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DescriptionThermal Skin Treatment Device

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The present invention concerns a thermal skin treatment apparatus. The like skin treatment devices are used for cosmetic and/or therapeutic treatment of human skin and generally include a cold side and a warm side. By alternating cold and heat treatment of the skin, possibly repeated in the course of one treatment session, the desired therapeutic/cosmetic effect may be achieved.

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In order to obtain the desired working temperatures of the warm side (heat section) and of the cold side (cold section), a heating and cooling means capable of producing the necessary thermal gradient between cold side and warm side is provided.

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Starting out from such an apparatus configuration, the invention is based on the object of furnishing a thermal skin treatment device having improved temperature control properties.

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This object is achieved by the features specified in claim 1.

Advantageous developments of the invention are described in the subclaims.

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Thus in the skin treatment device according to the present invention, an additional cooling element for accommodating the heat section of the hand-held device is provided besides the hand-held device. The user thus has the possibility of placing the warm side of the

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hand-held device on the cooling element, whereby the temperature increase of the warm side can be decelerated during the heat-up phase, or the warm side may even be cooled during operation if this is desired.

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The invention relates to the insight that heating the heat section to its desired target temperature can take place more rapidly than cooling the cold section to its target temperature after the skin treatment device has been switched on. Consequently there is a danger of the heat section already having heated to above the heat section target temperature of e.g. 39°C once the cold section has reached its target temperature of e.g. 4°C to 5°C, as a result of which the optimum therapeutic/cosmetic effect cannot be attained any more or even unpleasantly intense heat sensations may be caused. If, however, in a preferred development of the invention, a temperature control means comprising a temperature sensor is provided for the heat section, and heating means as well as cooling means are switched off once the heat section reaches its target temperature, then the cold section cannot be cooled to the desired low temperature of e.g. 4°C to 5°C any more. The temperature difference existing between cold section and heat section will in this case not conform to the expected difference, whereby the success of the cosmetic or therapeutic treatment may also be reduced.

The invention now makes it possible in a simple manner to place the heat section of the hand-held device on the cooling element during the start-up phase after the device was switched on, i.e. to place the warm side of the hand-held device on the cooling element during the heat-up phase. As a result the temperature increase of the heat section is distinctly

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decelerated as the heat energy generated by the heating means now serves not only to heat up the heat section but also to warm the physically contacted cooling element. Owing to this decelerated heat-up, a correspondingly longer time interval is taken until the heat section reaches its target temperature and until heating means and cooling means are switched off. Owing to this prolonged heat-up interval, the cooling interval for the cold section is prolonged correspondingly, such that the cold section may cool to a correspondingly lower value of preferably around approx. 4°C to 5°C.

The embodiment according to the present invention therefore makes it possible to jointly and simultaneously control the heating and cooling means by means of a simple control to thereby clearly reduce the expense in terms of control technology which would otherwise be required for separate control of the cooling means. Moreover it is now also possible to place the heat section of the hand-held device on the cooling element not only during the initial heat-up and cooling phase after the hand-held device has been switched on, but also in the course of a treatment to thereby draw thermal energy from the heat section. This is advantageous whenever the operation subsequently is to be continued at a somewhat reduced heat section temperature, and is sensible particularly if the temperature of the cold section is to be further reduced again. As the heat section is cooled down owing to the withdrawal of thermal energy, the heating and cooling means are in turn again activated continuously, resulting in a clear temperature drop of the cold section.

The cooling element itself may be provided with a temperature control means for generating a defined

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cooling element temperature, but preferably it is merely designed as a simple, solid cooling element lacking any control components to thus have a very simple design.

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The cooling element preferably comprises a depression for receiving the externally accessible heat section, whereby defined positioning of the heat section is obtained. The heat section being accommodated in the depression moreover has the result that heat dissipation can take place via not only the bottom region but also the side walls of the depression, such that thermal energy can efficiently and rapidly cross over into the cooling element.

