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(54) A kit for a domestic gas appliance

(57) A kit for a domestic gas appliance comprising at least one burner, the kit (300) comprising a gas control valve (2) connectable between a gas source and the burner (1); and control means (3) electrically coupled to the gas control valve (2) to control the opening and closing of said gas control valve (2). The control means (3) is adapted to be coupled to an audio input and are configured to receive an analog sound signal (Sson) and to generate a control signal (Sc) based on the analog sound signal (Sson) deliverable to the gas control valve (2) to cause the opening and/or closing of said gas control valve (2), for the purpose of inducing a modulation of a flame in the burner (1).

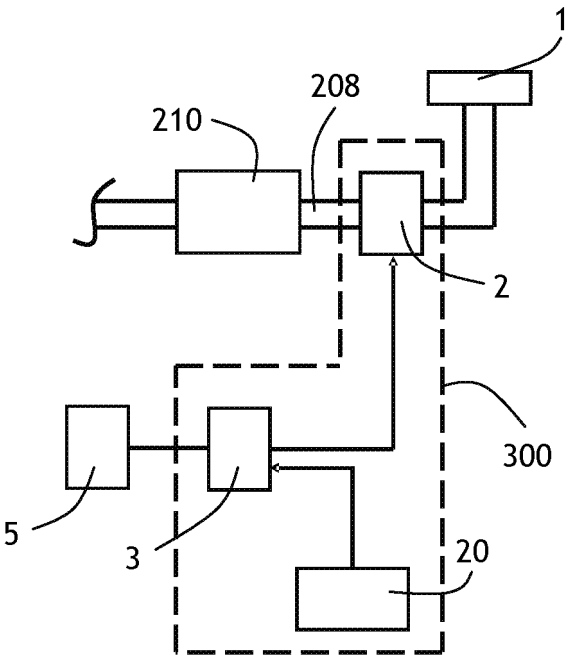

Fig. 6

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Description

TECHNICAL FIELD

[0001] This invention relates to a kit for a domestic gas appliances, and, more specifically, to a kit for a domestic gas appliances in which a flame is generated and in which the flame can be modified by acting on at least one valve. The invention also relates to a domestic gas burner, and to a method for modulating a flame of a burner of a domestic gas appliance.

PRIOR ART

[0002] Up until very recently domestic heating appliances and even lighting appliances functioned by burning solid materials such as wood. However, these types of appliances are gradually being replaced by appliances that burn non-solid materials such as gas or which generate heat or light electrically. The latter types of appliances do not, therefore, produce the combustion effect of flames that appliances burning solid materials do (e.g., visual effect and/or sound effect). The combustion effect often causes the user to feel a sense of well-being and relaxation that they do not experience with gas or electrical appliances.

[0003] In order to solve the absence of the combustion effect and generate these sensations in the user, different types of appliances are now appearing on the market. One type is electrical appliances that simulate the flame or fire to obtain these combustion effects, some of them even simulating the sound produced by the flames. An example of this type of appliance is disclosed in the document US20070125367A1 where a flame is simulated by electronic means. At least one light source, such as LEDs, is used to achieve this in conjunction with a microprocessor that is used to vary the intensity of the light and its colour of the light (of the LEDs) in order to simulate the natural effect of a live flame. Simulation of logs and wood are also disclosed.

[0004] Appliances that heat and/or light by means of a non-solid fuel such as gas for example, hereinafter referred to as gas appliances, comprise at least one burner to which the gas is supplied, a flame being generated in the burner when the gas is ignited. The intensity of the flame depends on the gas (or on an air-gas mixture) that reaches the burner, and there are known appliances that, in order to simulate the effect of combustion cause a modification of the flame by the blowing an air current directly into the burner (or onto the flame generated in the burner) for example, thereby altering the flame, which modifies its shape in accordance with the air current directed into the burner. U.S. Patent No. 6,162,045 discloses an example of this type of appliances, in which the vibrations of a speaker disposed in the burner disturb the air-gas mixture that reaches the burner, the flame being altered in accordance with the vibrations.

[0005] In other gas appliances, in order to simulate a combustion effect, the gas that reaches the burner is regulated by acting on a valve that regulates the passage of the gas to the burner. Normally, the valve is acted on in accordance with preset patterns, the user being able to select among a preset number of patterns at any given moment. These patterns can imitate known music or even certain ambiences such as a romantic ambience. U.S. Publication No. 2005/0208443A1 discloses a gas heating appliance that comprises control means for regulating the characteristics of a gas generated flame, such as its frequency and size, thereby providing a combustion effect. To achieve this, the control means acts on a valve to regulate the gas that reaches the burner. The control means comprises a plurality of preset control modes or patterns that can be selected to control the valve according to the pattern selected by the user. However, a user of such appliance is unable to recreate ambiences that have not been preset in the control means.

