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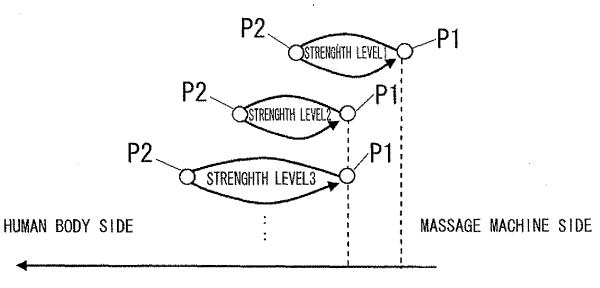
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(54) MASSAGE MACHINE

(57) A massage machine includes a treatment element to be contacted with a human body, and is configured to change an extending length of the treatment element to the human body side to give massage of variable strength to the human body. The massage machine also includes a control circuit configured to control cyclic movement of the treatment element in an extending direction of the treatment element to the human body side so that the treatment element extends from a first position to a second position to return to the first position. The control circuit is further configured to change at least one of the first position and the second position so that movement distance from the first position to the second position is changed in accordance with an instruction for changing massage strength.

FIG. 1



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Description

TECHNICAL FIELD

[0001] The invention relates generally to massage machines and, more particularly, to a massage machine capable of adjusting massage strength.

BACKGROUND ART

[0002] Massage machines with functions for adjusting massage strength have been traditionally provided (see e.g., Japanese Patent Application Publication No. 2002-369854). In such a massage machine, the arrival position of a treatment element is changed by changing a start position in massage operation of the treatment element. Relative movement distance of the treatment element from its start position to arrival position is the same even if the strength is changed.

[0003] Accordingly, it is difficult to provide multiple adjustment levels of massage strength, resulting in monotone massage operation.

DISCLOSURE OF THE INVENTION

[0004] The present invention is provided in view of the conventional problem described above, and an object is to provide a massage machine capable of having more ample variations (strong and weak levels).

[0005] A massage machine of the present invention comprises a treatment element to be contacted with a human body, and is configured to change an extending length of the treatment element to the human body side to give a massage of variable strength to the human body. The massage machine also comprises a control circuit configured to control cyclic movement of the treatment element in an extending direction of the treatment element to the human body side so that the treatment element extends from a first position to a second position to return to the first position. In an aspect of the invention, the control circuit is configured to change at least one of the first position and the second position so that movement distance from the first position to the second position is changed in accordance with an instruction for changing massage strength. Preferably, the control circuit is further configured to change both the first position and the second position while keeping the movement distance from the first position to the second position in accordance with an instruction for changing massage strength.

[0006] In this invention, the movement distance from the first position to the second position can be changed. Accordingly, it is possible to have more ample variations (strong and weak levels) concerning massage strength adjustment in comparison with prior art massage machine that shifts first and second positions while keeping the movement distance.

[0007] In an embodiment, the control circuit is configured to move the treatment element based on time varying target positions. In this embodiment, the memory of the control circuit can be reduced, and multiple strength adjustments can be performed at a moderate price.

[0008] In an embodiment, the control circuit is configured to move the treatment element based on time varying target positions in a plurality of directions. In this embodiment, the treatment element can be operated by a time function with respect to axes, and accordingly it is possible to increase variations of treatment operations in a plurality of directions at a moderate price.

[0009] In an embodiment, the control circuit is configured to determine the second position based on massage force detected with a massage force detecting means. In this embodiment, the second position can be set by massage force, and accordingly force pushing the human body is prevented from being too large in safety.

[0010] In an embodiment, the control circuit is configured to determine the second position based on a position of the treatment element detected with a treatment element position sensing means. In this embodiment, the treatment element is driven up to a predetermined second position, and accordingly even if body weight is heavy, change of strength level can be easily understood.

[0011] In an embodiment, the control circuit is configured to change the first position and the second position in response to each region of the subject's human body. In this embodiment, an appropriate massage can be given to each region of the human body.

[0012] In an embodiment, the control circuit is configured to change the first position and the second position in three-dimensional directions in response to each region of the subject's human body. In this embodiment, the first positions and the second positions are changed in three-dimensional directions, and thereby treatment direction can be varied.

[0013] In an embodiment, the massage machine comprises an operating portion for change instruction of the massage strength. The operating portion is configured capable of setting massage strength on each region of the human body. In this embodiment, a subject can adjust massage strength level by region per se. Accordingly, distastefulness due to strong or weak massage on only specific region is resolved. Subject can receive a massage having the favorite strength with respect to every region.

[0014] In an embodiment, the control circuit is configured to set, in response to massage strength setting or a region to be massaged, strength adjustment that the second position is fixed and only the first position is changed, and strength adjustment that the first position is fixed and only the second position is changed. In this embodiment, it is possible to perform an optimum massage operation in response to a region and massage strength.

