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FOOT CONTROLLER FOR DENTAL UNIT CHAIR

Abstract

The present invention provides a foot controller for a dental unit chair capable of easily and conveniently controlling the amount of air supplied to a treatment tool provided in the dental unit chair. The present invention provides a foot controller for a dental unit chair, including: an air valve configured to control a flow rate of air supplied to the treatment tool; a cam block configured to be installed under a rod provided in the air valve and having an inclined surface; a pedal unit configured to be disposed at a location spaced apart from the cam block by a predetermined distance and rotatable left and right by an external force and movable up and down; and a connection part configured to connect the cam block and the pedal unit so that the cam block moves in conjunction with movement of the pedal unit.

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Background/Summary

CROSS REFERENCE TO RELATED APPLICATIONS [0001] This application is a National Stage of International Application No. PCT/KR2021/004659 filed on Apr. 13, 2021, claiming priority based on Korean Patent Application No. 10-2020-0079899 filed on Jun. 30, 2020, the entire disclosures of which are incorporated herein by reference.

TECHNICAL FIELD

[0002] The present invention relates to a foot controller for a dental unit chair, and more particularly, to a foot controller for a dental unit chair through which an operator may easily and conveniently control the amount of air supplied to a treatment tool of the dental unit chair.

BACKGROUND ART

[0003] In general, dental care and treatment are performed in an oral cavity of a patient in a state in which an examinee lies on a unit chair.

[0004] A dental unit chair may include a lighting device to illuminate the oral cavity, a doctor table equipped with various treatment tools, a unit chair monitor arm to install a monitor for showing an inside of the oral cavity, displaying CT image information, or watching TV, a water supply device, a table for patient convenience, etc.

[0005] Various devices or instruments installed in the unit chair are installed so as to have an efficient movement and convenient operation in order to provide movement and convenience of a patient or an operator and sufficient functions during procedure.

[0006] Meanwhile, when an operator treats an examinee located in the unit chair, it is common to use various treatment tools such as a handpiece provided in the unit chair and a foot controller to control a chair on which the examinee sits or lies by foot manipulation.

DISCLOSURE

Technical Problem

[0007] The present invention provides a foot controller for a dental unit chair that enables an operator to easily and conveniently control the amount of air supplied to a treatment tool provided in the dental unit chair.

Technical Solution

[0008] In one general aspect, a foot controller for a dental unit chair for controlling a treatment tool provided in the dental unit chair may include: an air valve configured to control a flow rate of air supplied to the treatment tool; a cam block configured to be installed under a rod provided in the air valve and having an inclined surface; a pedal unit configured to be disposed at a location spaced apart from the cam block by a predetermined distance and rotatable left and right by an external force and movable up and down; and a connection part configured to connect the cam block and the pedal unit so that the cam block moves in conjunction with movement of the pedal unit.

[0009] The foot controller may further include: a rail configured to guide a left and right rotation of the pedal unit.

[0010] A range of the left and right rotation of the pedal unit may be limited by a length of the rail.

[0011] When the cam block rotates left and right according to the left and right rotation of the pedal unit, the air valve and the cam block may be disposed so that the rod of the air valve is always located above the inclined surface.

[0012] The air valve and the cam block may be disposed so that a distance between the inclined surface and the rod is changed by the left and right rotation of the connection part according to the