DISCLOSURE OF THE INVENTION

[0006] It is an object of the present invention to provide kit for a domestic gas appliance in which a flame can be modified to provide an aesthetic visual effect, to provide a domestic gas appliance, and to provide a method for modulating a flame of a burner of a domestic gas appliance.

[0007] The kit of the invention is adapted to be used in a domestic gas appliance comprising at least one burner where a flame is generated. The kit comprises at least one valve associated to the burner and which regulates the passage of gas to the burner, and control means that is associated to the valve and which is adapted to generate a control signal for controlling the position of the valve based on an analog audio/sound input for the purpose of regulating the flow of gas to the burner.

[0008] The control means generates the control signal representative of sounds generated in real - time. As a result, the user can select in real-time a sequence of sounds in order to produce a flame to recreate a desired ambience or feeling at any given moment without being forced to select from among a limited number of preset ambience. At the same time the domestic gas appliance fulfils its main function, which can be heating (if it is a gas stove/heater) or lighting (if it is a gas lamp) for example.

[0009] These and other advantages and characteristics of the invention will be made evident in the light of the drawings and the detailed description thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010]

Figure 1 schematically shows an embodiment of a gas appliance of the invention.

Figure 2a shows a linear relationship between a reference signal and a control signal of an appliance,

such as that illustrated in Figure 1.

Figure 2b shows a logarithmic relationship between a reference signal and a control signal of an appliance, such as that illustrated in Figure 1.

Figure 2c shows a potential relationship between a reference signal and a control signal of an appliance, such as that illustrated in Figure 1.

Figure 3a represents the variations in amplitude of a melody for which the most suitable relationship is a linear relationship and also a reference signal representative of the variations.

Figure 3b represents the variations in amplitude of a melody for which the most suitable relationship is a logarithmic relationship and also a reference signal representative of the variations.

Figure 3c represents the variations in volume of a melody for which the most suitable relationship is the potential relationship and also a reference signal representative of the variations.

Figure 4a illustrates a burner of one embodiment of the appliance of the invention.

Figure 4b illustrates a burner of another embodiment of the appliance of the invention.

Figure 5 is a cross-sectional view of a valve of one embodiment of the appliance of the invention, corresponding with a voice-coil type actuator.

Figure 6 is a block diagram illustrating one embodiment of a kit of the invention, incorporated into a domestic gas appliance.

DETAILED DISCLOSURE OF THE INVENTION

[0011] Figure 1 illustrates, in the form of a block diagram, a domestic gas appliance 100 according to one implementation of the present invention. The appliance 100 may be, for example, a gas heating appliance, a gas stove, or a lighting appliance such as a gas lamp. In one implementation appliance 100 comprises at least one burner 1 where a flame is generated, at least one valve 2 associated to the burner 1, and control means 3 that is associated with valve 2 and which is adapted to generate at least one control signal Sc used in the control of valve 2 to regulate the passage of gas to burner 1. The appliance 100 may also comprise lighting means, such as, for example, an igniter or a spark generator (not shown in the figures) to ignite the flame in the burner 1. In one implementation the control means 3 is adapted to cause the lighting means to ignite the gas that reaches burner 1 at a given moment, the flame being generated as a result of the lighting. The control means 3 may comprise a DSP (Digital Signal Processor), a control means, a microprocessor or an equivalent device.

[0012] In one embodiment of the invention, the control means 3 receives an analog reference signal Sref representative of the amplitudes of a sequence of sounds, and generates the control signal Sc in accordance with a reference signal Sref to cause the flame in the burner 1 to move in accordance with the sequence of sounds. The control signal Sc is preferably analogical, but it can also be digital.

[0013] The sequence of sounds comprises a melody or music, although any other type of sequences can be used, such as, for example, the simulation of sea-waves. The sequence of sounds can be generated by a stereo, music centre or any other type media player 5 that transmits an analog sound signal Sson identifying the music it is playing. In one embodiment the appliance 100 comprises an amplifying stage 6 that receives the analog sound signal Sson and which regulates the gain of the analog sound signal Sson. If the analog sound signal Sson has very high voltage values the amplifying stage 6 decreases the voltage values, if the analog sound signal Sson has very low voltage values it increases the voltage values, and if the analog sound signal Sson has intermediate or acceptable voltage values it maintains voltage values. Voltage values that can be accepted and treated by the control means 3 can be understood as intermediate or acceptable voltage values, which can depend on the control means 3 used.

[0014] The appliance 100 can comprise an adaptation stage 7 where the signal leaving the amplifying stage 6 is treated. In one implementation the manufacturer presets the parameter of the signal that is to be taken into account in generating the control signal Sc, which can correspond with its size (instantaneous signal), its effective value or which can be in accordance with the detection of peaks, for example. The output signal of the adaptation stage 7 corresponds with the reference signal Sref that reaches the control means 3, as shown in Figure 1, the control means 3 generating the control signal Sc in accordance with the reference signal Sref. Figures 3a and 3c illustrate exemplary reference signals, Sref, producible by an adaptation stage 7.

