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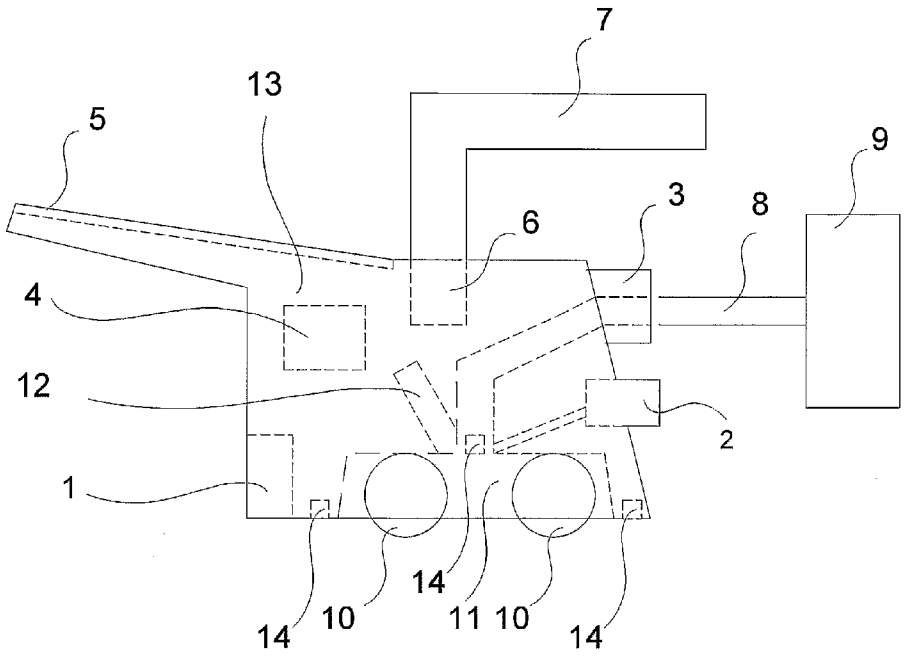
(54) Title: MASSAGE APPARATUS



(57) Abstract: The object of the invention is an adjustable massage apparatus, the massage effect of which is based on the suction effect created in connection with the treatment head of the apparatus. The treatment head of the apparatus comprises a surface which comes into contact with the skin, a frame, and a low-pressure chamber, associated with the surface for creating a low-pressure suction in order to lift the skin. The apparatus is mainly characterized in that it comprises a sensor for measuring one or more characteristics of skin tissue, and elements to automatically adjust the low-pressure suction to the desired value, on the basis of the obtained measurements.

WO 2007/051896 A1

MASSAGE APPARATUS

FIELD OF THE INVENTION

The object of the invention is an adjustable massage apparatus, the massage effect of which is based on the suction effect created in association with at least one roller, located on the frame of the apparatus.

BACKGROUND ART

Massage affects skin and muscles in many different ways. Massage is a pressing movement applied to soft tissues for treatment purposes, and it is performed in the form of stroking, rubbing, squeezing and different types of tapping. Traditionally, massage aims at improving the metabolism of musculoskeletal and locomotor systems, relaxing the tension of muscles and maintaining working capacity.

Today, massage is increasingly performed using different types of devices, in which case massage is also used for such purposes as plastic and corrective treatment, rheumatic problems, burn injuries, treatment of blood circulation problems, treatment of swelling and cellulite, stimulation of the circulation of lymphatic fluids, for relaxing and firming the tissues and treatment of fibromyalgia. Subcutaneous suction massage of fat and connective tissues stimulates metabolism, blood circulation and restores firmness of tissues and removes cellulite, swelling and muscle tension. The treatment also produces positive results for fibromyalgia pains, scar tissue problems, conditions resulting from sports activities, insomnia and stress.

The method of massage depends on the treatment to be performed. Suction roller treatment is used especially for treating skin problems such as cellulite and swelling. It is performed using a device consisting of a treatment head, which is moved on top of the

skin. This treatment head is connected to the suction apparatus with a flexible cord in order to create a vacuum on the skin as the treatment head moves against the patient's body.