[0015] In an embodiment, the massage machine of claim 1, comprising a plurality of automatic courses for automatically massaging the whole body in accordance with procedures of a preset probarm. The control circuit is configured to change the first position and the second position by course. In this embodiment, strength difference in the automatic courses is easily understandable. In a strong course, strong feel is easily obtained. In a weak course, weak feel is easily obtained.

[0016] In an embodiment, the massage machine comprises a favorite course capable of selecting a favorite massage with respect to a favorite region. The control circuit is configured to change the first position and the second position at each of the automatic courses and the favorite course. In this embodiment, strength levels can be set more finely at one of the automatic courses and the favorite course, thereby making ample massage strength variations.

[0017] In an embodiment, the massage machine comprises a display part configured to display the first position and the second position. In this embodiment, it is possible to indicate, to a subject, which position a massage is started from and which position the treatment element is extended up to.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] Preferred embodiments of the invention will now be described in further details. Other features and advantages of the present invention will become better understood with regard to the following detailed description and accompanying drawings where:

FIG. 1 is an explanatory diagram of operation of a massage machine in accordance with an embodiment of the present invention;
FIG. 2A is a schematic diagram showing a sectional view of the massage machine, and FIG. 2B is an explanatory diagram of movement of a treatment element in the massage machine;
FIG. 3 is an explanatory diagram of control of the treatment element;
FIGS. 4A and 4B are an explanatory diagram of control of the treatment element each;
FIG. 5 is an explanatory diagram of control of the treatment element;
FIG. 6 is an explanatory diagram of control of the treatment element;
FIG. 7 is an explanatory diagram of force control of the treatment element;
FIG. 8 illustrates each operation of treatment elements in the massage machine;
FIG. 9 illustrates each operation of treatment elements in the massage machine;
FIG. 10 is a front view of an operating portion in the massage machine; and
FIG. 11 shows a display example of the operating portion in the massage machine.

BEST MODE FOR CARRYING OUT THE INVENTION

[0019] The present invention is explained based on embodiments in the accompanying drawings. FIG. 2 shows a massage machine located in a backrest 5 of a chair (e.g., massage chair). The massage machine is configured so that each of treatment element (massage heads) 1 extending forward of the backrest 5 performs movement for changing its own extending length to a human body and thereby the machine gives the human body a variable strength massage. In the example of FIG. 2A, the massage machine includes two treatment elements 1 located at right and left.

[0020] The massage machine includes a driver 2, a control circuit 3, an operating portion 4 and so on. The driver 2 is configured to drive each treatment element 1. The control circuit 3 is configured to control the operation of the driver 2 so that each treatment element 1 gives a massage to a subject. The operating portion 4 is configured so that the subject can operate (adjust) massage strength. That is, if the subject adjusts the massage strength through the operating portion 4, the massage strength can be adjusted. As shown in FIG. 2B, a treatment element's (1) movement in one cycle for giving a massage takes a track that the treatment element 1 extends from a start position P1 (a first position) to an arrival position P2 (a second position) and then return from the arrival position P2 to the start position P1. FIGS. 2A and 2B show only the operation in an extending direction of the treatment element toward a human body, but each treatment element 1 may be moved in other directions.

[0021] The control circuit 3 is configured to change both of the start position P1 and the arrival position P2 while keeping distance constant in accordance with an instruction for adjusting (changing) massage strength from the operating portion 4, like conventional massage machines. The aforementioned distance is relative movement distance from the start position P1 to the arrival position P2. In an aspect of the present invention, the control circuit 3 is also configured to change at least one of the start position P1 and the arrival position P2 to change relative movement distance from the start position P1 to the arrival position P2 in accordance with an instruction for changing massage strength. For

example, the start position P1 is kept and the arrival position P2 is changed, or both of the start position P1 and the arrival position P2 are changed. Thereby, the relative movement distance from P1 to P2 is changed. FIG. 1 shows tracks of each treatment element 1 giving massages by the massage machine's adjusted strength.

[0022] In the strength level 1 and the strength level 2 in the figure, they are the same distance (start position to arrival position) and only each start position P1 is changed. In the strength level 2 and the strength level 3, they are the same start position P1 and each arrival position P2 is changed. That is, in the strength level 2 and the strength level 3, the treatment elements 1 have different movement distance. Also, Each treatment element 1 may be moved from the start position P1 same as that of the strength level 1 to the arrival position P2 in the strength level 3.

[0023] Operation control of each treatment element 1 for changing both of its own start position P1 and arrival position P2 so as to change its own movement distance is now explained.