left and right rotation of the pedal unit.
[0013] The air valve and the cam block may be disposed so that the rod is pressed or unpressed by the up and down movement of the connection part according to the up and down movement of the pedal unit.
[0014] The degree of pressing of the rod may vary according to a location at which the pedal unit moves downward in the range of the left and right rotation of the pedal unit.
[0015] The air valve may control the amount of air supplied to the treatment tool as the degree of pressing of the rod varies.
[0016] The foot controller may further include: when the pedal unit moves downward by an external force and then the external force disappears, an elastic member configured to provide a restoring force to return the pedal unit to an original location.
[0017] The elastic member may be disposed on the connection part.
[0018] The connection part may be configured so that the pedal unit is located vertically above a base of the cam block.
Advantageous Effects
[0019] According to a foot controller for a dental unit chair according to the present invention, it is possible for an operator to easily and conveniently control the amount of air supplied to a treatment tool provided in the dental unit chair.
[0020] However, the scope of the present invention is not limited by the above-described effects.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
[0021] FIG. **1** is a diagram illustrating an appearance of a dental unit chair to which the present invention according to an example is applied.
[0022] FIGS. **2** and **3** are diagrams illustrating an appearance of a foot controller according to an embodiment of the present invention.
[0023] FIG. **4** is a block diagram of the foot controller according to the embodiment of the present invention.
[0024] FIG. **5** is a diagram illustrating a concept of wireless communication between a foot controller **20** and a dental unit chair **10** according to an embodiment of the present invention.
[0025] FIG. **6** is a diagram illustrating a concept of wired communication between the foot controller **20** and the dental unit chair **10** according to the embodiment of the present invention.
[0026] FIGS. **7** and **8** are diagrams illustrating an example of an internal configuration of the foot controller according to the embodiment of the present invention.
[0027] FIGS. **9** to **11** are perspective views of the foot controller according to the embodiment of the present invention.
[0028] FIG. **12** is a side view of some components of the foot controller according to the embodiment of the present invention.
[0029] FIGS. **13** to **15** are diagrams illustrating a state in which a pedal unit is located at an exact center with respect to a rail.
[0030] FIGS. **16** and **17** are diagrams illustrating a case in which the pedal unit rotates to the left with respect to the rail.
[0031] FIGS. **18** and **19** are diagrams illustrating a case in which the pedal unit rotates to the right with respect to the rail.
BEST MODE
[0032] The acting effects and technical configuration for the objects of a foot controller for a dental unit chair according to the present invention will be clearly understood by the following description in which exemplary embodiments of the present invention are described with reference to the

accompanying drawings.
[0033] The following description illustrates only a principle of the present invention. Therefore, those skilled in the art may implement the principle of the present invention and invent various apparatuses included in the spirit and scope of the present invention although not clearly described or illustrated in the present specification. In addition, it is to be understood that all conditional terms and exemplary embodiments described in the present specification are basically intended only to allow those skilled in the art to understand a concept of the present invention, and the present invention is not limited to exemplary embodiments and states particularly mentioned described above.
[0034] Further, it is to be understood that all detailed descriptions mentioning specific exemplary embodiments of the present invention as well as principles, aspects, and exemplary embodiments of the present invention are intended to include structural and functional equivalences thereof. Further, it is to be understood that these equivalences include an equivalence that will be developed in the future as well as an equivalence that is currently well-known, that is, all elements invented so as to perform the same function regardless of a structure.
[0035] Further, when it is determined that a detailed description of the known art related to the present disclosure may obscure the gist of the present disclosure, the detailed description thereof will be omitted. Additionally, components in the accompanying drawings are not necessarily drawn to scale. For example, sizes of some of the components illustrated in the accompanying drawings may be exaggerated as compared with other components in order to assist in the understanding of exemplary embodiments of the present invention. Further, like reference numerals on different drawings will denote like components, and similar reference numerals on different drawings will denote similar components, but are not necessarily limited thereto.
[0036] Therefore, it is to be understood that, for example, block diagrams of the present specification illustrate a conceptual aspect of an illustrative circuit for embodying a principle of the present invention. Similarly, it is to be understood that all flow charts, state transition diagrams, pseudo-codes, and the like, illustrate various processes that may be tangibly embodied in a computer-readable medium and that are executed by computers or processors regardless of whether or not the computers or the processors are clearly illustrated.
[0037] Functions of various elements including processors or functional blocks represented as concepts similar to the processors and illustrated in the accompanying drawings may be provided using hardware having capability to execute software in connection with appropriate software as well as dedicated hardware. When the functions are provided by the processors, they may be provided by a single dedicated processor, a single shared processor, or a plurality of individual processors, and some of them may be shared with each other.
[0038] In addition, terms mentioned as a processor, a control, or a concept similar to the processor or the control should not be interpreted to exclusively cite hardware having capability to execute software, but should be interpreted to implicitly include digital signal processor (DSP) hardware and a read only memory (ROM), a random access memory (RAM), and a non-volatile memory for storing software without being limited thereto. The above-mentioned terms may also include well-known other hardware.
[0039] In the claims of the present specification, components represented as means for performing functions described in a detailed description are intended to include all methods of performing functions including all types of software including, for example, a combination of circuit elements performing these functions, firmware/micro codes, or the like, and are coupled to appropriate circuits for executing the software so as to execute these functions. It is to be understood that since functions provided by variously mentioned means are combined with each other and are combined with a method demanded by the claims in the present invention defined by the claims, any means capable of providing these functions are equivalent to means recognized from the present specification.

