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**Harth et al.**(10) **Pub. No.: US 2004/0122492 A1**(43) **Pub. Date: Jun. 24, 2004**(54) **PHOTOTHERAPEUTIC TREATMENT OF SKIN CONDITIONS**(76) Inventors: **Yoram Harth**, Haifa (IL); **Avner Korman**, Herzlia (IL)

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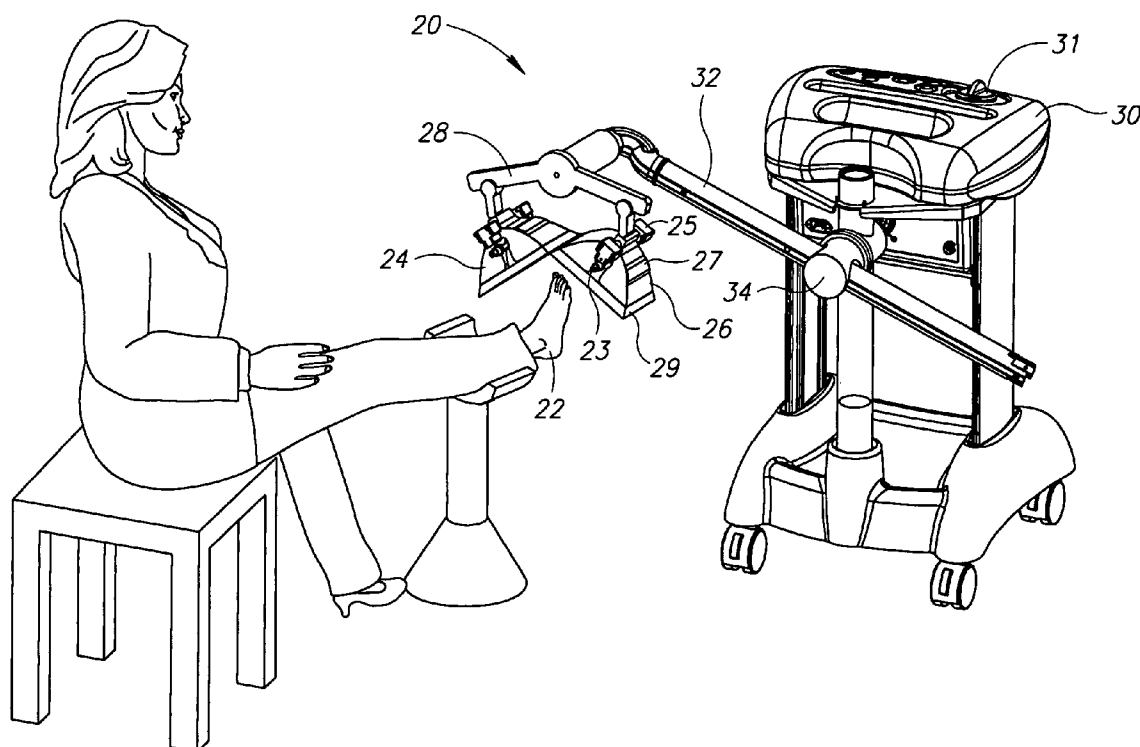
**WATOV & KIPNES, P.C.****P.O. Box 247****Princeton Junction, NJ 08550 (US)**(21) Appl. No.: **10/674,313**(22) Filed: **Sep. 30, 2003****Related U.S. Application Data**

(63) Continuation-in-part of application No. 10/366,452, filed on Feb. 13, 2003, which is a continuation-in-part

of application No. 10/098,592, filed on Mar. 18, 2002, which is a continuation-in-part of application No. 10/007,702, filed on Dec. 10, 2001, now abandoned, which is a continuation-in-part of application No. 09/756,130, filed on Jan. 9, 2001, which is a continuation-in-part of application No. PCT/IL99/00374, filed on Jul. 7, 1999.

**Publication Classification**(51) **Int. Cl.<sup>7</sup>** ..... **A61N 5/06**(52) **U.S. Cl.** ..... **607/88; 607/90**(57) **ABSTRACT**

A method for treating an inflammation in skin of a patient includes irradiating the skin with infrared (IR) radiation in a first wavelength band and with violet/blue light in a second wavelength band.



