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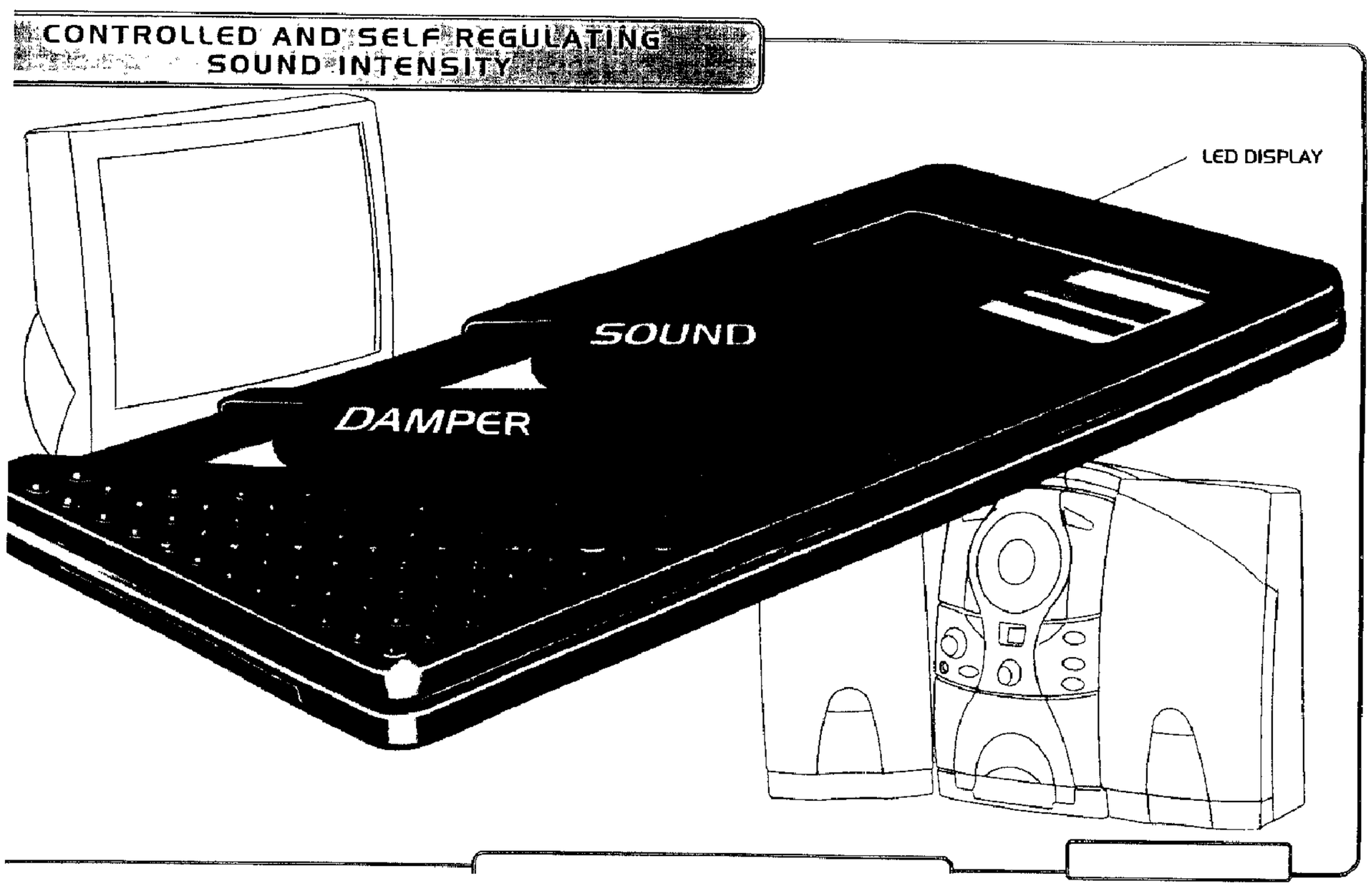
(54) Titre : FREQUENCE AUDIO CONTROLLEE ET SE CONTROLLANT SOI-MEME POUR CONTROLLER LE NIVEAU D'UN SON PRODUIT PAR APPAREIL OU MACHINE

(54) Title: CONTROLLED AND SELF REGULATING SOUND INTENSITY TO CONTROL THE SOUND LEVEL OF SOUND PRODUCING APPARATUS OR MACHINERY



