

Description

The present invention generally relates to a clothing equipment, and more particularly to a clothing equipment for controlling a musical tone which detects a movement of a player so as to control a musical tone based on the detected movement of the player.

Conventionally, a musical tone is generated by playing a musical instrument such as a piano, a violin and the like or by use of a vocal cord of the player. In addition, the known musical tone generating apparatus can not convert a body action of the player into the corresponding musical tone.

US-A-4 635 516 discloses a tone generating glove including switches and a tone generating circuit. The switches are mounted in the glove. The tone generating circuit produces a tone or tones in response to the situation of one or more of the switches. The switches are positioned at each finger joint of the glove. Since in this known tone generating glove the switches can only be actuated by the fingers, the possibilities of influencing musical tones are very limited.

Therefore, the present applicant proposed a musical tone control apparatus which converts the body action of the player into the musical tone, in U.S. Patent Application Ser. No. 108,205 and prior, not pre-published EP-A-0 264 782.

Next, description will be given with respect to an example of the proposed musical tone control apparatus in conjunction with Figs. 1A to 4.

Fig. 1A is a front view showing an appearance of the proposed musical tone control apparatus which is mounted to the player, and Fig. 1B is a back view thereof. This proposed musical tone control apparatus consists of a main body 1 and four detectors such as a detector 2 for a player's left elbow, a detector 3 for a player's right elbow, a detector 4 for a player's left shoulder and a detector 5 for a player's right shoulder. The main body 1 is mounted to a player's waist by a belt B, and the detectors 2 to 5 are respectively mounted to the player's left elbow, the player's right elbow, the player's left shoulder and the player's right shoulder.

Next, detailed description will be given with respect to the above-mentioned detectors 2 to 5. First, the detector 2 is constructed as shown in Fig. 2. In Fig. 2, a lever 8a is fixed at a shaft 7a of a potentiometer 6a, and this lever 8a is arranged so that this lever 8a can be freely put in and out of an inside of a cylinder 9a as shown in Fig. 3. In the inside of the cylinder 9a, a spring 10a is provided in order to pull the lever 8a therein. In addition, a fixing portion 11a is formed at an edge of the cylinder 9a, and this fixing portion 11a is fixed at a center of the player's arm.

When the player bends and stretches his left elbow, the lever 8a and the cylinder 9a is moved in response to such bending and stretching movement of the player's left elbow so that the shaft 7a is revolved. Hence, the resistance of the potentiometer 6a must be varied in accordance with a revolving angle of the shaft 7a, i.e., a bending angle of the player's left elbow. Such resistance variation of the potentiometer 6a is passed through a cable 12a and then transmitted to the main body 1 (shown in Fig. 1A), wherein a tone pitch of the musical tone to be generated is controlled based on such resistance variation of the potentiometer 6a, for example. Similar to this detector 2, the detector 3 is constructed and operated. More specifically, the resistance variation of a potentiometer 6b provided within the detector 3 is passed through a cable 12b and then transmitted to the main body 1, wherein the tone pitch of the musical tone to be generated is controlled based on such resistance variation of the potentiometer 6b.

Next, the detector 4 is constructed as shown in Fig. 4. In Fig. 4, when the player moves his left shoulder up and down, the resistance of the potentiometer 6c must be varied in response to the movement of the player's left shoulder. Such resistance variation of the potentiometer 6c is passed through a cable 12c and then transmitted to the main body 1, wherein a tone volume of the musical tone is controlled based on such resistance variation of the potentiometer 6c. On the other hand, the detector 5 is constructed as similar to the above mentioned detector 4. A resistance variation of a potentiometer 6d provided within the detector 5 is passed through a cable 12d and then transmitted to the main body 1, wherein a tone color of the musical tone is controlled based on such resistance variation of the potentiometer 6d.

In the proposed musical tone control apparatus described heretofore, the following problems must be inevitably occurred since the four detectors 2 to 5 are mounted to clothes of the player by sewing the detectors 2 to 5 on such clothes. First, it is burdensome for the player to mount such detectors. Secondary, once such detectors are mounted on the clothes of the player, it is not easy for the player to adjust mounting positions of such detectors.

It is accordingly a primary object of the invention to provide a clothing equipment for controlling a musical tone in which it is easy to mount the detectors to the player and it is also easy for the player to adjust the mounting positions of the detectors.

This problem is solved by the teaching contained in claim 1.

Further objects and advantages of the present invention will be apparent from the following de-

scription, reference being had to the accompanying drawings wherein preferred embodiments of the present invention are clearly shown.

