DESCRIPTION

Title of the Invention

LEG MASSAGE DEVICE

Technical Field

[0001] The present invention relates to a leg massage device suitable for use in massaging legs.

Background Art

[0002] As one of conventional leg massage devices capable of massaging legs (between below-knee and near-ankle regions, in particular), there is known a massage device incorporated in a footrest of a chair-type massage apparatus (refer to Patent Literature 1, for example). This leg massage device has a pair of right-hand and left-hand treatment recesses, and an air bag is disposed at each of the inner surfaces of the opposed side walls of the paired treatment recesses, and also on both sides of the intermediate wall thereof. By causing each air bag to inflate and deflate using an air supply-exhaust unit, it is possible to massage legs put in their respective treatment recesses simultaneously.

[0003] An air bag is generally so designed that it becomes inflated to the maximum volume at its midportion, and the volume of inflation decreases gradually with approach toward each end, wherefore sufficiently high pressing force is exerted only in a narrow region of the leg in its lengthwise direction. With this in view, there is proposed a leg massage device equipped

with a plurality of air bags juxtaposed in a direction longitudinally of each treatment recess, for massaging legs over as large an area as possible in the lengthwise direction by supplying air to and exhausting air from the air bags concurrently or sequentially (refer to Patent Literature 2, for example).

[0004] By way of contrast, there is proposed a leg massage device that employs, instead of an air bag, a mechanism for moving each wall constituting a treatment recess close to and away from a leg (refer to Patent Literature 3, for example). This leg massage device is provided with a pair of right-hand and left-hand treatment recesses, each contoured to the shape of a leg between calf and toe regions, arranged in a right-left, or horizontal direction, for holding legs between calf and toe regions in sandwich style in the horizontal direction. The treatment recesses massage legs between calf and toe regions while being moved close to and away from the legs repeatedly.

Prior Art Reference

Patent Literature

[0005]Patent Literature 1: Japanese Examined Patent Publication JP-B2 3012780

Patent Literature 2: Japanese Unexamined Patent Publication JP-A 11-347082 (1999)

Patent Literature 3: Japanese Unexamined Patent Publication JP-A 2006-304864

Summary of the Invention

Problems to be solved by the Invention

[0006] However, the conventional leg massage device of air-bag type as disclosed in Patent Literatures 1 and 2 is designed to press a to-be-treated area of user's body by inflating and deflating the air bag utilizing an air supply-exhaust unit or the like, wherefore pressing force necessary for the user cannot be obtained. Also, since the air bag is so designed that it becomes inflated to the maximum volume at its midportion and the volume of inflation decreases gradually with approach toward each end to define an elliptical form, it is impossible to obtain pressing force that is uniform throughout the to-be-treated area of user's body.

[0007] On the other hand, in the conventional leg massage device of mechanical type as disclosed in Patent Literature 3, legs between calf and toe regions can be massaged by repeated mutual approaching and separating actions of the treatment members that cover the legs in sandwich style, but, satisfactory massage, such as finger-pressure massage, cannot be performed over a wide calf-to-toe region.

Moreover, the treatment section of the mechanical leg massage device as disclosed in Patent Literature 3 is composed of a treatment member for calf massage and a treatment member for foot massage. In this case, each of the treatment members necessitates a drive shaft, a power transmission member (gear), and a power conversion unit for transmission of pressing force

to a to-be-treated area of user's body, wherefore the massage device comprises many constituent components, with consequent increase in structural complexity. That is, in the leg massage device disclosed in Patent Literature 3, rising costs entailed by an increase in the number of constituent components are inevitable.

[0008] The present invention has been devised in view of the circumstances as mentioned supra, and accordingly its object is to provide a leg massage device capable of affording innovative and comfortable massage effects, in which a treatment member thereof is designed as an elongated member extending along a calf-to-foot region for reduction of the number of constituent components.

Means for solving the problem

[0009] In order to accomplish the above object, the following means is adopted for the implementation of the present invention.

That is, a leg massage device pursuant to the present invention comprises: an outer treatment member formed so as to cover an outer part of a foot; a front-pressing treatment member disposed above the outer treatment member, for pressing a front of a calf while moving in a vertical direction; an inner treatment member opposed to the outer treatment member and the front-pressing treatment member in a horizontal direction, which is a vertically elongated member extending along a leg region

from an inner part of a calf to an inner part of a foot; a rotary shaft disposed so as to pass through the base-end sides of the inner treatment member and the outer treatment member in the horizontal direction; a driving section for rotatably driving the rotary shaft; and a conversion section for converting rotational drive force of the rotary shaft into massage actions of the inner treatment member and the outer treatment member to hold legs in sandwich-style.