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The depression of the cooling element may advantageously comprise an inclined bottom surface. As a result, the hand-held device having its heat section inserted into the depression is subject to a gravitational kinematic component which causes the heat section to automatically slide into a predetermined target position enabling optimum heat transfer. Hereby the extent of heat transition from the heat section to the cooling element is always defined even for the case where the hand-held device is initially inserted into the depression at slightly different positions.

The heat section or a wall portion adjacent thereto advantageously comprises a step at least on one side, with the depression comprising at its edge a contact shoulder. Step and contact shoulder are shaped such that the heat section matingly contacts the shoulder after its insertion into the depression. This results in the formation of a stop which creates a permanently defined position of the heat section of the gripping

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handle inside the depression. Preferably the shoulder originates at the lowest point of the inclined bottom surface of the depression, such that the stop may concurrently serve to limit a possible sliding movement of the heat section along the inclined bottom surfaces. Moreover, an additionally defined heat transfer surface is formed via the form-fit contact between heat section and depression in the area of step and contact shoulder to contribute to efficient heat transfer from the heat section to the cooling element.

An external surface of the heat section may furthermore advantageously extend at an inclination relative to the center plane of the hand-held device. This is particularly the one external surface facing the bottom surface of the depression when the hand-held device is placed on the cooling element. Inasmuch as the bottom surface of the depression as well as the contact surface of the heat section thus each have an inclined configuration, the hand-held device is given an increased tendency to slide towards the target position, thus ensuring that the desired target position can always be assumed in the cooling element. Another resulting advantage resides in the fact that the gripping handle extending at an inclination relative to this contact surface of the heat section can be at a greater distance from the support surface on which the cooling element is placed to thereby eliminate the danger of the gripping handle contacting this support surface, which would cause the heat section to be at least partly lifted from the bottom surface of the depression.

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A particularly efficient heat transfer can be achieved when the respective shapes of depression and outer contour of the heat section are adapted to match.

5 A recess adapted to the gripping handle of the hand-held device can advantageously be provided in the cooling element, wherein the gripping handle comes to lie when the heat section is inserted in the depression. This results in effective support for the gripping handle and thus for the entire hand-held device.

The heating and cooling means are advantageously formed by a single element, namely a Peltier element having its heat-evolving side and its heat-absorbing side connected to the heat section and to the cooling section, respectively. Utilisation of a Peltier element makes it possible to obtain an excellent energy balance in the sense that the heat drawn from the cold section may contribute to heating the heat section, allowing for a comparatively small energy requirement of heating and cooling means. The Peltier element may furthermore be given a comparatively flat shape whereby very little space is required for heating and cooling means, and cold and warm sides of the hand-held device may furthermore be located in directly opposing relation, which is advantageous for manipulating the apparatus during treatment.

The Peltier element can furthermore be controlled in a very simple manner as merely one power supply line is required for this purpose.

In a preferred manner, a temperature control means comprising a temperature sensor is provided to control switching ON/OFF of the heating and cooling means.

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Herein preferably a single temperature sensor detecting the temperature of the heat section is sufficient. The temperature control means switches on the heating and/or cooling means, preferably the Peltier element, until the desired target temperature of the heat section is attained which preferably lies distinctly lies above skin temperature and may particularly be approximately 39°C. As soon as this target temperature has been reached, the Peltier element is switched off and only switched on again when the temperature of the heat section has dropped to another threshold value, e.g. 38°C. Hereby the temperature of the heat section may be kept comparatively constant while easily controllable. In the case of a Peltier element, its activation at the same time activates its cold side, therefore the cold section is also cooled cyclically and may thus be kept substantially at its target temperature which preferably may be situated at approximately 5°C.

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The cooling element may advantageously have an outer contour substantially in the shape of a sphere segment in order to have an esthetically appealing design on the one hand and a comparately large mass for effectively absorbing the heat evolved by the heat section on the other hand.

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The cooling element may furthermore comprise an elongated projection which in particular projects outwardly from the outer contour shaped like a sphere segment and extends underneath the gripping handle of the hand-held device when the latter is inserted into the depression. The elongated projection thus provides a visual indication of the target position for the gripping handle and at the same time protects the

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gripping handle and thus the hand-held device at least from below against inadvertent impact and displacement of the hand-held device while it is placed on the cooling element.

