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(54) Title: A COSMETIC OR SKIN TREATMENT APPLIANCE FITTED WITH AN ACTIVE NOISE CONTROL SYSTEM

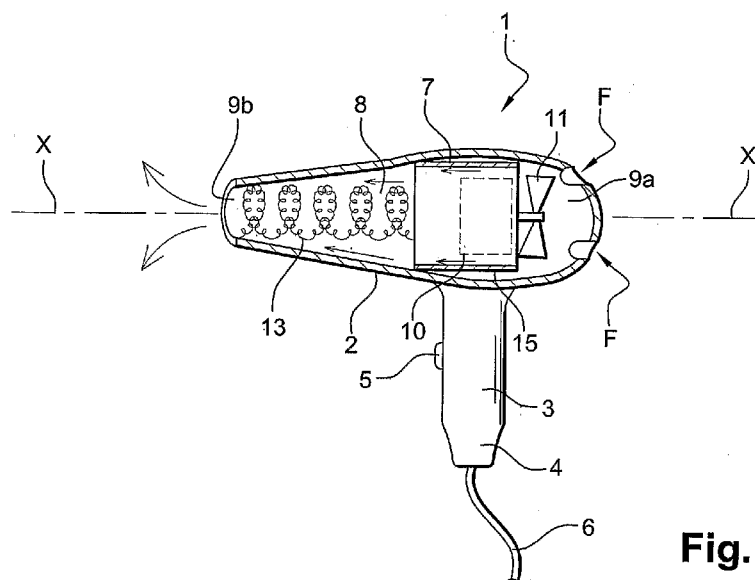


Fig. 1

(57) Abstract: The present invention relates to a cosmetic- or skin-treatment appliance (1) comprising: • an electric motor (10) coupled to drive an element (11); and • an active control system (21, 22, 23) for controlling noise emitted by the motor (10) and/or the element (11) coupled to said motor, said system being configured to modify noise emitted by the appliance (1).

A COSMETIC- OR SKIN-TREATMENT APPLIANCE FITTED WITH AN ACTIVE NOISE CONTROL SYSTEM

5 The present invention relates to cosmetic- or skin-treatment appliances that use an electric motor to rotate a mechanical member, e.g. a blower, so as to create a current of air.

By way of example, the appliance could be a hair dryer, a hand dryer, or appliances in which a fan cools a component that gives off heat, e.g. appliances delivering pulsed light, and in which the flow of air makes it possible to cool a component of the appliance.

10 The invention relates more particularly to modifying the noise emitted by such appliances, which, in operation, may generate a sound level that is relatively high and that is uncomfortable for users.

In order to reduce the noise emitted by such appliances, it is known to implement passive noise control, e.g. by making the shell of the appliance out of materials having absorbing, insulating, and/or anti-reverberating properties.

It is known, e.g. from US patent No. 4 596 921 or from Japanese application No. 2006/130035, to use insulating materials to make hair dryers.

US application No. 2006/0196075 teaches insulating the noise source by putting a soundproofing sleeve into place around the motor of the appliance.

20 It is also known, e.g. from US patents No. 4 678 410, US application No. 2007/0294909, or EP 0 993 788, to act on the structure of the fan in such a manner as to reduce the emitted noise.

When attempts are made to reduce the noise emitted by a hair dryer by means of a passive control system, the noise reduction obtained lies in the range about 10 decibels (dB) to 20 dB.

When hair dryers are used professionally in a hairdressing salon or in a beauty parlor, for example, a plurality of hair dryers may be in operation simultaneously in a relatively small space, and a noise reduction of 10 dB to 20 dB may not be sufficient for the comfort of the clients and of the hairdressers.

30 Furthermore, implementing passive noise control may result in a reduction in the flowrate of air delivered by the appliance.

JP 06-209818 discloses a device with an active control system configured to reduce the overall noise of the device. In such a device, the active control system comprises microphones set at an air outlet.

35 US 5 546 467 discloses an appliance with an active control system at least in part offset from the body of the appliance. The communication between parts of the active

control system is achieved with the power line carrier (PLC) technology, which involves specific emitters and receivers. Such an active control system acts on several appliances.

JP 08-299050 discloses an active control system for controlling the noise of an appliance that involves statistical processing. Such an active control system may be time-consuming and make it difficult or impossible to control the noise emitted by the appliance in a nearly-instantaneous way.

US 2006/064180 discloses an active control system for controlling the noise in an aircraft.

There exists a need to enable the noise emitted by a cosmetic- or skin-treatment appliance to be modified in relatively simple and effective manner.

Exemplary embodiments of the invention satisfy this need by means of a cosmetic- or skin-treatment appliance, in particular for treating hair, bristles, or the skin, said appliance comprising:

- an electric motor coupled to drive an element, in particular a blower;
- an active control system for controlling noise emitted by the motor and/or the element coupled to said motor, said system being configured to modify noise emitted by the treatment appliance.

The term "noise emitted by the treatment appliance" means the noise perceived by a person situated in the proximity of the treatment appliance while said treatment appliance is operating.

By means of one or more sound sources, an active noise control system generates sound waves having characteristics that are selected so as to neutralize, at least in part, the sound waves emitted by the appliance, e.g. by means of destructive interference.

The active noise control system may be configured to act on specific spectral lines of the noise emitted by the appliance. The noise may be reduced selectively. With such an active noise control system, the overall noise generated by the appliance may not be treated by the active noise control system. The active noise control system may not implement the negative feedback method.

The active noise control system may be configured to control the operation of the appliance. The active control system is for instance configured to control the speed of the blower, for example via a control motor module, or the temperature of the air at an air outlet of the appliance, for example via a temperature control module. The active control system may regulate the speed of the blower and/or the temperature and/or other parameters of the appliance. The active control system may comprise a processor that may perform noise reduction control as well as monitor parameters of operation of the appliance. These other parameters, such as speed of the blower, for example, may be

controlled for purposes of reducing the noise. For example, the speed may be regulated to lower mechanical resonance and corresponding vibrations at some frequencies.

By providing the active control system information related to the electrical signal supplied to the motor, the active control system determines one or more frequencies, which are for example harmonics of the frequency of the electrical signal supplied to the motor, on which the active noise reduction treatment may be focused. This may enable focusing noise active reduction on narrow bands instead of wide spectrum and may render noise reduction more efficient. The active noise control system may be configured so that the temperature of the body of the appliance is not greater than 40°C and/or so that the temperature at an air outlet lies between 110 and 140°C. The temperature rise may occur over less than 1 minute, in particular less than 30 seconds.

The motor may be a brushless motor. The use of a brushless motor may facilitate monitoring electronically the operation of the motor, and for example taking advantage of the knowledge of the phase applied to the motor to control an output phase of the active control system.

By way of example, the modification of the noise emitted by the appliance corresponds to a reduction that is greater than or equal to 6dB, preferably greater than 10 dB, of the intensity of the noise emitted by the appliance.