[0010] It is preferable that the opposed inner treatment member and outer treatment member are arranged in pairs in the horizontal direction, and that an inner wall of the inner treatment member is composed of a first treatment section opposed to the front-pressing treatment member and a second treatment section opposed to the outer treatment member.

It is preferable that the inner treatment member is constituted by forming integrally over the first treatment section and the second treatment section and has a boot-like shape as viewed from a side. In other words, it is preferable that the first treatment section and the second treatment section are integral to constitute the inner treatment member having a boot-like shape as viewed from the side.

[0011] It is preferable that the outer wall of the inner treatment member is fitted with a long reinforcing member extending continuously from a position corresponding to the first treatment section to a position corresponding to the second

treatment section.

It is preferable that the conversion section is located centrally of a lower part of each of the inner treatment member and the outer treatment member in a front-rear direction.

It is preferable that the conversion section comprises: a rotary boss portion secured to an axial midpoint of the rotary shaft with inclination to the rotary shaft for unitary rotation with the rotary shaft; a housing portion disposed in the outer treatment member and the inner treatment member, to which is externally fitted the rotary boss portion for free relative rotation; and a restraint portion for restraining the housing portion from rotating in response to a rotation of the rotary boss portion.

[0012] It is preferable that two or more bearing tools are mounted in the rotary boss portion of the conversion section provided in the inner treatment member.

It is preferable that the conversion section converts rotational drive force of the rotary shaft into a massage action that causes the front side of the second treatment section and the front side of the outer treatment member to approach each other and causes the upper part of the first treatment section to approach the front-pressing treatment member, and also a massage action that causes the upper part of the first treatment section to move away from the front-pressing treatment member and causes the front side of the second treatment section to

move away from the outer treatment member.

Advantageous effects of the Invention

[0013] According to the leg massage device pursuant to the present invention, the number of constituent components can be reduced by employing a treatment member designed as an elongated member extending along a calf-to-foot region, and nevertheless innovative and comfortable massage can be performed on a user.

Brief Description of Drawings

[0014][Fig. 1] Figure 1 is a front perspective view of the appearance of the leg massage device pursuant to the present invention.

[Fig. 2] Figure 2 is a front perspective view of the internal structure of the leg massage device pursuant to the present invention.

[Fig. 3] Figure 3 is a front view of the internal structure of the leg massage device pursuant to the present invention.

[Fig. 4] Figure 4 is a plan view of the internal structure of the leg massage device pursuant to the present invention.

[Fig. 5] Figure 5 is a sectional view of the leg massage device taken along the line A-A of Fig. 3, showing the structure of the inner treatment member.

[Fig. 6] Figure 6 is a side view of the internal structure of the leg massage device pursuant to the present invention, showing the internal structure of the leg massage device in a state as shown in Fig. 5 as viewed from the side.

[Fig. 7] Figure 7 is a sectional view of the leg massage device taken along the line B-B of Fig. 3, showing the outer-wall side of the inner treatment member.

[Fig. 8] Figure 8 is an enlarged sectional view of the inner treatment member taken along the line C-C of Fig. 3.

Modes for Carrying out the Invention

[0015] Hereinafter, embodiments of the present invention will be described with reference to drawings.

Figures 1 to 8 show the structure of a leg massage device 1 pursuant to the present invention. The leg massage device 1 illustrated in the figures, which is intended to massage both of the right and left legs of a user, performs sandwich-style massage and finger-pressure massage based on rectilinear motion simultaneously on each of a calf L and a foot F constituting the leg.

[0016] In the present description, the term “calf L” refers to part of a human leg in a range from below the knee to above the ankle, and the term “foot F” refers to part of the leg in a range downwardly from the ankle. Moreover, in Fig. 1, the direction indicated by an arrow X is defined as a front-rear direction, the direction indicated by an arrow Y is defined as a right-left, or horizontal direction (widthwise direction), and the direction indicated by an arrow Z is defined as a top-bottom, or vertical direction.

Furthermore, for purposes of description, the left-hand

part of Fig. 3 corresponds to the right side, and the right-hand part of Fig. 3 corresponds to the left side. Also, for purposes of description, the direction from top to bottom of Fig. 3 is defined as the vertical direction, and the direction of drilling through the paper sheet with Fig. 3 printed on it is defined as the front-rear direction. The definitions of directions used in the description are based on the sight of a user sitting with his/her legs set in the device as shown in Fig. 1.

[0017] As shown in Fig. 1, the leg massage device 1 is provided with a casing 2 which is of a transversely or longitudinally-elongated rectangular or square shape as viewed from the front, and is of a boot-like shape as viewed from the side.