[0015] The relationship between the reference signal Sref and the control signal Sc may be, for example, linear, logarithmic or potential, which are represented by the curves shown in Figures 2a, 2b and 2c respectively. Figures 3a, 3b and 3c show three different types of melodies, with different rhythms, shown in accordance with the variations in the amplitudes (peaks and/or valleys) of the melodies (reference signal Sref in the x-axis). In the representation shown in Figure 3a, the amplitude of the melody suffers frequent variations between an area of maximum levels Zmax and an area of minimum levels Zmin, these being major variations in amplitude, as a result of which the most suitable relationship to be applied in this case is the linear relationship shown in Figure 2a. In the

representation shown in 3b, the volume of the melody suffers frequent variations only in the area of minimum levels Zmin, these being minor variations in amplitude, and suffers very few variations between the area of minimum levels Zmin and the area of maximum levels Zmax, and/or area of maximum levels Zmax. In this case, therefore, in order to achieve good resolution, especially in the variations in amplitude of the area of minimum levels Zmin, as a result of which the most suitable relationship to be applied in this case is the logarithmic relationship shown in Figure 2b, by means of which a small range of analog input values (x-axis) of the area of minimum levels Zmin corresponds to a large range of digital output values (control signal Sc in the y-axis). In the representation shown in Figure 3c, the amplitude of the melody suffers frequent variations only in the area of maximum levels Zmax, these being minor variations in amplitude, and suffers very few variations between the area of maximum levels Zmax and the area of minimum levels Zmin, and/or in the area of minimum levels Zmin. In this case, therefore, in order to achieve a good resolution, especially in the variations in amplitude of the area of maximum levels Zmax, as a result of which the most suitable relationship to be applied in this case is the potential relationship shown in Figure 2c, by means of which a small range of analog input values (x-axis) of the area of maximum levels Zmax corresponds to a large range of digital output values (control signal Sc in the y-axis). In one implementation, the control means 3 automatically selects the most appropriate relationship to be applied. In another implementation one or more user interfaces are provided that enables the user to select between an automatic mode and a manual mode. In the automatic mode the control means automatically selects the most appropriate relation, whereas in the manual mode the user is permit to select the relationship to be applied.

[0016] Appliance 100 may comprise a single burner 1 with a single combustion area 1a where a flame is ignited, or with a plurality of combustion areas 1 a where a flame is capable of being ignited in each of the combustion areas 1 a. Appliance 100 may also comprise a plurality of burners 1, each of them comprising one or more combustion areas 1a. In one implementation appliance 100 comprises, for each combustion area 1 a, an associated gas supply valve 2 with the control means 3 capable of generating a control signal Sc for each valves 2. The control signals Sc may be equal or different for all the valves 2. In one implementation control signals Sc having different relationships (e.g., linear, logarithmic, potential) with the reference signal Sref are supplied to different valves 2 of a gas appliance. For example, in one implementation a control signal Sc having a linear relationship with the reference signal Sref is supplied to one valve 2 while a control signal Sc having a logarithmic or potential relationship with the reference signal Sref is supplied to another valve 2. In general, in each combustion area 1 a the flame may be modulated or modified separately to the rest of the combustion areas 1a. The burner 1 is not restricted to a specific shape and/or arrangement and can comprise any conventional shape such as those shown in Figure 4a (with a single combustion area 1 a in this case) and in Figure 4b (with two combustion areas 1a in this case, also disposed at different heights). In each combustion area 1a the corresponding tube 1c comprises a plurality of grooves 1a' through which the flame exits to the outside. As shown in Figure 4b, additionally, the shape and/or arrangement of a combustion area 1a (of a pipe 1c where the combustion area 1a is disposed) may be different to that of another combustion area 1a (the pipe 1c of another combustion area 1a), and the burner 1 can comprise an intermediate pipe 1b to connect the flame of one combustion area 1a with another combustion area 1a, so that the flames present in the burner 1 display a continuity despite being generated in different combustion areas 1a.

[0017] To obtain a flame that represents the amplitude of the sequence of sounds in the most realistic way possible, the use of valves 2 that can be opened and closed at high speeds, speeds in excess of about 30Hz for example, is advised. In one implementation of the present invention the valve 2 comprises a voice-coil type actuator as shown in Figure 5. This type of actuator comprises a permanent magnet 2b, and in one implementation the permanent magnet 2b is axially magnetised while in another it is radially magnetised. Alternatively, the valve 2 may comprise, without limitation, a piezoelectric-bender actuator or an ultrasonic-type motor, which can also be opened and closed at high speeds.

