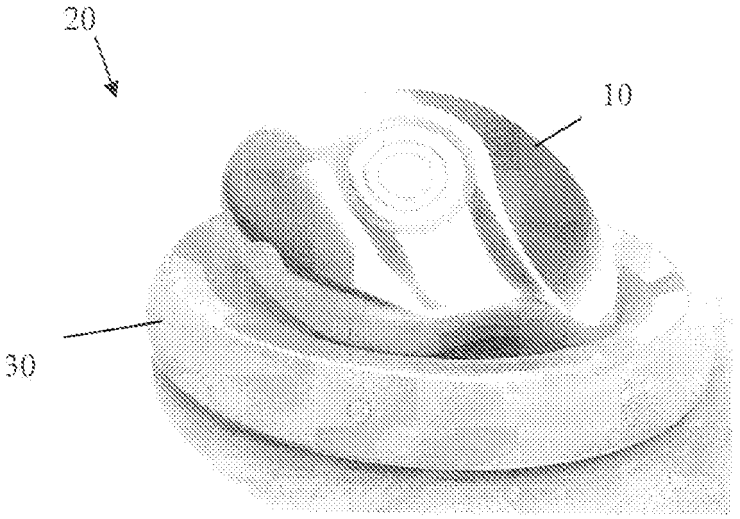
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Fig. 4b

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EUROPEAN SEARCH REPORT

Application Number
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Place of search	Date of completion of the search	Examiner
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