In the drawings:

Figs. 1A and 1B are front and back views both showing the musical tone control apparatus proposed by the prior art (prior, not pre-published EP-A-0 264 782);

Figs. 2 to 4 respectively show detailed constructions of the detectors used in the proposed musical tone control apparatus shown in Figs. 1A and 1B;

Figs. 5A and 5B are front and back views both showing a clothing equipment for controlling a musical tone according to a first embodiment of the present invention;

Fig. 6 is a perspective side view showing a detector for the player's left elbow used in the first embodiment;

Fig. 7 is a block diagram showing an electric constitution of the first embodiment;

Figs. 8A and 8B are views both showing an example of actually designed clothing equipment according to the first embodiment;

Fig. 9 shows an appearance of a player who clothing equipments a clothing equipment according to a second embodiment of the present invention;

Fig. 10 is a plan view showing a detailed construction of a wiring member used in the second embodiment;

Figs. 11A and 11B are side views each showing an arm portion provided with the wiring member of the clothing equipment according to the second embodiment;

Fig. 12 is a perspective side view showing a detector used in the second embodiment;

Fig. 13 shows an appearance of a detector for a player's left elbow mounted on the clothing equipment according to the second embodiment;

Fig. 14 shows an appearance of a detector for a player's wrist mounted on the clothing equipment according to the second embodiment;

Fig. 15 is a block diagram showing an electric constitution of the second embodiment;

Figs. 16A and 16B show appearances of a player who clothing equipments a clothing equipment according to the third embodiment;

Fig. 17 is a block diagram showing an electric constitution of the third embodiment;

Fig. 18 is a perspective side view showing a detector worn by a player's elbow; and

Fig. 19 is a graph showing a characteristic of a resistance of the detector shown in Fig. 18.

Next, description will be given with respect to the preferred embodiments of the present invention.

[A] FIRST EMBODIMENT

Next, description will be given with respect to a clothing equipment for controlling a musical tone according to a first embodiment of the present invention in conjunction with Figs. 5A to 8B. In Figs. 5A to 8B, parts identical to those shown in Figs. 1A to 4 will be designated by the same numerals, hence, description thereof will be skipped.

Fig. 5A is a front view showing an appearance of a first embodiment of a clothing equipment for controlling a musical tone which is mounted to the player, and Fig. 5B is a back view thereof. In Figs. 5A and 5B, 101 designates a clothing equipment having a symmetrical construction which covers the player from his shoulders to his wrists. In this clothing equipment 101, 102a designates a supporter made of elastic fibers which covers from the player's left shoulder to a player's left shoulder blade. In addition, the edge of this supporter 102a is sewed with one edge of a thin cloth 103a. This thin cloth 103a stretches between a player's left shoulder joint and a middle position of a player's left elbow joint. Between another edge of the thin cloth 103a and the player's left elbow joint, a band-shaped supporter 104a, a thin cloth 105a and a supporter 106a are sequentially sewed together. Next, one edge of a thin cloth 107a is sewed with an edge of the supporter 106a. This thin cloth 107a stretches between the player's left elbow joint and a middle position of a player's left wrist joint. Further, another edge of the thin cloth 107a is sewed with one edge of a supporter 108a, and this supporter 108a stretches to a front position of the player's left wrist. The above-mentioned thin clothes 103a, 105a and 107a are similar to clothes used in a clothing equipment for aerobics exercise and the like. On the other hand, the above mentioned supporters 102a, 104a, 106a and 108a are made of thick elastic fibers which are woven with rubber yarns. For example, these supporters are made of thick elastic fibers similar to those used at ankle portions of socks.

Similar to the above-mentioned left arm portion of the clothing equipment 101, a right arm portion of the clothing equipment 101 is constructed.

This right arm portion of the clothing equipment 101 is sewed with the left arm portion thereof via a thick cloth 109 (which is similar to that used in a training clothing equipment).

Next, a square plane fastener 110a is mounted to a shoulder blade portion of the supporter 102a as shown in Fig. 5B. In addition, a plane fastener 111a is mounted on the supporters 104a and 106a along an inside of the clothing equipment 101, i.e., along an inside of a player's left arm. Further, a plane fastener 112a is mounted along a backside

of the clothing equipment 101, i.e., along a back-side of the player's left arm. Similarly, a plane fastener 113a is mounted to the supporter 108a along the inside of the player's left arm. Similar to such left arm portion of the clothing equipment 101, several plane fasteners are mounted at respective positions thereof.