When the element coupled to the electric motor is a blower, said blower may generate a flow of air, in particular through the treatment appliance. The use of an active noise control system makes it possible to modify, in satisfactory manner, the noise emitted by the treatment appliance, without said modification being to the detriment of the flowrate at which air is blown, for example. Thus, the use of an active noise control system makes it possible to maintain a flowrate for the flow of air passing through the hair dryer that is satisfactory, e.g. about 50 liters per second (L/s). The appliance may be configured so that the flowrate for the flow of air passing through the appliance is greater than 90m³/h.

In addition, the presence of the active noise control system does not exclude also using soundproofing materials for reducing the noise even more.

By way of example, the blower is configured to reduce the noise generated, e.g. presenting an optimized shape or being positioned in the appliance in such a manner as to minimize noise emission.

By way of example, the treatment appliance is a hair dryer and comprises:

- a handle; and
- a body that extends along a longitudinal axis, the motor and the blower being disposed inside said body, which body includes a cavity in which there flows a flow of air that is generated by the blower.

The blower may rotate around an axis that is parallel to the longitudinal axis of the body of the appliance.

While in operation, the electric motor is preferably configured to emit noise that is regular, in particular periodic. This facilitates the action of the active noise control system.

The active control system may include a single sound source, or, in a variant, it may include a plurality of sound sources, e.g. distributed over the periphery of the body of the appliance. It may be desirable to use the invention to attenuate noise in omnidirectional manner. Sound sources may be disposed on the appliance in a symmetrical manner, e.g. a manner that is axially symmetrical.

By way of example, the sound source(s) comprise one or more electromechanical transducers. The term "electromechanical transducer" should be understood to mean any component that is capable of vibrating in such a manner as to generate sound waves when powered electrically. A loudspeaker is an example of an electromechanical transducer. The electromechanical transducer may optionally include a diaphragm that is set into vibration. Where appropriate, the transducer may vibrate a portion of the appliance, so as to produce the sound waves that it is desired to emit.

Where appropriate, the electromechanical transducer may be hollow and the flow of air may pass therethrough.

The sound source(s) may be fastened on the body of the appliance in optionally-removable and optionally-adjustable manner.

By way of example, the sound source(s) are fastened on an outer shell of the appliance, e.g. being disposed in housings that are formed in the outer shell and that open out to the outside surface of the appliance. This may avoid the attenuation of the sound waves, in particular when the shell is soundproofed.

The sound source(s) may be carried by a sleeve that is fitted on the appliance, the sleeve covering the motor of the appliance at least in part, for example.

The active control system may include a microphone and a processor for processing the signal delivered by the microphone, so as to control the sound source(s) in appropriate manner. The microphone converts the sound waves it picks up into an electrical signal that is analyzed by the processor, said processor controlling the sound source(s) as a function of the signal, e.g. through one or more amplifier(s). The processor may be analog and/or digital, and, by way of example, may comprise a digital signal processor (DSP).

The microphone may be located near the motor, near the blower and/or near an air inlet of the appliance. The microphone may be located in such a manner that the distance

between the microphone and the motor or between the microphone and the air inlet is less than the distance between the microphone and the air outlet of the appliance.

At such a location on the appliance, the noise detected may be a narrow-band noise and the active control system may be configured to treat this narrow-band noise. At
5 such location, the noise is less likely to be polluted by the rush of the air exiting the appliance. The frequency of the narrow-band noise may lie between 100Hz and 10 kHz, lying in particular between 200 Hz and 3kHz. A location of the microphone close to the motor, blower or air inlet may facilitate reducing the noise emitted by the appliance and heard by the person using the appliance. In addition, at an air outlet of
10 the appliance, the temperature may be high and the components of the active control system may not be suitable for withstanding such high temperatures for extended periods. The active control system may include a number of microphones and sound sources that is greater than the number of processors. By way of example, the active control system may include only one processor that communicates with a plurality of microphones
15 and/or sound sources.

The active control system may include a plurality of sound sources and microphones. Several sound sources and/or microphones are preferable to perform an omnidirectional noise control.

The microphones and the sound sources may be paired together and may be
20 fastened on a single support secured to the appliance, e.g. the above-mentioned sleeve or the shell of the appliance. Pairing a sound source and a microphone together may make it easier to process the signal, by providing an accurate spatial reference.

The processor(s) may be fastened on said support.

The active control system may also include as many processors as there are
25 microphones and sound sources. A microphone, the processor, and the corresponding sound source may be grouped together within a single module, preferably a miniaturized module, and, by way of example, said module may be fastened on the above-mentioned sleeve or outer shell.

In a variant, the processor(s) are offset from the body of the appliance.

By way of example, the processor(s) are situated at a distance from the
30 microphone(s) and from the sound source(s), thereby making it possible to distance the processor(s) from hot points of the appliance.

By way of example, the processor(s) are disposed in the handle of the appliance or in a housing that is external to the handle and to the body of the appliance and that is
35 connected via an electric cable to the motor of the appliance, the housing including pins for connecting to an electricity outlet for powering the appliance electrically. The sound source(s) may be fastened on the body of the appliance.

The active control system may be fastened in removable manner on the appliance, at least in part, thereby making it possible to use a single active control system for different appliances, at least in part.

5 Preferably, all the components of the active control system, e.g. the sound source(s), the digital processor(s) and the microphone(s) are fastened, optionally in removable manner, on the appliance which is preferably handheld. The active control system may be configured to control the noise emitted by only the appliance on which it is fastened.

10 The active control system may be specific to the noise signature of a particular of appliance.

When the active control system includes a digital processor, it is possible to take advantage of its computing power in order to execute additional functions. By way of example, the active control system may be configured to play music while the appliance is operating. The active control system is for instance configured to play digital music.

15 The appliance may include several interfaces, like a keyboard or a screen and the active control system may be configured to control theses interfaces. The power of a processor of the active control system running a noise reduction software on the appliance may be enough to operate various user interfaces and/or other modules.

20 Data may be stored to treat narrow-band noises. Parameters of digital filters directed to treating such narrow band noises may be stored in a memory of the digital processor or accessible by the digital processor and may be loaded when filtering algorithms are initialized.

The active noise control system may include a sensor configured to measure a phase of the noise to be reduced. Such a sensor is for instance located near the blower.

25 The digital processor may be configured so that a user may modify at least one parameter of the digital filter while using the appliance, so that the way the noise is heard by a user is modified, for example reduced and/or rendered more pleasant.

30 The digital processor may be configured to apply a discrete Fourier transform (DFT) to the noise and to focus the treatment on high-power spectral lines of the noise thus transformed.

The filtering algorithm may be modified as a function of a template that may be deduced from the average noise increased by an amount of 6 to 10 dB or by a maximal number of peaks determined during an initialization phase.