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The cooling element may advantageously consist of zinc diecast and thus possess good heat absorbing capacity together with high stability. Advantageously, the cooling element may furthermore consist of ceramic material which is equally characterised by a high heat absorbing capacity.

The cooling element may furthermore be provided with an electric connection to ground such that the cooling element is reliably ensured to be current-less at any time. The hand-held device in a preferred embodiment is furthermore designed as a low-voltage apparatus to make sure that only voltages altogether harmless to the touch may occur in the hand-held device. To nevertheless enable operation of the hand-held device with a customary wall outlet, preferably a power transformer supplying electric power to the hand-held device is provided.

Further details of the invention will be apparent from the following description of an embodiment making reference to the accompanying drawings, wherein:

Fig. 1 is a plan view of an embodiment of a skin treatment device according to the present invention comprising hand-held device and cooling element;

Fig. 2 shows a plan view, a sectional view and lateral views of the cooling element shown in Fig. 1;

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Fig. 3 shows a plan view and a lateral view of the hand-held device shown in Fig. 1; and

Fig. 4 shows details of the hand-held device shown in Figs. 1 and 3.

Fig. 1 shows a plan view of an embodiment of the thermal skin treatment apparatus. The skin treatment device comprises a hand-held device 1 and a cooling element 2. In the representation of Fig. 1, the hand-held device 1 is shown while placed on the cooling element 2, i.e. it is in the position it occupies during the initial heat-up and cooling phase and possibly also during treatment breaks within the treatment cycle.

In Fig. 2 the cooling element 2 is represented in more detail and shown in plan view without the hand-held device 1 as well as in a sectional view along the longitudinal center plane partly superimposed on the plan view. The cooling element 2 has a symmetrical structure with respect to the longitudinal center plane and includes a main portion 3 with an outer contour substantially having the shape of a sphere segment and an elongated portion (elongated projection) 4 projecting from the spherical outer contour. The portion 3 having the shape of a sphere segment is encompassed by a base 5 which also forms the elongated projection 4.

Referring to Fig. 2, a depression 6 having straight lateral surfaces 7 which extend in a vertical upward direction and a bottom surface 8 is formed centrally in the upper side of the sphere segment-shaped portion 3. As is indicated at 9, the bottom surface has an arc-shaped curvature which is adapted to the outer contour

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of the heat section of hand-held device 1, which shall be described in more detail below.

The sectional view at the bottom of Fig. 2 shows
5 that the bottom surface 8 extends downwards at an inclination such that the lowest point of the depression 6 faces the cooling element projection 4. The bottom surface 8 at its lowest point joins in a curve into a front wall 10 having a vertical upward alignment
10 which forms at its edge a shoulder for contact with the heat section of the hand-held device 1.

In continuation of the depression 6, a recess 11 in the upper side of the sphere segment-shaped portion 3
15 of the cooling element 2 is provided on the side facing the projection 4. The recess 11 has a bottom surface 12 in parallel with the bottom surface of the cooling element 2, with this bottom surface 12 having a curvature corresponding to a circle section which is visualised by the arc-shaped line 13 in the rotated representation of Fig. 2. The recess 11 reaches as far as the
20 outside of the sphere segment-shaped portion 3 and continues on the inside into the front surface 10 while forming a step. The recess forms a reception for the gripping handle of the hand-held device 1 which is thus
25 stably held when placed on the cooling element 2. The width of the recess 11 corresponds to the width of the depression 6 and is approximately 39 mm in this embodiment. The bottom surface 12 is at a greater distance
30 from the bottom surface of the base 5 than the bottom surface 10.

The diameter of the sphere segment-shaped portion 3 is approximately 122 mm in this embodiment, whereas the
35 greatest diameter of the base 5 (at its bottom surface)

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is approximately 145 mm. The width of projection 4 is approximately 60 mm, whereas its height and thus the height of base 5 can be approximately 18 mm. The length of the projection 4 measured from the center of the sphere segment-shaped portion 3 is approximately 150 mm. These dimensions may, however, differ depending on the specific embodiment and vary by e.g. +/- 50%.