Instead of providing two plane fasteners, namely plane fastener 110a at the shoulder blade and plane fastener 112a at the upper arm, it would also be possible to provide only one plane fastener extending from the shoulder to the upper arm of the player.

In the left side of the clothing equipment 101, a V-shaped belt 114 is mounted as shown in Fig. 5A, and a button 115 is sewed at the top of the belt 114. Similarly, in the right side of the clothing equipment 101, a V-shaped belt 116 is also mounted. These two belts 114 and 116 are connected together by the button 115, so that the clothing equipment 101 is fixed on a player's upper body.

Next, a detector 117 for the player's left shoulder is mounted between the plane fasteners 110a and 112a, and a detector 118 for the player's left elbow is mounted between the plane fasteners 111a and 113a. In this case, the detector 118 is constructed as shown in Fig. 6. In Fig. 6, a plateshaped plane fastener 119a is mounted at a bottom plane of the potentiometer 6a of the detector 118, and another plate-shaped plane fastener 120a is mounted at the fixing portion 11a of the potentiometer 6a. Hence, both edges of the detector 118 are respectively mounted to the plane fasteners 111a and 113a provided on the clothing equipment 101 via the plane fasteners 119a and 120a. Incidentally, the cable 12a connected to the potentiometer 6a is connected to the main body 1 through a through hole 121a which is made at a certain position of the clothing equipment 101 near the detector 118. In this case, the through hole 121a is made at the certain position on an upper backside of the supporter 104a as shown in Fig. 5B.

Similar to the above-mentioned left arm portion of the clothing equipment 101, a detector 122 for the player's right shoulder and a detector 123 for the player's right elbow are respectively mounted on the right arm portion of the clothing equipment 101 by use of plane fasteners (not shown).

As described heretofore, the plane fasteners are used as the fasteners which mount the detectors 117, 118, 122 and 123 on the clothing equipment 101. Hence, it is possible to mount such detectors on the clothing equipment 101 with ease, and it is also possible to adjust the mounting position of such detectors with ease.

Next, description will be given with respect to an electric constitution of the main body 1 in con-

junction with Fig. 7. In Fig. 7, 125 designates a four-channel analog multiplexer which selects and outputs one of the detection signals (i.e., voltage signals) of the detectors 117, 118, 122 and 124 based on a channel select signal CS supplied to a select terminal thereof. Next, an analog-to-digital (A/D) converter 126 converts the detection signal from the analog multiplexer 125 into digital detection data having the predetermined bits. In addition, 127 designates a central processing unit (CPU), 128 designates a read only memory (ROM) for storing programs used in the CPU 127, and 129 designates a random access memory (RAM) used as a working area. The CPU 127 supplies the sequentially varying channel select signal CS to the analog multiplexer 125, so that the outputs of the detectors 117, 118, 122 and 123 are scanned with a high speed.

If the detection signals of the detectors 118 and 123 are selectively converted into the detection data in the A/D converter 126, the CPU 127 discriminates the bending angles of the player's left and right elbows by use of four angle stages based on such detection data. Based on such discrimination result of the CPU 127, the CPU 127 generates a key code data KC designating the predetermined tone pitch in response to a combination of the bending angles of the player's left and right elbows.

On the other hand, if the detection signal of the detector 117 is selectively converted into the detection data, the CPU 127 discriminates the bending angle of the player's left shoulder by use of three angle stages based on such detection data. Based on such discrimination result of the CPU 127, the CPU 127 generates tone volume data VOL selectively designating one of predetermined three tone volumes (i.e., big, middle and small tone volumes) in response to the bending angle of the player's left shoulder.

Further, if the detection signal of the detector 122 is selectively converted into the detection data, the CPU 127 discriminates the bending angle of the player's right shoulder by use of four angle stages based on such detection data. Based on such discrimination result of the CPU 127, the CPU 127 generates tone color data TD selectively designating one of the predetermined tone colors (such as the piano, an organ, a flute, a saxophone, a clarinet and the like) in response to the bending angle of the player's right shoulder.

The CPU 127 generates and outputs musical tone control data such as the key code data KC, the tone volume data VOL and the tone color data TD to a musical tone signal generating circuit 131 via a bus line 130. This musical tone signal generating circuit 131 generates a musical tone signal having a tone pitch corresponding to the key code

data KC, a tone volume corresponding to the tone volume data VOL and a tone color corresponding to the tone color data TD. Such musical tone signal is supplied to a speaker 132 wherein a musical tone corresponding to the musical tone signal is to be generated. In addition, a transmitter circuit 133 transmits the musical tone signal by wireless via an antenna 134.