[0024] FIG. 3 is a graph showing the time varying target position of a treatment element 1. A target position is given by a polynomial time function. For example, target positions z(t) are given through the time function as:

$$z(t)=10(1.25t^3 - 0.9375t^4 + 0.1875t^5) \text{ if } 0\leq t\leq 2; \quad (1)$$

$$z(t)=-10(0.37037t^3 - 0.185185^4 + 0.0246914t^5 - 1) \text{ if } 2<t\leq 5. \quad (2)$$

[0025] In this example, the polynomial time function for defining target positions is a quintic expression and the default position of the target positions is 0. For example, plus direction of 10 mm is operated if 2.0 seconds, and minus direction of 10 mm is operated if 3.0 seconds. That is, the start position and the arrival position are 0 mm and 10 mm, respectively. The total time that the treatment element 1 moves from P1 to P2 and then returns to P1 is 5 seconds. If the coefficients 10 and -10 in the expressions 1 and 2 are changed, the arrival position can be changed.

[0026] FIGS. 4A and 4B show an example of the time varying target positions of a treatment element 1. The control circuit 3 is configured to drive each treatment element 1 in different directions through the driver 2. In the examples of FIG. 4, in accordance with the time varying target positions, a treatment element 1 is driven so that it moves along each of two axes. In the examples, the two axes are x and y axes, and x and y components of the target positions are given by an independent polynomial time function each. For example, the coordinate of each start position is (0, 0), and three laps in an x-y plane constitute one cycle of the massage operation. These are synthesized in the x-y plane and then becomes the track as shown in FIG. 5, so that a two-dimensional track of the treatment element can be produced.

[0027] FIG. 6 shows an example of position control for a treatment element 1 in an x-y plane. The massage machine further includes position sensing devices 6 (treatment element position sensing means) located at the treatment elements 1, respectively. Each position sensing device 6 is configured to detect each position on x and y axes of the corresponding treatment element 1. The control circuit 3 is configured to decide each arrival position P2 of the treatment elements 1 based on each position of the treatment elements 1 detected with the position sensing devices 6. For example, each position sensing device 6 has resolution performance of 10 levels with respect to each of the x and y axes. Accordingly, each of the start position and the arrival position in the x-y plane is previously defined to any position in 10 levels of each or x and y axes. The treatment element 1 is moved from the start position P1 to the arrival position P2 by a velocity pattern per n-rotation of a motor in the driver 2. The treatment element 1 subsequently reaches the arrival position P2, and then is returned toward the start position P1. In this instance, the start position P1 and the arrival position P2 are limited to positions detected with the position sensing device.

[0028] The start position P1 is defined with the position sensing device, but when the arrival position P2 is decided by polynomial time function(s) as described above, the arrival position P2 can be set voluntarily by changing coefficient (s) of the polynomial time function(s).

[0029] When the velocity pattern per n-rotation of a motor is previously provided as described above, changing movement distance of a treatment element 1 requires another velocity pattern as well as a larger memory on the control circuit 3. If the movement distance is changed by calculating the time function(s) in real time during control and also changing coefficient(s) of the time function(s), such larger memory on the control circuit 3 is unnecessary.

[0030] The aforementioned control can be also applied to the control in which the operation of the treatment elements 1 is controlled in response to each massage force given by the treatment elements 1. In this instance, the massage machine is provided with a plurality of massage force detecting means 7 configured to detect massage force given to a human body with the treatment elements 1, respectively. The detecting means 7 (pressure sensors) are each located at the treatment elements 1 or other places in each of which massage force can be detected. The control circuit 3 is configured to decide each arrival position P2 based on each massage force detected with the massage force detecting means 7. That is, the control circuit 3 performs feed back control by force detected with the detecting means 7, and

decides whether or not, based on detected force, a corresponding treatment element 1 reaches the arrival position P2.

[0031] FIG. 7 shows temporal response, during a massage cycle, between treatment element's (1) position and the massage force. The massage machine (driver 2 and control circuit 3) moves each treatment element 1 from a start position P1. If massage force reaches "massage force threshold for determining arrival position (Th)", the machine judges that the treatment element 1 reaches the arrival position P2, and stops the extending operation of the treatment element 1. The machine then moves the treatment element 1 to the start position P1. A cycle of the massage operation may be a predetermined constant time, but the cycle may be shortened by the value of the threshold Th. In this instance, if massage force reaches the threshold Th, a corresponding treatment element 1 have only to be immediately returned to the start position P1.

[0032] When the cycle of the massage operation is a constant time, the time reaching the arrival position P2 is suitably set as a temporal value. If massage force reaches the threshold Th at a time earlier than the temporal value, it is desirable that the treatment element 1 is stopped up to the temporal value, and then returned from the position to the start position P1 in the time obtained by subtracting the temporal value from the cycle.

[0033] On the contrary, if the massage force reaches the threshold Th at a time later than the temporal value, it is desirable that the position at a time point that becomes the temporal value is regarded as the arrival position P2, and then the operation for returning to the massage start position P1 is performed.

[0034] When the arrival position P2 is decided based on massage force, desired massage force may not be obtained. Accordingly, the method to decide whether or not each treatment element 1 reaches the arrival position P2 based on its own position or arrival time to the arrival position may be used at the same time.