The casing 2 has a pair of right-hand and left-hand first treatment recesses 4 that are spaced apart in the horizontal direction, each of which is opened forward and upward at substantially upper half of the front face of the casing. The right and left calves L can be inserted into the right-hand and left-hand first treatment recesses 4, respectively.

[0018] Moreover, the casing 2 has a pair of right-hand and left-hand second treatment recesses 5 that are spaced apart in the horizontal direction, each of which is opened upward and forward at substantially lower half of the front face of the casing. The right and left feet F can be inserted into the right-hand and left-hand second treatment recesses 5,

respectively.

In the interest of concurrent insertion of the calf L and the foot F in the first treatment recess 4 and the second treatment recess 5, respectively, the right-hand first treatment recess 4 and the right-hand second treatment recess 5 are continuous with each other, and so are the left-hand first treatment recess 4 and the left-hand second treatment recess 5. The first treatment recess 4 and the second treatment recess 5 are each internally formed with a lining 6.

[0019] As shown in Figs. 2 and 3, the right-hand and left-hand first treatment recesses 4 are each provided with a vertical massage system 151 for massaging the calf L from the front side and the back (rear) side.

On the other hand, the right-hand and left-hand second treatment recesses 5 are each provided with a horizontal massage system 150 for massaging the foot from the right and left sides.

In the leg massage device 1, the casing 2 is made changeable in position between a stand-up position and a lying-down position (with its front face lying face-up) as desired.

[0020] As shown in Figs. 2 and 3, a support frame 15 is disposed in the interior of the casing 2. The support frame 15 is constructed of a base frame portion 16 standing substantially horizontal at a lower-end position and a back frame portion 17 extending upwardly and substantially vertically from the rear end of the base frame portion 16 that are combined in

a single-piece structure in the form of the letter L as viewed from the side.

In the support frame 15, the above-described horizontal massage system 150 is attached relatively to the base frame portion 16, and the above-described vertical massage system 151 is attached relatively to the back frame portion 17. As will hereafter be described, at each end of the base frame portion 16 in the horizontal direction, there is disposed a support part 304 for supporting a rotary shaft 186 provided in the horizontal massage system 150. The support part 304, which is configured for engagement with a bearing, supports both ends of the rotary shaft 186.

[0021] The horizontal massage system 150 is composed of an outer treatment member 300 formed so as to cover the outer part of user’s foot, and an inner treatment member 301 opposed to the outer treatment member 300 in the horizontal direction, which is a vertically elongated member extending along a leg region from the inner part of the calf to the inner part of the foot as viewed from the side. The outer treatment member 300 and the inner treatment member 301 perform kneading massage on both sides of the foot in the horizontal direction and the inner part of the calf.

[0022] Moreover, the vertical massage system 151 is composed of a front-pressing treatment member 160 disposed above the outer treatment member 300, for pressing the front of the

calf while moving vertically (treatment member for the shin) and a back-pressing treatment member 161 (treatment member for the back of the calf). The treatment members 160 and 161 perform a pressing massage on both sides of the calf in the front-rear direction.

[0023] Firstly, the vertical massage system 151 will be described in detail.

The vertical massage system 151 comprises: the front-pressing treatment member 160 for pressing that part of the calf L displaced obliquely outwardly from the front side thereof; the back-pressing treatment member 161 opposed to the front-pressing treatment member 160, with the calf L lying between them, for supporting the calf L at the back; a holding mechanism 162 for allowing the front-pressing treatment member 160 and the back-pressing treatment member 161 to keep pressing the calf; and a moving mechanism 26 for imparting up-and-down motion to the treatment members 160 and 161 and the holding mechanism 162.

[0024] The front-pressing treatment member 160 and the back-pressing treatment member 161 are opposed to each other in the front-rear direction, and a pair of these members 160 and 161 is provided for each of the right and left legs of a user (user's body) individually. As a matter of course, the holding mechanism 162 is correspondingly provided for each pair of the treatment members 160 and 161 individually.

As shown in Figs. 2 to 6, in the moving mechanism 26, a

rail retaining portion 163, which is disposed at each end of a vertically-moving slider 30 in the horizontal direction, is fitted for free up-and-down motion onto each of paired right-hand and left-hand vertical rails 21 attached to the back frame portion 17, and the vertically-moving slider 30 is driven to move up and down by a raising-lowering driving section 31. Moreover, the treatment members 160 and 161 and the holding mechanism 162 are arranged on both sides of the vertically-moving slider 30 in the horizontal direction.