[0040] The above-mentioned objects, features, and advantages will become more obvious from the following detailed description associated with the accompanying drawings. Therefore, those skilled in the art to which the present invention pertains may easily practice a technical idea of the present invention.
[0041] Hereinafter, various example embodiments by the technical ideas of the present inventive concept will be described in detail with reference to the accompanying drawings.
[0042] FIG. **1** is a diagram illustrating an appearance of a dental unit chair to which the present invention according to an example is applied.
[0043] The dental unit chair **10** may basically include a seat on which examinee's legs are mounted, a backrest on which an examinee's back rests, and a headrest for supporting an examinee's head.
[0044] An armrest on which an examinee's arm rests may be formed on a side surface of at least one of the backrest and the seat.
[0045] In addition, the dental unit chair **10** may include a base for supporting the seat, a driving unit for driving at least one of the backrest and the seat, and a controller for controlling the driving unit.
[0046] In addition, the dental unit chair **10** includes at least one of a lighting unit for illuminating the examinee, a water supply unit for supplying gargle water for rinsing an examinee's mouth, a control unit, a display unit, and a foot control unit **20**, and a power supply unit.
[0047] In addition, the dental unit chair **10** may include a work table.
[0048] A representative example of the work table is a doctor table for mounting various instruments for medical care and treatment in dentistry.
[0049] For example, the work table may be equipped with a surgical instrument, a medical care chart, or the like for medical care of an examinee who has visited dentistry, or an interface for manipulating the instrument.
[0050] The work table may be supplied with at least one of electricity, pneumatic, and hydraulic pressure to be used for operation of the surgical instrument. For example, an oral light that is one of the supplied electric furnace surgical instruments may be turned on.
[0051] In addition, the work table may include various switches. Considering a location of an operator, the work table may be located at a distance that the operator may easily reach with his or her hand.
[0052] Accordingly, various switches capable of controlling each unit of the dental unit chair **10** may be located on the work table.
[0053] FIGS. **2** and **3** are diagrams illustrating an appearance of a foot controller according to an embodiment of the present invention. FIG. **4** is a block diagram of the foot controller according to the embodiment of the present invention.
[0054] Referring to FIGS. **2** to **4**, a foot controller **20** according to an embodiment of the present invention may be configured to include a power supply unit **100**, a communication unit **110**, an input unit **120**, a terminal unit **130**, and a cover part **140**, a flow rate control unit **150**, and a control unit **160**.
[0055] The power supply unit **100** supplies power required for each component of the foot controller **20**. Here, the power supply unit **100** may include a rechargeable battery.
[0056] The communication unit **110** is a module for communicating with the dental unit chair **10**, and may include at least one of a wired communication unit **111** for performing wired communication with the dental unit chair **10**, and wireless communication unit **112** for performing wireless communication with the dental unit chair **10**.
[0057] As described above, the dental unit chair **10** includes a plurality of objects. For example, the plurality of objects may include a seat, a backrest, a lighting device, and a treatment tool.
[0058] Examples of the treatment tool include a high-speed handpiece, a low-speed handpiece, a three-way-syringe, a scaler, and the like.
[0059] That is, the communication unit **110** may perform a function of transmitting a control signal

generated by the foot controller **20** to the dental unit chair **10** in order to control a plurality of objects.

[0060] FIG. **5** is a diagram illustrating a concept of wireless communication between a foot controller **20** and a dental unit chair **10** according to an embodiment of the present invention.

[0061] Wireless communication referred to in this specification includes short-range wireless communications including ZigBee, Bluetooth, and the like. However, the wireless communication mentioned herein is not limited thereto.

[0062] FIG. **6** is a diagram illustrating a concept of wired communication between the foot controller **20** and the dental unit chair **10** according to the embodiment of the present invention.