35 The digital processor may automatically determine the parameters of the filter to be applied.

The digital processor may be configured to select the frequency lines to be reduced by means of a selection of harmonics of a frequency of operation of the motor

detected on the motor or determined based on the electric signal provided to the motor. In a variant, the frequency lines to be reduced may be determined by the electronic system controlling the motor of the appliance.

5 The digital processor may be configured to send an amplitude and a phase to the power stage(s) powering the sound source(s) to generate the noise aimed at cancelling the undesirable noise.

10 The digital processor may be configured so that control of the noise is achieved in a nearly simultaneous manner, and in particular suitable for narrow-band noise, the frequency of the noise lying for instance between 200Hz and 3kHz. The digital processor may receive from the microphone(s) an error signal enabling the control to be carried out in a real time manner.

The processor(s) may also be configured to control the temperature at the outlet or at the inlet of the flow of air, and/or to control the speed of rotation of the motor, and/or to detect movement of the appliance or the appliance making contact with an operator.

15 By way of example, the active noise control system implements noise reduction by phase opposition, the processor(s) computing, as a function of sound waves emitted by the appliance and picked up by the microphone(s), the signal to be sent to the sound source(s) so as to emit sound waves that make it possible to mask the noise emitted by the appliance, at least in part. By way of example, the sound waves emitted by a sound
20 source are in phase opposition with the sound waves emitted by the appliance and picked up by the microphone.

By way of example, the sound waves emitted by a sound source have the same amplitude as the sound waves emitted by the appliance and detected by a microphone, so that the amplitude resulting from the waves is substantially zero.

25 The body of the appliance may be made out of a soundproofing material, at least in part, and may comprise an inner shell and an outer shell, between which a gap is formed so as to receive said material.

The overall weight of the appliance, including the active control system may be less than 1kg, in particular less than 0,5kg, better less than 0,4kg.

30 The weight of the appliance, being in particular a hair-dryer, may be compensated so that the appliance may be handled by a user to reduce or minimize fatigue.

The electric power of the appliance may be about 1600W.

35 The invention can be better understood on reading the following detailed description of non-limiting embodiments thereof, and on examining the accompanying drawings, in which:

- Figure 1 shows an appliance constituting a first embodiment of the invention;
- Figure 2 shows a sleeve in isolation, fitted with an active noise control system;

· Figure 3 is a diagram showing the components of an active noise control system in isolation;

· Figures 4 to 9 show appliances constituting other embodiments of the invention,

- Figure 10 is a schematic view of an appliance provided with an active noise control system according to some exemplary embodiments of the invention,
- Figure 11 and 12 show measurements related to treatment by the active noise control system according to some exemplary embodiments of the invention, and
- Figure 13 is a diagram showing how, according to an exemplary embodiment of the invention, the digital processor operates.

Figure 1 shows an appliance 1 constituting a first embodiment of the invention.

By way of example, the appliance 1 is a hair dryer, but the invention is not limited to such an appliance, as explained below.

In the embodiment described, the appliance 1 includes a body 2 that extends longitudinally along an axis X, and a handle 3 that extends transversally to the axis X.

The handle 3 may be fastened in permanent manner on the body 2, as shown.

The handle 3 includes a switch 5, e.g. a pushbutton or a slider switch, making it possible to switch the appliance 1 on, and, where appropriate, to modify the operating mode of said appliance, e.g. by switching the active noise control system on or off, or by selecting a noise treatment option.

In the embodiment under consideration, the handle 3 is connected at its bottom end 4 to an electric cable 6 enabling the appliance 1 to be powered electrically.

By way of example, the body 2 is made of a material that presents soundproofing properties, and may include an outer shell 7 defining a cavity 8.

As can be seen in Figure 1, the appliance 1 includes an electric motor 10, e.g. an alternating current (AC) motor of power that is sufficient to generate a flow of air at a rate that is compatible with drying and/or styling hair, e.g. said power lying in the range 1 kilowatt (kW) to 5 kW, e.g. greater than 2 kW. The electric motor is coupled to an air blower 11.

In the embodiment in Figure 1, the body 2 includes, at a longitudinal end 9a, an air inlet that may be provided with a mesh, and at its other longitudinal end 9b, an air outlet that may be provided with a removable endpiece, where appropriate.

The body 2 houses a resistor circuit 13, e.g. having coiled resistor wire, through which the flow of air passes. In operation, and by way of example, the temperature at the outlet lies in the range 55°C to 75°C, for air inlet at 20°C.

The appliance may include a sleeve 15, as shown in isolation in Figure 2, that surrounds the motor 10 inside the cavity 8. By way of example, the sleeve 15 is made of a material that withstands high temperatures, e.g. a fiberglass-based material, and may

include a plurality of openings 17 that, by way of example, are distributed angularly in such a manner as to enable the motor 10 to be ventilated. Between the motor 10 and the sleeve 15, there is provided a gap through which the air generated by the blower 11 can pass.

5 The appliance 1 includes an active noise control system, e.g. carried by the sleeve 15, at least in part.

 The active control system may comprise one or more modules 20, each module 20 being constituted, by way of example and as shown in Figure 2, by at least one microphone 21 receiving sound waves S1 emitted by the motor and/or the blower 11, at
10 least one processor 22 for processing the electrical signal delivered by at least one microphone 21, and at least one sound source 23 that is controlled by the processor 22 and that is arranged to emit sound waves S2. The microphone 21 transmits a signal to the processor 22, which signal is representative of the sound waves S1 emitted by the appliance 1. As shown in Figure 10, the active control system may also include an
15 amplifier 24 and a sensor 26 located near the blower 11, such a sensor being for instance a tachometer to detect a rotation speed of the blower.

 The processor 22 may compute a complex signal of phase that is opposite to the phase of the received signal, and it may control the sound source 23 in such a manner that said sound source emits sound waves S2 in phase opposition relative to the sound waves
20 S1.

 At least one microphone 21 and at least one sound source 23 may be disposed on a single support in proximity with each other, e.g. being grouped within a sub-module 25, as shown in Figure 2, the processor(s) 22 being situated remote from the sub-modules 25, for example.

25 The microphone(s) 21, the processor(s) 22, and the sound source(s) 23 may also be at a distance from one another.

 Firstly the microphone(s) and the processor(s), and secondly the processor(s) and the sound source(s), may communicate via optionally wireless connections. Examples of wireless connections include an infrared connection, a radio connection, or a power line carrier (PLC).
30

 A single processor 22 may be associated with a plurality of microphones 21 and/or with a plurality of sound sources 23.

 By way of example, the active control system may include only one processor 22 that interacts with a plurality of microphones 21 and with a plurality of sound sources 23.

35 In a variant, the active control system includes a plurality of modules 20, each of which comprises only one microphone 21, only one processor 22, and only one sound source 23.

The sound source 23 may include any suitable electromechanical transducer.

In the embodiment in Figures 1 and 2, the active control system includes a processor 22 that is fastened on the sleeve 15, with the microphones 21 and the sound sources 23 in the form of sub-modules 25 being distributed over the periphery of the sleeve 15.

