MILLIMETER WAVE THERAPEUTIC APPARATUS FOR WRAPAROUND IRRADIATION

TECHNICAL FIELD

[0001] The present application relates to the technical field of millimeter wave therapeutic apparatus, and particularly to a millimeter wave therapeutic apparatus for a wraparound irradiation.

BACKGROUND ART

[0002] A millimeter wave therapeutic apparatus is an apparatus that uses a millimeter wave high frequency electromagnetic wave with a wavelength of 1-10 mm and a frequency of 30-300 GHz for treating a disease. The millimeter wave is a high frequency electromagnetic wave belonging to a microwave band. As an electromagnetic wave, the millimeter wave can penetrate biological epidermis and act on deep tissues. Due to a high frequency of the millimeter wave has, the power can be effectively limited to a small scope, which only acts on a specific part. Biological effects of the millimeter wave are divided into a thermal effect and a non-thermal effect. For the thermal effect, the millimeter wave power can be converted to heat, so that a partial temperature is increased to stimulate metabolism. For the non-thermal effect, the millimeter wave can affect and resonate with biological macromolecules such as protein and RNA, etc., and thus affect and adjust a life activity process. Current millimeter wave therapeutic apparatus generally has a large volume, a large weight, and poor portability.

[0003] There are many technical solutions to solve the above technical problems in the exiting technology. For example, a China patent application no. CN202022913899.X provides a millimeter wave therapeutic apparatus with a plane structure design, which provides a millimeter wave energy by a millimeter wave chip and transmits the millimeter wave energy with a small millimeter wave antenna for treating diseases. With this structure, the volume and weight of the millimeter wave therapeutic apparatus can be decreased, which can make the millimeter wave

therapeutic apparatus more portable.

[0004] However, such operation has a limitation when applying to a part, such as a leg, that not suitable for a handheld apparatus and in which the desired treatment area is dense. For example, most of the current millimeter wave therapeutic apparatuses are handheld in treatment. However, when facing to a part, such as a leg, etc., in which the desired treatment area is dense (for example, there are multiple desired treatment zones in the leg medial region), if the millimeter wave therapeutic apparatus is handheld by the operator, once the apparatus moves, the treatment area of the treatment instrument cannot be kept coincident with the desired treatment area, which cannot achieve a desired therapeutic effect in partial area.

[0005] Therefore, the millimeter wave therapeutic apparatus in the exiting technology cannot solve the problem that when applying to a part, such as a leg, that not suitable for a handheld apparatus and in which the desired treatment area is dense, a deviation between the treatment area and the desired treatment area would cause an undesired therapeutic effect in partial area.

SUMMARY

[0006] The purpose of the present application is providing a millimeter wave therapeutic apparatus for a wraparound irradiation, which can solve the problem that when facing to a part that not suitable for handheld such as a leg and a dense needful treatment area, the treatment areas are easy to deviate the needful treatment areas, thereby not causing anticipated therapeutic effect in partial area.

[0007] In order to solve the above problem, the present application provides the following technical solution:

[0008] a millimeter wave therapeutic apparatus for a wraparound irradiation includes:

[0009] a wrapping belt for wrapping around a human skin;

[0010] a therapeutic apparatus column provided on the wrapping belt for delimiting a treatment area on the human skin and releasing a millimeter wave to the treatment area;

[0011] an area limiting mechanism provided around an edge of the wrapping belt;

[0012] wherein the area limiting mechanism includes an attaching unit, a limiting unit and an adjusting unit;

[0013] the attaching unit is provided around the edge of the wrapping belt, and the attaching unit is configured to push the wrapping belt to attach onto the human skin;

[0014] the limiting unit is provided on the attaching unit and connected to the wrapping belt and is configured to, after the wrapping belt attaches onto the human skin, delimit the treatment area on the human skin and limit the therapeutic apparatus column in the treatment area; and

[0015] the adjusting unit is connected to the limiting unit and is configured to adjust a position of the therapeutic apparatus column in the treatment area to prevent a deviation of the treatment area.

[0016] As a preferred embodiment of the present application, the attaching unit includes an inflatable ring column connecting at the edge of the wrapping belt, and the inflatable ring column is configured to push the wrapping belt to tightly attach onto the human skin;

[0017] the limiting unit includes a partition ring frame connecting to the inflatable ring column, the partition ring frame is provided with an anti-deviation support connecting to the therapeutic apparatus column;

[0018] the adjusting unit includes an adjusting pipe column connecting to the partition ring frame, a first end of the adjusting pipe column is connected to the anti-deviation support, a second end of the adjusting pipe column is in communication with the inflatable ring column, and the adjusting pipe column is configured to extend by filling air from the inflatable ring column; and

[0019] when the adjusting pipe column extends, the anti-deviation support is pushed by the adjusting pipe column to slide along the partition ring frame.