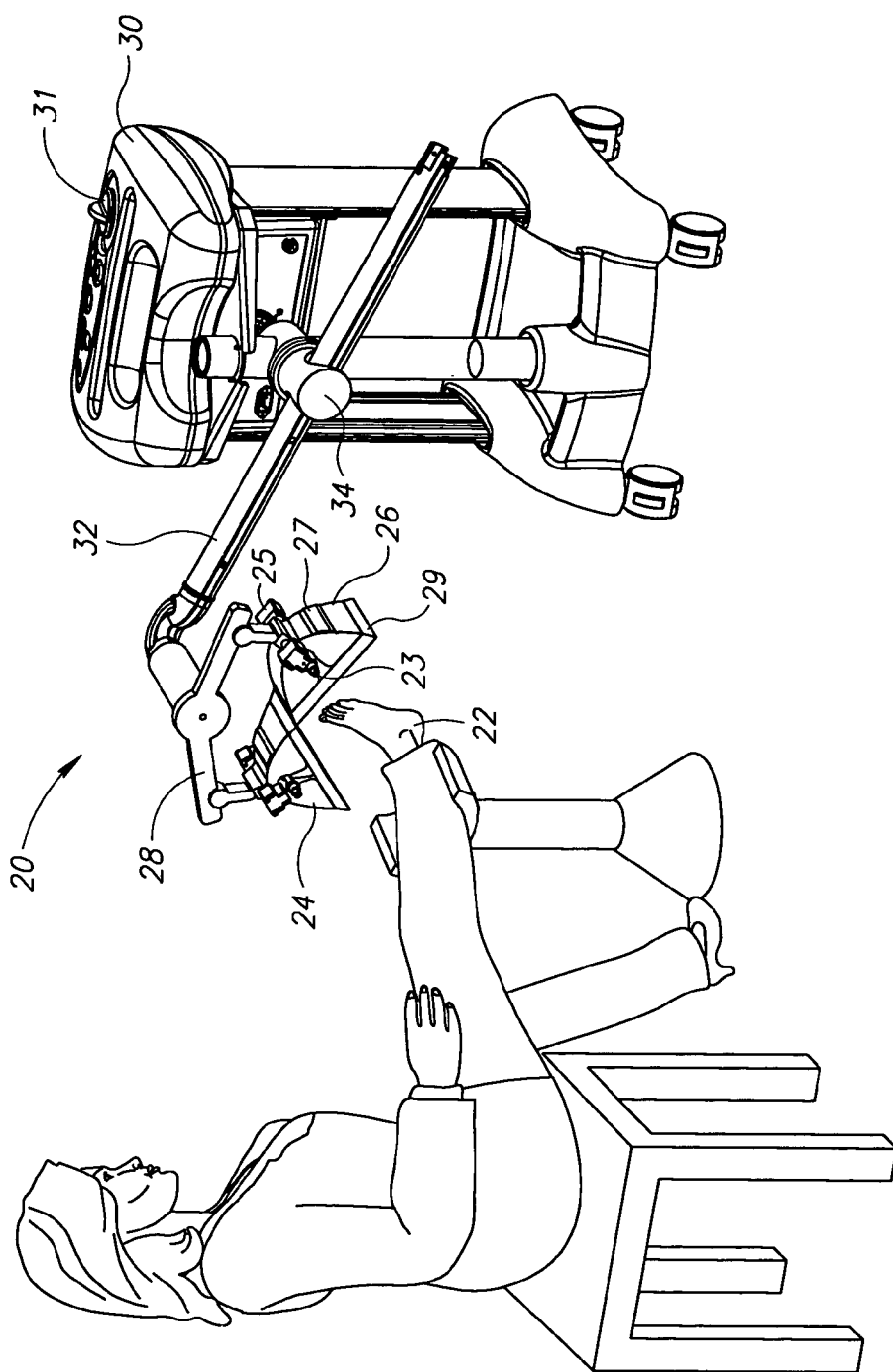


FIG. 1

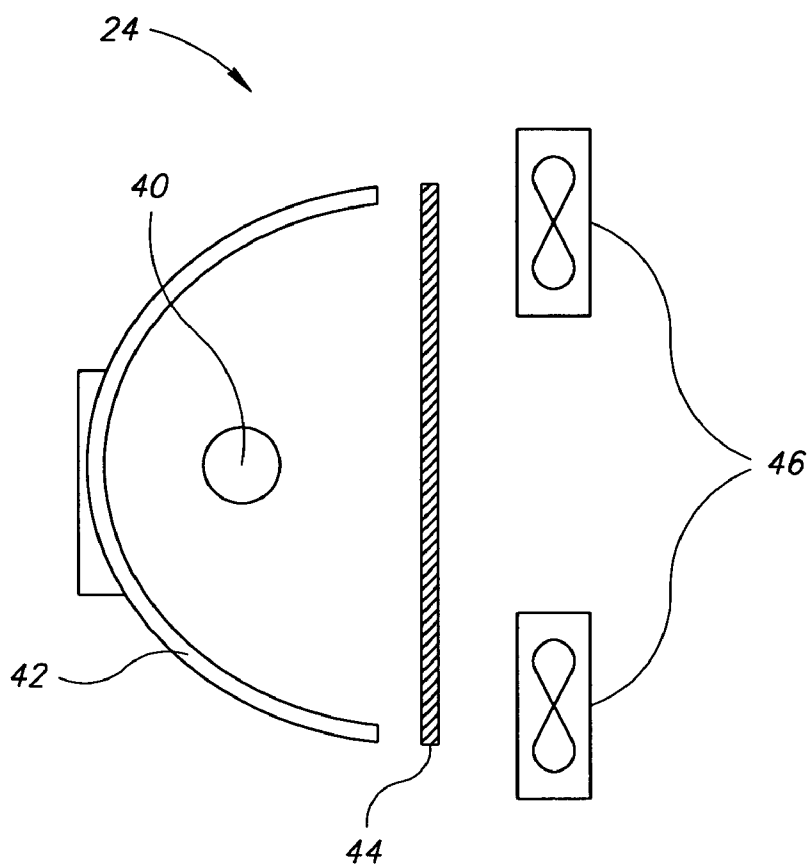


FIG. 2

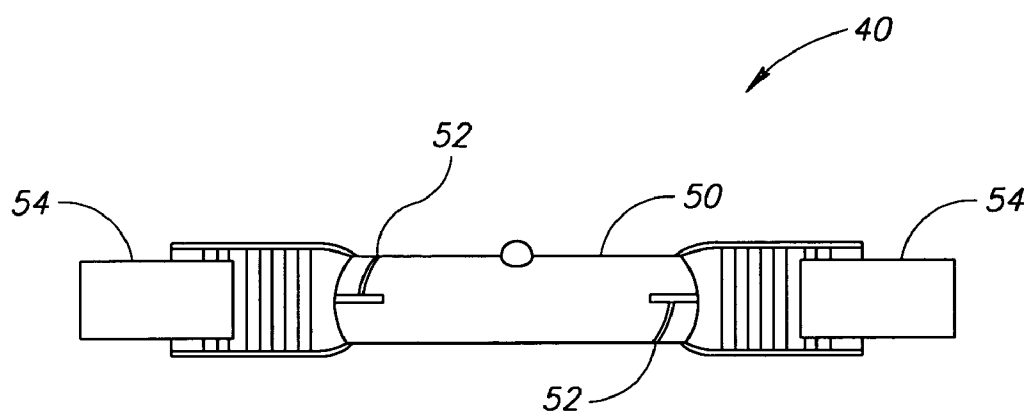


FIG. 3

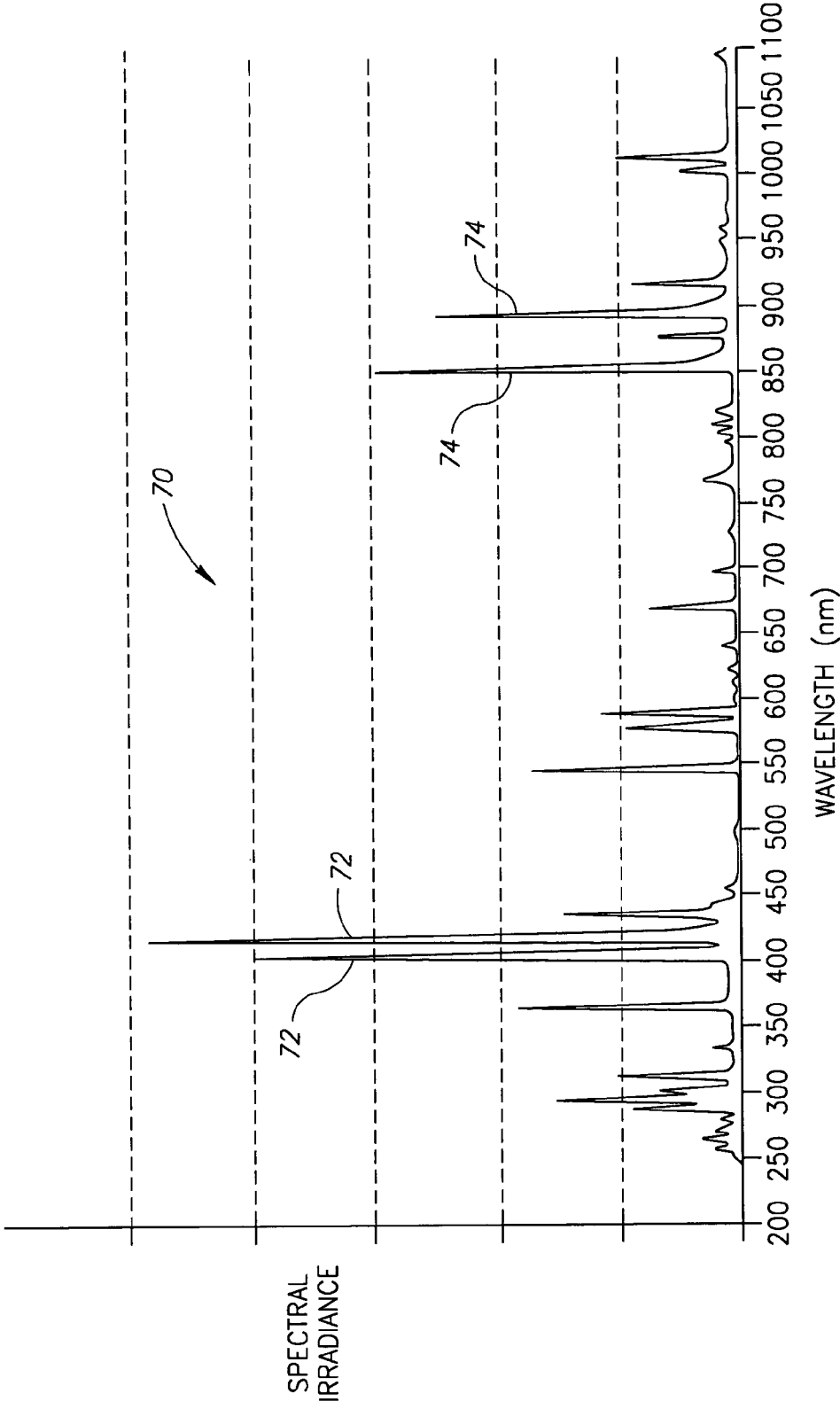


FIG.4

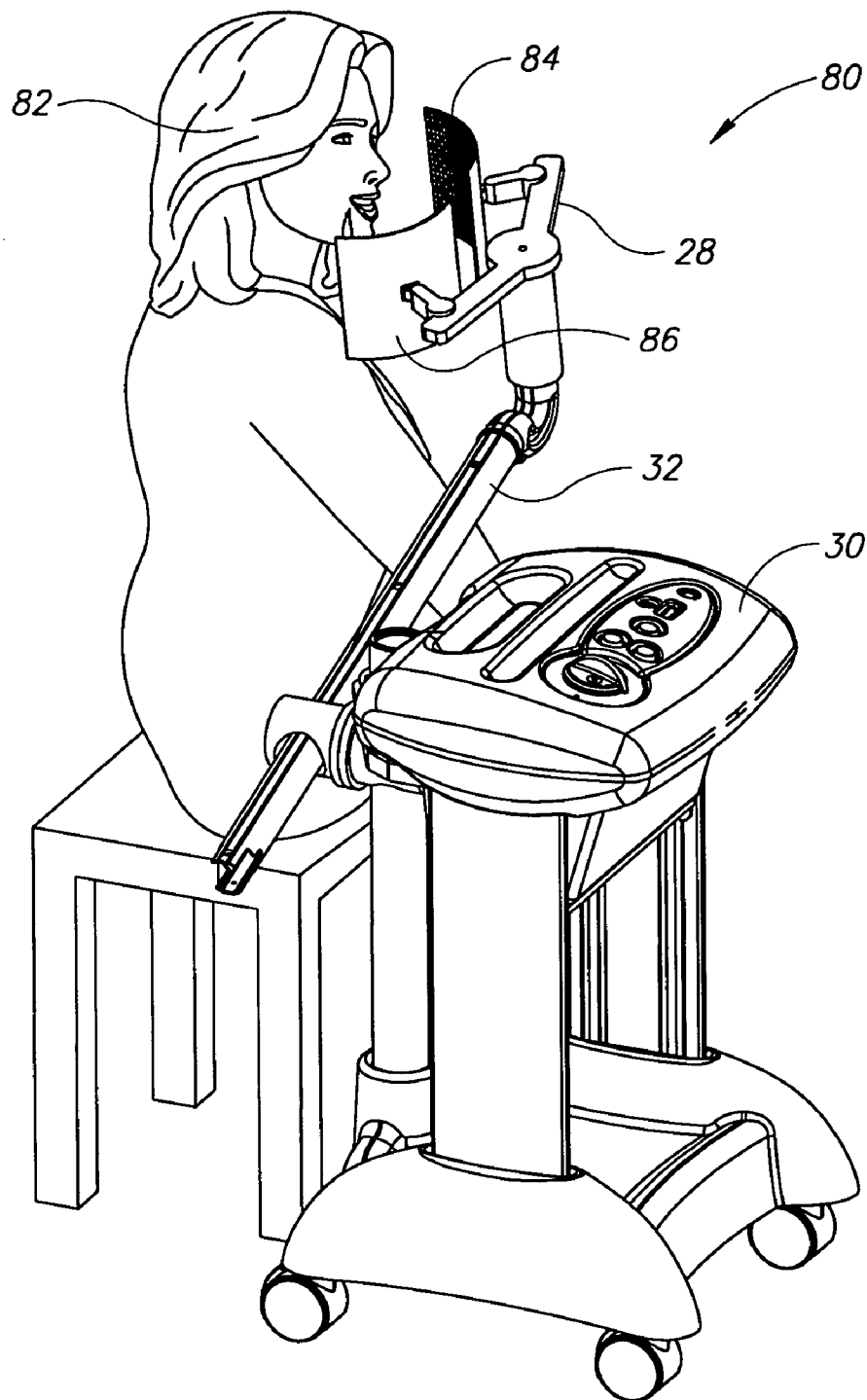


FIG.5

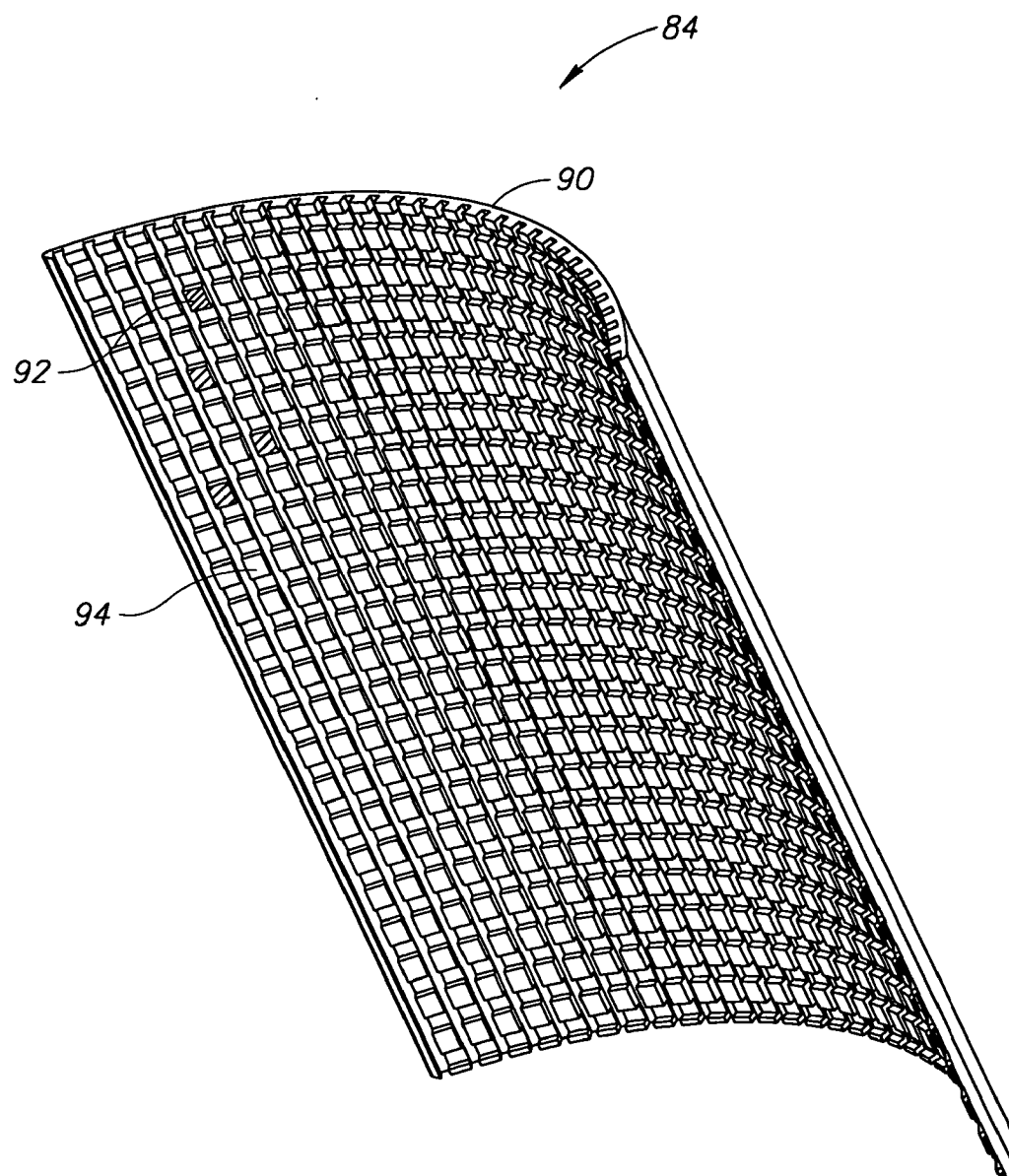


FIG. 6

## PHOTOTHERAPEUTIC TREATMENT OF SKIN CONDITIONS

### CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation-in-part application of U.S. patent application Ser. No. 10/366,452, filed Feb. 13, 2003, and of U.S. patent application Ser. No. 10/098,592, filed Mar. 18, 2002. These applications are continuations-in-part of U.S. patent application Ser. No. 10/007,702, filed Dec. 10, 2001, which is a continuation-in-part of U.S. patent application Ser. No. 09/756,130, filed Jan. 9, 2001, which is a continuation-in-part of PCT Patent Application No. PCT/IL99/00374, filed Jul. 7, 1999. The disclosures of all these related applications are incorporated herein by reference.