By way of example, the microphones 21, the processor 22, the sound sources 23, and the sub-modules 25 are fastened in permanent manner on the sleeve 15. In a variant, at least some of the components of the active control system are fastened on the sleeve 15 in removable manner, e.g. the processor 22.

At an initialization step 100, an operation mode of the appliance may be selected. During this step, communication may take place between the processor 22 and another electronic device 50 that may be miniaturized, for example a user interface.

The selection of the mode of noise reduction may be based on an input on the user interface.

At step 101, the digital processor 22 determines the temperature of the air to be blown by the appliance, in particular at the air outlet of the device. This temperature may result from the operation mode of the appliance that has been selected by a user. The user interface 50 may comprise switch 5 to enable control of temperature, for instance. During step 101, the digital processor 22 may communicate with a heater module 51. The temperature control may be carried out at numerous other steps (not shown), in an interactive manner, to maintain the temperature at a given set value.

At step 102, the digital processor 22 determines the speed of the motor 10 of the appliance. During step 102, the digital processor may communicate with a control module 52 of the motor. The digital processor may control the module 52 so that the motor operates at a given speed. The digital processor 22 may receive an information from the module 52 allowing the processor to know the actual speed of rotation and regulate such speed or a given set value.

The processor may also use frequency information from the motor or module 52 to synchronize a noise treatment with the motor, for example to focus treatment on harmonious of this frequency.

At step 103, the digital processor interacts with microphone(s) 21 and implements digital filtering of the noise received by the microphone(s) 21 and spectral analysis of said noise.

At step 104, the digital processor 22 determines which frequencies are going to be treated, based for example on amplitude of such frequencies.

Such frequency determination may be based on a Fourier transform analysis to determine the spectral lines of the noise.

At step 105, digital processor 22 implements digital treatment of said frequencies. The treatment may be focused on spectral lines related to a frequency of rotation of the motor, based on the control information for the motor and/or information received from the module 52.

5 The noise lines to be processed may correspond to a noise signature of the appliance. A template may be applied during the digital treatment, such template being generated for example by increasing an average noise by a given amount, such as 6dB to 10dB, for example.

10 When referring to Figure 12, one can see that the amplitude of the noise exceeds a template for some frequencies. The noise reduction treatment may be applied only to those frequencies, to lower amplitude to a value below the template.

At step 106, analog signals to be sent to the sound source(s) are synthesized by the digital processor, to counteract the noise to be reduced.

15 On Figure 13, steps 105 and 106 are shown as separate steps, but they may be performed together when desired.

As shown in Figure 13, the digital treatment of step 105 and the synthesization of step 106 may be carried out as a function of information related to the control of the motor. For example, the frequency of operation of the motor may be used to determine frequencies at which noise cancellation should operate. For example, noise cancellation
20 lines may include harmonies of the frequency of the motor.

Figure 11 shows the amplitude of the noise with the active control system respectively on and off.

Figure 4 shows a hair dryer constituting another embodiment of the invention.

25 In the variant shown in Figure 4, the appliance 1 does not have a sleeve 15, and the processor 22 and the sub-modules that group together the microphones 21 and the sound sources 23 are fastened in permanent or removable manner on the outer shell 7.

In a variant (not shown) of the appliance shown in Figure 4, the microphones 21 and the sound sources 23 are carried by the outer shell 7 at a distance from each other.

30 In the embodiment in Figure 5, the active noise control system is carried both by the outer shell 7 of the body 2 and by the handle 3. The processor 22 and at least one of a microphone 21 and a sound source 23 are fastened on the handle 3, for example.

In the embodiment in Figure 6, the active noise control system is carried only by the handle 3 and said handle is fastened in removable manner to the body 2.

35 In another variant (not shown), the active noise control system is disposed in cavities that are formed in the body of the appliance, e.g. in the outer shell 7, and that open out to the outside surface of said shell.

In the embodiment in Figure 7, openings 18 are formed in the outer shell 7 of the body 2 in the proximity of the longitudinal end 9b so as to define an air inlet. In this embodiment, the opposite longitudinal end 9a of the body 2 does not have an air inlet and the end does 9a not have a flow of air passing therethrough. The active noise control
5 system, in particular the processor(s) 22 and/or the sound source(s) 23, may thus be housed in the proximity of the longitudinal end 9a, at least in part.

It may be advantageous to locate a sound source at the rear of the appliance since that makes it possible to use a loudspeaker that is relatively large in diameter, and that is capable of generating low frequencies. In addition, the sound source may be located on
10 the axis of the motor, thereby facilitating omnidirectional attenuation of noise around the axis.

The embodiment shown in Figure 7 also makes it possible to distance the active noise control system from hot points of the appliance.

In the embodiment of Figure 8, the microphones 21 and the sound sources 23 are
15 fastened on the outer shell 7 of the body 2, and the processor(s) 22 is/are disposed in a housing 30 to which the end of the cable 6 is connected. The housing 30 includes two pins 31 enabling the appliance 1 to be plugged into an electricity outlet.

In the embodiment in Figure 9, the active control system comprises a plurality of independent miniature modules 20.

20 The invention is not limited to the examples described above.

The processor need not be digital, e.g. it may include analog components such as phase shifters and servo-controlled differential systems.

In a variant, the processor 1 is a hand dryer or any appliance that make use of a flow of air, e.g. for cooling a source of light or a source of radiofrequency or of
25 ultrasound. By way of example, such an appliance includes a hand-piece, and the component to be cooled by means of the flow of air is situated at the hand-piece, for example.

The expression "comprising a" should be understood as "comprising at least one", unless specified to the contrary.

30

CLAIMS

1. A cosmetic- or skin-treatment appliance comprising:
 - an electric motor (10) coupled to drive an element (11); and
 - an active control system (21, 22, 23) for controlling noise emitted by the motor (10) and/or the element (11) coupled to said motor, said system being configured to modify noise emitted by the appliance (1) and to control the operation of the appliance.
2. An appliance according to the preceding claim, the element (11) coupled to the electric motor (10) being a blower.
3. An appliance according to the preceding claim being a hair dryer comprising:
 - a handle (3); and
 - a body (2) that extends along a longitudinal axis (X), the motor (10) and the blower (11) being disposed inside said body (2), which body includes a cavity (8) in which there flows a flow of air that is generated by the blower.
4. An appliance according to the preceding claim, the electric motor (10) being configured to emit noise that is regular, in particular periodic, while in operation.
5. An appliance according to any one of claims 1 to 3, the active control system including a single sound source (23).
6. An appliance according to any one of claims 1 to 4, the active control system including a plurality of sound sources (23), in particular distributed over the periphery of the body (2) of the appliance defined in claim 3.
7. An appliance according to claim 3 and to claim 5 or 6, the sound source(s) (23) being fastened on the body (2).
8. An appliance according to claim 3 and to claim 5 or 6, the sound source(s) (23) being carried by a sleeve (15) that is fitted on the appliance (1).
9. An appliance according to any preceding claim, the active control system including a microphone (21) and a processor (22) for processing the signal delivered by the microphone (21).