[0025] The raising-lowering driving section 31 is, more specifically, composed of: a feed screw shaft 32 mounted so that the direction of its length corresponds to the vertical direction; a motor 33 operable in forward and reverse directions and a reduction gear portion 34 coupled to the rear of the motor 33, for rotatably driving the feed screw shaft 32; and a nut member 35 attached to the vertically-moving slider 30 for threadable engagement with the feed screw shaft 32 in impaled fashion. The motor 33 and the reduction gear portion 34 are fixed inside of the support frame 15 (in the midsection on the base frame portion 16 in the horizontal direction).

[0026] The front-pressing treatment member 160 is placed in a location displaced somewhat obliquely outwardly (rightwardly or leftwardly) from the front side of the calf L (directly in front of the calf). More specifically, the left-hand treatment member 160 is placed in a location displaced

leftwardly from the front side of the calf L, whereas the right-hand treatment member 160 is placed in a location displaced rightwardly from the front side of the calf L. By virtue of such an arrangement, the treatment member 160 is capable of pressing, while avoiding direct contact with the shin at the front side of the calf L, the lateral part of the calf next to the shin in the horizontal direction.

[0027] The treatment member 160 is supported on a forwardly protruding part of a stay 165 disposed so as to protrude forward, along the outer part of the calf L in the horizontal direction, from the rail retaining portion 163 of the vertically-moving slider 30 provided in the moving mechanism 26. The treatment member 160 shaped like a cylindrical roller (drum) expanded at its axial center has formed at its axis a pivot shaft 166 which is coupled to the stay 165. The treatment member 160 may either be configured for free rotation about the pivot shaft 166 or be mounted in an unrotatable fashion.

[0028] The pivot shaft 166 is so disposed that the base side coupled to the stay 165 lies outermost in the horizontal direction, whereas the opposite side protrudes obliquely forwardly, with its end pointing inward in the horizontal direction. With such an obliquely protruding pivot shaft 166, the treatment member 160 is bent inwardly for covering the outer part of the calf L, and is abutted only on that part of the calf L displaced obliquely outwardly from the front side, while

avoiding contact with other outer side surface of the calf L.

[0029] On the other hand, the back-pressing treatment member 161 supports the central part of the back of the calf L in a state of being pressed rearward by the front-pressing treatment member 160. This treatment member 161 has the form of a cylindrical roller which is installed, with its roller shaft staying horizontal in the horizontal direction, relatively on the front face of the vertically-moving slider 30 provided in the moving mechanism 26. The roller is designed as a taper roller shaped so that its thickness becomes smaller gradually from the inner side to the outer side in the horizontal direction.

[0030] The front-pressing treatment member 160 and the back-pressing treatment member 161 are unitarily moved up and down in response to the up-and-down movement of the vertically-moving slider 30 of the moving mechanism 26. Thus, the calf L can be given finger-pressure massage at its two locations, namely the part displaced obliquely from the front side (part next to the shin) and the back, with a high degree of effectiveness.

The vertical massage system 151 of this embodiment is provided with the holding mechanism 162. Upon the insertion of the calf L in between the front-pressing treatment member 160 and the back-pressing treatment member 161, the holding mechanism 162 holds the front-pressing treatment member 160 so that it will not move greater-than-predetermined distance away

from the back-pressing treatment member 161 to assume the open position, and also causes the treatment members 160 and 161 to keep on pressing both sides of the calf L in the front-rear direction. Moreover, the vertical massage system 151 of this embodiment is provided with an advance-retraction driving section 37. When the vertically-moving slider 30 of the moving mechanism 26 is moved further downward beyond a predetermined lower-limit position, the advance-retraction driving section 37 allows the front-pressing treatment member 160 to move greater-than-predetermined distance away from the back-pressing treatment member 161 to assume the open position.

[0031] For example, the systems disclosed in Japanese Patent Application No. 2011-230791 that has already been submitted by the applicants of the present application can be adopted for use as specific systems for the holding mechanism 162 and the advance-retraction driving section 37.

Next, the horizontal massage system 150 mounted in the leg massage device 1 will be described in detail.

[0032] As shown in Figs. 2 to 7, the horizontal massage system 150 comprises: the outer treatment member 300 formed so as to cover the outer part of the foot; the inner treatment member 301 opposed to the outer treatment member 300 in the horizontal direction, which is a vertically elongated member extending along a leg region from the inner part of the calf to the inner part of the foot as viewed from the side; and a kneading mechanism

185 for imparting foot F-kneading actions to the treatment members 300 and 301.

[0033] The outer treatment member 300 and the inner treatment member 301 are opposed to each other, so that the foot F can be held between them in sandwich style, and a pair of these treatment members 300 and 301 is provided for each of the right and left legs of a user (user's body) individually.