The suction roller apparatus comprises rollers, in between which there is a suction chamber which is open at the bottom, into which the skin is sucked, creating a bulge in the skin. The fold of skin formed from the bulge is pressed between the rollers against roller surfaces.

Massage force is most often only determined on the basis of the treatment being given, or by the therapist's touch, or from an idea about what massage force would be suitable to use. Injuries which have to be treated, however, are different, and also different people react in different ways. If there is too little force used in the massage, the treatment will be ineffective, whereas the use of too much force will often lead to tissue damage, bruises and aching.

Moreover, the suction roller apparatuses are difficult to use, with correct use of the apparatuses demanding extensive experience, and acquiring a good "touch" takes years. We refer, for example, to the article "Endermologie: Taking a Closer Look", published in the May-April 2001 issue of Aestethic Surgery Journal, which asserts that the massage force may vary greatly with different users, and that treatment results are mostly dependent on the therapist. Also, the article "Noninvasive Mechanical Body Countouring: A preliminary Clinical Outcome Study" in the Aesthetic Plastic Surgery issue 21:61-67, 1997, asserts that the suction roller treatment is highly user-dependent and may lead to bruises if the massage force is too great, but that the treatment is efficient if the therapist is skillful. With regard to this we also refer to articles published in the 1999 issues of Aesthetic Surgery Journal: "Endermologie Revisited" in the March-April issue, and "Endermologie versus Liposuction with External Ultrasound Assist" in the November-December issue.

Massage apparatuses which are adjustable according to the level of technology are presented in US patent application 2003/0073937. In an apparatus according to this patent, negative pressure and massage force are adjusted at the user's discretion according to the purpose of the massage. In US patent 5,885,232, the suction force is adjusted in the massage apparatus by maintaining the value in the preset value.

The apparatuses which use the latest technology, do not take into account the personal characteristics of the patient being treated, which is one of the objects of this invention.

Moreover, the purpose is to develop an apparatus which is easier to use than the apparatuses of prior art.

SUMMARY OF THE INVENTION

The object of the invention is an adjustable massage apparatus, the massage effect of which is based on the suction effect created in association with the treatment head. The treatment head of the apparatus comprises a surface which comes in contact with the skin, a frame, and a low-pressure chamber positioned in connection with this surface in order to create a low-pressure suction to lift the skin. The apparatus is mainly characterized in that it has a sensor for measuring one or more characteristics of the skin tissue, and means to automatically adjust the low-pressure suction to the desired value, based on the results measured by the sensor.

The advantageous embodiments of the invention are presented in the subclaims.

An advantageous embodiment of the invention comprises two rollers, which are in connection with the apparatus frame, between which negative pressure is formed in the low-pressure chamber. The rollers may move against the skin surface, but they may also be static, which means that in one embodiment only one roller moves and the other stays in place, which is advantageous when the front roller, moving in the direction of treatment,

stays in place and the back roller moves in order to produce a pinching effect. Also, there can be one or more rollers. In other types of embodiments, the treatment head may just have a cavity at the low-pressure chamber, or sliding surfaces can be used instead of rollers.

Thus, a massage apparatus according to the invention comprises advantageously different sensors, one of which, for example, measures the composition of the skin tissue, such as fluid content, and advantageously also fat and oil contents. Two sensors may also be used for measuring fluid and fat contents. The second sensor, for example, measures the raised skin (bulge) produced by the suction effect, and the third sensor measures, for example, the massage force applied to the skin. The low-pressure suction and massage force are adjusted according to the results of the measurements. The massage apparatus may also comprise a fourth sensor, which measures the skin temperature, and other sensors measuring the characteristics mentioned below. The low-pressure suction and massage force are then adjusted according to the measurement results obtained by these sensors. One sensor measures either one characteristic or several characteristics. Each sensor may be connected to the apparatus either through a wired or wireless connection, such as a radio frequency signal, infrared signal or the like. Thus, the sensors may be an integrated part of the apparatus or separate components.