[0020] As a preferred embodiment of the present application, a sliding slot is provided on a sidewall of the partition ring frame at a position corresponding to the inflatable ring column , and one end of the anti-deviation support is slidingly connected into the sliding slot; the sliding slot is

configured to guide the anti-deviation support to move; and

[0021] a plurality of bulging cystic columns are provided in the sliding slot, the bulging cystic columns are in communication with the inflatable ring column for limiting a speed of the anti-deviation support in the sliding slot.

[0022] As a preferred embodiment of the present application, a plurality of toggle stops are provided in the sliding slot for blocking movement of the anti-deviation support, the toggle stops are positioned between adjacent bulging cystic columns and rotationally connected to an inner wall of the sliding slot, and the toggle stops is configured to rotate to disengage with the sliding slot to release the blocking of the anti-deviation support; and

[0023] a plurality of toggle-stop clamped slots are formed in the inner wall of the sliding slot for clamping the plurality of toggle stops.

[0024] As a preferred embodiment of the present application, the anti-deviation support comprises a stabilized column, and an end of the stabilized column is connected to an inner wall of the sliding slot; the stabilized column is provided with a fixing sleeve, a side wall of the stabilized column is connected to the adjusting pipe column, the fixing sleeve is configured to fix the therapeutic apparatus column, and an end of the fixing sleeve close to the human skin is connected with a plurality of retractable air columns; and

[0025] the retractable air column is configured to increase a friction with the human skin by compressing volume of the retractable air column when the wrapping belt tightly attaches onto the human skin.

[0026] As a preferred embodiment of the present application, the adjusting pipe column comprises a manifold connecting to the partition ring frame, a first end of the manifold is provided with an air diversion column connecting to the inflatable ring column, and a second end is provided with at least two branch columns; and

[0027] each of branch columns has a force-applying point on a sidewall of the stabilized column, and the force-applying points are symmetrical about a center of the stable column.

[0028] As a preferred embodiment of the present application, a sidewall of each of the branch columns is sleeved with a force-applying sleeve, which is provided at one end of each of the branch columns away from the manifold; a sidewall of the force-applying sleeve is connected to an anti-bending sleeve, and the anti-bending sleeve is connected to the partition ring frame for limiting the sidewalls of the branch columns to prevent the branch columns from bending.

[0029] As a preferred embodiment of the present application, one side of the inflatable ring column away from the wrapping belt is provided with a plurality of adhesive discs, which is able to be pushed by the inflatable ring column and attached onto the human skin.

[0030] As a preferred embodiment of the present application, an anti-overlap sleeve is provided in the inflatable ring column, which is configured to shape the inflatable ring column, and a longitudinal section of the anti-overlap sleeve is a ring shape or a C-shape.

[0031] As a preferred embodiment of the present application, the wrapping belt is provided with an expansion column connecting to the inflatable ring column, and the expansion column is configured to increase adhesion of the wrapping belt to the human skin.

[0032] Comparing with the exiting technology, the present application has the following technical solution:

[0033] In the present application, alignment and fine adjustment actions of the treatment area and a needful treatment area can be realized, and a condition of large deviation between the treatment area and the needful treatment area can be prevented through the limiting unit and the adjusting unit. In a specific embodiment, the wrapping belt extrudes and pushes to attach onto the human skin by the attaching unit. After that, the limiting unit delimits the treatment area on the human skin and limits the therapeutic apparatus column in the treatment area after the wrapping belt attaches onto the human skin. Then the adjusting unit adjusts the position of the therapeutic apparatus column in the treatment area to prevent deviation of the treatment area.

BRIEF DESCRIPTION OF THE DRAWINGS

[0034] In order to describe the embodiments of the present application or technical solution of the exiting technology more clearly, the embodiments or the diagrams to be used in the description of the exiting technology will be simply described as follows. Obviously, the diagrams described as follows are only illustration, those skilled in the technical field can also obtain other implementation diagrams from the provided diagrams without a creative work.

[0035] FIG. 1 is an overall structure diagram according to an embodiment of the present application;

[0036] FIG. 2 is a structure diagram of an anti-deviation support according to an embodiment of the present application;

[0037] FIG. 3 is a structure diagram of a sliding slot according to an embodiment of the present application; and

[0038] FIG. 4 is a stereogram of a wrapping belt according to an embodiment of the present application.