According to the first embodiment as described heretofore, the tone pitch of the musical tone to be generated from the speaker 132 of the main body 1 can be varied in response to the combination of the bending angles of the player's left and right elbow joints. In addition, the tone volume of the musical tone can be varied by three tone volume stages in response to the bending angle of the player's left shoulder joint. Further, the tone color of the musical tone can be varied by four tone color stages in response to the bending angle of the player's right shoulder joint.

In the first embodiment, the plane fasteners are mounted on one position at each of shoulder portions, elbow portions and wrist portions of the clothing equipment 101. However, it is possible to mount the plane fasteners so that each of the shoulder portions, the elbow portions and the wrist portions of the clothing equipment 101 can be covered by the plane fasteners. In addition, it is also possible to mount the plane fasteners so that whole portion of the clothing equipment 101 can be covered by the plane fasteners.

Incidentally, an example of an actually designed clothing equipment 101 and several measurements thereof are shown in Figs. 8A and 8B. In Fig. 8A, a measurement shown by a numeral "X" is determined by a body shape of the player. In addition, B1 designates a position of a shoulder bone, and B2 designates a position of an elbow bone. Further, in a sectional view of Fig. 8B taken in a line A-A of Fig. 8A, the measurements of the plane fasteners 111a and 113a in a longitudinal direction are shown.

[B] SECOND EMBODIMENT

Fig. 9 is a front view showing a player who clothing equipments a clothing equipment 201 according to the second embodiment of the present invention. As shown in Fig. 9, this clothing equipment 201 is formed so that this clothing equipment 201 can be worn by an upper half of the player's body, and this clothing equipment 201 is also made of elastic fiber materials. In such clothing equipment 201, one edge of a wiring member 202 is positioned at the left elbow portion of the clothing equipment 201, and another edge thereof is positioned at a left skirt portion of the clothing equipment 201. Similar to such wiring member

202, one edge of a wiring member 203 is positioned at a left shoulder blade portion of the clothing equipment 201, and another edge thereof is positioned at the left skirt portion of the clothing equipment 201. Similarly, one edge of a wiring member 204 is positioned at a right wrist portion of the clothing equipment 201, and another edge thereof is positioned at a right skirt portion of the clothing equipment 201.

Next, description will be given with respect to each construction of the wiring members 202 to 204. First, the wiring member 202 is constructed as shown in Fig. 10. In Fig. 10, 202a designates a two-core cable which is sewed into the clothing equipment 201 in a zigzagging manner. One edge of this two-core cable 202a is connected with a connector 202b, and another edge thereof is connected with another connector 202c. These connectors 202b and 202c are sewed to the surface of the clothing equipment 201.

The connector 202b employs a square plate-shape plane fastener having a hook portion Pr. The center portion of this hook portion Pr is cut away so that a groove is formed thereon and the surface of the hook portion Pr is divided into right and left hook portions Pr1 and Pr2. In addition, a fine wire Ca1 is zigzagged, folded and then fixed at the hook portion Pr1. Similarly, a fine wire Ca2 is zigzagged, folded and then fixed at the hook portion Pr2. Each of these fine wires Ca1 and Ca2 is pressed against and then connected to each of two cores of the cable 202a. Further, conductive coating is painted on the hook portion Pr fixed with the fine wires Ca1 and Ca2. Furthermore, the connector 202c similar to the connector 202b is connected at another edge of the two-core cable 202a.

In Fig. 9, a plane fastener 205 is sewed at a position which is apart the connector 202b by a predetermined distance.

A detector 207 for the player's left elbow (similar to the detector 118 shown in Fig. 6) is mounted between the plane fastener 205 and the connector 202b. Fig. 12 shows a construction of this detector 207. In Fig. 12, a connector 208 is mounted at a bottom face of a potentiometer 207a. This connector 208 is constructed as similar to the connector 202b of the wiring member 202 shown in Fig. 10. In this connector 208, fine wires Ca3 and Ca4 are respectively fixed at hook portions Pr3 and Pr4, and these fine wires Ca3 and Ca4 are also connected to output terminals of the potentiometer 207a. In addition, a plane fastener 209 is mounted at a bottom face of the fixing portion 11a as shown in Fig. 3.

As shown in Fig. 13, the detector 207 can be mounted to the clothing equipment 201 by connecting the plane fastener 209 of the connector 208 to the connector 202b of the clothing equip-

ment 201, and the output terminals of the potentiometer 207a can be connected to the wiring member 202. Thus, the potentiometer 207a is connected to the main body 1 via the cable 202a, the connector 202c and a cable 210 (shown in Fig. 9) connected to the connector 202c.