The adjustment is based on mechanical characteristics and/or electrical characteristics and/or structure and/or composition of the skin. Mechanical characteristics include strength, flexibility, elasticity and resilience etc. Electrical characteristics include, for example, capacitance, impedance, resistance, reactance and inductance.

Moreover, adjustment of this invention can be based on the flow of lymphatic fluid. Measuring techniques for the flow of lymphatic fluid are selected from known technologies.

In addition, the apparatus may comprise a sensor for measuring the skin's blood circulation, the measurements of which determine the adjustment.

Furthermore adjustment may be based on the measurement of transepidermal water loss and skin pH.

Adjustments may also be based on the measurement of the patient's experience of cutaneous pain. In this case, the patient himself/herself, or the therapist, or both together adjust the apparatus's running parameters. Skin characteristics, when mentioned in this text, also include the pain felt and experienced on the skin. The skin refers to all skin layers i.e. epidermis, dermis, hypodermis or subcutis. The apparatus may comprise a sensor which registers a signal given by the patient for increasing/decreasing the suction effect, and which triggers the adjustment. The patient may thus give a signal to the sensor (for example, based on the pain experienced) and the sensor then relays to the apparatus the wish for the increase/decrease in suction.

The apparatus may also comprise other energy sources for warming the skin tissue and furthermore, means for automatically adjusting these energy sources to the desired value, based on the measurements obtained by one or more sensors.

Measuring techniques include the measurement of different sound frequencies, such as ultrasound and infrasound, techniques based on radio frequencies and on different wave lengths of light i.e. optical measurement such as laser and infrared measurement, bioimpedance spectroscopy, magnetic resonance spectroscopy, raman spectroscopy, nuclear magnetic resonance spectroscopy, microsensor mapping, heat camera imaging, spectrofotometric intracutaneus imagining.

A computer program guides the masseur in the application of force by presenting the force level visually in the treatment head and/or in the external display. Low-pressure suction is adjusted automatically using the computer program, and thus it is not necessary for the masseur to adjust the low-pressure suction during the treatment. Advantageously, when the massage force exceeds the permitted value, the program stops the apparatus.

By monitoring the measurements, it is possible for the masseur to achieve an optimal or the best massaging result without skin or tissue damages. The massage performance is

nearly independent of the therapist's skills when considering the subcutaneous fluid content, fat content, skin lift, the massage force applied to the skin and the suction effect.

It is also possible to install a speed measurement in the apparatus which will calculate the optimal treatment speed. The suction can be located inside the rollers which is an entirely novel solution.

The suction force generated from inside the rollers, and the suction sector, i.e. the adjustment of the suction area, can be determined accurately in order to create a desired skin lift for the fold of the skin. This enables a one-roller treatment apparatus. A multi-roller solution is also possible, which makes it possible to control the skin lift even more precisely over a wider area, which also produces suction also between the rollers.

In the following section, the invention will be presented with reference to a certain advantageous embodiment with the use of a figure. The invention shall, however, not be limited to the details of the embodiment. Therefore, as mentioned earlier, the connection of each sensor to the apparatus may vary, within the scope of the invention, for different embodiments of the apparatuses.

FIGURE

Figure 1 illustrates one example of a massage apparatus according to the invention.

DETAILED DESCRIPTION

Figure 1 illustrates one example of a massage apparatus according to the invention. The massage effect of the massage apparatus is based on the suction effect created between two rollers 10a, 10b located on the frame 13 of an apparatus according to Figure 1.

The treatment head of the apparatus comprises a frame 13 and two rollers 10a, 10b connected to the bottom part of the frame. The bottom part of the frame 13, where the rollers 10a, 10b are also located, has a low-pressure chamber 11 for low-pressure suction which is generated through the vacuum pipe/hose 8 using a low-pressure pump 9. Necessary adjustment valves are also mounted in the low-pressure pump 9.

As the treatment head of the massage apparatus is moved against the patient's skin, most comfortably using a handle 7, the effect of the low-pressure causes a fold of skin to be pulled up between the rollers 10a, 10b, and into the low-pressure chamber 11.