### FIELD OF THE INVENTION

[0002] The present invention relates generally to skin phototherapy, and specifically to treatment of skin inflammations.

### BACKGROUND OF THE INVENTION

[0003] It is known in the art to use violet/blue light, in the spectral range between 405 and 450 nm, for treatment of skin conditions, such as acne vulgaris. The *P. Acnes* bacteria, which are the cause of acne skin lesions, produce porphyrins, which become toxic in the presence of light in this range. This method of treating acne is described in the above-referenced related applications, as well as in an article by Elman et al., entitled "The Effective Treatment of Acne Vulgaris by a High-Intensity, Narrow Band 405-420 nm Light Source," *Journal of Cosmetic and Laser Therapy* 5 (2003), pages 111-116.

[0004] U.S. Pat. No. 6,183,500, to Kohler, whose disclosure is incorporated herein by reference, describes a process and apparatus for the cosmetic treatment of acne vulgaris by irradiating the affected skin areas with light characterized by a combination of two emission spectra, one in a blue region and the other in a red region. The light is generated by low-pressure mercury discharge having two different spectra, one in the blue range from 400 to 450 nm, and the other in the red range from 580 to 659 nm.

[0005] The above-mentioned U.S. patent application Ser. No. 10/098,592 (published as U.S. Ser. No. 2002/0,173,833) describes the use of violet/blue radiation in the range of 400-450 nm to reduce the level of extra-cellular pro-inflammatory cytokines. The inventors indicate that this cytokine-reducing effect may be useful not only in anti-inflammatory treatment of acne sites, but also in treating other inflammatory skin conditions, such as skin ulcers and cutaneous autoimmune diseases.