10. An appliance according to any preceding claim, the processor (22) comprising a digital signal processor.
- 5 11. An appliance according to claim 3 and to claim 9 or 10, the processor (22) being offset in a housing outside the handle (3) and the body (2), and being connected via an electric cable (6) to the motor (10).
12. An appliance according to any preceding claim, the active control system (21, 22,
10 23) being fastened in removable manner on the appliance (1), at least in part.
13. An appliance according to claim 10, the digital signal processor (22) being configured to achieve at least one additional function amongst the following:
 - playing music;
 - 15 · controlling the temperature at the outlet or at the inlet of the flow of air;
 - controlling the speed of rotation of the blower (11); and
 - detecting movement of the appliance (1) or said appliance making contact with an operator.
- 20 14. An appliance according to any preceding claim, the modification of the noise emitted by the appliance (1) corresponding to a reduction that is greater than or equal to 6dB, preferably 10 dB of the intensity of the noise emitted by the appliance (1).
- 25 15. An appliance according to any preceding claim, wherein the electric motor is driven by an electronic motor module (52), and wherein the active control system determines one or more spectral lines for applying noise reduction thereto based on information related to operation of the motor module (52).
- 30 16. An appliance according to any one of the claims 1 to 15, wherein the active control system is configured to determine high-power spectral lines of the noise emitted by the appliance and focus noise reduction on at least one of these high-power spectral lines.
- 35 17. An appliance according to claim 16, wherein the high-power spectral lines are determined after applying a discrete Fourier Transform to the noise.