A computer program automatically calculates and adjusts the level of low-pressure suction to the target value, based on the measurements obtained. The parameters of the measurements, which affect the target value of the low-pressure suction, include fluid content of the skin tissue, fat content of the skin tissue, the bulge i.e. the lift of the skin tissue (the size of the fold in the skin) and/or the skin temperature.

In order to obtain the measurements, the apparatus comprises a sensor 1 for measuring the fluid content and fat content of the skin tissue, a sensor 12 for measuring the lift of the skin tissue, and, optionally, a temperature sensor 14 for measuring the skin temperature. Additionally, the apparatus may comprise one or more elements, which operate as energy sources for treating the tissue, such as for heating, which are based on sound, light, radio frequency or electricity, for example, it can be an infrared sensor, radio frequency sensor (RF), ultrasound sensor, laser or other element that emits monochromatic light, infrasound sensor, electric resistance or electric electrode. These elements may be wired or wireless.

The measurements from one or more sensors are used for automatically adjusting the low-pressure suction and other energy sources to the desired value. Automatic adjustment of the low-pressure suction uses, for example, a control unit 4 with a microprocessor, which is either inside or outside of the apparatus. The control unit 4 receives the desired value of the low-pressure suction from the computer program running in the microprocessor, which calculates the desired value of the low-pressure suction, based on one or more

measurements. Furthermore, the control unit has a central memory. The control unit, microprocessor and central unit may be integrated into the treatment head or be separate, or they may be both integrated and separate.

The massage apparatus in Figure 1 has two or more rollers 10a, 10b, in between which negative pressure is created in the low-pressure chamber 11. It is also possible to use one or more perforated rollers, inside of which negative pressure is created (not presented). The rollers may move against each other during the massage in order to produce a pinching effect, or they may be locked at a determined distance from one another to eliminate the pinching effect.

The computer program calculates the target value of one or more on-going treatment forces, such as massage force, based on the measurements obtained and/or on the desired value of the suction pressure. Therefore, the apparatus also comprises a sensor 6 for measuring one or more on-going treatment forces, such as the level of the massage force.

The treatment head has a display 5 which displays the massage force, and the person performing the treatment may monitor the massage force from the display 5, which shows both the target value (i.e. the desired value) of the massage force and the on-going massage force value, and applies the force accordingly. The program stops the apparatus if the massage force exceeds the permitted value. Furthermore, the program may be joined to the database, which contains the patient's treatment information. The display 5 is in the control panel, which may be integrated into the treatment head, or be separate, or both.

Also, the power of the energy source 14 may be controlled based on the tissue measurements. A temperature sensor 14 may be integrated into the treatment head, or it may be used separately.

CLAIMS

1. An adjustable massage apparatus, the massage effect of which is based on the suction effect created in connection with a treatment head, the treatment head of the apparatus comprising a surface which comes into contact with the skin, a frame (13), and a low-pressure chamber (11) positioned in connection with the said surface for generating low-pressure suction in order to make the skin tissue lift, **characterized in** that the apparatus also comprises a sensor for measuring one or more characteristics of the skin, elements for automatically adjusting the low-pressure to the desired value, based on the measurements obtained.

2. A massage apparatus according to claim 1, **characterized in** that the apparatus comprises a sensor for measuring skin composition, such as fluid and/or fat content, for example, from oil content, and/or swelling, the measurement results of which determine the adjustment.

3. A massage apparatus according to claims 1 or 2, **characterized in** that the apparatus comprises a sensor for measuring mechanic characteristic(s) of the skin, such as strength, flexibility, elasticity and/or resilience, the measurement results of which determine the adjustment.

4. A massage apparatus according to any of claims 1 – 3, **characterized in** that the apparatus comprises a sensor for measuring electrical characteristic(s) of the skin such as capacitance, impedance, reactance and inductance, the measurement results of which determine the adjustment.

5. A massage apparatus according to any of claims 1 – 4, **characterized in** that the apparatus comprises a sensor for measuring the lymphatic fluid flow of the skin, the measurement result of which determines the adjustment.

6. A massage apparatus according to any of claims 1 – 5, **characterized in** that the apparatus comprises a sensor for measuring the skin's blood circulation, the measurement result of which determines the adjustment.