In Fig. 9, the wiring member 203 is constructed as similar to the wiring member 202. More specifically, a plane fastener 206 is sewed at a position which is apart from a terminal 203b of the wiring member 203 by a predetermined distance. A detector 211 for the player's left shoulder is constructed as similar to the detector 207 so that the detector 211 can detect a movement of the player's left shoulder joint. This detector 211 can be mounted between the terminal 203b of the wiring member 203 and the plane fastener 206. In this case, a potentiometer 211a of the detector 211 is connected to the main body 1 via a cable 203a, a connector 203c and a cable 212 connected to the cable 203c.

Incidentally, each one edge of cables 210 and 212 is provided with a connector similar to the connector 202b of the wiring member 202.

Next, a glove 213 made of the elastic fiber materials is used for a player's right hand, and this glove 213 is constructed as shown in Fig. 14. In Fig. 14, one edge of a wiring member 214 is positioned at a wrist portion of the glove 213, and another edge thereof is positioned at a right sleeve portion of the clothing equipment 201. In this case, the wiring member 214 is zigzagged and then sewed into the glove 213. In addition, one edge of the wiring member 214 is connected to a connector 214b which is sewed to a surface of the glove 213, and another edge thereof is connected to a connector 214c which is also connected to the connector 204b of the wiring member 204. Further, a plane fastener 215 is sewed at a position which is apart from the connector 214b of the wiring member 214 by a predetermined distance in a thumb direction of the glove 213. Incidentally, the wiring member 204 is constructed as similar to the above-mentioned wiring member 202. As shown in Figs. 11A and 11B, when the player stretches and bends his right arm, the state of the wiring member 204 is changed. Meanwhile, the connectors 214b and 214c are constructed as similar to the connectors 202b and 202c of the wiring member 202.

Next, a detector 216 for detecting a movement of the player's right wrist joint is constructed as similar to the detector 207, but a size of the detector 216 is smaller than that of the detector 207. In this detector 216, a connector 217 mounted on a bottom face of a potentiometer 216a is connected with the connector 214b of the wiring member 214, and a plane fastener 219 mounted on a bottom face of a fixing portion 218 is connected with the

plane fastener 215 provided on the glove 213. As described above, the detector 216 is connected between the plane fastener 215 and the connector 214b of the wiring member 214 provided on the glove 213. Thus, the potentiometer 216a is connected to the main body 1 via the cable 204a, the connector 204c and a cable 220 (shown in Fig. 9) connected to the connector 204c. Incidentally, one edge of the cable 220 is connected to a connector similar to the connector 202b of the wiring member 202.

Next, Fig. 15 is a block diagram showing an electric constitution of the main body 1 according to the second embodiment. In Fig. 15, 221 designates a three-channel analog multiplexer which selects one of detection signals from the detectors 207, 211 and 216 based on the channel select signal CS outputted from the CPU 127. Other parts within the main body 1 are similar to those shown in Fig. 7, hence, description thereof will be skipped.

In the second embodiment, the key code data KC are generated based on detection data of the detector 207, and a tone pitch of the musical tone is controlled based on the bending angle of the player's left elbow. In addition, the tone volume data VOL are generated based on detection data of the detector 211, and a tone volume of the musical tone is controlled based on the bending angle of the player's left shoulder. Further, the tone color data TD are generated based on detection data of the detector 216, and a tone color of the musical tone is controlled based on the bending angle of the player's right wrist.

[C] THIRD EMBODIMENT

Figs. 16A and 16B show appearances of a player who clothing equipments a clothing equipment according to the third embodiment of the present invention, and Fig. 17 is a block diagram showing the third embodiment. This clothing equipment according to the third embodiment consists of the main body 1, a detector S1 for the player's right elbow, a detector S2 for the player's left elbow, a detector S3 for a player's right knee and a detector S4 for a player's left knee. As described before, the main body 1 is mounted at the player's waist by the belt B. In addition, the detectors S1, S2, S3 and S4 are respectively mounted at the right elbow, the left elbow, the right knee and the left knee of the player.

Next, description will be given with respect to the detectors S1 to S4. First, the detector S1 is constructed as shown in Fig. 18. In Fig. 18, 301a designates a supporter made of elastic and insulating fiber materials (such as rubber materials). The shape of this supporter 301a can be fitted to the shape of the player's right elbow. At outer peripher-

ies of both edges of the supporter 301a, band-shape conductive members 302a and 303a are respectively attached. On outer peripheries of the supporter 301a, carbon fibers Cf1 to Cfn (where n denotes an integral number) are attached by pre-determined intervals in a longitudinal direction of the supporter 301a. Each one edge of the carbon fibers Cf1 to Cfn is connected to the conductive member 302a, and each another edge of the carbon fibers Cf1 to Cfn is connected to the conductive member 303a.