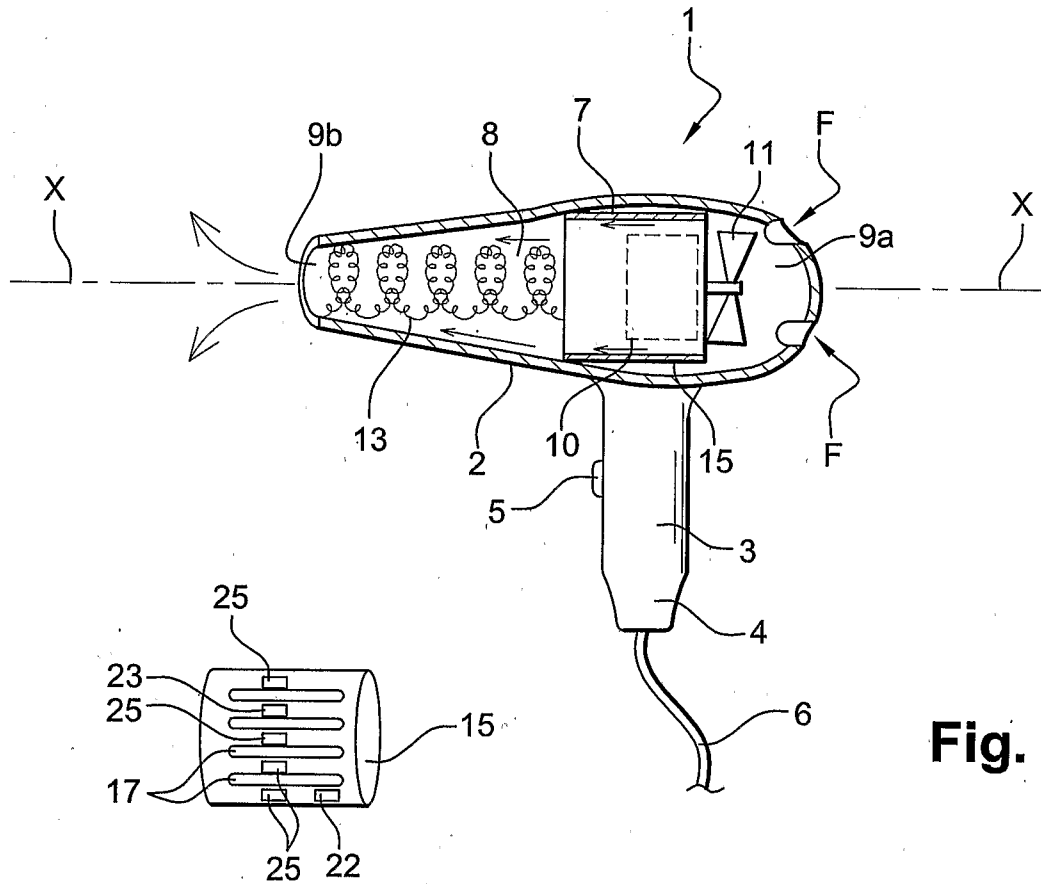


Fig. 1

Fig. 2

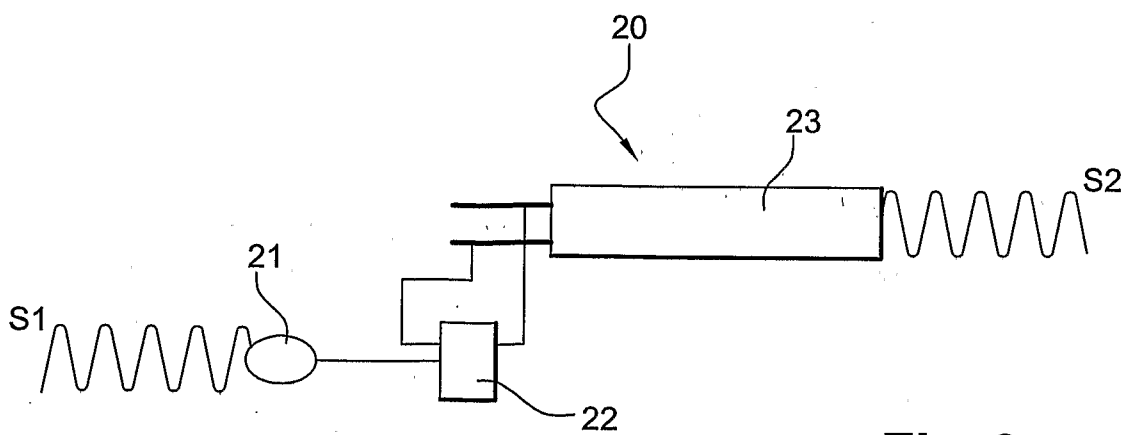


Fig. 3

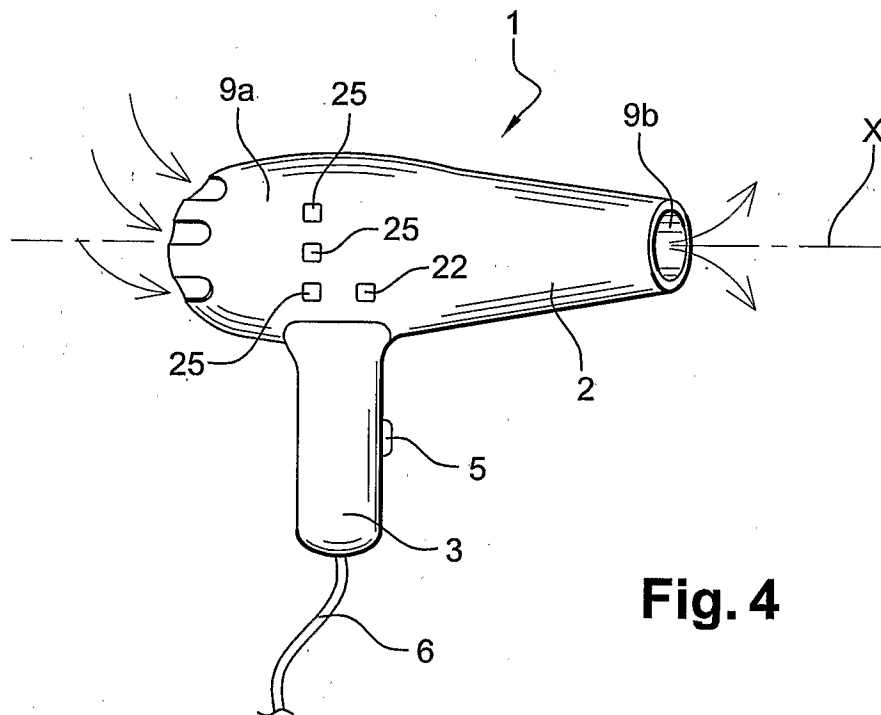


Fig. 4

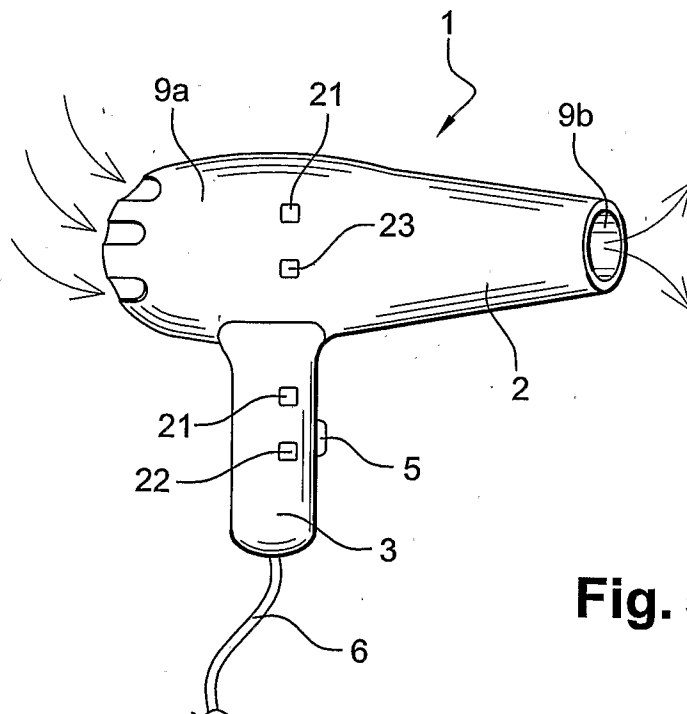


Fig. 5

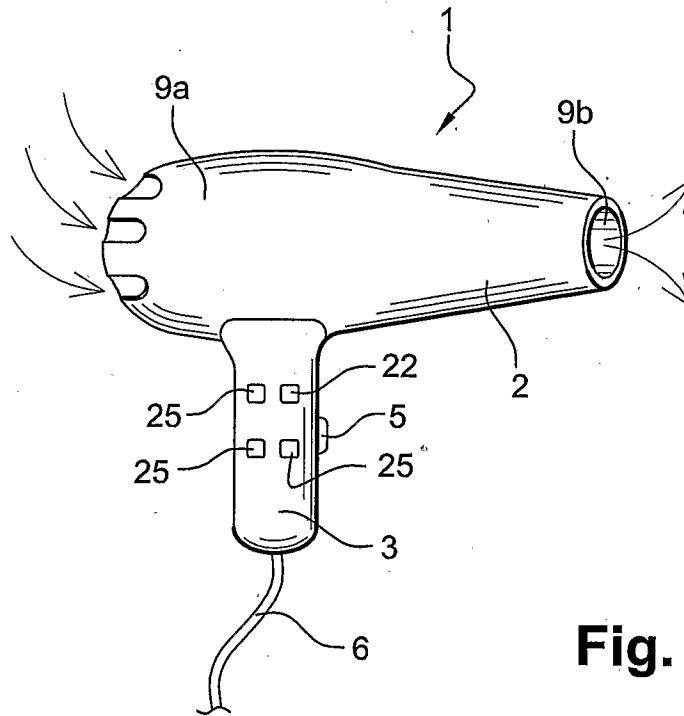


Fig. 6

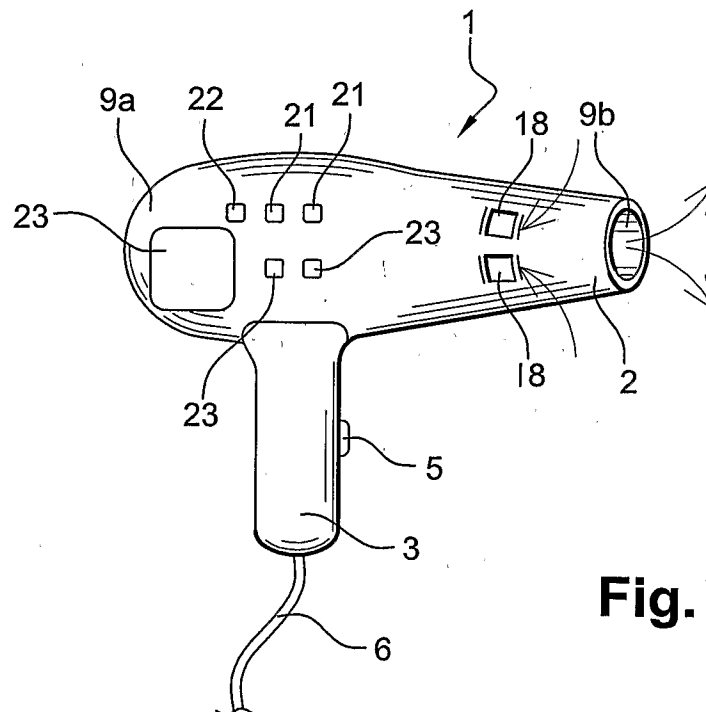


Fig. 7

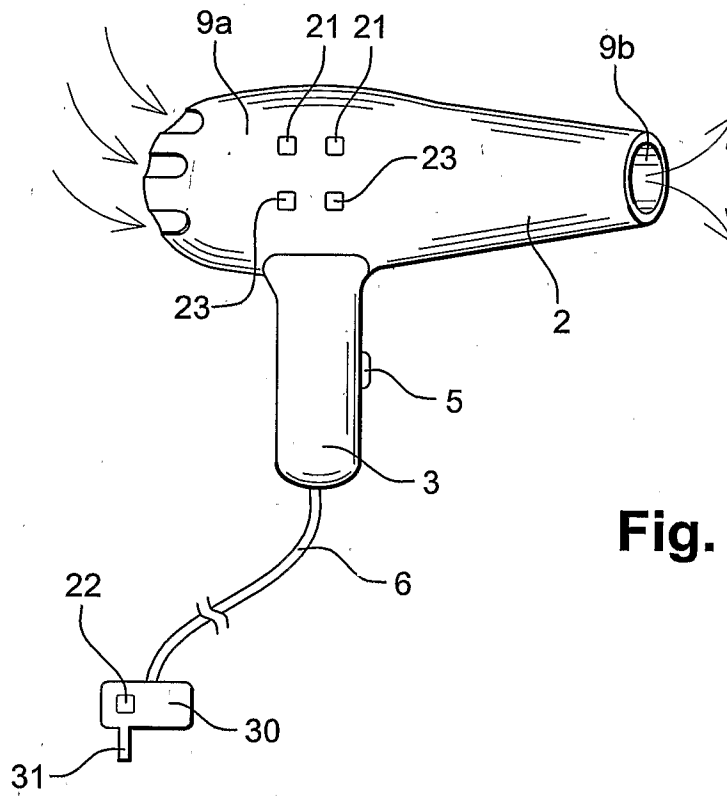


Fig. 8

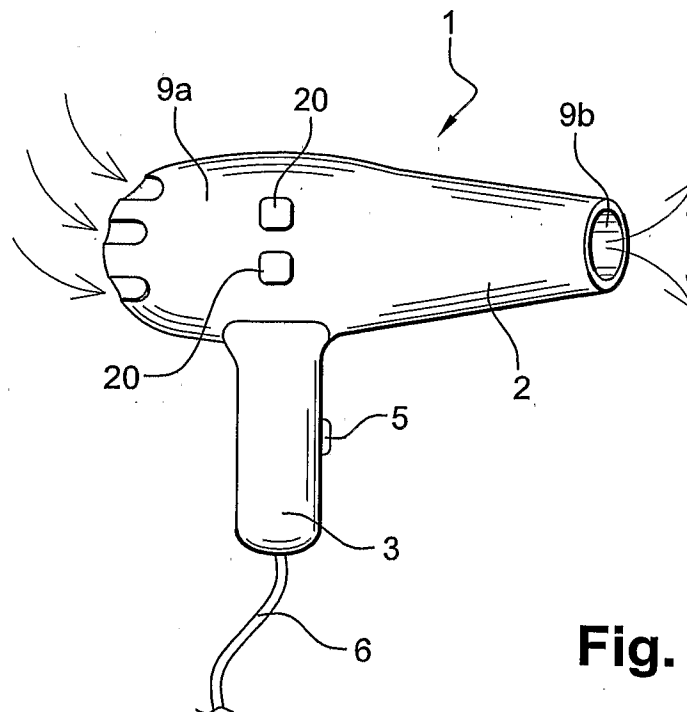


Fig. 9

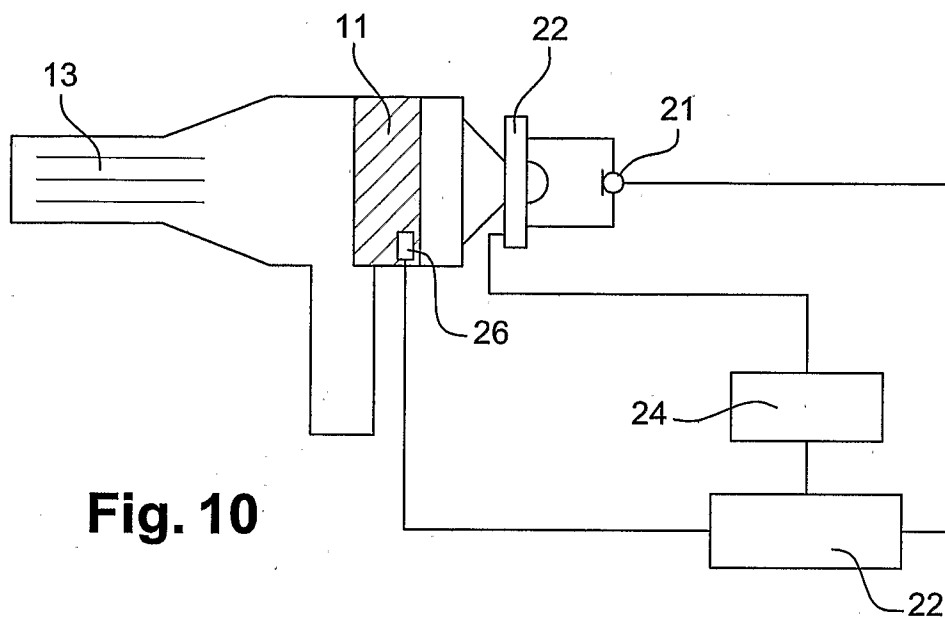


Fig. 10

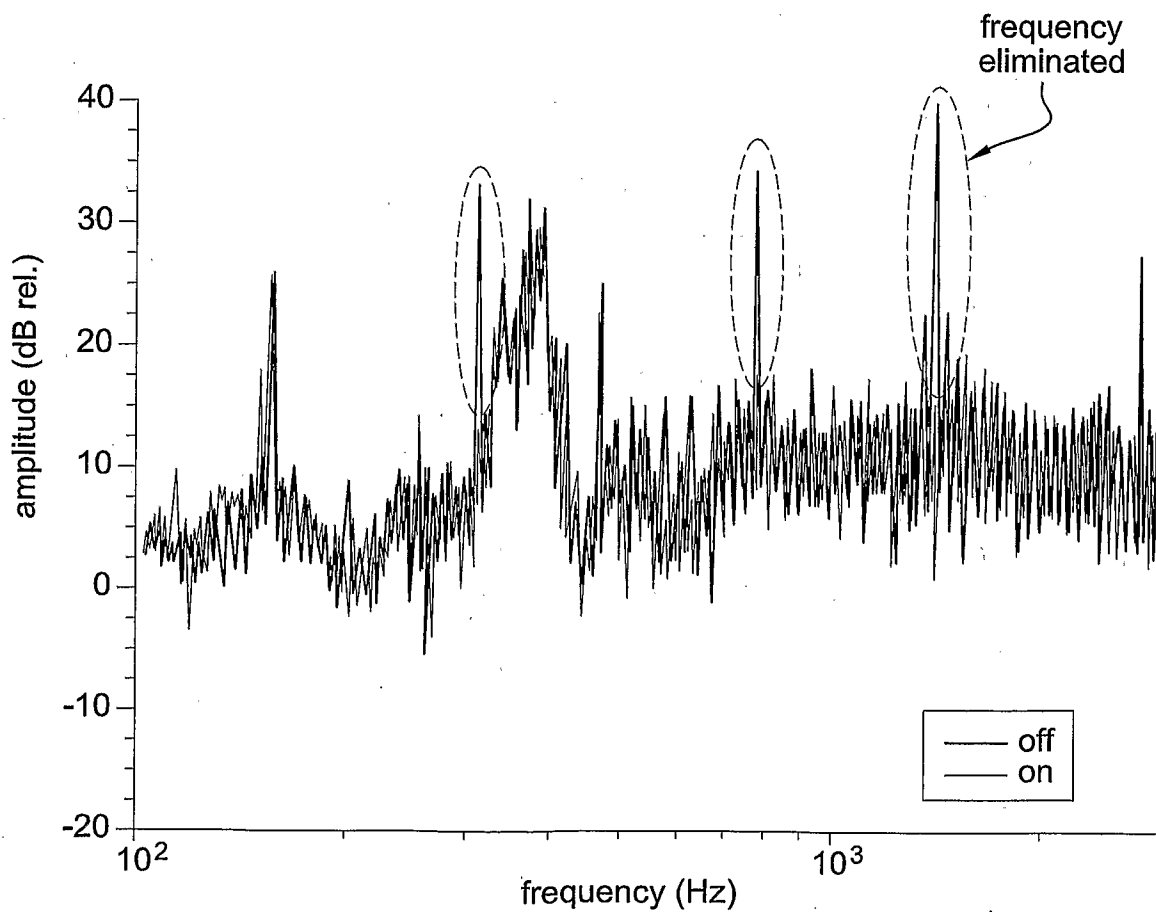


Fig. 11