[0006] Shnitkind et al. describe a study into the therapeutic effect of blue light in a poster paper entitled, "Anti-Inflammatory Properties of Narrow Band Blue Light," presented at the Annual Meeting of the US Society of Investigative Dermatology (May, 2002), which is incorporated herein by reference. This study was conducted to investigate the effect of narrow band blue light on the inflammatory process in the presence and absence of cytokines and UVB radiation. (The release of cytokines from

cutaneous cells is known to be important in the initiation and development of many inflammatory skin disorders.) The study showed that high-intensity, narrow band blue light has anti-inflammatory effect on keratinocytes by suppressing the cytokine-induced upregulation of IL-1 $\alpha$ .

[0007] Infrared (IR) radiation sources, operating at around 890 nm, have been used to promote healing of different types of skin wounds. This use of IR radiation is described, for example, by Horwitz et al., in "Augmentation of Wound Healing Using Monochromatic Infrared Energy," *Advances in Wound Care* (January/February 1999), pages 35-40, which is incorporated herein by reference. The authors applied monochromatic IR radiation at 890 nm to recalcitrant dermal lesions, including venous ulcers, diabetic ulcers and a wound related to scleroderma. They note that the rate and quality of healing following IR irradiation may be related to local increases in nitric oxide (NO) concentration, which have been demonstrated to correlate with vasodilatory and anabolic responses.

### SUMMARY OF THE INVENTION

[0008] Embodiments of the present invention provide improved methods and apparatus for treatment of inflammatory skin conditions, by combined irradiation with violet/blue and infrared (IR) radiation. The present invention stems from the realization that swelling due to skin inflammations, such as ulcers, post-resurfacing and post-operative conditions, aging and other lesions, tends to reduce blood and/or lymphatic circulation in the vicinity of the inflammation. The impaired circulation, in turn, exacerbates the inflammatory condition and retards healing. The effectiveness of violet/blue light by itself in reducing levels of pro-inflammatory agents may thus be limited by inadequate circulation in the inflamed area. The addition of IR irradiation, as taught by the present invention, overcomes this limitation by enhancing circulation during the anti-inflammatory violet/blue light treatment.

[0009] There is therefore provided, in accordance with an embodiment of the present invention, a method for treating an inflammation in skin of a patient, including irradiating the skin with infrared (IR) radiation in a first wavelength band and with violet/blue light in a second wavelength band.

[0010] Typically, the first wavelength band is selected to cause dilation of blood vessels in a vicinity of the inflammation, and irradiating the skin with the violet/blue light includes applying the violet/blue light to the inflammation while the blood vessels are dilated. Irradiating the skin may include irradiating the skin with the IR radiation and the violet/blue light simultaneously or sequentially.

[0011] In disclosed embodiments, the first wavelength band is in the range 800-980 nm, and the second wavelength band is in the range 405-450 nm. Typically, the first wavelength band is in the range 850-900 nm. In some embodiments, irradiating the skin includes irradiating the skin with at least 4 mW/cm<sup>2</sup> of the violet/blue light and at least 1 mW/cm<sup>2</sup> of the IR radiation, and typically with at least 20 mW/cm<sup>2</sup> of the violet/blue light and at least 8 mW/cm<sup>2</sup> of the IR radiation.

[0012] Typically, irradiating the skin includes irradiating the skin continuously for at least one minute. Alternatively, irradiating the skin includes irradiating the skin with pulsed radiation.

[0013] In a disclosed embodiment, irradiating the skin includes irradiating the skin using a single radiation source, which emits both the violet/blue light and the IR radiation, wherein the single radiation source includes a discharge lamp containing metal halide materials selected to radiate in the first and second wavelength bands. In another embodiment, irradiating the skin includes irradiating the skin using an array of solid-state radiation sources.

[0014] Typically, irradiating the skin includes treating a condition selected from a group of conditions consisting of skin aging, ulcers, edema, rosacea, chronic cutaneous inflammatory conditions and acne. A medicated cream may be applied to the skin in conjunction with irradiating the skin.

[0015] In one embodiment, irradiating the skin includes irradiating the skin using a radiation source that is in contact with the skin.

[0016] There is also provided, in accordance with an embodiment of the present invention, apparatus for treating an inflammation in skin of a patient, including at least one radiation source, which is adapted to irradiate the skin with infrared (IR) radiation in a first wavelength band and with violet/blue light in a second wavelength band.

[0017] In a disclosed embodiment, the at least one radiation source includes a single radiation source, which emits both the violet/blue light and the IR radiation. Typically, the single radiation source includes a discharge lamp containing metal halide materials selected to radiate in the first and second wavelength bands, wherein the metal halide materials may include gallium and cesium halides.

[0018] In another embodiment, the at least one radiation source includes a plurality of radiation sources, and the apparatus includes an adjustable bracket, on which the radiation sources are mounted, so as to allow a relative angular orientation of the radiation sources to be adjusted. Typically, the bracket is adjustable so as to direct at least two of the radiation sources to irradiate a common region of the skin, and so as to direct the at least two of the radiation sources to irradiate different regions of the skin.

[0019] Additionally or alternatively, the plurality of radiation sources includes an array of solid-state radiation sources, including first radiation sources, which emit the radiation in the first wavelength band, and second radiation sources, which emit the radiation in the second wavelength band. Typically, the solid-state radiation sources are selected from a group of sources consisting of light-emitting diodes (LEDs) and laser diodes. In a disclosed embodiment, the first radiation sources include at least one of GaAs and GaAlAs diodes, while the second radiation sources include at least one of GaN, SiN, InSiN, and SiC diodes.

[0020] Typically, the at least one radiation source includes a spectral filter, for blocking ultraviolet (UV) radiation generated by the at least one radiation source. Additionally or alternatively, the at least one radiation source includes a forced air cooling device for cooling the skin that is irradiated by the at least one radiation source. Further additionally or alternatively, the at least one radiation source is adapted to be placed in contact with the skin.

[0021] There is additionally provided, in accordance with an embodiment of the present invention, a lamp, including:

[0022] an envelope, which is at least partly transparent;

[0023] an excitation circuit, which is coupled to the lamp so as to excite an electrical discharge within the envelope; and

[0024] a gas and metal mixture, contained within the envelope, which is adapted, upon excitation of the electrical discharge by the excitation circuit, to emit both narrowband infrared (IR) radiation in a first wavelength band and narrowband violet/blue light in a second wavelength band.