[0035] In addition, by changing each treatment element's position and the threshold Th for determining the arrival position P2, it is possible to provide more various strength levels

[0036] FIG. 8 shows an example that arrival positions P2 can be varied in response to regions of a subject, respectively. In this example, the arrival positions P2 from the shoulders to the waist become longer in a stepwise fashion. In the figure, each start position P1 is the same position. However, both a start position P1 and an arrival position P2 may be varied.

[0037] FIG. 9 shows an example that start positions P1 and arrival positions P2 can be varied in three-dimensional directions in response to regions of a subject. The start positions P1 and arrival positions P2 are in three-dimensional directions so that when a massage is given to the shoulders, it is given in a direction pushing the shoulders from above, and also when a massage is given to the back, the massage is given in a direction pushing the back. When a massage is given to the neck, it is desirable to set start positions P1 and arrival positions P2 in directions in which the neck is intervened (not shown). Anyhow, if start positions P1 and arrival positions P2 can be varied in three-dimensional directions, treatment directions can be varied.

[0038] FIG. 10 shows a concrete example of the operating portion 4. In this example, the operating portion 4 is configured to adjust, by region, massage strength individually with respect to regions to be massaged. When massage strength is strengthened with the operating portion 4, it is possible to set strength level with respect to each of the regions by setting various arrangements of the start potions P1 and the arrival positions P2, such as: setting the start potions P1 toward directions of the human body; setting the arrival positions P2 toward directions of the human body; setting the start potions P1 and the arrival positions P2 toward directions of the human body; or the like.

[0039] In the present invention, it is possible to adaptively use, based on region(s) to be massaged, massage strength setting that only start potion(s) P1 is changed, or massage that start potion(s) P1 is fixed and only arrival position(s) P2 is changed like strength levels 2 and 3 shown in FIG. 2. For example, when a massage is given in a direction pushing shoulders from above, if start potion(s) P1 approaches the shoulders to be too near to them, the massage strength may be too strong from the start of the massage. In this instance, the start potion(s) P1 is fixed and only arrival position(s) P2 is changed, and thereby the massage strength can be prevented from being too strong from the start of the massage. In the setting that the start potion(s) P1 is apart from a human body to be located slightly above the shoulders, the minimum massage force of zero is obtained, and it is possible to provide stronger and weaker massage.

[0040] There is a massage machine with an automatic course treatment function that sequentially performs different massage operations in accordance with the procedures of a preset program. This massage machine is usually configured to have automatic courses, prepared for subject's fatigue levels, from which the subject can select. In an embodiment, the massage machine has a weak course and a strong course. In the weak course, the start potion(s) P1 and arrival position(s) P2 are set at the massage machine side. In the strong course, the start potion(s) P1 and arrival position(s) P2 are set at a human body side. Thereby, the courses with different strength can be made.

[0041] There is a massage machine having, in addition to the aforementioned automatic course, a favorite course for giving a favorite massage with respect to a favorite region of a subject. For example, the start potion(s) P1 and arrival position(s) P2 can be varied at each of the automatic course and the favorite course so that the favorite course can have more detailed strength levels.

[0042] FIG. 11 shows an example that a start potion P1 and an arrival position P2 can be displayed on a display part 30 included in the operating portion 4. The display part 30 is configured to correlate a start potion P1 and an arrival

position P2 with subject's human body figure to graphically display them. If a subject looks at the display, the subject can understand which region is massaged, and from which position a massage is performed and to which position. If concrete movement distance of a treatment element(s) is displayed accessorily, the subject can easily understand the movement of the treatment element. In conventional massage machines, a subject cannot understand which position a massage is started from and which position a treatment element(s) is extended to.

[0043] Although the present invention has been described with reference to certain preferred embodiments, numerous modifications and variations can be made by those skilled in the art without departing from the true spirit and scope of this invention.

Claims

1. A massage machine, comprising a treatment element to be contacted with a human body, wherein the massage machine is configured to change an extending length of the treatment element to the human body side to give a massage of variable strength to the human body,
wherein the massage machine comprises a control circuit configured to control cyclic movement of the treatment element in an extending direction of the treatment element to the human body side so that the treatment element extends from a first position to a second position to return to the first position,
wherein the control circuit is configured to change at least one of the first position and the second position so that movement distance from the first position to the second position is changed in accordance with an instruction for changing massage strength.

2. The massage machine of claim 1, wherein the control circuit is further configured to change both the first position and the second position while keeping the movement distance from the first position to the second position in accordance with an instruction for changing massage strength.

3. The massage machine of claim 1, wherein the control circuit is configured to move the treatment element based on time varying target positions.

4. The massage machine of claim 1, wherein the control circuit is configured to move the treatment element based on time varying target positions in a plurality of directions.