[0039] List of reference signs:

1. Wrapping belt; 2. Therapeutic apparatus column; 3. Area limiting mechanism; 4. Attaching unit; 5. Limiting unit; 6. Adjusting unit; 11. Expansion column; 41. Inflatable ring column; 411. Adhesive disc; 412. Anti-overlap sleeve; 51. Partition ring frame; 52. Anti-deviation support; 511. Sliding slot; 512. Cystic column; 513. Toggle stop; 514. Toggle-stop clamped slot; 521. Stabilized column; 522. Fixing sleeve; 523. Retractable air column; 61. Adjusting pipe column; 611. Manifold; 612. Air diversion column; 613. Branch column; 614. Force-applying sleeve; 615. Anti-bending sleeve.

DETAILED DESCRIPTION

[0040] Technical solutions of embodiments of the present application are further described in detail below in combination with the accompanying drawings in the embodiments of the present application. Obviously, the described embodiments are only part of embodiments of the present

application, not the all embodiments. Based on the embodiments in the present application, the embodiments acquired by those skilled in the technical field without creative work belong to protecting scope of the present application.

[0041] As shown in FIG. 1, the present application provides a millimeter wave therapeutic apparatus for a wraparound irradiation, including:

[0042] a wrapping belt 1 for wrapping a human skin;

[0043] a therapeutic apparatus column 2, which is provided on the wrapping belt 1, for delimiting a treatment area on the human skin and releasing a millimeter wave to the treatment area; and

[0044] an area limiting mechanism 3 provided around edges of the wrapping belt 1.

[0045] The area limiting mechanism 3 includes a attaching unit 4, a limiting unit 5 and an adjusting unit 6.

[0046] The attaching unit 4 is provided around the edges of the wrapping belt 1, and may extrude and push the wrapping belt 1 to attach onto the human skin.

[0047] The limiting unit 5 is provided on the attaching unit 4 and connected to the wrapping belt 1. After the wrapping belt 1 attaches onto the human skin, the limiting unit 5 may delimit an operation area on the human skin and limits the therapeutic apparatus column 2 in the operation area.

[0048] The adjusting unit 6 is connected to the limiting unit 5 and adjusts a position of the therapeutic apparatus column 2 in the operation area to prevent an offset of the treatment area.

[0049] In the present application, with the limiting unit 5 and the adjusting unit 6, an alignment and fine adjustment actions of the treatment area with an area to be treated can be realized, in order to avoid a large deviation between the treatment area and the area to be treated. Specifically, the attaching unit 4 extrudes and pushes the wrapping belt 1 to attach onto the human skin, the limiting unit 5 delimits an operation area on the human skin and limits the therapeutic apparatus column 2 in the operation area after the wrapping belt 1 attaches onto the human skin, and the adjusting unit

6 adjusts the position of the therapeutic apparatus column 2 in the operation area to prevent an offset of the treatment area.

[0050] Comparing with the exiting technology, the present application can realize a temporary fixed connection between the treatment area and human body by means of a wraparound irradiation without a handheld operation of the therapeutic apparatus, which can reduce operational difficulty. Meanwhile, the offset of the treatment area can be reduced during a treatment process, and also the position of the treatment area can be adjusted freely.

[0051] As shown in FIGs. 1 and 3, the attaching unit 4 includes an inflatable ring column 41 connecting at the edges of the wrapping belt 1. After being filled with gas, the inflatable ring column 41 can push the wrapping belt 1 to tightly attach onto the human skin.

[0052] The limiting unit 5 includes a partition ring frame 51 connecting to the inflatable ring column 41. The partition ring frame 51 is provided with an anti-deviation support 52 connecting to the therapeutic apparatus column 2.

[0053] The adjusting unit 6 includes an adjusting pipe column 61 connecting to the partition ring frame 51. A first end of the adjusting pipe column 61 is connected to the anti-deviation support 52, and a second end is in communication with the inflatable ring column 41. The adjusting pipe column 61 can extend by filling air from the inflatable ring column 41 into the adjusting pipe column 61.

[0054] When the adjusting pipe column 61 extends, the anti-deviation support 52 is pushed by the extended adjusting pipe column 61 to slide along the partition ring frame 51.

[0055] In this embodiment, as shown in FIG. 1, the wrapping belt 1 includes a belt body and a tightening strip, and a cavity is provided in a center area of the belt body for accommodating the therapeutic apparatus column 2 to move therein.