[0063] As illustrated in FIG. **6**, when the dental unit chair **10** and the foot controller **20** communicate in a wired manner, the dental unit chair **10** may supply power to the foot controller **20** through a cable. In this case, the battery provided in the foot controller **20** may also be charged.

[0064] The wired communication described in this specification may include at least one of a local area network (LAN), Ethernet, and Wi-Fi. However, the wireless communication described in this specification is not limited thereto.

[0065] The input unit **120** may receive a command for controlling a plurality of objects provided in the dental unit chair **10**.

[0066] The input unit **120** may include a pedal unit **121** and a switch unit **122** as illustrated in FIGS. **3** and **4**.

[0067] A user may input a specific command by rotating the pedal unit **121** left and right using a foot and then stepping on the pedal unit **121** at a specific location.

[0068] In addition, the user may input a command assigned to the first switch **122***a* or the second switch **122***b* by stepping on the switch units **122***a* and **122***b*.

[0069] The terminal unit **130** is connected to a wired communication cable for performing wired communication with the dental unit chair **10**.

[0070] The cover part **140** is a component for covering the terminal part **130** with a stopper or the like to protect the terminal unit **130** from dust.

[0071] The flow rate control unit **150** may perform a function of controlling a flow rate of air flowing into the treatment tool provided in the dental unit chair **10**.

[0072] To this end, the flow rate control unit **150** may include a cam block **40** and an air valve **50**. A detailed description of the flow control unit **150** will be described later with reference to the necessary drawings.

[0073] The control unit **160** may control the overall operation of the foot controller **20** according to an embodiment of the present invention and manage the flow of information or data between each component.

[0074] Accordingly, the controller **160** includes at least one processor and an execution memory (e.g., registers and/or random access memory (RAM)) including a central processing unit (CPU)/micro processing unit (MPU) in hardware, and a bus (or internal cable) for inputting and outputting predetermined data.

[0075] In addition, the control unit **160** may include a predetermined program routine and/or program data that is loaded from a predetermined recording medium into an execution memory and is computed by the processor to perform various operations and functions of the foot controller **20** in software according to an embodiment of the present invention.

[0076] In addition, for example, more specifically, the control unit **160** may control all or part of the power supply unit **100**, the communication unit **110**, the input unit **120**, the terminal unit **130**, the cover part **140**, and the flow rate control unit **150**.

[0077] For example, the control unit **160** may transmit a command received through the input unit **120** to the dental unit chair **10** through the communication unit **110**.

[0078] The dental unit chair **10** is also provided with a separate communication unit. The communication unit provided in the dental unit chair **10** may also include a wired communication