The outer treatment member 300 is a platy member extending in the front-rear direction, which is disposed above the rotary shaft 186 provided in the kneading mechanism 185 (as will hereafter be described in detail). The upper end of the outer treatment member 300 is situated at substantially the same level as the lower end of a rail member 171, or is situated in a position near that lower end. Moreover, the outer treatment member 300 has its front side curved downwardly to provide a radiused upper end as viewed from the side, and has its upper end bent inwardly in the horizontal direction.

[0034] In other words, the outer treatment member 300 is a platy member disposed so as to face the outer part of the foot, which protrudes in a length somewhat greater than the height of the foot (the distance from a floor to the instep of the foot). That surface of the outer treatment member 300 opposed to the foot (the inner wall of the outer treatment member 300) is so shaped as to conform to the instep of the outer part of the foot, and has a plurality of kneading projections. The outer treatment

member 300 performs kneading massage on the outer part of the foot in response to rocking motion of the kneading mechanism 185.

[0035] As shown in Figs. 4 to 7, the inner treatment member 301 is a platy member extending in the front-rear direction, which is disposed above the rotary shaft 186 provided in the kneading mechanism 185, and, the upper end located toward the rear of the inner treatment member 301 is elongated upward. Moreover, the inner treatment member 301 has its front side curved downwardly to provide a radiused upper end as viewed from the side, and has its upper end bent outwardly.

[0036] In other words, the inner treatment member 301 is a platy member opposed to the outer treatment member 300 and the front-pressing treatment member 160, the dimension of which is such as to permit application of pressing force to a leg region from the inner part of the foot to the inner part of the calf (the entire inner part of the leg). That is, the inner treatment member 301 has the form of a long boot extending up to the lower end of the calf as viewed from the side.

The inner wall of the inner treatment member 301 that is brought into contact with the entire inner part of the leg is provided with a first treatment section 302 for pressing the inner part of the calf and a second treatment section 303 for pressing the inner part of the foot formed integrally with each other.

[0037] The first treatment section 302 is opposed to the front-pressing treatment member 160 in the horizontal direction, for holding the calf together with the front-pressing treatment member 160 in sandwich style. In conjunction with the front-pressing treatment member 160, the first treatment section 302 performs vertical finger-pressure massage on the calf. The first treatment section 302 is formed with a plurality of second projections 305 for enhancing finger-pressure massage effects exerted on the calf.

[0038] The second treatment section 303 is opposed to the outer treatment member 300 in the horizontal direction, for covering the foot together with the outer treatment member 300. In conjunction with the outer treatment member 300, the second treatment section 303 performs sandwich-style massage on the foot. Disposed at the rear of the second treatment section 303 is a protrusion 306 for performing kneading massage on user's heel.

Meanwhile, as shown in Fig. 7, a long, platy reinforcing member 308 is attached to the outer wall of the inner treatment member 301. The reinforcing member 308 is so disposed as to extend continuously from the base-end side of the second treatment section 303 of the inner treatment member 301 to a midpoint of the first treatment section 302, for surrounding a conversion section 188 (as will hereafter be described in detail) provided on the base-end side of the second treatment section 303. The

reinforcing member 308 is intended to protect the inner treatment member 301 massaging the calf against deformation and damage. Another role of the reinforcing member 308 is to transmit kneading force produced by the kneading mechanism 185 (as will hereafter be described in detail) to the calf without causing any decrease of the force. The reinforcing member 308 is constructed of a hard plate material made of iron, stainless steel, or the like for the protection of the inner treatment member 301 against deformation and damage.

[0039] A material which exhibits elasticity in the direction of its thickness, such as nylon, can be adopted for use as the material of formation of the inner treatment member 301 and the outer treatment member 300. It is desirable to attach a cushion material made of rubber or urethane to the inner walls of the inner treatment member 301 and the outer treatment member 300 to ease a sense of slight discomfort in the foot resulting from contact with the constituent members.

The kneading mechanism 185 of the horizontal massage system 150 is composed of the rotary shaft 186 disposed so as to pass through the base-end sides (lower-end sides) of the inner treatment member 301 and the outer treatment member 300 in the horizontal direction, and a driving section 309 for rotatably driving the rotary shaft 186. In the driving section 309, the motor 33 operable in forward and reverse directions mounted in the moving mechanism 26 (raising-lowering driving section 31)

of the vertical massage system 151 serves as a drive source. The motor 33 is provided with two rotary drive shafts extending in the front-rear direction, of which the front-side rotary drive shaft actuates the horizontal massage system 150, whereas the rear-side rotary drive shaft actuates the vertical massage system 151.