(57) Abrégé/Abstract:
A device for regulating sound level of audio systems and noise level of machinery as a function of the desired human auditory level. In the case of audio systems, the produced sound from the speakers is collected by a microphone and measured by a sound level meter in decibels and converted to electrical signal and by the use of a computation process of a computer, the

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(57) Abrégé(suite)/Abstract(continued):
electrical signal is then sent to the damper selector switch which averages the signal value over periods of time and sends the stabilized signal to the comparator unit. The desired human auditory level is selected on the sound level selector switch which generates a proportional signal and send it to the comparator as a reference level. The comparator compares the signal received from the damper selector switch to the reference line generated by the signal from the sound level selector switch. If the signal value from the damper selector switch is higher than the signal value from the sound level selector switch, the comparator sends a signal to decrease the volume control until the signal from the damper selector switch is equal to the signal from the sound level selector switch. If the signal value from the damper selector switch is lower than the signal value from the sound level selector switch, the comparator sends a signal to increase the volume control at a much slower rate than decreasing it until the damper signal is equal to the sound level selector switch. If the signal value from the damper selector switch is equal to the signal value of the sound level selector switch then the signal is disabled. In the case of machinery circuit it is similar to the audio system circuit with minor differences.

ABSTRACT

A device for regulating sound level of audio systems and noise level of machinery as a function of the desired human auditory level. In the case of audio systems, the produced sound from the speakers is collected by a microphone and measured by a sound level meter in decibels and converted to electrical signal and by the use of a computation process of a computer, the electrical signal is then sent to the damper selector switch which averages the signal value over periods of time and sends the stabilized signal to the comparator unit. The desired human auditory level is selected on the sound level selector switch which generates a proportional signal and send it to the comparator as a reference level. The comparator compares the signal received from the damper selector switch to the reference line generated by the signal from the sound level selector switch. If the signal value from the damper selector switch is higher than the signal value from the sound level selector switch, the comparator sends a signal to decrease the volume control until the signal from the damper selector switch is equal to the signal from the sound level selector switch. If the signal value from the damper selector switch is lower than the signal value from the sound level selector switch, the comparator sends a signal to increase the volume control at a much slower rate than decreasing it until the damper signal is equal to the sound level selector switch. If the signal value from the damper selector switch is equal to the signal value of the sound level selector switch then the signal is disabled. In the case of machinery circuit it is similar to the audio system circuit with minor differences.

DESCRIPTION

BACKGROUND OF THE INVENTION

1. Field of the invention

The present invention relates to an electronic sound regulator device for automatically controlling the
audio system sound level and machinery noise level.

2. Description of the Prior Art

In equipment possessing sound output such as television sets, it has been attempted to automatically control the volume depending on the level changes in the ambient noise. For the sound reproducing equipment used in noisy environment, such as a car radio, it has been attempted to automatically raise the volume depending on the level of the ambient noise or speed signal detected by a speed sensor soas to maintain a favorable listening condition even in noisy situation. Other equipment selectively suppress any or all of multiple noises in the environment, that is the ambient noise, or selectively listen to any of these while suppressing all other sound in the ambient noise. The art also discloses systems to reduce audible switching noise created by conventional electronic volume control devices when the volume is changed by absorbing over time the rapid change in the sound wave envelope caused by volume control adjustment. It is not a function of either sound reproduction or ambient noise. Under the same principles, apparatuses and methods were provided for use in modems, data communications devices, or scrambling video signals in television receivers or for digitalized audio channel in telephone networks or in output voltage of amplifiers or video detection of video signal level or high speed automatic gain control which provides greater stability and improve response time or in computer-to-computer communications network using intelligence

in the signal to control the receiver gain or by using fuzzy-logic to detect low-frequency noise level. Typical devices are as follows:

(a) an equipment in which a mixed sound of an ambient noise with a speaker sound is detected by a microphone, and the level difference in the detected signal from the signal out of a sound signal output circuit is calculated to detect the level of the ambient noise, thereby to control the gain of the sound signal output circuit. Adequate control by detecting the level of the ambient noise signal component separately from the mixed signal of the ambient noise with speaker sound is difficult because the speaker sound component detected by the microphone is greatly different from the original electric signal due to phase delay of the speaker sound, frequency response of loudspeaker, and room reverberation characteristic.

(b) an equipment in which the ambient noise is detected only when no sound is produced from the loudspeaker so as to obtain a sound level corresponding to the ambient noise thereby to control the volume by maintaining the same level when the loudspeaker produces sound. This equipment is not practical. When used in a place where the ambient noise changes suddenly or periodically while the loudspeaker is producing sound, and in particular if the sound is continuous such as with music, the equipment is almost impossible to control because the loudspeaker rarely stops producing sound.