[0018] In one implementation valve 2 comprises a voice-coil type actuator. This type of actuator comprises a moving part 2a (moving reel), the movement of which causes the valve 2 to open and close, thereby enabling or preventing the passage of gas to the burner 1. In one implementation the voice-coil has a low mechanical inertia in order to allow the moving part 2a to move at frequencies of 30Hz or greater. In order to cause the moving part 2a to move, an electrical current is supplied to the actuator with the result that a magnetic field is generated that is opposed to the force exerted by the permanent magnet 2b, causing the valve 2 to open. In one implementation appliance 100 comprises a driver 8 or a control system (not shown in the figures) for the valve 2, which receives the control signal Sc. In such an implementation the driver 8 generates the electrical current for the actuator of the valve 2 in accordance with the control signal Sc, which in the implementation in which the control signal Sc is digital it can be a square wave signal. The square signals may comprise, in each period, an interval Ton in which the signal corresponds with a "1" logic, and an interval Toff in which the signal corresponds with a "0" logic, the relationship between the intervals Ton and Toff being known as a duty-cycle. The adjusting of the duty-cycle of the electrical current signal enables the opening and closing of the valve 2 to be controlled. In the implementation in which the control signal Sc is analogical, the valve 2 can comprise intermediate positions, not only

a totally open position or a totally closed position, different amounts of gas being allowed through said valve 2 towards the burner 2 depending on said control signal Sc.

[0019] The sequence of sounds is generated by a sound device 5, which in one implementation is a conventional device that is already disposed with an output that corresponds with the sound signal Sson. The sound device 5 can comprise, for example, capture devices such as CD and DVD players, microphones etc, or devices known as virtual electronic devices, such as a guitar or an electronic baton for example. The sound device 5 can also be a device external to the heating appliance 100, as shown in Figure 1, or it can be built into the appliance 100 itself. In the event that the sound device 5 is external, the appliance 100 comprises an input 15 for receiving the sound signal Sson originating from the sound device 5, which in one implementation comprises a plug.

[0020] In one implementation, a control system of the present invention includes a user interface 9 that permits, for example, a user of the system to deactivate the control system. When an OFF mode is selected, the gas control valve 2 is adapted to remain open in spite of any audio signal introduced into the system. The user interface 9 can be operatively connected to the control means 3 so that a control signal Sc is generated to maintain the gas control valve 2 open. The interface 9 can also deactivate the control means 3, or otherwise acts upon other control system components in a manner such that no control signal Sc is delivered to the gas control valve 2, the gas control valve 2 being adapted to assume and maintain an open position in the absence of receiving a control signal Sc. The user interface 9 can also be used for selecting between an automatic mode and a manual mode to select the relationship between the analog sound signal son and the reference signal Sref, or additional user interface can also be used for this purpose.

[0021] An advantage of present invention is that it may easily be integrated into a wide variety of gas appliances. In one implementation a kit 300 for integration or incorporation into a gas appliance is provided. In one implementation, as shown in Figure 6, the kit 300 comprises a gas control valve 2 and control means 3, with an optional ON/OFF switch 20. In the example of Figure 6, the gas control valve 2 is installed in the gas line 208 between a shut-off valve 210 and a gas burner 1. In one implementation, the shut-off valve 210 is a safety valve that is coupled to a thermocouple situated in or near the burner and is adapted to close upon a disruption or extinguishing of a pilot flame associated with the burner 1. In another implementation the shut-off valve is a manually operated valve. In one implementation the control means 3 comprises at least an analog input for receiving an analog audio signal, equal to that previously discussed, for generating a control signal Sc to be delivered to and regulate the position of gas control valve 200. In addition to the control means 3, the kit 300 also includes one or more of the components 5, 6, 7, 8 and 9 or any of the other features previously described herein. Although the present invention has been disclosed in the context of certain embodiments and examples, it will be understood by those skilled in the art that the present invention extends beyond the specifically disclosed embodiments to other alternative embodiments and/or uses of the invention and obvious modifications and equivalents thereof. Thus, it is intended that the scope of the present invention herein disclosed should not be limited by the particular disclosed embodiments described above.

Claims

1. A kit for a domestic gas appliance comprising at least one burner, the kit (300) comprising:

   a gas control valve (2) connectable between a gas source and the burner (1); and
   control means (3) electrically coupled to the gas control valve (2) to control the opening and closing of said gas control valve (2),
   characterised in that
   the control means (3) is adapted to be coupled to an audio input and is configured to receive an analog sound signal (Sson) and to generate a control signal (Sc) based on the analog sound signal (Sson) deliverable to the gas control valve (2) to cause the opening and/or closing of said gas control valve (2), for the purpose of inducing a modulation of a flame in the burner (1).