[0025] Typically, the first wavelength band is in the range 800-980 nm, and the second wavelength band is in the range 405-450 nm. In a disclosed embodiment, the first wavelength band is in the range 850-910 nm.

[0026] In some embodiments, the gas mixture includes metal halide materials selected to radiate in the first and second wavelength bands. Typically, the metal halide materials include gallium and cesium halides. Additionally or alternatively, the gas mixture further includes mercury. Further additionally or alternatively the excitation circuit includes electrodes, which are spaced a predetermined distance apart within the envelope.

[0027] The present invention will be more fully understood from the following detailed description of the embodiments thereof, taken together with the drawings in which:

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0028] FIG. 1 is a schematic, pictorial illustration of a system for phototherapy, in accordance with an embodiment of the present invention;

[0029] FIG. 2 is a schematic, sectional view of a radiator for use in phototherapy, in accordance with an embodiment of the present invention;

[0030] FIG. 3 is a schematic side view of a discharge lamp, in accordance with an embodiment of the present invention;

[0031] FIG. 4 is a schematic spectral diagram showing an emission spectrum of a discharge lamp, in accordance with an embodiment of the present invention;

[0032] FIG. 5 is a schematic, pictorial illustration of a system for phototherapy, in accordance with an alternative embodiment of the present invention; and

[0033] FIG. 6 is a schematic front view of a radiator for use in phototherapy, in accordance with an alternative embodiment of the present invention.

#### DETAILED DESCRIPTION OF EMBODIMENTS

[0034] FIG. 1 is a schematic, pictorial illustration of a system 20 for phototherapy, in accordance with an embodiment of the present invention. System 20 is used to treat inflammations of the skin, such as an ulcer on a leg 22 of a patient. The system in this embodiment comprises two radiators 24 and 26, each comprising a lamp 23, a lamp holder 25, a reflector 27 and an optical filter 29, which are described in greater detail herein below. Each radiator may



be enclosed in a metal or a plastic housing, not shown here. Typically, both of radiators **24** and **26** emit both violet/blue and IR radiation. Alternatively, one or the radiators may emit violet/blue radiation, while the other emits IR radiation. Further alternatively, system **20** may comprise only a single radiator (emitting both violet/blue and IR) or three or more radiators.

**[0035]** Radiators **24** and **26** are mounted on an adjustable bracket **28**, which allows the positions and angular orientations of the radiators to be adjusted. Thus, bracket **28** may be set so that both radiators are aimed toward the same region of the patient's skin, as shown in **FIG. 1**. Alternatively, bracket **28** may be adjusted so that each radiator irradiates a different region, so that a large area of the skin can be treated at one time. Bracket **28** and radiators **24** and **26** are coupled to a control and power supply console unit **30** by an adjustable arm **32** and a joint module **34**. The arm and joint module together permit flexible 3D positioning of the radiators, so as to enable treatment of all body parts of both seated and reclining patients. The console **30** comprises a power supply module for operating the radiators and user controls **31** for setting treatment parameters, such as the treatment duration and power level of irradiation.

**[0036]** Typically, radiators **24** and **26** emit violet/blue light in the range of 405-450 nm, for anti-inflammatory effect, and IR radiation in the range of 800-980 nm for vascular dilation. Preferably, radiators **24** and **26** are narrowband sources, meaning that most of the radiation emitted by the radiators falls within bands no more than 100 nm wide in the violet/blue and IR spectral ranges. Most preferably, most of the IR radiation is emitted in a band between 850 and 910 nm. Absorption of radiation in this wavelength range by hemoglobin in the blood is believed to cause the hemoglobin to release NO (nitric oxide), which is then absorbed in the blood vessel walls, causing them to dilate. The lifetime of NO in the blood is approximately 10 sec. Therefore, the effect of the IR irradiation by radiators **24** and **26** is local and temporary. To take advantage of this effect, the radiators may either emit the violet/blue and IR radiation simultaneously, or they may emit the IR and violet/blue radiation in sufficiently rapid succession so that the violet/blue radiation is applied while the blood vessels are dilated.

**[0037]** For effective treatment of skin inflammation, the violet/blue light intensity on the patient's skin should typically be at least 4 mW/cm<sup>2</sup>, while the IR intensity is at least 1 mW/cm<sup>2</sup>. For more rapid treatment, the violet/blue light intensity may be 20 mW/cm<sup>2</sup> or greater, while the IR intensity is 9 mW/cm<sup>2</sup> or greater. Typically, the radiators are set to operate continuously for periods of one minute or more. Alternatively, the radiators may operate in pulsed modes, with accumulated pulse intensities of at least 200 mJ/cm<sup>2</sup> in the violet/blue range and 60 mJ/cm<sup>2</sup> in the IR. The treatment area is determined by the area of the inflammation, and typically varies between about 5×5 and 30×30 cm. The total radiation dosage depends on the type of condition and its extent. For healing skin ulcers, for example, a regimen of daily treatments of 30 minutes each over a period of two to three weeks, with a dose per treatment of 30 J/cm<sup>2</sup>, is believed to be effective.

**[0038]** **FIG. 2** is a schematic, sectional illustration showing details of radiator **24**, in accordance with an embodiment of the present invention. (The same design may be used for

radiator **26**.) The radiator comprises a lamp **40**, typically a gas discharge lamp, which emits both violet/blue and IR radiation, as described further hereinbelow. A reflector **42** collects and reflects the radiated energy from the lamp **40** toward the patient's skin. The reflector may have a parabolic cross-section, for example, or it may be specially designed with multiple curved reflective facets. A filter **44** blocks ultraviolet (UV) radiation output below about 400 nm. Filter **44** may comprise, for example, a GG400 UV-blocking filter, approximately 4 to 6 mm thick, produced by Schott Optics Division (Mainz, Germany). One or more fans **46** or other types of ventilators or blowers may be mounted on radiator **24** in order to cool the treated area of the skin.

**[0039]** **FIG. 3** is a schematic side view of lamp **40**, in accordance with an embodiment of the present invention. The lamp comprises a transparent quartz tube **50**, about 8-14 mm in diameter, containing at least two electrodes **52** separated by a gap of about 30 to 40 mm. The electrodes are coupled to terminals **54** so as to define an excitation circuit, which is connected to the power supply that drives the lamp. Typically, the excitation circuit is driven by an electrical current between 3.0 and 3.6 A, at 115 VAC. Alternatively, both higher- and lower-power AC and DC voltage-driven lamps and other types of discharge excitation circuits, as are known in the art, may be used in system **20**.