7. A massage apparatus according to claims 1 – 6, **characterized in** that the apparatus comprises a sensor for measuring the skin's water loss, the measurement of which determines the adjustment.

8. A massage apparatus according to claims 1 – 7, **characterized in** that the apparatus comprises a sensor for measuring the pH, the measurement result of which determines the adjustment.

9. A massage apparatus according to any of claims 1 – 8, **characterized in** that the apparatus comprises a sensor which may register a signal given by a patient for increasing/decreasing the treatment effect, which in turn determines the adjustment.

10. A massage apparatus according to any of claims 1 – 9, **characterized in** that the apparatus also comprises a sensor for measuring the lift of the skin tissue, the measurement result of which determines the adjustment.

11. A massage apparatus according to claims 1 – 10, **characterized in** that the apparatus comprises also a sensor for measuring the skin temperature, the measurement result of which determines the adjustment.

12. A massage apparatus according to any of claims 1 – 11, **characterized in** that each sensor of the apparatus measures one or more skin characteristics.

13. A massage apparatus according to any of claims 1 – 12, **characterized in** that the apparatus also comprises other either wired or wireless energy sources for treating the skin tissue which are based, for example, on sound, light, radio frequency or electricity such as an infrared sensor, radio frequency sensor (RF), ultrasound sensor, infrasound

sensor, laser source or other element that emits monochromatic light, electric resistance or electric electrode.

14. A massage apparatus according to any of claims 1 – 13, **characterized in** that the apparatus also comprises elements for treating the skin tissue so that other energy sources are adjusted automatically to the desired value, based on one or more of the sensor measurements.

15. A massage apparatus according to any of claims 1 – 14, **characterized in** that one or more moving or static rollers (10a, 10b) are connected to the frame of the massage apparatus, advantageously two rollers, between which negative pressure is created in the low-pressure chamber (11).

16. A massage apparatus according to any of claims 1 – 14, **characterized in** that at the low-pressure chamber there is cavity on the surface, which comes into contact the skin.

17. A massage apparatus according to any of claims 1 – 14, **characterized in** that there are sliding surfaces on the surface which comes against the skin.

18. A massage apparatus according to any of claims 1 – 14, **characterized in** that the massage apparatus comprises one or more perforated rollers (10), inside of which a negative pressure is created in the low-pressure chamber (11).

19. A massage apparatus according to any of claims 14 – 18, **characterized in** that the rollers move towards one another during the massage to produce a pinching effect.

20. A massage apparatus according to any of claims 14 – 18 **characterized in** that the rollers may be locked at a certain distance from one another in order to eliminate the pinching effect.

21. A massage apparatus according to any of claims 1 – 20, **characterized in** that the elements for automatically adjusting the low-pressure suction comprise a control unit (4), which is connected to a computer program running in a processor, such as a microprocessor, which is located either inside or outside of the apparatus, and is able to analyze, monitor and/or calculate the low-pressure suction, in order to obtain from the computer program the desired value, which has been calculated on the basis of one or more measurements.

22. A massage apparatus according to claim 21, **characterized in** that the target value of one or more on-going treatment forces such the massage force, can be adjusted by computer program calculations, which have been carried out on the basis of one or more measurements and/or on the basis of the desired value of the suction pressure.

23. A massage apparatus according to any of claims 1 – 22, **characterized in** that the apparatus comprises also a sensor for measuring the level of one or more on-going treatment forces such as the massage force.

24. A massage apparatus according to any of claims 1 – 23, **characterized** in that the treatment head has a display (5), which displays the level of one or more on-going treatment forces such as the massage force.

25. A massage apparatus according to claim 24, **characterized** in that the display (5) shows both the targeted and the on-going level of a treatment force such as the massage force.

26. A massage apparatus according to any of claims 21 – 25, **characterized** in that it can be stopped when the computer program detects that one of the apparatus's treatment forces, such as the massage force is exceeding the permitted value.

27. A massage apparatus according to any of claims 1 – 26, **characterized in** that the connection of each sensor to the apparatus is either wired or wireless.