When the above-mentioned detector S1 is stretched in the longitudinal direction thereof, a resistance between the conductive members 302a and 303a is increased in accordance with the stretching of the detector S1 as shown in Fig. 19. In short, when the player mounts the detector S1 on his right elbow as shown in Fig. 18 and then stretches his right elbow, the resistance between the conductive members 302a and 303a must be varied in response to the bending angle of the player's right elbow.

Similar to the detector S1, other detectors S2, S3 and S4 are constructed. Detection signals outputted from the detectors S1 to S4 are respectively supplied to the fourchannel analog multiplexer 125 within the main body 1 shown in Fig. 17. This main body 1 shown in Fig. 17 functions as similar to the main body 1 shown in Fig. 7, hence, description thereof will be skipped.

In the third embodiment, the tone pitch of the musical tone is controlled based on a combination of the bending angle s of the player's right and left elbows, the tone volume of the musical tone is controlled based on the bending angle of the player's right knee, and the tone color of the musical tone is controlled based on the bending angle of the player's left knee.

Above is the description of the preferred embodiments of the present invention. This invention may be practiced or embodied in still other ways without departing from the essential character thereof. Therefore, the preferred embodiments described herein are illustrative and not restrictive, the scope of the invention being indicated by the appended claims and all variations which come within the meaning of the claims are intended to be embraced therein.

Claims

1. Clothing equipment for controlling a musical tone, comprising:

- a) a wearable article (101) to be worn by a player;
- b) at least one mounting member (110a - 113a) fixedly mounted to a surface of said wearable article near a joint of a player

such that the mounting member bridges over the joint of the player; and

c) movement detecting means (117, 118, 122, 123) for detecting a bending angle of said joint, said movement detecting means being detachably mounted to the surface of said wearable article by said fixed mounting member, whereby said musical tone is controlled on the basis of the detected movement of said joint.

2. A clothing equipment according to claim 1, wherein said movement detecting means comprises a potentiometer.

3. A clothing equipment according to claim 1, wherein said mounting member is a plane fastener.

4. A clothing equipment according to claims 1 and 2 further comprising a main body (1) which generates a musical tone, at least one of a tone pitch, a tone volume and a tone color of said musical tone being controlled based on said bending angle of said player's joint detected by said potentiometer.

5. Clothing equipment according to claim 1, wherein said movement detecting means (117, 118, 122, 123) detects the relative positions of first and second body members joined at said joint by detecting a distance between a first position of the first body member and a second position of the second body member.

6. Clothing equipment according to claim 1, wherein said movement detecting means (117, 118, 122, 123) detects the relative positions of body members joined at said joint by detecting a rotation of one of said body members about an associated axis.

7. Clothing equipment according to anyone of the preceding claims wherein said movement detecting means (117, 118, 122, 123) is detachably mounted to said wearable article by said mounting member such that said movement detecting means bridges over said joint.

8. Clothing equipment according to claim 7, wherein a first end of said movement detecting means (117, 118, 122, 123) is positioned on one side of said joint and a second end of said movement detecting means is positioned on another side of said joint.

9. Clothing equipment according to claim 7, wherein said movement detecting means (117,



ies of both edges of the supporter 301a, band-shape conductive members 302a and 303a are respectively attached. On outer peripheries of the supporter 301a, carbon fibers Cf1 to Cfn (where n denotes an integral number) are attached by pre-determined intervals in a longitudinal direction of the supporter 301a. Each one edge of the carbon fibers Cf1 to Cfn is connected to the conductive member 302a, and each another edge of the carbon fibers Cf1 to Cfn is connected to the conductive member 303a.

When the above-mentioned detector S1 is stretched in the longitudinal direction thereof, a resistance between the conductive members 302a and 303a is increased in accordance with the stretching of the detector S1 as shown in Fig. 19. In short, when the player mounts the detector S1 on his right elbow as shown in Fig. 18 and then stretches his right elbow, the resistance between the conductive members 302a and 303a must be varied in response to the bending angle of the player's right elbow.