(c) an equipment where an ambient noise is detected by picking up a mixed sound of the ambient noise with a speaker sound by a microphone, producing a signal imitating the speaker sound from the signal outputted from the sound signal output circuit by using an adaptive filter, then subtracting the adaptive filter output signal from the microphone output signal, thereby to control the volume

depending on the ambient noise level. As for the equipment, it functions normally when the sound source is monaural but has difficulty detecting the ambient noise in case of stereo.Since the sum of the right and let signals is used as the input o the adaptive filter, the equipment is affected by the positions of the microphone and the loudspeakers, or shape of the room.

(d) an equipment where an ambient noise is obtained by subtracting the adaptive filters outputs from the microphone outputs to obtain a signal representing the ambient noise and thereby use this signal as a coefficient updating signal. A means to convert the signal representing ambient noise into an ambient noise level representing the volume of ambient noise. A means to control the gain by which amplifiers amplify signals sent from the sound producing equipment to speakers thereof based on the ambient noise level.

(e) A system and method for reducing audible switching noise created by conventional electronic volume control when the volume is changed, by absorbing over time the rapid change in the sound wave envelope caused by volume adjustment. Switching noise generated when an audio signal envelope is abruptly changed and this system provides for gradual change of the audio signal envelope from one level to another. This gradual change over time in the audio signal envelope can be either near-linear or logarithmic. The system has a volume control register for storing a digital value representative of the envelope magnitude, an up/down counter initialized to a predetermined value,a comparator for comparing the contents of the volume control register and the up/down counter, and a digital-to-analog converter which produces the audio signal envelope. This system has no provisions for a microphone to collect ambient noise or sound produced by the speakers.

It is apparent from the prior art that the volume change in reproduced sound level in any sound

producing electronic equipment are mainly a function of the ambient noise or a speed sensor, but none whatsoever as a function of the desired human auditory and as such reached a dead end. In the prior art the microphone collects the ambient noise or background noise then the system extracts the ambient noise from the collected background noise. The reproduced sound was then regulated in relation to the ambient noise. Without the ambient noise these systems will be rendered inoperative. In the present invention the device operates at its optimum performance in the total absence of ambient noise and as such it should be "shielded" from "ambient noise" as much as possible. The present invention is a function of the desired human auditory level as selected by the user on the sound selector switch which regulates the reproduced sound picked up by the microphone from the speakers to the same level of the desired human auditory as per the selection made on the sound selector switch. Furthermore, the user has the option of selecting a convenient elapsed time on the damper switch which averages the microphone's signal for a stabilized sound reproduction.

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SUMMARY OF THE INVENTION

The present invention is devised to improve mankind's quality of life and the first object of the invention is to provide an electronic sound regulator device where the desired human auditory level can be selected and immediately reproduced and heard from the audio systems speakers. The

desired human auditory is achieved by utilizing a microphone to collect the produced sound from the same audio system speakers or similarly collect noise from machinery and automatically adjust it as desired.

It is a further aspect of the invention to provide an electronic sound regulator device capable of maintaining a stabilized reproduced sound from audio system speakers by allowing the user to select a convenient elapsed time on the damper selector switch which averages the changes in speaker's or machine reproduced sound.

It is a further aspect of the invention to provide an electronic sound regulator device capable of maintaining a stabilized reproduced sound from audio system speakers by automatically suppressing sudden increase in speaker's reproduced sound by increasing the signal rate to lower the audio system volume control and decreasing the signal rate to raise the volume control of audio system.

It is a further aspect of the invention to make an electronic sound regulator device comprising:

a) an electronic volume adjusting circuit having use for connection to the volume adjusting control of an audio system;

b) a microphone producing a first signal from the sound of the said audio system;

c) adjustable means for averaging the said first signal over periods of time producing second signal;

d) adjustable electronic signal generator for generating the third signal;

e) said third signal constitutes a reference line for comparison means;

f) computer control means comparing said second signal to said third signal and for

transmitting to said volume adjusting control of said audio system a fourth signal for reducing the deviation of the said second signal from the said reference line of the said third signal to thereby maintain a constant sound intensity.

It is a further aspect of the invention to provide an electronic noise regulator device capable of controlling the speed of machinery as a function of human desire similar in design to the electronic sound regulator device.