**[0040]** Lamp **40** is filled with a novel combination of gases and metals in order to provide simultaneous violet/blue and IR narrowband emission. Tube **50** is first evacuated to a high vacuum in order to eliminate all atmospheric gases and humidity. The tube is then filled with about 40 mg of pure mercury, about 0.2 mg of a gallium halide, and about 0.1 to 0.5 mg of a cesium halide. The gallium and cesium halides typically comprise bromides or iodides or a combination of the two. The gallium halide causes the lamp to emit strongly on lines in the 405-450 nm range, while the cesium halide causes IR emission on lines in the 850-910 nm range. Depending on the amount of cesium halide in the tube, the IR emission accounts for between 10% and 50% of the total optical power output of the lamp.

**[0041]** **FIG. 4** is a schematic typical spectral diagram showing an output spectrum **70** of lamp **40**, in accordance with an embodiment of the present invention. Strong violet/blue lines **72** are seen in the 405-450 nm range due to the gallium in the lamp, along with IR lines **74** at 852nm and 894 nm due to the cesium. A lamp produced to the above specifications by Lamptech Ltd. (Ashkelon, Israel) gave optical power density on the skin, when installed in system **20**, over 30 mW/cm<sup>2</sup> in the violet/blue and IR bands together.

**[0042]** **FIG. 5** is a schematic, pictorial illustration of a system **80** for phototherapy, in accordance with another embodiment of the present invention. System **80** in this embodiment shown in another treatment application—treating skin inflammation on a face **82** of a patient—but is otherwise functionally similar to system **20**. Radiators **84** and **86** in this case comprise panels with multiple miniature solid-state emitters, such as light-emitting diodes (LEDs), mounted on the panels. The emitters may be organized in a single-dimensional or a two-dimensional diode matrix array. As in system **20**, both of radiators **84** and **86** typically emit

radiation in both the violet/blue and near IR bands. Alternatively, one of the radiators may emit violet/blue radiation, while the other emits IR, either simultaneously or in succession. Greater or smaller numbers of radiators may be used. As a further alternative, one or the radiators may comprise an array of miniature emitters, and the other may comprise a gas discharge lamp, as described above, or a single radiator may comprise both a matrix of miniature emitters and a gas discharge lamp.

[0043] FIG. 6 is a schematic front view of radiator 84, in accordance with an embodiment of the present invention. In this embodiment, the radiator comprises a panel 90, preferably curved, on which a two-dimensional matrix array of high-intensity solid-state radiation sources 92 and 94 are mounted. Typically, sources 92 comprise, GaN, SiN, InSiN or SiC (silicon carbide) based LEDs, or other diode lasers or LEDs of other types that emit violet/blue light. Sources 94 comprise IR-emitting LEDs, such as GaAlAs diodes or GaAs diodes, or laser diodes. The power density requirements of radiator 84 are similar to those of radiator 24, as described above. Suitable violet/blue LEDs are produced, for example, by Nichia Chemical Industries Ltd. (Tokyo, Japan), LumiLED (San Jose, Calif.) and HP/Agilent (PALO ALTO, Calif.). High-intensity IR LEDs are made by many manufacturers, such as LumiLED, Kingbright (Taipei Hsien, Taiwan) and Fairchild Semiconductor (Irvine, Tex.). The LEDs in radiator 84 may be wired and controlled separately or in matrix groups.

[0044] Although in the embodiment shown in FIG. 5, radiators 84 and 86 are spaced away from the skin, in other embodiments panel 90 may have the form of a mask, which contacts the skin. The mask might also include thermoelectric cooler elements (TEC) to cool the irradiated skin. The mask may be placed against the skin in combination with a suitable cream or other medication, such as glycolic acid or other antioxidants or peeling creams. Alternatively, the mask may be used without cream or medication. Systems 20 and 80 (and other implementations of the present invention) may be used in treating a wide range of inflammatory skin conditions, including:

[0045] Ulcers (as detailed above).

[0046] Skin aging, particular in heavy smokers, who tend to have yellowish skin due to reduced blood flow to the skin. These patients' skin suffers from both insufficient capillary supply and chronic sub-clinical inflammation, both related to the effects of smoking. Chronic exposure to heavily polluted air or excessive sunlight may have similar effects. The skin in these cases may be treated by violet/blue and IR radiation, possibly in combination with fruit acids, such as glycolic acid, and other creams. A course of five to fifteen treatments is expected to visibly improve the skin condition, and can be followed subsequently by periodic maintenance treatments.

[0047] Post-surgical edema and redness of the skin. Liposuction, for example, may be followed by marked edema and changes of skin color, which may be relieved by a small number of treatments with

violet/blue and IR radiation at high intensity (over 20 mW/cm<sup>2</sup> violet/blue and 8 mW/cm<sup>2</sup> IR radiation).

[0048] Rosacea, grades II and III.

[0049] Chronic cutaneous inflammatory conditions, such as atopic dermatitis.

[0050] Acne-related inflammations.

[0051] Other applications of violet/blue and IR radiation in reducing inflammation will be apparent to those skilled in the art. Although the embodiments described above are based on certain particular treatment systems and types of radiation sources, the principles of the present invention may similarly be applied in other system configurations and using other suitable radiation sources, as will be apparent to those skilled in the art.

[0052] It will thus be appreciated that the embodiments described above are cited by way of example, and that the present invention is not limited to what has been particularly shown and described hereinabove. Rather, the scope of the present invention includes both combinations and subcombinations of the various features described hereinabove, as well as variations and modifications thereof which would occur to persons skilled in the art upon reading the foregoing description and which are not disclosed in the prior art.

1. A method for treating an inflammation in skin of a patient, comprising irradiating the skin with infrared (IR) radiation in a first wavelength band and with violet/blue light in a second wavelength band.

2. The method according to claim 1, wherein the first wavelength band is selected to cause dilation of blood vessels in a vicinity of the inflammation, and wherein irradiating the skin with the violet/blue light comprises applying the violet/blue light to the inflammation while the blood vessels are dilated.

3. The method according to claim 2, wherein irradiating the skin comprises irradiating the skin with the IR radiation and the violet/blue light simultaneously.

4. The method according to claim 2, wherein irradiating the skin comprises irradiating the skin with the IR radiation and the violet/blue light sequentially.