Similar to the detector S1, other detectors S2, S3 and S4 are constructed. Detection signals outputted from the detectors S1 to S4 are respectively supplied to the fourchannel analog multiplexer 125 within the main body 1 shown in Fig. 17. This main body 1 shown in Fig. 17 functions as similar to the main body 1 shown in Fig. 7, hence, description thereof will be skipped.

In the third embodiment, the tone pitch of the musical tone is controlled based on a combination of the bending angle s of the player's right and left elbows, the tone volume of the musical tone is controlled based on the bending angle of the player's right knee, and the tone color of the musical tone is controlled based on the bending angle of the player's left knee.

Above is the description of the preferred embodiments of the present invention. This invention may be practiced or embodied in still other ways without departing from the essential character thereof. Therefore, the preferred embodiments described herein are illustrative and not restrictive, the scope of the invention being indicated by the appended claims and all variations which come within the meaning of the claims are intended to be embraced therein.

Claims

1. Clothing equipment for controlling a musical tone, comprising:
 - a) a wearable article (101) to be worn by a player;
 - b) at least one mounting member (110a - 113a) fixedly mounted to a surface of said wearable article near a joint of a player

such that the mounting member bridges over the joint of the player; and
 c) movement detecting means (117, 118, 122, 123) for detecting a bending angle of said joint, said movement detecting means being detachably mounted to the surface of said wearable article by said fixed mounting member, whereby said musical tone is controlled on the basis of the detected movement of said joint.

2. A clothing equipment according to claim 1, wherein said movement detecting means comprises a potentiometer.
3. A clothing equipment according to claim 1, wherein said mounting member is a plane fastener.
4. A clothing equipment according to claims 1 and 2 further comprising a main body (1) which generates a musical tone, at least one of a tone pitch, a tone volume and a tone color of said musical tone being controlled based on said bending angle of said player's joint detected by said potentiometer.
5. Clothing equipment according to claim 1, wherein said movement detecting means (117, 118, 122, 123) detects the relative positions of first and second body members joined at said joint by detecting a distance between a first position of the first body member and a second position of the second body member.
6. Clothing equipment according to claim 1, wherein said movement detecting means (117, 118, 122, 123) detects the relative positions of body members joined at said joint by detecting a rotation of one of said body members about an associated axis.
7. Clothing equipment according to anyone of the preceding claims wherein said movement detecting means (117, 118, 122, 123) is detachably mounted to said wearable article by said mounting member such that said movement detecting means bridges over said joint.
8. Clothing equipment according to claim 7, wherein a first end of said movement detecting means (117, 118, 122, 123) is positioned on one side of said joint and a second end of said movement detecting means is positioned on another side of said joint.
9. Clothing equipment according to claim 7, wherein said movement detecting means (117,



118, 122, 123) includes a rotatable member positioned on the equipment so that the rotatable member of said movement detecting means rotates in correspondence with a movement of said joint and said movement detecting means detects a rotation of said rotatable member.

Patentansprüche

1. Bekleidungs Vorrichtung zur Steuerung eines Musiktons mit:

- a) einem von einem Spieler zu tragenden, nach Art einer Bekleidung tragbaren Gegenstand (101);
- b) mindestens einem Befestigungsglied (110a - 113a), das fest an einer Oberfläche des tragbaren Gegenstands nahe einem Gelenk eines Spielers derart angebracht ist, daß sich das Befestigungsglied über das Gelenk des Spielers erstreckt; und
- c) Bewegungsdetektionsmitteln (117, 118, 122, 123) zur Ermittlung eines Beugungswinkels des Gelenks, wobei die Bewegungsdetektionsmittel mittels des festen Befestigungsglieds auf der Oberfläche des tragbaren Gegenstands abnehmbar angebracht sind, wobei der Musikton auf der Grundlage der ermittelten Bewegung des Gelenks gesteuert wird.

2. Bekleidungs Vorrichtung gemäß Anspruch 1, bei der die Bewegungsdetektionsmittel ein Potentiometer aufweisen.

3. Bekleidungs Vorrichtung gemäß Anspruch 1, bei der das Befestigungsglied ein Flachverschluß ist.

4. Bekleidungs Vorrichtung gemäß den Ansprüchen 1 und 2, die des weiteren ein Hauptteil (1) aufweist, das einen Musikton erzeugt, wobei die Tonhöhe und / oder die Tonlautstärke und / oder die Klangfarbe des Musiktons auf der Grundlage des durch das Potentiometer ermittelten Beugungswinkels des Gelenks des Spielers gesteuert wird.