It is a further aspect of the invention to make an electronic noise regulator device comprising:

a) an electronic noise intensity adjusting circuit having use for connection to the speed adjusting control of a machine;

b) a noise detecting device producing a first signal from the said machine;

c) adjustable means for averaging the said first signal over periods of time producing second signal;

d) adjustable electronic signal generator for generating the third signal;

e) said third signal constitutes a reference line for comparison means;

f) computer control means comparing said second signal to said third signal and for transmitting to said speed adjusting control of said machine a fourth signal for reducing the deviation of the said second signal from the said reference line of the said third signal to thereby maintain a constant noise intensity.

Other aspects, advantages and attainments together with a fuller understanding of the invention will become apparent and appreciated by referring to the following description and claims taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation view of the device of the present invention.

FIG. 2 is a semi-diagrammatic view of the device of the present invention.

FIG. 3 is a flowchart illustrating the operation of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference to the drawings and with reference to FIG. 1, the illustration of the electronic sound regulator device indicates that it possesses numerous benefits and advantages. In particular, the present invention relates to a light weight device capable of automatically controlling the volume of a television to the desired human auditory level of the user. The invention utilizes a reliable material in manufacturing and easy to use and no installation is needed. The device maybe independent of the television and it is free to move along all axis of motion.

With reference to FIG. 2 it is an schematic illustration of the components lay out in the device. With reference to FIG. 3 it is an schematic diagram for the flow of signals starting with the microphone and ending at the signal transmission means to audio systems or machines.

In the First Embodiment and with reference to FIG. 3 the electronic sound regulator device includes a sound level meter (b) which measures the audio system sound intensity collected by the microphone(a) in decibels and then converted to an electrical signal. By separating means of the signal to different sound levels the signal enter the central processing unit of the microcomputer at the damper switch (f). As a function of the programed microcomputer, the damper switch (f) averages the electrical signal by the elapsed time in seconds that the user may select. The range varies from zero to a recommended number of 4 seconds, but the invention is not so limited. If, for example, on the first second the voltage was 15 v. and on the second second the voltage was 20 v. and the third second was 5 v. and the fourth second was 30 v., and the level of the damper selector switch just before the power was cut off was 50 v., then when 1 second is selected on the damper switch, the average signal is (50 v +15 v) divided by 2 = 32 ½ v., and when 2 seconds is selected on the damper switch, the average signal is (50 v + 15 v + 20 v) divided by 3 = 28 1/3 v, and when 3 seconds is selected is selected on the damper switch, the average signal is (50 v + 15 v + 20 v +5 v) divided by 4 = 22 ½ v, and when 4 seconds is selected on the damper switch, the average signal is (50 v + 15 v + 20 v + 5 v + 30 v) divided by 5 = 24 v. When we compare the minimum and maximum peaks from the actual signals received over a span of 4 seconds before dampening these peaks are 5 and 50 and are very high compared to the dampened peaks of 22 ½ v and 32 ½ v. The dampened signal is then sent to the comparator (h).

The sound level selector switch (g) where the desired human auditory level is selected by the user comprises a selector on a scale from zero to 10 where a zero stands for sound off and then ascends in increments of ONE to TEN. Any increment or part of as selected is a proportionate representation of sound intensity as heard by the human ear at that instant and then the user may either maintain the present selection or adjust to a new selection until the reproduced sound is to the satisfaction of the human auditory level as desired by the user.

The sound level selector switch (g) generates a signal proportional to the selection made by the user to the comparator (h). As a product of the computation process of the programmable microcomputer, this signal represents a reference line for the comparator to compare the signal from the damper switch (f) to the said reference line from the sound level selector switch (g) where the user's desired human auditory level of sound is selected.

Any deviation of the damper selector switch signal from the sound level selector switch reference line signal will result in a corrective signal to either increase or decrease the volume control of the audio system. The deviation is also induced by the user when selecting a new desired sound level which results in re- adjustment of the reference line. This is a continuous operation which result in a gradual reduction in the deviation at extremely high frequency until the deviation is null and the correction signal is disabled.

Although the present invention has been disclosed using one preferred embodiment, it is recognized that variations and changes can be made without departing from the scope and spirit of the invention as set forth in the claims.