2. The kit according to to claim 1, comprising an adaptation stage (7) that is configured to receive the analog sound signal (Sson) and to generate a reference signal (Sref) to be delivered to the control means (3), the reference signal (Sref) being based on the analog sound signal (Sson) and being received by the control means (3).

3. The kit according to claim 2, wherein the control means (3) is configured to automatically act upon the reference signal (Sref) to establish either a linear, a logarithmic or a potential relationship between the reference signal (Sref) and the control signal (Sc).

4. The kit according to claim 2, comprising a user interface (9) coupled to the control means (3) and selectable between an automatic mode and a manual mode, in the automatic mode the control means (3) configured to automatically act upon the reference signal (Sref) to establish either a linear, a logarithmic or a potential relationship between the reference signal (Sref) and the control signal (Sc), in the manual mode the control means (3) configured to act upon the reference signal (Sref) to establish either a linear, a logarithmic or a potential relationship between the reference signal (Sref) and the control signal (Sc)

based on a manual selection of a user of the gas appliance (100).

5. The kit according to any of claims 1 to 4, comprising an input (15) adapted for connection to a sound generating device (5) to receive the analog sound signal (Sson).

6. The kit according to any of claims 1 to 6, comprising an integrated sound generating device (5) that is configured to generate the analog sound signal (Sson).

7. The kit according to any of claims 1 to 6, wherein the valve (2) comprises a voice-coil type actuator that, when operated, operates at frequencies of about 30Hz or greater.

8. The kit according to any of claims 1 to 7, wherein the control signal (Sc) is an analog signal (Sson).

9. The kit according to any of claims 1 to 7, wherein the control signal (Sc) is a digital signal.

10. The kit according to claim 9, comprising a driver (8) that is configured to receive the control signal (Sc) and which generates therefrom a square wave current signal deliverable to the gas control valve (2), the opening and closing of the gas control valve (2) being regulated in accordance with the duty-cycle of the square wave current signal.

11. The kit according to any of claims 1 to 10, comprising an amplifier (6) that is configured to regulate the gain of the analog sound signal (Sson) prior to the analog sound signal (Sson) being received in the control means (3).

12. The kit according to any of claims 1 to 11, wherein the burner (1) comprises a plurality of combustion areas (1 a), the kit (300) comprising a plurality of gas control valves (2), one gas control valve (2) for each combustion area (1 a), when the burner (1) comprises a plurality of combustion areas (1 a).

13. A domestic gas appliance comprising
at least one burner (1), and
a valve (210) arranged between a gas source and the burner (1);
characterised in that
also comprises at least one kit (300) according to any of the preceding claims.

14. A method for modulating a flame of a burner of a domestic gas appliance, the method comprising a control upon a gas control valve (2) that is arranged to control the flow of gas to the burner (1),
characterised in that also comprises
producing an analog sound signal (Sson),
creating a reference signal (Sref) based on the analog sound signal (Sson),
acting on the reference signal (Sref) to create a control signal (Sc), the reference signal (Sref) being acted upon to establish either a linear, a logarithmic or a potential relationship between the reference signal (Sref) and the control signal (Sc); and
delivering the control signal (Sc) to the gas control valve (2),
said control signal (Sc) acting upon the gas control valve (2) to cause said gas control valve (2) to open and/or close to modulate the flame in the burner (1).

15. A method according to claim 14, comprising regulating the gain of the analog sound signal (Sson) prior to creating the reference signal (Sref).