28. A massage apparatus according to any of claims 21 – 27, **characterized in** that the computer program associated with it is connected to a database containing the patients' treatment information.

29. A massage apparatus according to any of claims 1 – 28, **characterized** in that the sensor with which measurements are taken are based on one or more of the following measuring techniques: sound frequency such as measurement of ultrasound and/or infrasound, measurement of radio frequency, measurements based on different forms of light such as laser doppler, laser and/or infrared light, measurements based on different wave lengths, bio impedance spectroscopy, magnetic resonance spectroscopy, nuclear magnetic resonance spectroscopy, raman spectroscopy, micro sensor mapping, heat camera imaging, spectrometric subcutaneous imaging.

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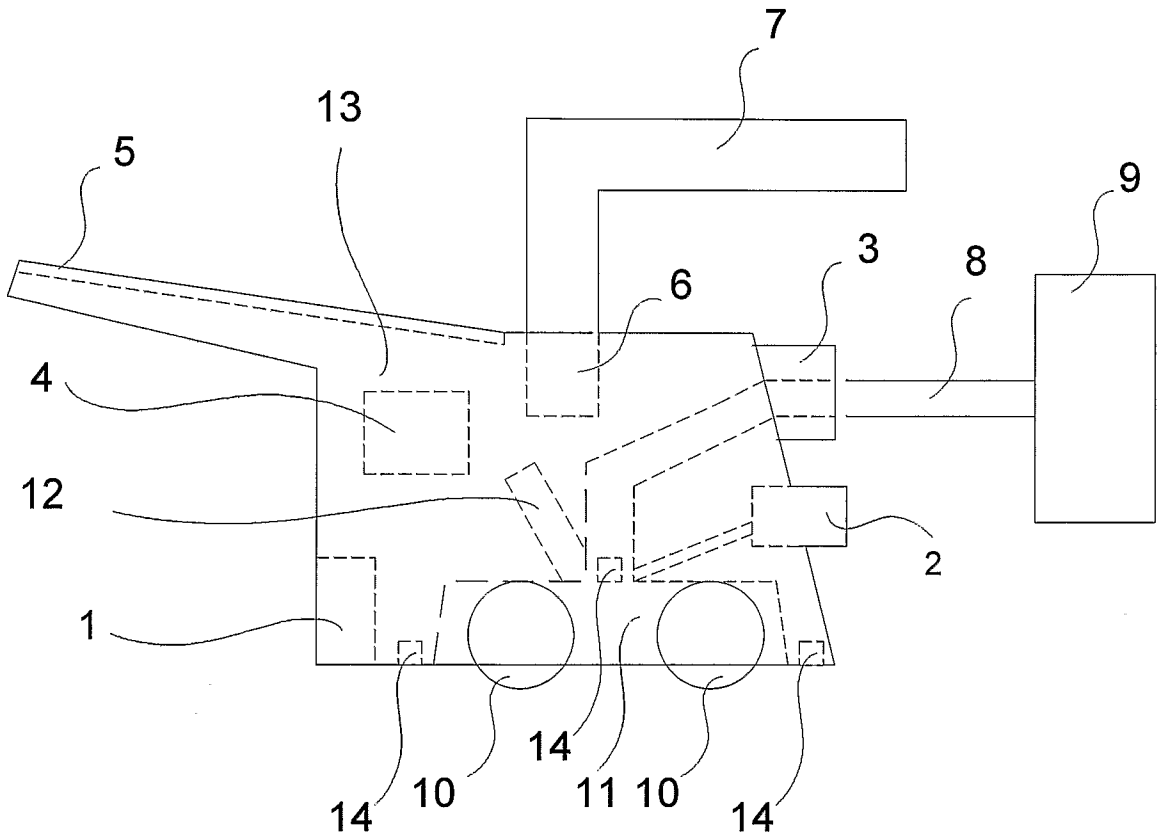

Fig. 1

INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER
INV. A61H7/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A61H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
29 March 2007	05/04/2007

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INTERNATIONAL SEARCH REPORT

International application No
PCT/FI2006/000343

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