5. The massage machine of claim 1, wherein the control circuit is configured to determine the second position based on massage force detected with a massage force detecting means.

6. The massage machine of claim 1, wherein the control circuit is configured to determine the second position based on a position of the treatment element detected with a treatment element position sensing means.

7. The massage machine of claim 5, wherein the control circuit is configured to change the first position and the second position in response to each region of the subject's human body.

8. The massage machine of claim 7, wherein the control circuit is configured to change the first position and the second position in three-dimensional directions in response to each region of the subject's human body.

9. The massage machine of claim 1, comprising an operating portion for change instruction of the massage strength, wherein the operating portion is configured capable of setting massage strength on each region of the human body.

10. The massage machine of claim 1, wherein the control circuit is configured to set, in response to massage strength setting or a region to be massaged,
strength adjustment that the second position is fixed and only the first position is changed, and
strength adjustment that the first position is fixed and only the second position is changed.

11. The massage machine of claim 1, comprising a plurality of automatic courses for automatically massaging the whole body in accordance with procedures of a preset probarm,
wherein the control circuit is configured to change the first position and the second position by course.

12. The massage machine of claim 11, comprising a favorite course capable of selecting a favorite massage with respect to a favorite region,

wherein the control circuit is configured to change the first position and the second position at each of the automatic courses and the favorite course.

13. The massage machine of claim 1, comprising a display part configured to display the first position and the second position.