[0056] In alignment and fine adjustment actions of the treatment area with an area to be treated, the wrapping belt 1 is inserted into the area to be treated of a patient and fixed with a Velcro (that is, a first end of the wrapping belt 1 is pressed on epidermis of the patient, and a second end is

wrapped around the epidermis of the patient and covered the first end, an overlapping area of the two ends of the wrapping end 1 is fixed by the Velcro), the inflatable ring column 41 is filled with external gas by an external gas filling device (e.g., a press airbag), and the inflatable ring column 41 is fulfilled with gas to push the wrapping end 1 to tightly attach onto the epidermis of the human body.

[0057] After the wrapping belt 1 is tightly attached onto epidermis of the human body, an active area of the therapeutic apparatus column 2 is limited by the partition ring frame 51, and the therapeutic apparatus column 2 is fixed by the anti-deviation support 52, so that after the wrapping belt 1 is wrapped, the therapeutic apparatus column 2 is aligned with the area to be treated without deviation.

[0058] After a treatment on one treatment area is finished, the adjusting pipe column 61 can extend to push the anti-deviation support 52 to slide along the partition ring frame 51 to adjust the position of the current treatment area.

[0059] As shown in FIGs. 1-3, during sliding of the anti-deviation support 52 along the partition ring frame 51, if a sliding speed is too fast, the position of the current treatment area cannot accurately align with the needful treatment area. Thus, a sliding slot 511 is provided on a sidewall of the partition ring frame 51 at a position corresponding to the inflatable ring column 41. One end of the anti-deviation support 52 is slidingly connected into the sliding slot 511. The sliding slot 511 can guide the anti-deviation support 52 to move (the movement of therapeutic apparatus column 2 is limited through limiting the position of the anti-deviation support 52 via the sliding slot 511, meanwhile it can prevent the anti-deviation support 52 from separating from the wrapping belt 1 when the anti-deviation support 52 slides along the sliding slot 511).

[0060] A plurality of cystic columns 512 are arranged in the sliding slot 511. The plurality of cystic columns 512 are in communication with the inflatable ring column 41 and are configured to expand upon inflation, which can limit a speed of the anti-deviation support 52 in the sliding slot 511.

[0061] When the inflatable ring column 41 is fulfilled with gas, the plurality of cystic columns 512 is also inflated. After that, once the anti-deviation support 52 slides along the sliding slot 511, at the same time the plurality of cystic columns 512 can increase friction of the anti-deviation support 52 in sliding along the sliding slot 511 to reduce a sliding speed of the anti-deviation support 52.

[0062] As shown in FIGs. 1-3, a slippage of the anti-deviation support 52 need to be controlled during sliding of the anti-deviation support 52 along the partition ring frame 51, and an inclined phenomenon of the anti-deviation support 52 also need to be controlled when stopping movement. Thus, a plurality of toggle stops 513 are arranged in the sliding slot 511 for blocking the movement of the anti-deviation support 52. The plurality of toggle stops 513 are positioned between adjacent cystic columns 512, and rotationally connected to an inner wall of the sliding slot 511. The plurality of toggle stops 513 can rotate to disengage the sliding slot 511 to release the blocking for the anti-deviation support 52.

[0063] A plurality of toggle-stop clamped slots 514 are formed in the inner wall of the sliding slot 511, and the plurality of toggle-stop clamped slots 514 are used to clamp the plurality of toggle stop 513.

[0064] Before the anti-deviation support 52 slides along the partition ring frame 51, the users may select a number of toggle stops 513 from the plurality of toggle stops 513 for blocking depending on the position of the needful treatment area (the plurality of the toggle stops 513 limits the position of the anti-deviation support 52 in pairs, this is adjusted by the number of pairs). After the number of the toggle stops 513 for blocking is determined, the wrapping belt 1 can be wrapped around the patient body.

[0065] Referring to FIG. 3, if the first pair of the toggle stops 513 at the right side of the anti-deviation support 52 are toggled, once the anti-deviation support 52 slides along the partition ring frame 51, the anti-deviation support 52 may directly slide until contacting the second pair of the toggle stops 513 at the right side of the anti-deviation support 52. Meanwhile, because the

adjusting pipe column 61 will continue to apply force, two ends of the anti-deviation support 52 will contract the second pair of the toggle stops 513, so that the anti-deviation support 52 does not incline when stopped.