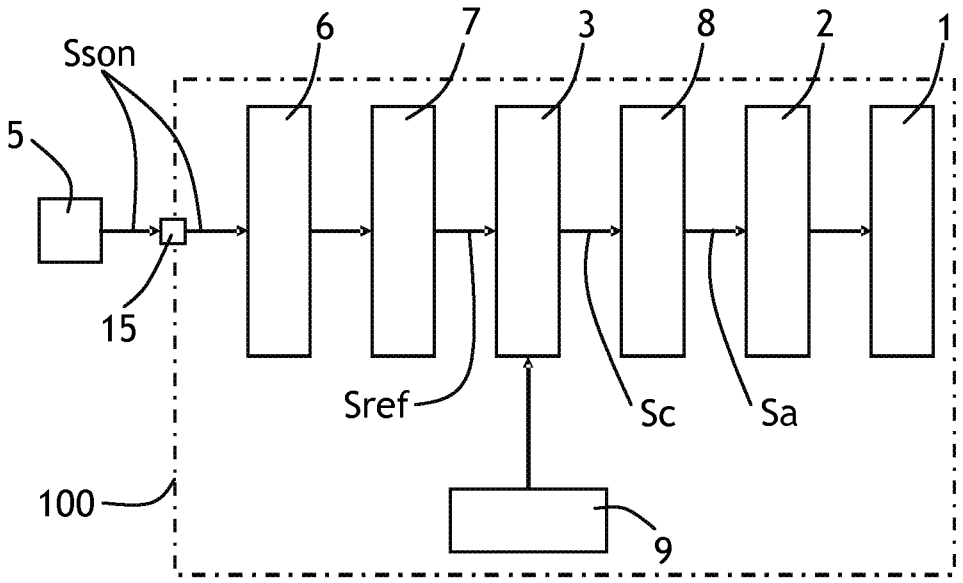

Fig. 1

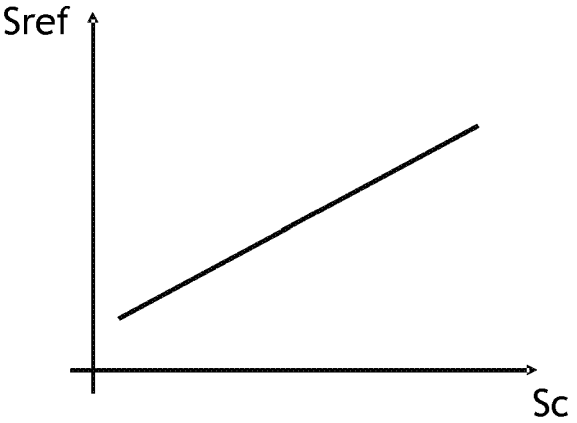

Fig. 2a

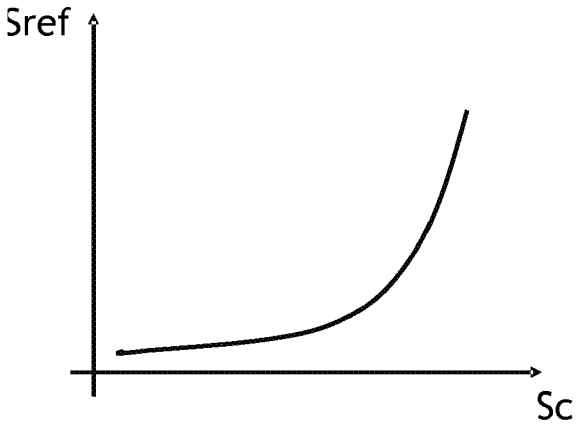

Fig. 2b

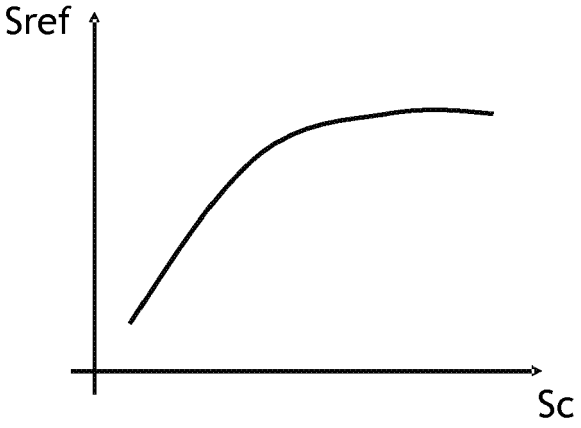

Fig. 2c

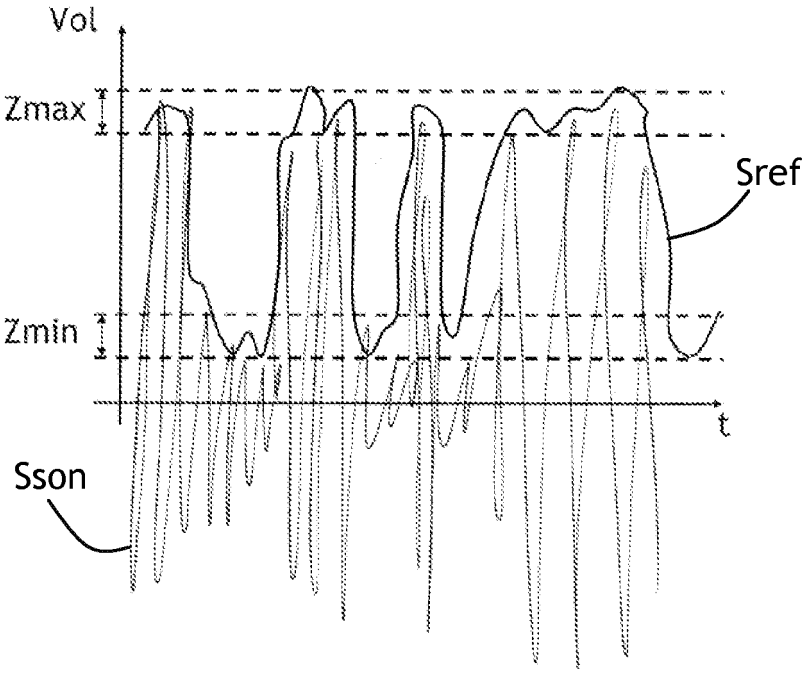