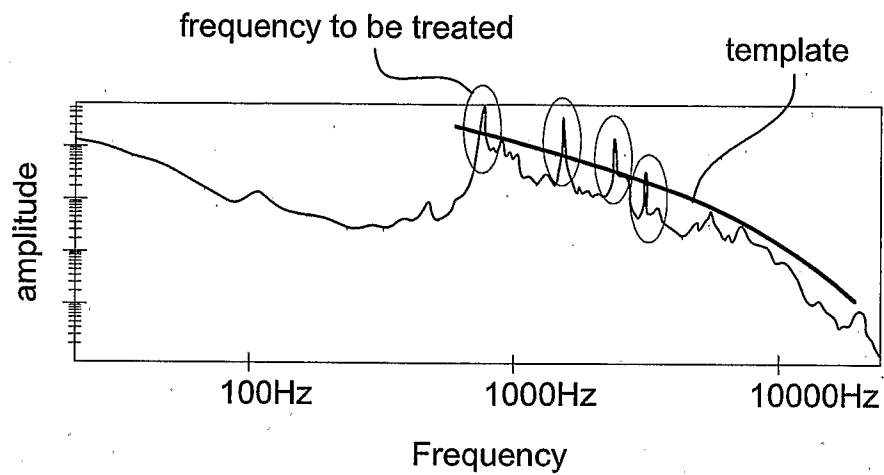


Fig. 12

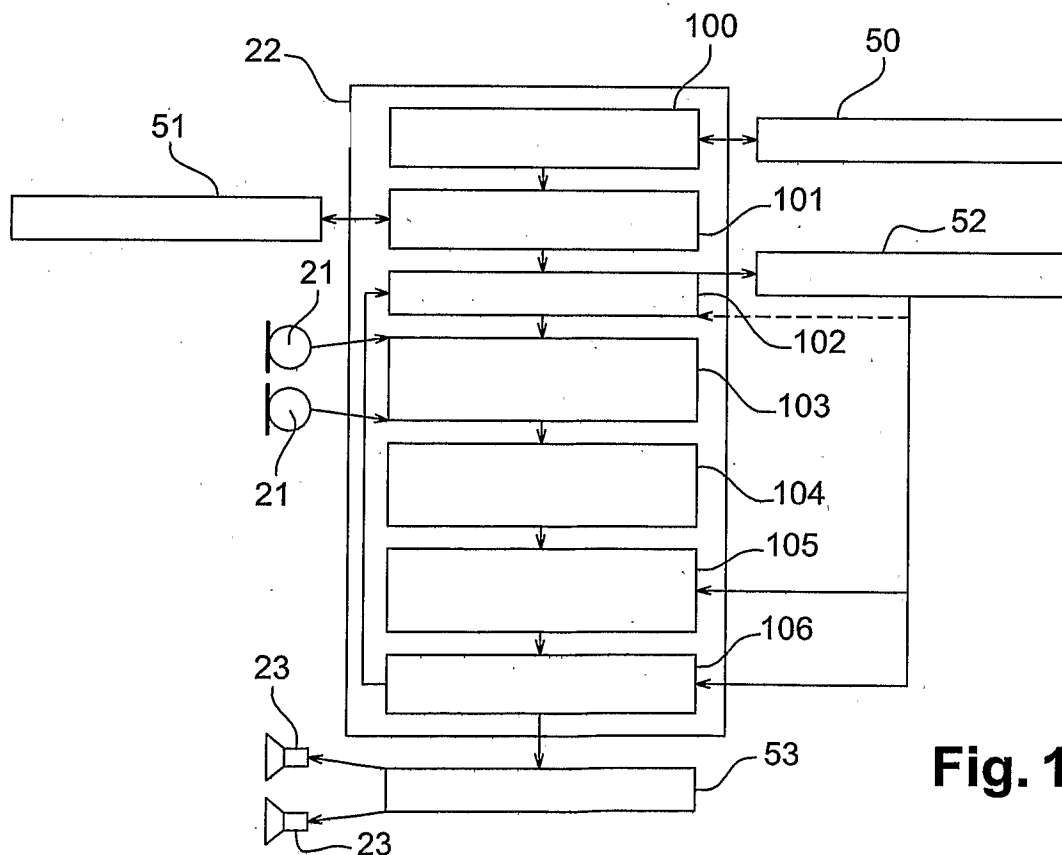


Fig. 13

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2010/050853

A. CLASSIFICATION OF SUBJECT MATTER

INV. G10K11/178 H04B15/00 A45D20/10
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

G10K H04B A45D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 6 209818 A (MATSUSHITA) 2 August 1994 (1994-08-02) paragraphs [0007], [0012], [0023], [0024], [0029]; claim 6; figure 5 -----	1-7, 9, 10, 12-16
X	US 5 546 467 A (DENENBERG) 13 August 1996 (1996-08-13) column 1, line 3 - line 19 column 4, line 22 - column 5, line 37; figures 1-4 -----	1-7, 9-12, 14-16



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

11 June 2010

Date of mailing of the international search report

23/06/2010

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Authorized officer

Ionescu, C

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2010/050853

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
JP 6209818	A	02-08-1994	NONE	
US 5546467	A	13-08-1996	WO 9524876 A1	21-09-1995