5. Bekleidungs Vorrichtung gemäß Anspruch 1, bei der die Bewegungsdetektionsmittel (117, 118, 122, 123) die Relativpositionen der ersten und zweiten über das Gelenk verbundenen Körperteile ermitteln, indem sie einen Abstand zwischen einer ersten Position des ersten Körperteils und einer zweiten Position des zweiten Körperteils ermitteln.

6. Bekleidungs Vorrichtung gemäß Anspruch 1, bei der die Bewegungsdetektionsmittel (117, 118, 122, 123) die Relativpositionen der mit dem Gelenk verbundenen Körperteile ermitteln, indem sie eine Drehung eines der Körperteile um eine zugehörige Achse ermitteln.

7. Bekleidungs Vorrichtung gemäß einem der vorangehenden Ansprüche, bei der die Bewegungsdetektionsmittel (117, 118, 122, 123) derart mittels des Befestigungsglieds am tragbaren Gegenstand abnehmbar angebracht sind, daß die Bewegungsdetektionsmittel sich über das Gelenk erstrecken.

8. Bekleidungs Vorrichtung gemäß Anspruch 7, bei der ein erstes Ende der Bewegungsdetektionsmittel (117, 118, 122, 123) auf einer Seite des Gelenks und ein zweites Ende der Bewegungsdetektionsmittel auf einer anderen Seite des Gelenks positioniert sind.

9. Bekleidungs Vorrichtung gemäß Anspruch 7, bei der die Bewegungsdetektionsmittel (117, 118, 122, 123) ein drehbares Glied beinhalten, das so an der Vorrichtung positioniert ist, daß sich das drehbare Glied der Bewegungsdetektionsmittel entsprechend einer Bewegung des Gelenks dreht und daß die Bewegungsdetektionsmittel eine Drehung des drehbaren Glied ermitteln.

Revendications

1. Equipement vestimentaire pour commander des sons musicaux comprenant :

- a) un article portable (101) devant être porté par un musicien ;
- b) au moins un élément de montage (110a-113a) monté fixement à la surface dudit article portable près d'une articulation d'un musicien de telle façon que l'élément de montage passe par-dessus l'articulation du musicien ; et

c) des moyens de détection de mouvement (117, 118, 122, 123) pour détecter un angle de pliure de ladite articulation, lesdits moyens de détection étant montés de façon détachable à la surface dudit article portable par lesdits éléments de montage fixés, lesdits sons musicaux étant commandés en étant basés sur le mouvement détecté de ladite articulation.

2. Equipement vestimentaire selon la revendication 1, dans lequel ledit moyen de détection de mouvement comprend un potentiomètre.



3. Equipement vestimentaire selon la revendication 1, dans lequel l'élément de montage est une fixation plate.

4. Equipement vestimentaire selon les revendications 1 et 2 comprenant en plus un corps principal (1) qui génère des sons musicaux, au moins un d'une hauteur tonale, d'un volume sonore et d'une couleur de son desdits sons musicaux qui sont commandés en étant basés sur ledit angle de pliure de ladite articulation du musicien détecté par ledit potentiomètre.

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5. Equipement vestimentaire selon la revendication 1, dans lequel ledit moyen de détection de mouvement (117, 118, 122, 123) détecte les emplacements respectifs des premier et second membres du corps reliés à ladite articulation en détectant une distance entre un premier emplacement du premier membre du corps et un second emplacement du second membre du corps.

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6. Equipement vestimentaire selon la revendication 1 dans lequel ledit moyen de détection de mouvement (117, 118, 122, 123) détecte les emplacements respectifs des membres du corps reliés à ladite articulation en détectant une rotation d'un desdits membres du corps autour d'un axe associé.

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7. Equipement vestimentaire selon l'une quelconque des revendications précédentes dans lequel ledit moyen de détection de mouvement (117, 118, 122, 123) est monté de façon détachable sur ledit article portable par ledit élément de montage de telle façon que lesdits moyens de détection de mouvement passent par-dessus ladite articulation.

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8. Equipement vestimentaire selon la revendication 7, dans lequel une première extrémité dudit moyen de détection de mouvement (117, 118, 122, 123) est placée sur un côté de ladite articulation et une seconde extrémité desdits moyens de détection de mouvement est placée sur un autre côté de ladite articulation.

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9. Equipement vestimentaire selon la revendication 7, dans lequel ledit moyen de détection de mouvement (117, 118, 122, 123) renferme un élément rotatif placé sur l'équipement de sorte que l'élément rotatif dudit moyen de détection de mouvement tourne en correspondance avec un mouvement de ladite articulation et que ledit moyen de détection de mouvement détecte une rotation dudit membre rotatif.

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