Fig. 3a

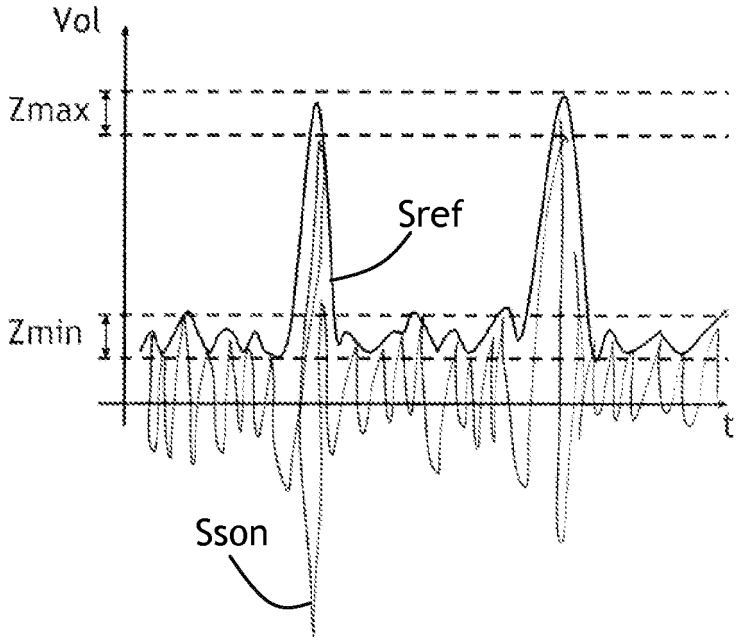

Fig. 3b

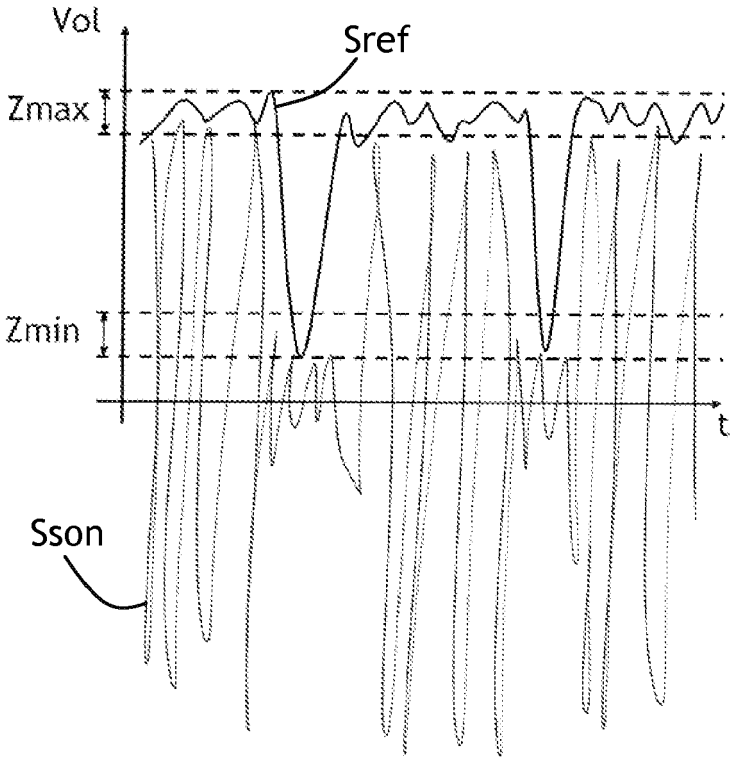

Fig. 3c

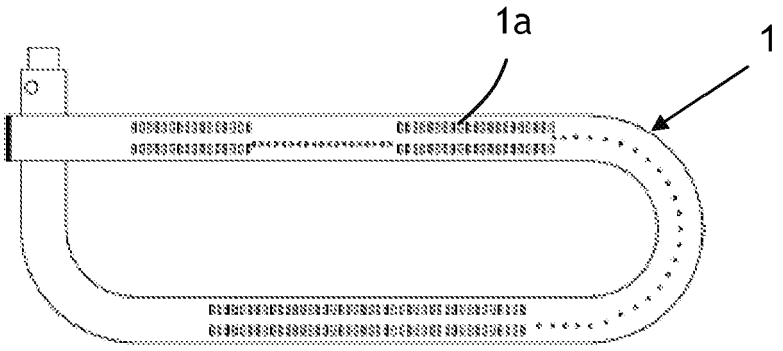

Fig. 4a

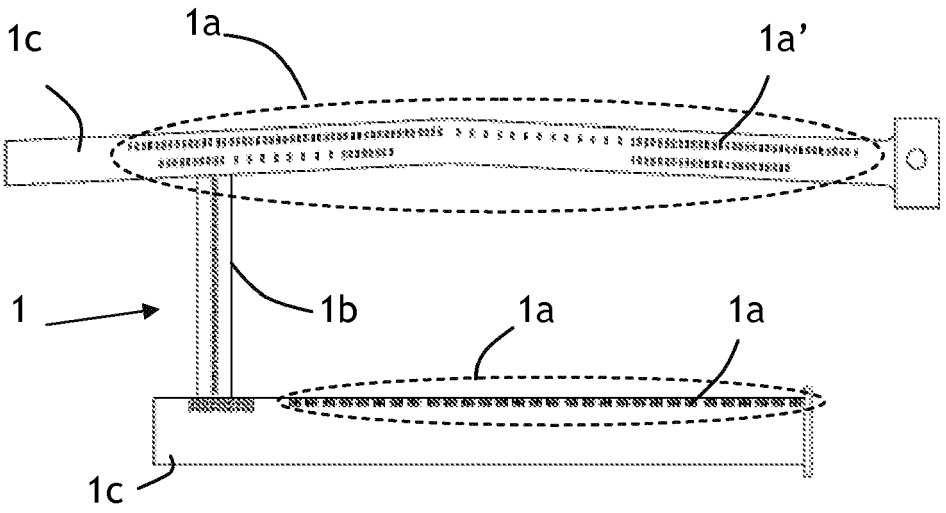

Fig. 4b