[0040] As shown in Figs. 2 to 7, a gear box 187 is coupled to the front side of the motor 33, and, one rotary shaft 186 passing through the base-end sides (lower-end sides) of the inner treatment member 301 and the outer treatment member 300 in the horizontal direction is rotatably supported by the gear box 187. Moreover, the rotary shaft 186 is supported at both ends by the support part 304 provided in the base frame portion 16. Accordingly, the rotary shaft 186 is supported at three points, namely the gear box 187 and the support parts 304.

[0041] The gear box 187 has built-in worm gear and worm wheel, through which the power of the motor 33 is transmitted to the rotary shaft 186.

In a through region where the rotary shaft 186 passes through the lower parts of the treatment members 300 and 301, there is disposed the conversion section 188 for converting the rotational drive force of the rotary shaft 186 into the actions of the inner treatment member 301 and the outer treatment member 300 to massage the leg in sandwich-style.

[0042] A pair of conversion sections 188 is provided for

the inner treatment members 301, as well as for the outer treatment members 300, and the conversion section 188 is located centrally of the lower part of its respective treatment member in the front-rear direction. Now, the structure of the conversion section 188 will be described with reference to the inner treatment member 301 for example.

The conversion section 188 is disposed at the lower-end side (lower part) of the inner treatment member 301 so as to be situated slightly forward of the front end face of the first treatment section 302, as well as to be situated below the lower end face (base end) of the second treatment section 303. That is, the topside of the outer periphery of the conversion section 188 corresponds to the position of the arc of the foot (central part of the foot in the front-rear direction). The rotary shaft 186 passes through the conversion section 188 so as to be supported for free rotation relative to the conversion section 188. Note that the conversion section 188 of the outer treatment member 300 is opposed to the conversion section 188 of the inner treatment member 301. The conversion section 188 of the outer treatment member 300 and the conversion section 188 of the inner treatment member 301 are arranged side by side in the horizontal direction.

[0043] The conversion section 188 comprises: a rotary boss portion 189 secured to an axial midpoint of the rotary shaft 186 for unitary rotation with the rotary shaft 186; a housing portion 190 disposed in each of the outer treatment member 300

and the inner treatment member 301, to which is externally fitted the rotary boss portion 189 for free relative rotation; and a restraint portion 191 for restraining the housing portion 190 from rotating in response to a rotation of the rotary boss portion 189.

[0044] The rotary boss portion 189 is a disk-like component inclined with respect to the rotary shaft 186, and a bearing tool 307 such as a bearing is attached to the outer periphery of the rotary boss portion 189. Particularly in the inner treatment member 301, which is a vertically elongated member, great moment (moment entailed by kneading actions) is produced during its massage operation. The great moment places a heavy load on the conversion section 188 (the rotary boss portion 189) and the rotary shaft 186 disposed below the inner treatment member 301. This leads to a damage to the inner treatment member 301.

In order to avoid this problem, as shown in Fig. 8, a plurality of (for example, two) bearing tools 307 are mounted on the outer periphery of the rotary boss portion 189 of the inner treatment member 301.

[0045] The rotary boss portion 189 in the outer treatment member 300 and the rotary boss portion 189 in the inner treatment member 301 are inclined oppositely.

The restraint portion 191 has an engagement projection protruding downwardly from the housing portion 190, and, the engagement projection engages in a horizontally-extending

sliding guide slot formed in the base frame portion 16 of the support frame 15.

[0046] Thus, during the rotation of the rotary shaft 186, the engagement projection engaging in the sliding guide slot is allowed to slide only in the horizontal direction, so that the housing portion 190 is restrained against a following rotation, and the outer treatment member 300 and the inner treatment member 301 are rocked back and forth, as well as right and left, with the back-and-forth movement and the right-and-left movement restricted within predetermined angular ranges. As has already been described, since the rotary boss portions 189 of the right-hand and left-hand outer treatment members 300, as well as the rotary boss portions 189 of the right-hand and left-hand inner treatment members 301, are opposite to each other in terms of inclination with respect to the rotary shaft 186, it follows that, in the outer treatment member 300 and the inner treatment member 301, when their front sides are close to each other, their rear sides are away from each other. That is, the outer treatment member 300 and the inner treatment member 301 take on a shape like the letter inverted V as viewed from the top.

[0047] As the rotary shaft 186 is rotated, an action is produced that causes the front side of the second treatment section 303 and the front side of the outer treatment member 300 to approach each other, and correspondingly an action is produced that causes the upper part of the first treatment section

302 to approach the front-pressing treatment member 160. After that, the upper part of the first treatment section 302 is moved away from the front-pressing treatment member 160, and the front side of the second treatment section 303 is moved away from the outer treatment member 300. From then on, the treatment members 160, 300, and 301 repeat the above actions in cycles.