FIG. 1

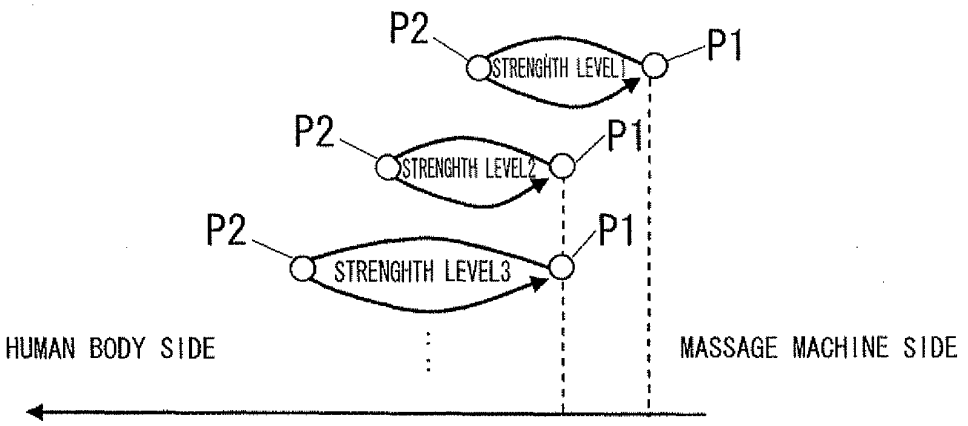


FIG. 2A

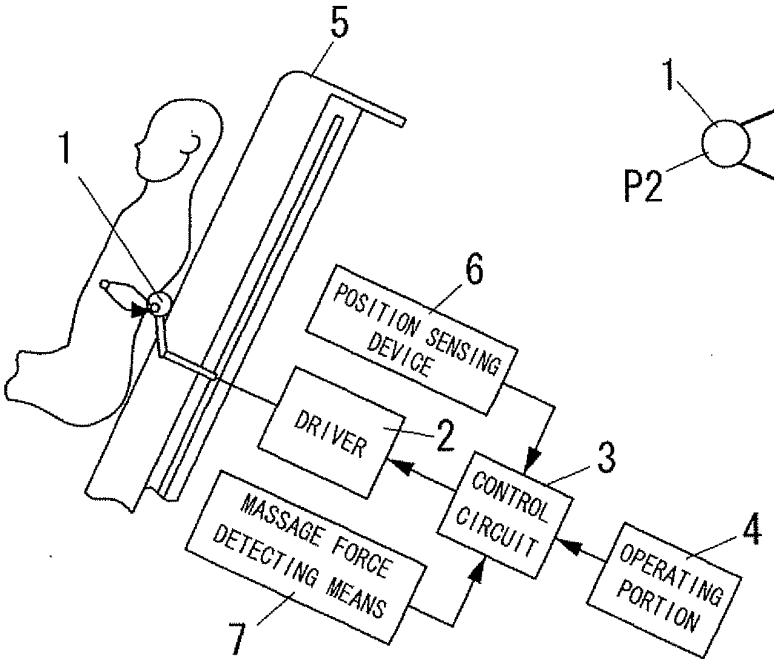


FIG. 2B

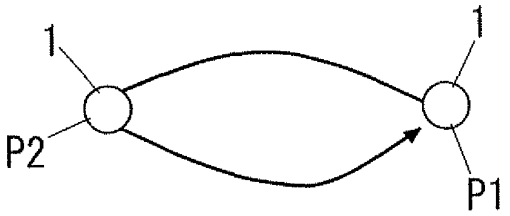


FIG. 3

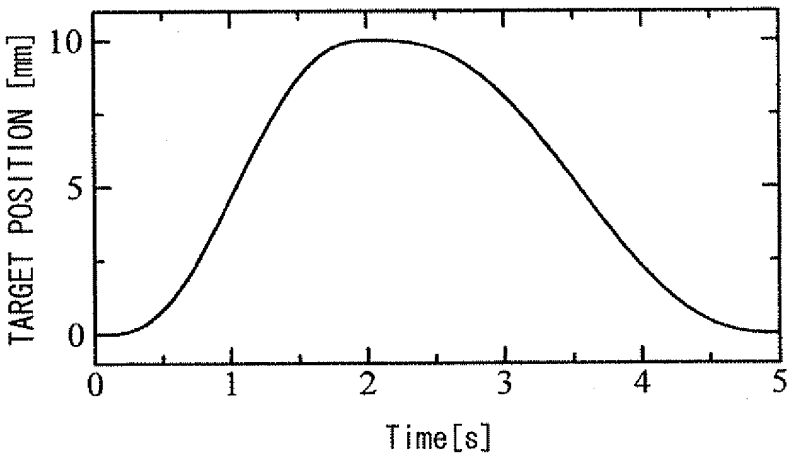


FIG. 4A

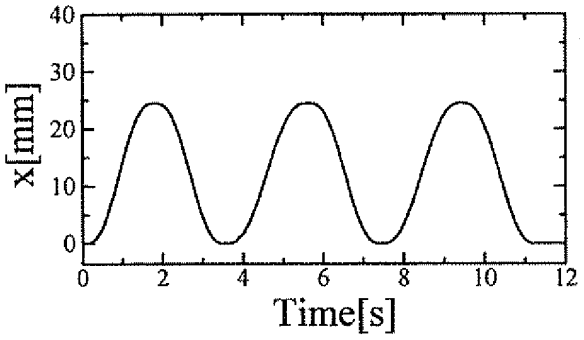


FIG. 4B

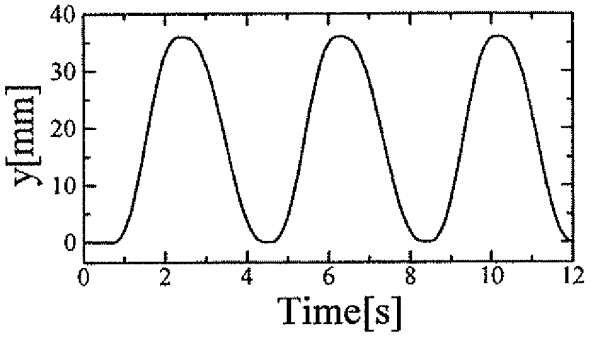


FIG. 5

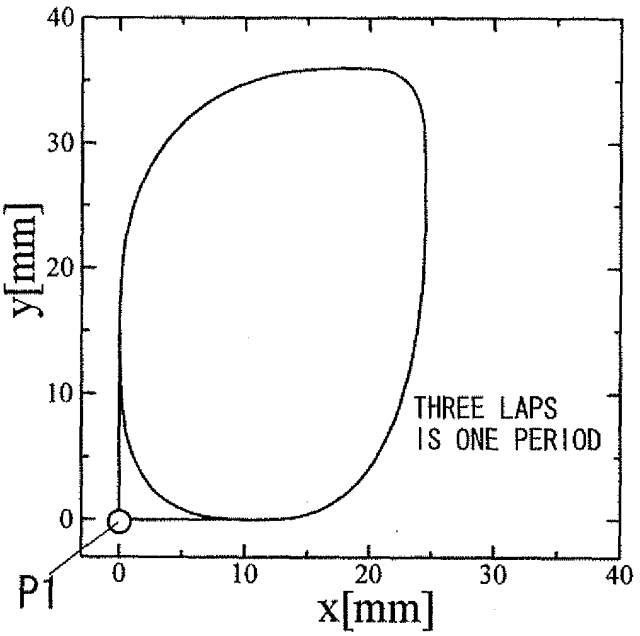

40
30
20
10
0
y[mm]
THREE LAPS
IS ONE PERIOD
P1
0
10
20
30
40
x[mm]