In a central position of projection 4 of the cooling element 2 a switch 14 may be provided which, for example, is actuated through the gripping handle of the hand-held device 1 placed thereon and transmits a signal indicating the presence or absence of the hand-held device 1 on the cooling element 2 to a control circuit not shown here. The control means can control the excitation of the hand-held device 1 in accordance with this signal. A passage 15 forming an exit for a cable connected to the switch 14 and/or to a ground connection of the cooling element 2 can furthermore be provided in the projection 4, with this cable possibly forming a connection between the cooling element 2 and the control means and/or a ground connection.

The lateral view on the right side in Fig. 2 shows the cable outlet opening 15 in more detail.

Figs. 3 and 4 represent the structure and the design of the hand-held device 1. The hand-held device 1 has an elongated shape with a gripping handle 16 which, as is shown in the top representation of Fig. 3, smoothly continues into a cooling section 17 having a rounded front edge. Fig. 4 shows the gripping handle 16 consisting of two grip shells 19, 20 which sandwich a panel 21 between each other. The panel 21 is dimensioned such as to project beyond the grip shells 19, 20

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and serve not only for accommodating the electric control components but also as a mount and stabiliser for the cooling section 17 and the heat section 18 positioned opposite thereof. The lateral outer edge of the panel 21 coincides with the outer edge of the hand-held device 1.

Fig. 3 shows that the cooling section 17 has a flat bottom side whereby it contacts the panel 21, and a convexely shaped upper surface which is externally accessible and serves as the treatment surface. When viewed in the longitudinal direction of the hand-held device 1, the thickness of the cooling section 17 is substantially uniform with the exception of the rounded margin area.

The heat section 18, on the other hand, has a substantially wedge-shaped design in lateral view, with the end facing the grip shell 20 having a clearly greater thickness than the opposite end. The inclination of the external surface of the heat section 18, when viewed in the longitudinal direction, coincides with the inclination of the bottom surface 8 of the depression 6 of cooling element 2, such that the gripping handle 16 is substantially parallel with the support surface of the cooling element 2 when the heat section 18 is inserted into the depression 6. The inclination preferably is approximately 10° .

The lower grip shell 20 has at the one end thereof facing the heat section 18 a shoulder 22 projecting in a downward direction, the dimension and outer contour of which are designed such that the outer contour of the shoulder 22 smoothly continues to the front surface of the heat section 18 facing it. Furthermore the

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projection 22 has the rounding of its outer edges designed such as to matingly contact the contact shoulder 10 when the hand-held device 1 is inserted into the depression 6 of the cooling element. As the outer
5 contour of the heat section 18 is also adapted to the inner contour of the depression 6, the heat section 18 and the projection 22 are on all sides matingly received by the depression 6 when the hand-held device 1 is placed on the cooling element 2, resulting in very
10 efficient heat transfer. The curvature of the recess 11 moreover is also adapted to the curvature of the grip shell 20 such as to stably rest in the recess 11.

The curvature of the outer contour of grip shells
15 19, 20, cooling section 17 and heat section 18 can be seen clearly in Fig. 3. The lateral edges of the heat section 18 adjacent the panel 21 are flattened, resulting in a wedge-shaped configuration of the heat section 18 with straight lateral surfaces, flat contact surface
20 on the panel 21, and convex wedge surface opposing this contact surface.

Between the cooling section 17 and the heat section 18 a heating and cooling means in the form of a Peltier
25 element not shown here is provided, the cool side of which is connected to the cold section 17 and the heat-evolving side of which is connected to the heat section 18. The Peltier element is held by the panel 21. On the panel 21 furthermore a temperature control means not
30 shown here and a temperature sensor thermally connected with the heat section 18 are provided. The temperature control means is designed such as to switch off the Peltier element when the heat section 18 attains the threshold temperature of 39°C and again switch on the
35 Peltier element when the temperature has diminished to

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38°C. The temperature of the heat section 18 is thus kept comparatively constant during the operation of the hand-held device 1. As the heat section 18, despite its volume which is clearly larger than the one of the cold section 17, can nevertheless heat up much more rapidly than the cold section 17 cools down, the cold section 17 presumably might still be at its desired target temperature of approximately 5°C without the cooling element when the Peltier element is switched off because the heat section temperature has risen to the threshold temperature. This problem is solved by the cooling element 2 which dissipates the heat of the heat section 18 inserted into it and thus clearly decelerates heating up of the heat section 18 during the initial phase following switching on or also during treatment breaks within one treatment cycle.