[0048] A sole massage roller 200 is piercingly attached to the rotary shaft 186 in impaled fashion so as to extend along the through region between the outer treatment member 300 and the inner treatment member 301. The sole massage roller 200 is given an outside diameter large enough to support the arc of the foot F through surface contact, and has an outer periphery which is in concentric or slightly eccentric relation to the rotary shaft 186. The outer periphery of the sole massage roller is formed with a plurality of first projections 201 spaced apart in the circumferential direction, as well as in the axial direction of the rotary shaft 186.

[0049] The sole massage roller 200 is rotated in response to the above-described cyclic actions of the outer treatment member 300 and the inner treatment member 301.

At the front of the sole massage roller 200, there is disposed a foot support member 195a for supporting the back of the toe of the foot F at a position between the outer treatment member 300 and the inner treatment member 301, and, at the rear of the sole massage roller 200, there is disposed a foot support

member 195b for supporting the back of the heel of the foot F at a position between the outer treatment member 300 and the inner treatment member 301.

[0050] Next, the operation of the leg massage device 1 as shown in Figs. 2 to 7 will be described in accordance with usage conditions.

In the leg massage device 1, when its power switch or operation switch is in the OFF position, as shown in Fig. 2, the front-pressing treatment member 160 and the back-pressing treatment member 161 of the vertical massage system 151 remains at rest in their lowermost positions.

[0051] To begin with, a user inserts each of his/her right and left calves L in between the front-pressing treatment member 160 and the back-pressing treatment member 161, and also inserts each of his/her right and left feet F in between the outer treatment member 300 and the inner treatment member 301 of the horizontal massage system 150.

Under this condition, the power switch or operation switch is turned to the ON position, whereupon the motor 33 is set in motion, and, in the vertical massage system 151, the moving mechanism 26 initiates upward motion of the vertically-moving slider 30 via the reduction gear portion 34 of the raising-lowering driving section 31. Moreover, in the horizontal massage system 150, the rotary shaft 186 starts to rotate via the gear box 187 of the kneading mechanism 185.

[0052] In the vertical massage system 151, as the vertically-moving slider 30 is moved upward, that part of the calf L displaced obliquely from the front side (part next to the shin) is pressed by the front-pressing treatment member 160, and also the back of the calf L is pressed by the back-pressing treatment member 161, whereby the calf is subjected to finger-pressure massage with a high degree of effectiveness.

[0152] Still under the above condition, the vertically-moving slider 30 repeats a plurality of cycles of reciprocal up-and-down movements on an as needed basis.

[0053] On the other hand, in the horizontal massage system 150, when the front side of the second treatment section 303 of the inner treatment member 301 and the front side of the outer treatment member 300 approach each other under the rotation of the rotary shaft 186, in response to this approaching action, the first treatment section 302 of the inner treatment member 301 is moved close to the front-pressing treatment member 160. In contrast to this, when the front side of the second treatment section 303 of the inner treatment member 301 and the front side of the outer treatment member 300 are separated from each other, in response to this separating action, the first treatment section 302 of the inner treatment member 301 is moved away from the front-pressing treatment member 160. Such repeated kneading massages are performed on each side of the foot F in the horizontal direction.

[0054] At the same time, the sole massage roller 200 disposed in the rotary shaft 186 is rotated together with rotary shaft 186, so that the two or more first projections 201 formed on the outer periphery of the sole massage roller 200 give finger-pressure massage to the back of the foot F while moving from the rear to the front, and vice versa.

Moreover, in the leg massage device 1 pursuant to the present invention, the vertical massage system 151 is provided with an interference preventive mechanism 250 for preventing interference between the foot F and the paired treatment members (the front-pressing treatment member 160 and the back-pressing treatment member 161) that are being moved by the moving mechanism 26.

[0055] The interference preventive mechanism 250 provided in the leg massage device 1 comprises a restraint member 251, a back member 252, and an impact-avoiding member 253.

The restraint member 251 is intended to restrain the foot F from reaching a position at which the back-pressing treatment member 161 (treatment member for the back of the calf) arrives (lower reaching position) when the moving mechanism 26 operates to move the paired treatment members 160 and 161 from the knee to the foot F.

[0056] On the other hand, the back member 252 is intended to restrain the foot F from reaching a travel path over which the vertically-moving slider 30 and the back-pressing treatment

member 161 attached to the vertically-moving slider 30 move up and down, and also restrain the foot F from passing backward beyond the travel path.

Moreover, the impact-avoiding member 253 is intended to permit the back-pressing treatment member 161 to displace (escape) rearward or upward from its travel direction in the event that the back-pressing treatment member 161 abuts on the foot F while being moved from the knee to the foot F (moved downward) by the moving mechanism 26.