Other applications for the electronic sound regulator device are numerous and to mention a few:

a) when a vehicle is moving at a certain rate of speed the produced noise level generated by the engine corresponds to the vehicle's speed and when selected on the sound level selector device any acceleration or deceleration on horizontal surfaces will result in a change of engine noise which will cause the device to make corrections to maintain the noise level which corresponds to the vehicle's speed. Uphill vehicle speed is decreased and downhill is increased . This operation includes land, marine and heavier than air machines.

b) as an anti-theft device when the sound level selector device is selected to minimum reading which corresponds to engine fuel cut off.

c) as an instantaneous visual display of "Howgoesit" in the life span of a machine or engine or part of where the produced noise is collected by noise collection devices and printed against the manufacturer recommended display of noise versus time at a certain engine speed in a healthy engine or machine and whereas the desired human auditory limits which corresponds to the manufacturer's catastrophic engine or machine failure may occur is selected on the sound regulator selector device for the purpose of a precautionary engine shut down. However, once the noisy condition or explosive bang condition is removed the electronic sound regulator device will

automatically reset the engine controls allowing a normal re-start. A minimum of three odd numbered electronic sound regulator devices systems with an electronic voting device for a majority of at least two to one are needed to avoid inadvertent or false engine shut down due to a wild signal or a single system malfunction.Furthermore, any deviation from the manufacturer's recommended "Howgoesit" chart is an early indication of engine problems that require immediate attention by the maintenance department. This early warning privilege saves life and money.

d) as a noise abatement enforcer at airports where noise abatement procedures are mandatory. The desired noise level is selected on the electronic sound regulator device and placed at noise sensitive locations on the ground. By secured transmission means the system will either reduce engine power through the automatic throttle system in the aircraft or induce shallow climb through the autopilot vertical navigation mode, and the invention is not so limited.

While the invention has been described in conjunction with several specific embodiments, it is evident to those skilled in the art that many further alternatives, modifications and variations will be apparent in light of the foregoing description. Thus, the invention described herein is intended to embrace all such alternatives, modifications, applications and variations as may fall within the spirit and scope of the subjoined claims.

CLAIMS

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

What I claim is:

1. An electronic sound regulator device comprising:

a) an electronic volume adjusting circuit having use for connection to the volume adjusting control of an audio system;

b) a microphone producing a first signal from the sound of the said audio system;

c) adjustable means for averaging the said first signal over periods of time producing second signal;

d) adjustable electronic signal generator for generating the third signal;

e) said third signal constitutes a reference for comparison means;

f) computer control means comparing said second signal to said third signal and for transmitting to said volume adjusting control of said audio system a fourth signal for reducing the deviation of the said second signal from the said reference line of the said third signal to thereby maintain a constant sound intensity;

2. An electronic sound regulator device of claim 1 for means to increase the said transmitting power of the said fourth signal when transmitting to decrease the volume to said volume adjusting control of said audio system.

3. An electronic sound regulator device of claim 1 for means to decrease the said transmitting power of the said fourth signal when transmitting to increase the volume to said volume adjusting control of said audio system.

4. An electronic noise regulator device comprising:

a) an electronic noise intensity adjusting circuit having use for connection to the speed adjusting control of a machine;

b) a noise detecting device producing a first signal from the said machine;

c) adjustable means for averaging the said first signal over periods of time producing second signal;

d) adjustable electronic signal generator for generating the third signal;