module and a wireless communication module, respectively, like the foot controller **20**.
[0079] FIGS. **7** and **8** are diagrams illustrating an example of an internal configuration of the foot controller according to the embodiment of the present invention.
[0080] FIGS. **9** to **11** are perspective views of the foot controller according to the embodiment of the present invention. In particular, FIG. **10** is a top perspective view of a foot controller according to an embodiment of the present invention, and FIG. **11** is a front perspective view of the foot controller according to an embodiment of the present invention. FIG. **12** is a side view of some components of the foot controller according to the embodiment of the present invention.
[0081] The air valve **50** may perform a function of controlling the flow rate of air supplied to the treatment tool provided in the dental unit chair **10**. The RPM of the treatment tool may be controlled by controlling the flow rate of air supplied to the treatment tool.
[0082] An air inlet pipe and an air outlet pipe are connected to the air valve **50**, and air may be supplied to the treatment tool through the air outlet pipe.
[0083] As illustrated in FIG. **11**, the air valve **50** may include a rod **51**. The flow rate of air supplied to the treatment tool may vary according to the degree of pressing of the rod **51**.
[0084] Since the structure of the air valve **50** and the rod **51** provided therein and their operations are known techniques, further detailed description thereof will be omitted.
[0085] As illustrated in FIGS. **11** and **12**, the cam block **40** has an inclined surface **41** and is installed under the rod **51**.
[0086] That is, as illustrated in FIG. **11**, the cam block **40** has an inclined surface **41** on which one side of the upper surface (e.g., the right in the example of FIG. **11**) is gradually lowered toward the ground.
[0087] FIG. **11** illustrates components viewed through the pedal unit **121** toward the flow rate control unit **150** in FIG. **10**.
[0088] In addition, as illustrated in FIG. **11**, the cam block **40** may have the inclined surface **41** formed on a part of the upper surface instead of the entire upper surface, or have the inclined surface formed on the entire upper surface of the cam block **40**.
[0089] In addition, as illustrated in FIGS. **10** and **12**, the pedal unit **121** is disposed at a location spaced apart from the cam block **40** included in the flow rate control unit **150** by a predetermined distance, and as described above, may rotate left and right by external force and move up and down.
[0090] For example, the operator may move the pedal unit **121** up and down by rotating the pedal unit **121** left and right using a foot or stepping on the pedal unit **121** with a foot at a specific location.
[0091] In addition, as illustrated in FIG. **12**, the foot controller **20** according to the embodiment of the present invention may further include a connection part **60** connecting the pedal unit **121** and the cam block **40** so that the cam block **40** moves in conjunction with the movement of the pedal unit **121** (i.e., left and right rotation or up and down movement).
[0092] Therefore, when the pedal unit **121** rotates left and right by the connection part **60**, the cam block **40** rotates left and right in conjunction with the pedal unit **121**, and when the pedal unit **121** moves up and down, the cam block **40** may move up and down in conjunction with the pedal unit **121**.
[0093] A detailed description of the left and right rotation and up and down movement of the cam block **40** according to the left and right rotation and up and down movement of the pedal unit **121** will be described below with reference to FIGS. **16** to **19**.
[0094] Meanwhile, the connecting part **60** may be configured so that the pedal unit **121** is located vertically above the base of the cam block **40**, but is not limited thereto.
[0095] For example, referring to FIG. **12**, the pedal unit **121** is disposed farther away from the ground than the base of the cam block **40**. The relative locations of the pedal unit **121** and the cam block **40** may vary depending on the configuration (e.g., the shape of the connection part **60**) of the

connection part **60**.
[0096] The connection part **60** may be made of a metal material having a predetermined thickness in order to firmly connect the pedal unit **121** and the cam block **40**, but is not limited thereto.
[0097] As illustrated in FIG. **12**, the foot controller **20** according to the embodiment of the present invention may further include an elastic member **62**.
[0098] When the downward movement of the pedal unit **121** occurs by the external force (for example, when the operator steps on the pedal unit **121** with a foot) and then the external force disappears (for example, when an operator takes his/her foot off the pedal unit **121**), the elastic member **62** may provide a restoring force for returning the pedal unit **121** to its original location.
[0099] As illustrated in FIG. **12**, the elastic member **62** may be disposed on the connection part **60**.
[0100] Meanwhile, as illustrated in FIG. **10**, the foot controller **20** according to the embodiment of the present invention may further include a rail **30** for guiding the left and right rotation of the pedal unit **121**.
[0101] When the pedal unit **121** rotates left and right, as illustrated in FIGS. **10** and **13**, a range of the left and right rotation may be limited by the length of the rail **30**.
[0102] For example, as illustrated in FIG. **10**, the pedal unit **121** may rotate 12° to the left and 12° to the right, but is, of course, not limited thereto. It should be clearly noted that 12° to the left and 12° to the right illustrated in FIG. **10** are merely examples.
[0103] On the other hand, when the cam block **40** rotates left and right according to the left and right rotation of the pedal unit **121**, the air valve **50** and the cam block **40** may be disposed so that the rod **51** of the air valve **50** is always located above the inclined surface **41** formed on the cam block **40**.
[0104] Because, when an operator steps on the pedal unit **121** with a foot (moving the pedal unit **121** downward), the cam block **40** moves upward by the connection part **60** to press the rod **51**.
[0105] In addition, the air valve **50** and the cam block **40** may be disposed so that the distance between the inclined surface **41** and the rod **51** is changed by the left and right rotation of the connection part **60** according to the left and right rotation of the pedal unit **121**. A detailed description thereof will be provided below in more detail with reference to FIGS. **16** to **19**.
[0106] FIGS. **13** to **15** are diagrams illustrating a state in which the pedal unit is located at an exact center with respect to a rail.
[0107] When the pedal unit **121** is located at the exact center with respect to a rail **30** ("AA" in FIG. **13**), in a state in which an operator does not step on the pedal unit **121** with a foot, a vertical distance between the inclined surface **41** and the rod **51** is Z1 (see FIG. **15**).
[0108] FIGS. **16** and **17** are diagrams illustrating a case in which the pedal unit rotates to the left with respect to the rail.
[0109] Referring to FIGS. **16** and **17**, in a state in which an operator rotates the pedal unit **121** to the left and does not step on the pedal unit **121** with a foot, the vertical distance between the inclined surface **41** and the rod **51** is Z2 (see FIG. **17**).
[0110] FIGS. **18** and **19** are diagrams illustrating a case in which the pedal unit rotates to the right with respect to the rail.
[0111] Referring to FIGS. **18** and **19**, in a state in which an operator rotates the pedal unit **121** to the right and does not step on the pedal unit **121** with a foot, the vertical distance between the inclined surface **41** and the rod **51** is Z3 (see FIG. **19**).
[0112] It should be noted that FIGS. **15**, **17** and **19** are diagrams when viewed from the pedal unit **121** side toward the cam block **40**.
[0113] For example, when an operator rotates the pedal unit **121** to the left as illustrated in FIG. **16**, the rod **51** is located on the right of the cam block **40** as illustrated in FIG. **17**.
[0114] In addition, when an operator rotates the pedal unit **121** to the right as illustrated in FIG. **18**, the rod **51** is located on the left of the cam block **40** as illustrated in FIG. **19**.
[0115] Here, when the distances of Z1, Z2, and Z3 are compared, the Z2 value is the largest and the