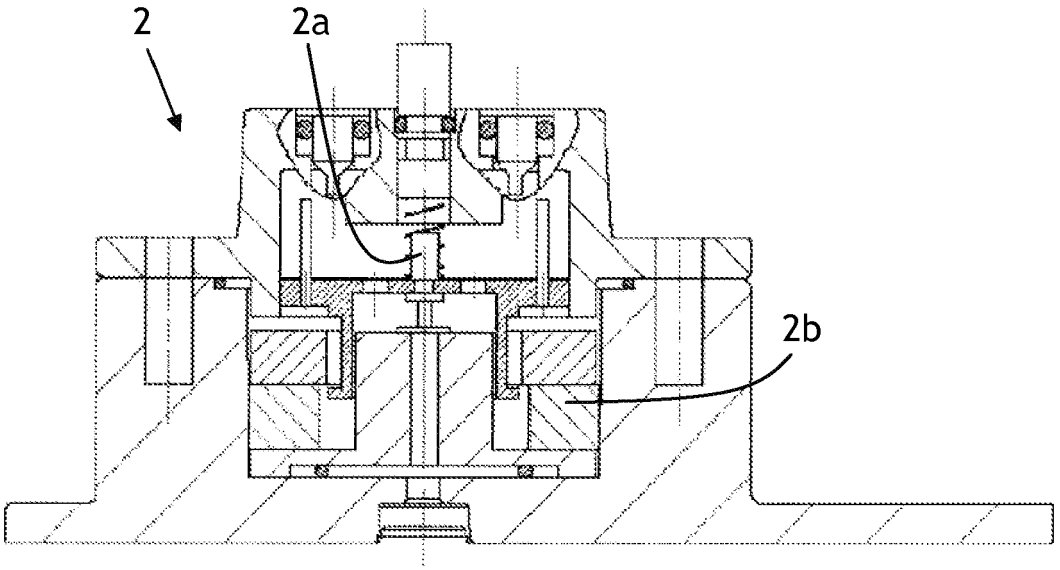

Fig. 5

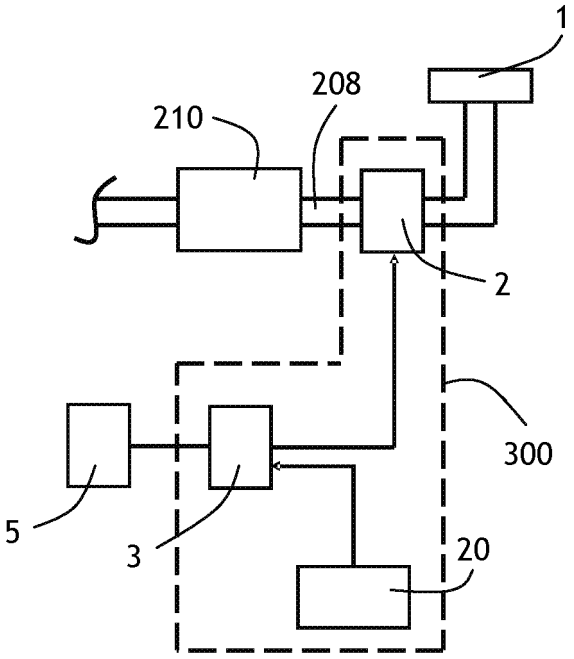

Fig. 6

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 20070125367 A1 **[0003]**
- US 6162045 A **[0004]**
- US 20050208443 A1 **[0005]**