At its rear end, the hand-held device 1 is equipped with a power supply cable 23 which is used to provide the necessary energy to the Peltier element and to the control components. On the upper side of the grip shell 19 a panel 24 is furthermore provided which serves as a mount for an ON/OFF switch 25 and indicator lamps 26 indicating the waiting mode, ready mode, or the supply status of the Peltier element during the waiting phase. Fig. 4 furthermore shows that the intermediate panel 21 supports a circuit board 27 which is connected to the ON/OFF switch and to the indicator lamps 26.

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Claims

1. Thermal skin treatment device comprising a hand-
5 held device (1) which is provided with a heating means
for heating an externally accessible heat section (18)
and a cooling means for cooling an externally
accessible cooling section (17), characterised by a
cooling element (2) separate from said hand-held device
10 (1) for receiving said heat section (18).

2. Skin treatment device according to claim 1,
characterised in that said cooling element (2)
15 comprises a depression (6) for receiving said heat
section (18).

3. Skin treatment device according to claim 2,
20 characterised in that said depression (6) comprises an
inclined bottom surface (8).

4. Skin treatment device, according to claim 2 or 3,
25 characterised in that said heat section (18) or a wall
portion (22) connecting thereto comprises a step on at
least one side, and said depression (6) comprises at
its edge a contact shoulder (10) substantially having
an upward alignment, and that said step and said
30 contact shoulder matingly contact each other when said
heat section (18) is inserted into said cooling element
(2).

35 5. Skin treatment device according to any one of the
preceding claims, characterised in that an external

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surface of said heat section (18) extends at an inclination relative to the longitudinal center plane of said hand-held device (1).

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6. Skin treatment device according to any one of claims 2 to 5, characterised in that said depression (6) and the outer contour of said heat section (18) are adapted to match.

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7. Skin treatment device according to any one of the preceding claims, characterised in that in said cooling element (2) a recess (11) adapted to a gripping handle (16) of said hand-held device (1) is provided, which is designed to receive said gripping handle (16) when said heat section (18) is inserted into said depression (6).

8. Skin treatment device according to any one of the preceding claims, characterised in that said heating and cooling means are formed by a Peltier element having its heat-evolving side connected to said heat section (18) and its heat-absorbing side connected to said cooling section (17).

9. Skin treatment device according to any one of the preceding claims, characterised by a temperature control means comprising at least a temperature sensor, said temperature control means serving to control switching on/off of said heating and/or cooling means while said skin treatment device is in the switched-on state.

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10. Skin treatment device according to claim 9,
characterised in that said temperature control means is
designed such as to switch off said heating and cooling
5 means at a first temperature threshold value of said
heat section (18) preferably situated at approximately
39°C and to again switch on said heating and cooling
means at a second temperature threshold value prefer-
ably situated at approximately 38°C.

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11. Skin treatment device according to any one of the
preceding claims, characterised in that said cooling
element (2) at least partly has an outer contour in the
15 shape of a sphere segment.

12. Skin treatment device according to claim 11,
characterised in that said cooling element (2)
20 comprises an elongated projection (4) which is arranged
such that it extends underneath said gripping handle
(16) of said hand-held device (1) when said heat
section (18) is inserted into said depression (6).

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13. Skin treatment device according to any one of the
preceding claims, characterised in that said cooling
element (2) consists of zinc diecast or ceramic
material.

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14. Skin treatment device according to any one of the
preceding claims, characterised in that said cooling
element (2) is provided with an electric connection to
35 ground.

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15. Skin treatment device according to any one of the
preceding claims, characterised in that said hand-held
5 device (1) is designed as a low-voltage apparatus, and
that preferably a power transformer is provided for
connection with said hand-held device.