Z3 value is the smallest.
[0116] As described above, the air valve **50** and the cam block **40** are disposed so that the rod **51** is pressed or unpressed by the up and down movement of the connection part **60** according to the vertical movement of the pedal unit **121**.
[0117] In addition, the degree of pressing of the rod **51** may vary according to the location at which the pedal unit **121** moves downward in the range of the left and right rotation of the pedal unit **121**.
[0118] The air valve **50** controls the amount of air supplied to the treatment tool as the degree of pressing of the rod **51** varies.
[0119] Meanwhile, the range of the up and down movement of the pedal unit **121** may also be limited in the same way that the range of the left and right rotation may be limited.
[0120] For example, the range of the up and down movement of the pedal unit **121** may be limited in such a way that the pedal unit **121** moves downward only until it reaches the ground or the base in the state in which the pedal unit **121** is spaced apart from the ground or the base constituting a lower end portion of the foot controller **20** (in the state in which an operator does not step on the pedal unit **121**).
[0121] However, the range of the up and down movement of the pedal unit **121** may be limited by various mechanical configurations of the foot controller **20**.
[0122] For example, as illustrated in FIG. **12**, the pedal unit **121** may move (rotate) by 5° in the vertical direction (Z axis). Of course, the limited range of the up and down movement (rotation) of the pedal unit **121** is not limited to the above 5°. Hereinafter, for convenience of explanation, it is assumed that the pedal unit **121** moves (rotates) up and down by 5°.
[0123] An example of the control or change of the supply amount of air of the air valve **50** by the pressing of the rod **51** described above is as follows.
[0124] For example, referring to FIGS. **13** to **15**, when an operator steps on the pedal unit **121** in a state in which the pedal unit **121** is located at the exact center with respect to the rail **30**, the cam block **40** presses the rod **51** by a distance (hereinafter referred to as “D1”) corresponding to an angle obtained by subtracting an angle corresponding to Z1 from 5°.
[0125] Here, the air valve **50** supplies air to the treatment tool at a flow rate corresponding to D1.
[0126] In addition, for example, referring to FIGS. **16** and **17**, when an operator steps on the pedal unit **121** in a state in which the pedal unit **121** is located on the left with respect to the rail **30**, the cam block **40** presses the rod **51** by a distance (hereinafter referred to as “D2”) corresponding to an angle obtained by subtracting an angle corresponding to Z2 from 5°.
[0127] Here, the air valve **50** supplies air to the treatment tool at a flow rate corresponding to D2.
[0128] Of course, since Z2 is greater than Z1, D2 is smaller than D1.
[0129] In addition, for example, referring to FIGS. **18** and **19**, when an operator steps on the pedal unit **121** in a state in which the pedal unit **121** is located on the right with respect to the rail **30**, the cam block **40** presses the rod **51** by a distance (hereinafter referred to as “D3”) corresponding to an angle obtained by subtracting an angle corresponding to Z2 from 5°.
[0130] Here, the air valve **50** supplies air to the treatment tool at a flow rate corresponding to D3.
[0131] Of course, since Z3 is less than Z1, D3 is greater than D1.
[0132] In the above-described manner, an operator uses the foot to rotate the pedal unit **121** left and right and/or up and down movement, so that the flow rate of air supplied to the treatment tool provided in the dental unit chair through the air valve **50** may be controlled.
[0133] In the present specification, ‘an exemplary embodiment’ and the like and other modified expressions of principles of the present disclosure mean that specific features, structures, characteristics, or the like, are included in at least one exemplary embodiment of the principles of the present disclosure. Accordingly, the expression “an exemplary embodiment” and other modified examples in the present specification may not denote the same embodiment.
[0134] When a method in the present specification is described as comprising a series of steps, the order of those steps presented herein is not necessarily the order in which those steps can be