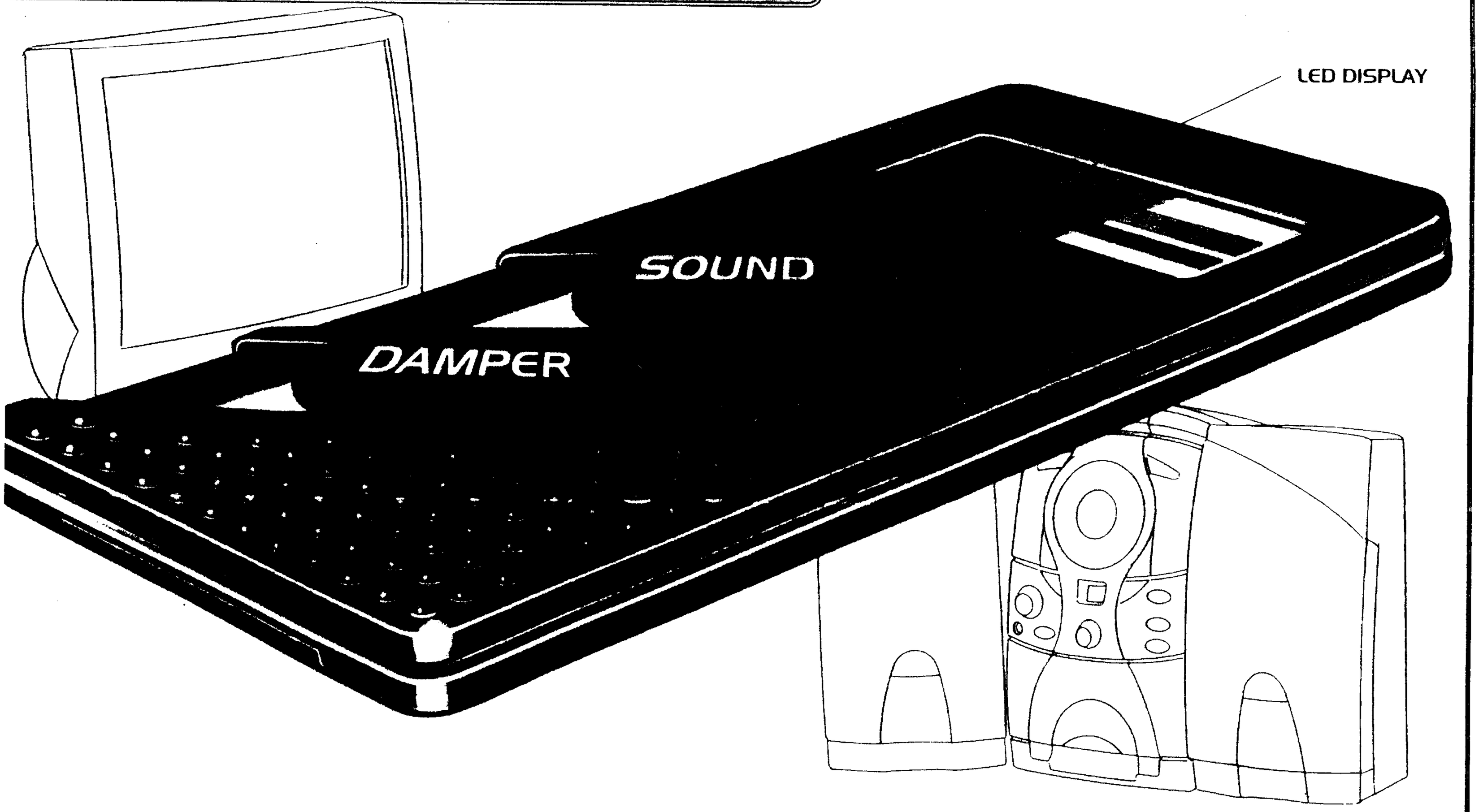
e) said third signal constitutes a reference for comparison means;

f) computer control means comparing said second signal to said third signal and for transmitting to said speed adjusting control of said machine a fourth signal for reducing the deviation of the said second signal from the said reference of the said third signal to thereby maintain a constant noise intensity.

5. The invention as defined in any one of claims 1 to 4 wherein the computations are a result of a programmable computer.