5. The method according to claim 1, wherein the first wavelength band is in the range 800-980 nm, and the second wavelength band is in the range 405-450 nm.

6. The method according to claim 5, wherein the first wavelength band is in the range 850-900 nm.

7. The method according to claim 1, wherein irradiating the skin comprises irradiating the skin with at least 4 mW/cm<sup>2</sup> of the violet/blue light and at least 1 mW/cm<sup>2</sup> of the IR radiation.

8. The method according to claim 7, wherein irradiating the skin comprises irradiating the skin with at least 20 mW/cm<sup>2</sup> of the violet/blue light and at least 8 mW/cm<sup>2</sup> of the IR radiation.

9. The method according to claim 1, wherein irradiating the skin comprises irradiating the skin continuously for at least one minute.

10. The method according to claim 1, wherein irradiating the skin comprises irradiating the skin with pulsed radiation.

11. The method according to claim 1, wherein irradiating the skin comprises irradiating the skin using a single radiation source, which emits both the violet/blue light and the IR radiation.

12. The method according to claim 11, wherein the single radiation source comprises a discharge lamp containing metal halide materials selected to radiate in the first and second wavelength bands.

13. The method according to claim 1, wherein irradiating the skin comprises irradiating the skin using an array of solid-state radiation sources.

14. The method according to claim 1, wherein irradiating the skin comprises treating a condition selected from a group of conditions consisting of skin aging, ulcers, edema, rosacea, chronic cutaneous inflammatory conditions and acne.

15. The method according to claim 14, and comprising applying a medicated cream to the skin in conjunction with irradiating the skin.

16. The method according to claim 1, wherein irradiating the skin comprises irradiating the skin using a radiation source that is in contact with the skin.

17. Apparatus for treating an inflammation in skin of a patient, comprising at least one radiation source, which is adapted to irradiate the skin with infrared (IR) radiation in a first wavelength band and with violet/blue light in a second wavelength band.

18. The apparatus according to claim 17, wherein the first wavelength band is selected to cause dilation of blood vessels in a vicinity of the inflammation, and wherein irradiating the skin with the violet/blue light comprises applying the violet/blue light to the inflammation while the blood vessels are dilated.

19. The apparatus according to claim 18, wherein the at least one radiation source is adapted to irradiate the skin with the IR radiation and the violet/blue light simultaneously.

20. The apparatus according to claim 18, wherein the at least one radiation source is adapted to irradiate the skin comprises irradiating the skin with the IR radiation and the violet/blue light sequentially.

21. The apparatus according to claim 17, wherein the first wavelength band is in the range 800-980 nm, and the second wavelength band is in the range 405-450 nm.

22. The apparatus according to claim 21, wherein the first wavelength band is in the range 850-910 nm.

23. The apparatus according to claim 17, wherein the at least one radiation source is adapted to irradiate the skin with at least  $4 \text{ mW/cm}^2$  of the violet/blue light and at least  $1 \text{ mW/cm}^2$  of the IR radiation.

24. The apparatus according to claim 23, wherein the at least one radiation source is adapted to irradiate the skin with at least  $20 \text{ mW/cm}^2$  of the violet/blue light and at least  $9 \text{ mW/cm}^2$  of the IR radiation.

25. The apparatus according to claim 17, wherein the at least one radiation source is adapted to irradiate the skin continuously for at least one minute.

26. The apparatus according to claim 17, wherein the at least one radiation source is adapted to irradiate the skin with pulsed radiation.

27. The apparatus according to claim 17, wherein the at least one radiation source comprises a single radiation source, which emits both the violet/blue light and the IR radiation.

28. The apparatus according to claim 27, wherein the single radiation source comprises a discharge lamp containing metal halide materials selected to radiate in the first and second wavelength bands.

29. The apparatus according to claim 28, wherein the metal halide materials comprise gallium and cesium halides.

30. The apparatus according to claim 17, wherein the at least one radiation source comprises a plurality of radiation sources.

31. The apparatus according to claim 30, and comprising an adjustable bracket, on which the radiation sources are mounted, so as to allow a relative angular orientation of the radiation sources to be adjusted.

32. The apparatus according to claim 31, wherein the bracket is adjustable so as to direct at least two of the radiation sources to irradiate a common region of the skin, and so as to direct the at least two of the radiation sources to irradiate different regions of the skin.

33. The apparatus according to claim 30, wherein the plurality of radiation sources comprises an array of solid-state radiation sources, comprising first radiation sources, which emit the radiation in the first wavelength band, and second radiation sources, which emit the radiation in the second wavelength band.

34. The apparatus according to claim 33, wherein the solid-state radiation sources are selected from a group of sources consisting of light-emitting diodes (LEDs) and laser diodes.

35. The apparatus according to claim 34, wherein the first radiation sources comprise at least one of GaAs and GaAlAs diodes, while the second radiation sources comprises at least one of GaN, SiN, InSiN, and SiC diodes.

36. The apparatus according to claim 17, wherein the at least one radiation source comprises a spectral filter, for blocking ultraviolet (UV) radiation generated by the at least one radiation source.

37. The apparatus according to claim 17, wherein the at least one radiation source comprises a forced air cooling device for cooling the skin that is irradiated by the at least one radiation source.

38. The apparatus according to claim 17, wherein the at least one radiation source is adapted to be placed in contact with the skin.

39. A lamp, comprising:

an envelope, which is at least partly transparent;

an excitation circuit, which is coupled to the lamp so as to excite an electrical discharge within the envelope; and

a gas and metal mixture, contained within the envelope, which is adapted, upon excitation of the electrical discharge by the excitation circuit, to emit both narrowband infrared (IR) radiation in a first wavelength band and narrowband violet/blue light in a second wavelength band.

40. The lamp according to claim 39, wherein the first wavelength band is in the range 800-980 nm, and the second wavelength band is in the range 405-450 nm.

41. The lamp according to claim 40, wherein the first wavelength band is in the range 850-910 nm.

42. The lamp according to claim 39, wherein the gas mixture comprises metal halide materials selected to radiate in the first and second wavelength bands.

43. The lamp according to claim 42, wherein the metal halide materials comprise gallium and cesium halides.

44. The lamp according to claim 39, wherein the gas mixture further comprises mercury.

45. The lamp according to claim 38, wherein the excitation circuit comprises electrodes, which are spaced a predetermined distance apart within the envelope.