FIG. 6

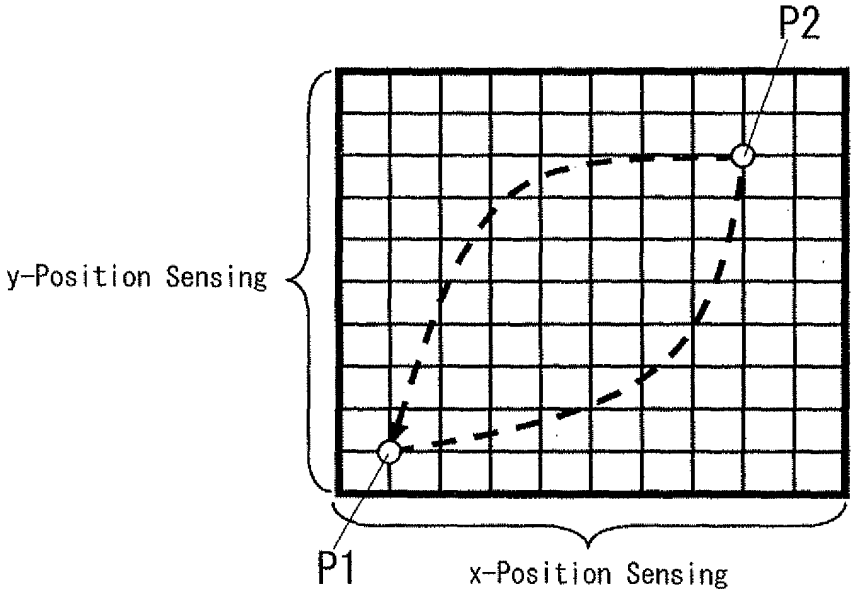

P2
y-Position Sensing
P1
x-Position Sensing

FIG. 7

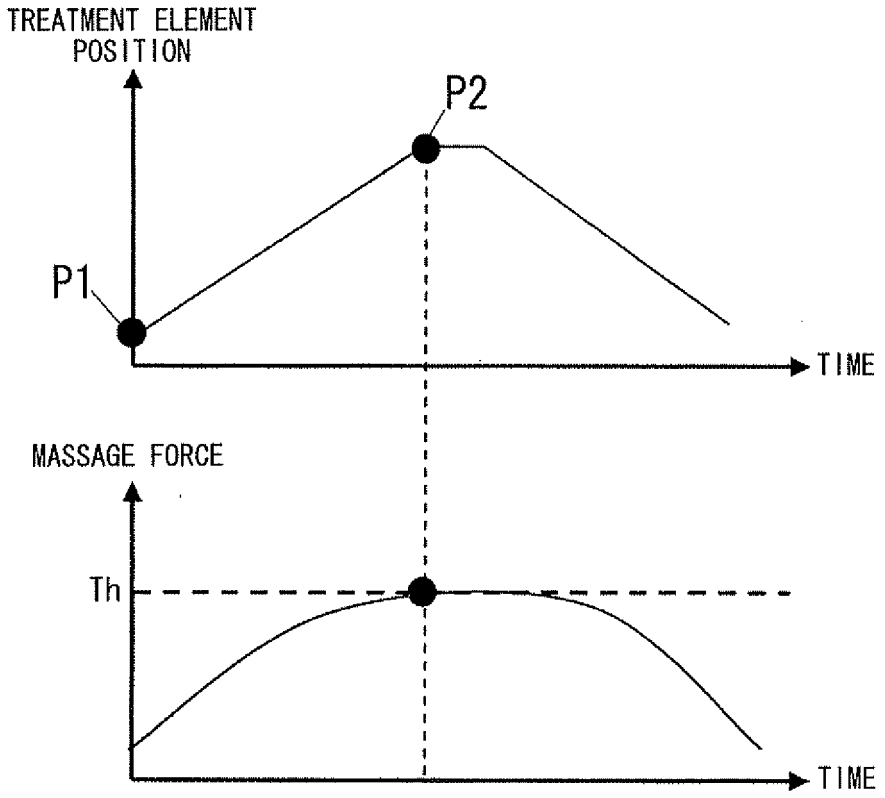


FIG. 8

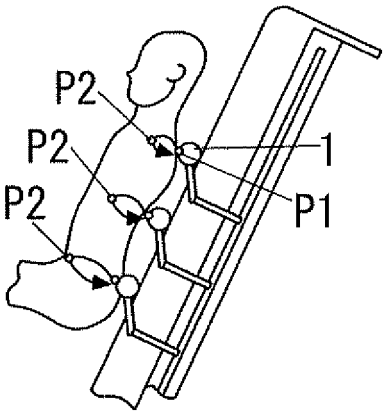


FIG. 9

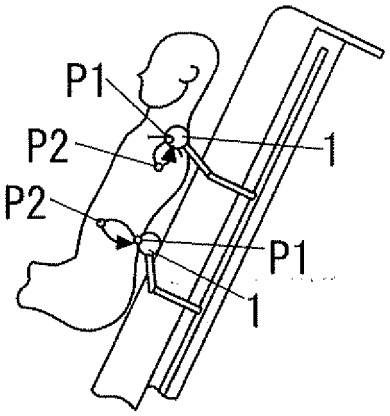


FIG. 10

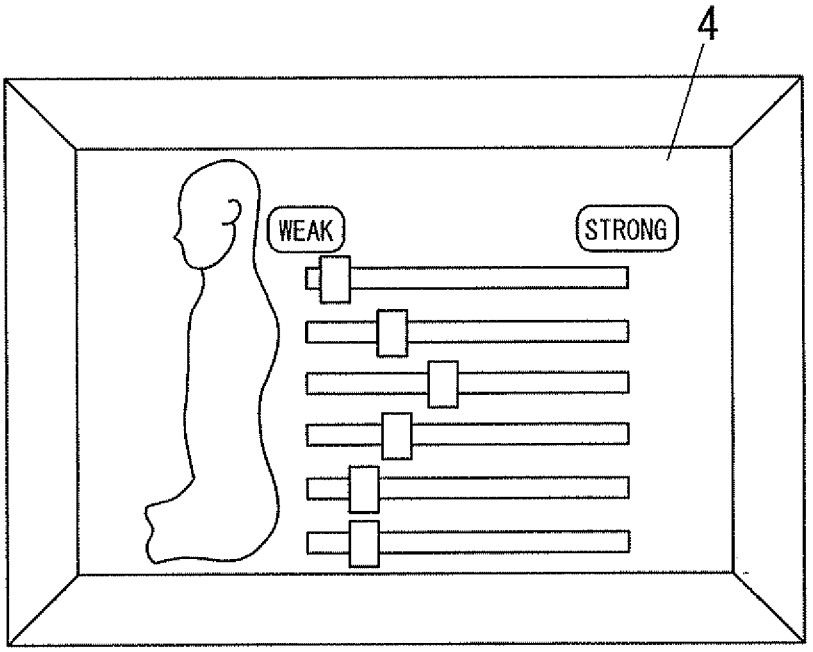
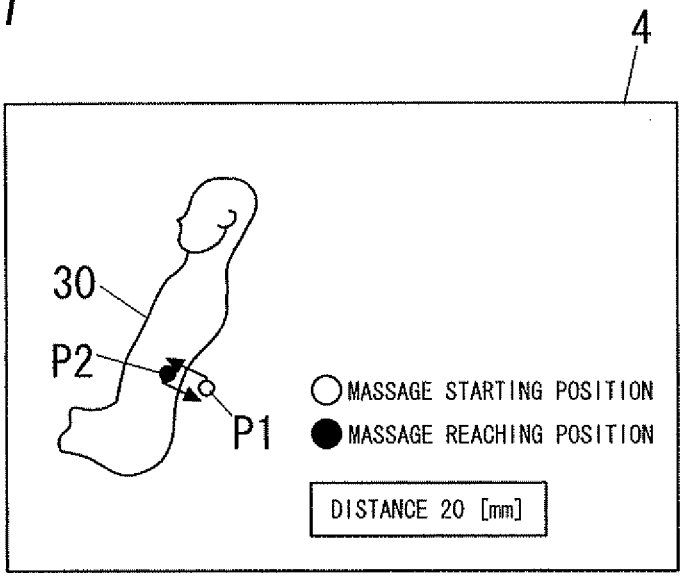

4
WEAK
STRONG

FIG. 11


4
30
P2
P1
MASSAGE STARTING POSITION
MASSAGE REACHING POSITION
DISTANCE 20 [mm]

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2009/056626

A. CLASSIFICATION OF SUBJECT MATTER
A61H7/00(2006.01)i

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)
A61H7/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2009
Kokai Jitsuyo Shinan Koho 1971-2009 Toroku Jitsuyo Shinan Koho 1994-2009

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y A	JP 2007-117266 A (Kyushu Hitachi Maxell, Ltd.), 17 May, 2007 (17.05.07), Full text; all drawings (Family: none)	1,9 2-8,11-13 10
Y	JP 2003-245319 A (Kyushu Hitachi Maxell, Ltd.), 02 September, 2003 (02.09.03), Fig. 1 (Family: none)	2,5-8,11,12
Y	JP 2003-180771 A (Family Co., Ltd.), 02 July, 2003 (02.07.03), Full text; all drawings (Family: none)	2,5-8,11,12

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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"A" document defining the general state of the art which is not considered to be of particular relevance
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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
16 June, 2009 (16.06.09)	30 June, 2009 (30.06.09)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

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International application No.
PCT/JP2009/056626

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2004-73882 A (Matsushita Electric Works, Ltd.), 11 March, 2004 (11.03.04), Par. No. [0020] & JP 6-190012 A & JP 2004-24911 A & JP 2004-73881 A	2,3,5-8,11, 12
Y	JP 2006-55378 A (Family Co., Ltd.), 02 March, 2006 (02.03.06), Figs. 9 to 13 (Family: none)	4,7,8
Y	JP 2007-7208 A (Fujiiryoki Co., Ltd.), 18 January, 2007 (18.01.07), Figs. 17 to 20 (Family: none)	13

Form PCT/ISA/210 (continuation of second sheet) (April 2007)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2002369854 A **[0002]**