[0066] As shown in FIGs. 1-2, in adjusting of the treatment area, the human skin is uneven (for example, wrinkles appear in the needful treatment area caused by obesity), in order to prevent the uneven coverage of the treatment area of the therapeutic apparatus column 2 caused by the loose bearing of the anti-deviation support 52, the anti-deviation support 52 includes a stabilized column 521 with an end connected to the inner wall of the sliding slot 511. A fixing sleeve 522 is provided on the stabilized column 521, a side wall of the stabilized column 521 is connected to the adjusting pipe column 61, the fixing sleeve 522 is used to fix the therapeutic apparatus column 2, and an end of the fixing sleeve 522 close to the human skin is connected with a plurality of retractable air columns 523.

[0067] The retractable air column 523 can increase the friction with the human skin by compressing its volume when the wrapping belt 1 tightly attaches onto the human skin.

[0068] When the stabilized column 521 is inserted into the sliding slot 511, the two ends of the stabilized column 521 can be embedded into the sliding slot 511 (the partition ring frame 51 is a square shape as shown in FIG.1, so that the sliding slot 511 has two and separately fixed on the two ends of the stabilized column 521). Once the stabilized column 521 is driven by the partition ring frame 51 to move towards the human skin, then the fixing sleeve 522 will be driven by the stabilized column 521 to press against the human skin. Meanwhile, the retractable air column 523 will attach onto the human skin and compress volume of which to increase the friction with the human skin.

[0069] As shown in FIG. 1, the adjusting pipe column 61 includes a manifold 611 connecting to the partition ring frame 51, a first end of the manifold 611 is provided with an air diversion column 612 connecting to the inflatable ring column 41, and a second end is provided with at least two branch columns 613.

[0070] Each of branch columns 613 has a force-applying point on a sidewall of the stabilized column 521, and the two force-applying points are symmetrical about a center of the stable column 521.

[0071] The air diversion column 612 can divert air in the inflatable ring column 41 to enter the manifold 611, after the air is fulfilled into at least two branch columns 613 through the manifold 611, the branch columns 613 extends to push the stabilized column 521 to move.

[0072] As shown in FIG.1, the sidewall of the branch columns 613 is sleeved with a force-applying sleeve 614, which is arranged at one end of the branch columns 613 away from the manifold 611. A sidewall of the force-applying sleeve 614 is connected to an anti-bending sleeve 615, and the anti-bending sleeve 615 is connected to the partition ring frame 51, and limits the sidewall of the branch columns 613 to prevent the branch column 613 from bending.

[0073] In order to prevent the branch column 613 from bending when the stabilized column 521 does not move, further, when the stabilized column 521 does not move, the anti-bending sleeve 615 will apply a limiting force to the sidewall of the branch column 613 to prevent the branch column 613 from bending. However, when the stabilized column 521 moves, the branch column 613 will push the stabilized column 521 to move via the force-applying sleeve 614.

[0074] As shown in FIG.1, one side of the inflatable ring column 41 away from the wrapping belt 1 is arranged with a plurality of adhesive discs 411, which can be pushed by the inflatable ring column 41 and attached onto the human skin.

[0075] When the wrapping belt 1 is wrapped around the human skin, the inflatable ring column 41 will further touch the human skin, that is, the adhesive disc 411 can be pushed by the adhesive discs 411 and attached onto the human skin. The adhesive disc 411 can limit the wrapping belt 1 around the human skin to prevent the wrapping belt 1 from sliding when in use.

[0076] As shown in FIG.1, an anti-overlap sleeve 412 is arranged into the inflatable ring column 41, which can shape the inflatable ring column 41, and longitudinal section of the anti-overlap sleeve 412 is a ring shape or a C-shape.

[0077] When the inflatable ring column 41 are bended, the anti-overlap sleeve 412 can prevent poor air flow due to internal overlap of the inflatable ring column 41.

[0078] In this embodiment, the inflatable ring column 41 and the partition ring frame 51 can select flexible materials such as rubber etc. to apply to different human bodies.

[0079] As shown in FIG.1, the wrapping belt 1 is arranged with an expansion column 11 connecting to the inflatable ring column 41, the expansion column 11 can increase adhesion on the human skin by the wrapping belt 1, so that when the wrapping belt 1 is wrapped around the human skin, which can be pushed by expanded expansion column 11 to be always in a tight state without relaxation.

[0080] The above are the preferred embodiments of the present application, which are not intended to limit the protection scope of the present application. Therefore, all equivalent changes made according to the structure, shape and principle of the present application should be covered within the protection scope of the present application.