FIG. 1

CONTROLLED AND SELF REGULATING SOUND INTENSITY



INVENTOR(s): ZIAD ANANI

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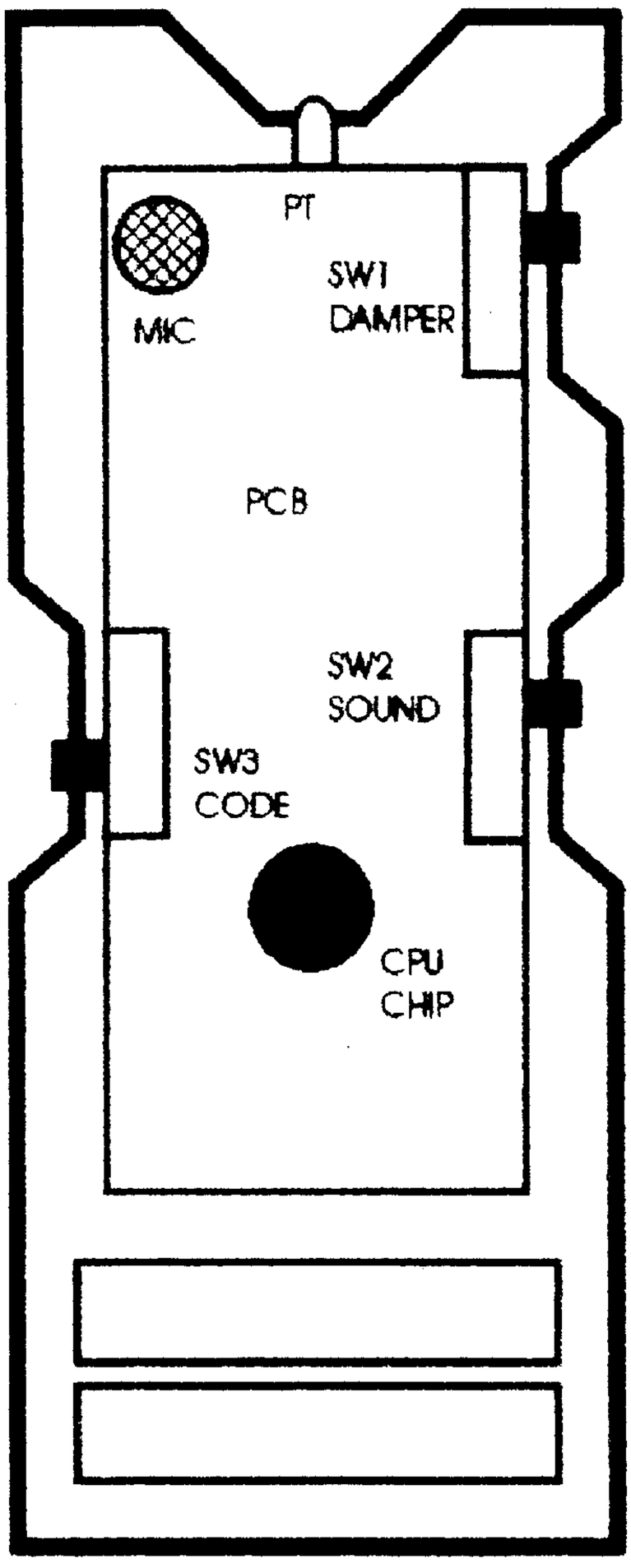
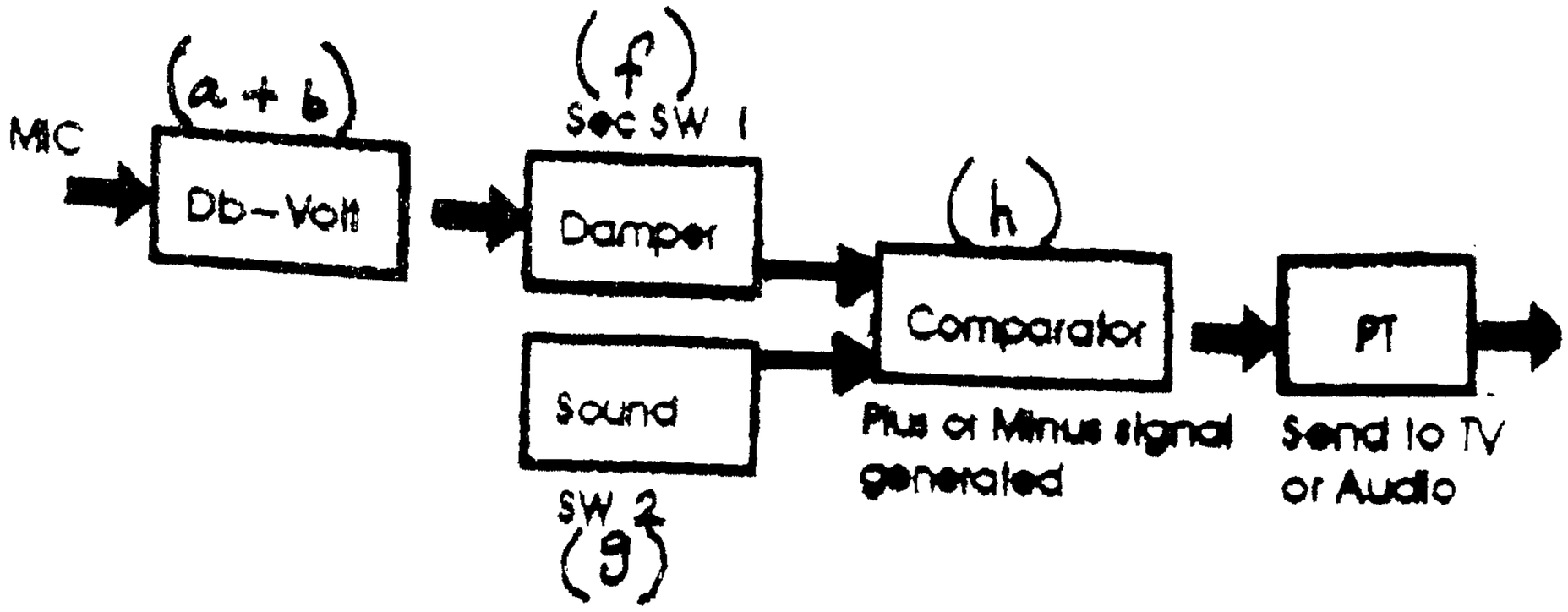