[0057] In addition, in preparation for emergency situations such as a power failure, it is advisable to provide a manual mechanism (escape mechanism) by which the user is able to forcibly release the restraint put on the calf L by the horizontal massage system 150, as well as the restraint put on the foot F by the vertical massage system 151, with his/her hands.

According to the leg massage device thus far described, the number of constituent components can be reduced by employing the treatment member designed as an elongated member extending along a calf-to-foot region, and nevertheless innovative and comfortable massage effects can be given to the user.

[0058] It should be understood that the embodiments as set forth hereinabove are considered in all respects as illustrative only and not restrictive. The scope of the present invention is indicated by the appended claims rather than the foregoing description, and all changes that come within the meaning of

and the range of equivalency of the claims are intended to be embraced therein.

For example, the leg massage device 1 pursuant to the present invention may be mounted at the front of a seat of a chair-type massage apparatus so as to serve also as a footrest.

Explanation of reference numerals and symbols

[0059]

1	leg massage device
2	casing
4	first treatment recess
5	second treatment recess
6	lining
15	support frame
16	base frame portion
17	back frame portion
21	vertical rail
26	moving mechanism
30	vertically-moving slider
31	raising-lowering driving section
32	feed screw shaft
33	motor
34	reduction gear portion
35	nut member
37	advance-retraction driving section
150	horizontal massage system
151	vertical massage system

160 front-pressing treatment member

161 back-pressing treatment member

162 holding mechanism

163 rail retaining portion

165 stay

166 pivot shaft

171 rail member

185 kneading mechanism

186 rotary shaft

187 gear box

188 conversion section

189 rotary boss portion

190 housing portion

191 restraint portion

195a foot support member

195b foot support member

200 sole massage roller

201 first projection

250 interference preventive mechanism

251 restraint member

252 back member

253 impact-avoiding member

300 outer treatment member

301 inner treatment member

302 first treatment section

303	second treatment section
304	support part
305	second projection
306	protrusion
307	bearing tool
308	reinforcing member
309	driving section
F	foot
L	calf

CLAIMS

1. A leg massage device comprising:

an outer treatment member formed so as to cover an outer part of a foot;

a front-pressing treatment member disposed above said outer treatment member, for pressing a front of a calf while moving in a vertical direction;

an inner treatment member opposed to said outer treatment member and said front-pressing treatment member in a horizontal direction, which is a vertically elongated member extending along a leg region from an inner part of a calf to an inner part of a foot;

a rotary shaft disposed so as to pass through base-end sides of said inner treatment member and said outer treatment member in the horizontal direction;

a driving section for rotatably driving said rotary shaft; and

a conversion section for converting rotational drive force of said rotary shaft into massage actions of said inner treatment member and said outer treatment member to hold legs in sandwich-style.

2. The leg massage device according to claim 1,

wherein said opposed inner treatment member and outer

treatment member are arranged in pairs in the horizontal direction,

and wherein an inner wall of said inner treatment member is composed of a first treatment section opposed to said front-pressing treatment member and a second treatment section opposed to said outer treatment member.

3. The leg massage device according to claim 2,

wherein said inner treatment member is constituted by forming integrally over said first treatment section and said second treatment section and has a boot-like shape as viewed from a side.

4. The leg massage device according to claim 3,

wherein an outer wall of said inner treatment member is fitted with a long reinforcing member extending continuously from a position corresponding to said first treatment section to a position corresponding to said second treatment section.

5. The leg massage device according to any one of claims 1 to 4,

wherein said conversion section is located centrally of a lower part of each of said inner treatment member and said outer treatment member in a front-rear direction.

6. The leg massage device according to claim 5,

wherein said conversion section comprises:

a rotary boss portion secured to an axial midpoint of the rotary shaft with inclination to said rotary shaft for unitary rotation with the rotary shaft;

a housing portion disposed in said outer treatment member and said inner treatment member, to which is externally fitted said rotary boss portion for free relative rotation; and

a restraint portion for restraining the housing portion from rotating in response to a rotation of said rotary boss portion.

7. The leg massage device according to claim 6,

wherein two or more bearing tools are mounted in the rotary boss portion of the conversion section provided in said inner treatment member.

8. The leg massage device according to claim 5,

wherein said conversion section converts rotational drive force of said rotary shaft into a massage action that causes a front side of said second treatment section and a front side of said outer treatment member to approach each other and causes an upper part of the first treatment section to approach the front-pressing treatment member, and also a massage action that causes the upper part of said first treatment section to move

away from the front-pressing treatment member and causes the front side of the second treatment section to move away from the outer treatment member.