performed, and any described steps may be omitted and/or may be omitted herein. Any other steps not described herein could be added to the method.
[0135] In addition, unless explicitly described to the contrary, a singular form includes a plural form in the present specification. In addition, components, steps, operations, and elements mentioned by terms ‘include’ or ‘including’ used in the present specification mean the existence or addition of one or more other components, steps, operations, elements, and devices.
[0136] Hereinabove, the present disclosure has been described with reference to exemplary embodiments. All exemplary embodiments and conditional illustrations disclosed in the present disclosure have been described to intend to assist in the understanding of the principle and the concept of the present invention by those skilled in the art to which the present invention pertains. Therefore, it will be understood by those skilled in the art to which the present invention pertains that the present invention may be implemented in modified forms without departing from the spirit and scope of the present invention. Therefore, embodiments disclosed herein should be considered in an illustrative aspect rather than a restrictive aspect.
[0137] The scope of the present invention should be defined by the claims rather than the above-mentioned description, and equivalents to the claims should be interpreted to fall within the present invention.

Claims

1. A foot controller for a dental unit chair for controlling a treatment tool provided in the dental unit chair, the foot controller comprising: an air valve configured to control a flow rate of air supplied to the treatment tool; a cam block configured to be installed under a rod provided in the air valve and having an inclined surface; a pedal unit configured to be disposed at a location spaced apart from the cam block by a predetermined distance and rotatable left and right by an external force and movable up and down; and a connection part configured to connect the cam block and the pedal unit so that the cam block moves in conjunction with movement of the pedal unit.
2. The foot controller of claim 1, further comprising: a rail configured to guide a left and right rotation of the pedal unit.
3. The foot controller of claim 2, wherein a range of the left and right rotation of the pedal unit is limited by a length of the rail.
4. The foot controller of claim 1, wherein, when the cam block rotates left and right according to the left and right rotation of the pedal unit, the air valve and the cam block are disposed so that the rod of the air valve is always located above the inclined surface.
5. The foot controller of claim 1, wherein the air valve and the cam block are disposed so that a distance between the inclined surface and the rod is changed by the left and right rotation of the connection part according to the left and right rotation of the pedal unit.
6. The foot controller of claim 5, wherein the air valve and the cam block are disposed so that the rod is pressed or unpressed by the up and down movement of the connection part according to the up and down movement of the pedal unit.
7. The foot controller of claim 6, wherein the degree of pressing of the rod varies according to a location at which the pedal unit moves downward in the range of the left and right rotation of the pedal unit.
8. The foot controller of claim 7, wherein the air valve controls the amount of air supplied to the treatment tool as the degree of pressing of the rod varies.
9. The foot controller of claim 1, further comprising: when the pedal unit moves downward by an external force and then the external force disappears, an elastic member configured to provide a restoring force to return the pedal unit to an original location, wherein the elastic member is disposed on the connection part.

10. The foot controller of claim 1, wherein the connection part is configured so that the pedal unit is located vertically above a base of the cam block.