FIG. 2

FIG. 3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Db – Volt
(f)
Sec SW 1
Damper
Sound
SW 2
(g)
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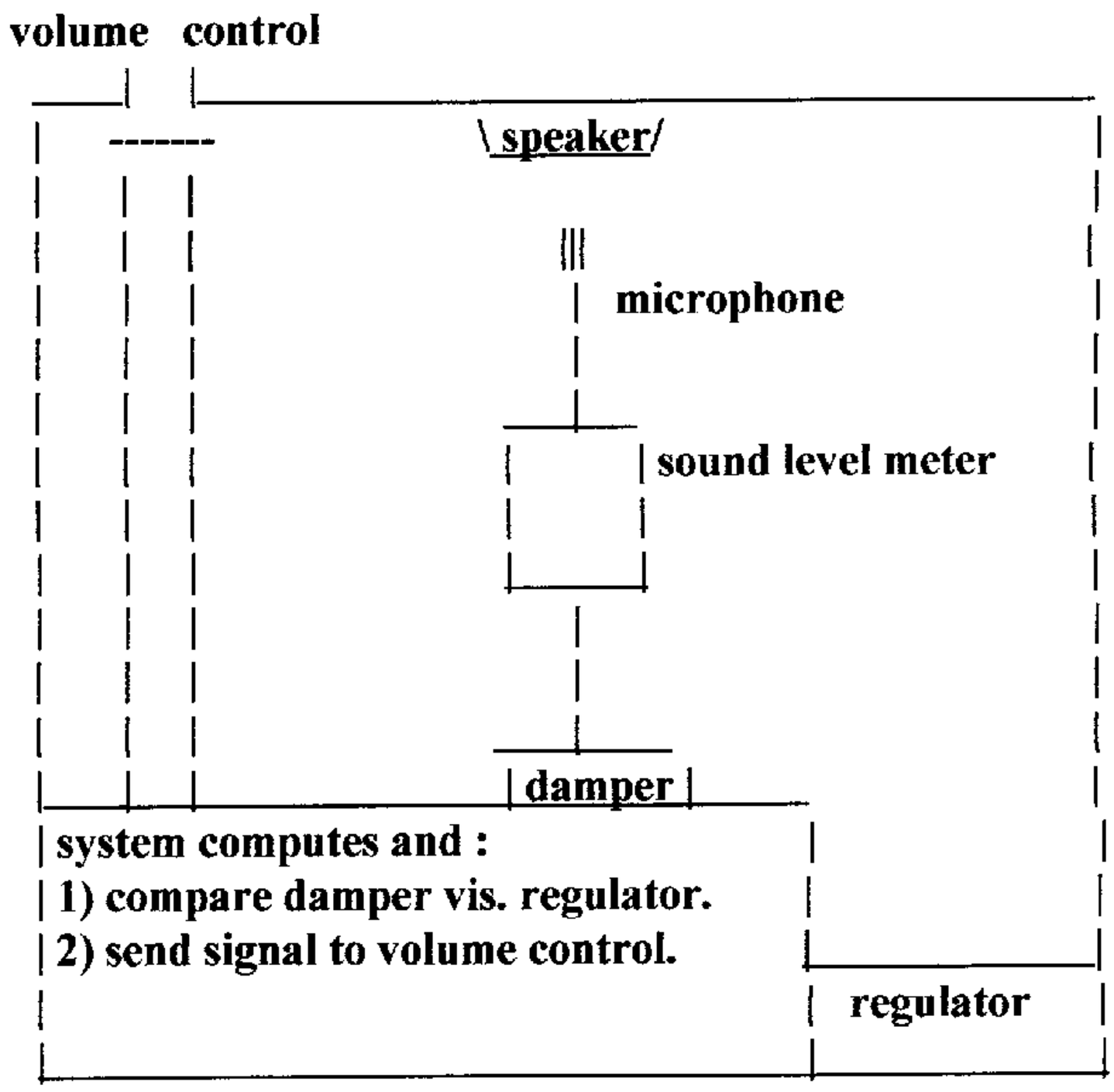
Comparator
Plus or Minus signal generated
PT
Send to TV or Audio



Television Frame & general layout of components