airtight enclosure **29** may be used for the speaker **37**, in order to enhance the monopole component of the radiated acoustic signal. Instead of a piezoelectric speaker one may use an electromagnetic loudspeaker with a voice coil. Because of the low impedance of the voice coil, a resistor must then be included in the output circuitry in order to keep the output currents to low values such as to allow battery powering of the device. Small voice coil currents are sufficient for the low acoustic powers required.

Low pulse frequencies can be monitored with the LED **35** of FIG. **3**. The LED blinks on and off with the square wave, and it doubles as a power indicator. The pulse frequency can be determined by reading a clock and counting the LED light pulses. For higher frequencies a monitoring LED can still be used, if it is driven by a signal obtained by frequency division of the generator signal.

The automatic shutoff described above is an example for automatic control of the generated voltage; more sophisticated forms of control involve automatic frequency sequences. A computer that runs a simple timing program can be used for the generation of all sorts of square waves that can be made available at a computer port. An economic and compact version of such arrangement is provided by the Basic Stamp manufactured by Parallax Inc, Rocklin, Calif., which has an onboard EEPROM that can be programmed for the automatic control of the generated pulses, such as to provide desired on/off times, frequency schedules, or chaotic waves. The square waves can be rounded by RC circuits, and further smoothed by integration and filtering.

A compact packaging of the device such as shown of FIG. **4** is depicted in FIG. **5** where all circuit parts and the speaker, piezoelectric or voice-coil type, are contained in a small casing **62**. Shown are the speaker **37**, labelled "SPEAKER", driven by the generator **6**, labeled "GENERATOR", with tuning control **9**, LED **35**, battery **41**, and power switch **42**. The LED doubles as a mark for the tuning control dial. With the circuit of FIG. **4**, the device draws so little current that it can be used for several months as a sleeping aid, with a single 9 Volt battery.

For the purpose of thwarting habituation to the stimulation, irregular features may be introduced in the pulse train, such as small short-term variations of frequency of a chaotic or stochastic nature. Such chaotic or stochastic acoustic pulses can cause excitation of a sensory resonance, provided that the average pulse frequency is close to the appropriate sensory resonance frequency. A chaotic square wave can be generated simply by cross coupling of two timers. FIG. **6** shows such a hookup, where timers **72** and **73**, each labeled "TIMER", have their output pins **74** and **75** connected crosswise to each other's control voltage pins **76** and **77**, via resistors **78** and **79**. The control voltage pins **76** and **75** have capacitors **80** and **81** to ground. If the timers are hooked up for astable operation with slightly different frequencies, and appropriate values are chosen for the coupling resistors and capacitors, the output of either timer is a chaotic square wave with an oval attractor. Example circuit parameters are: R_{78}=440KΩ, R_{79}=700KΩ, C_{80}=4.7 μF, C_{81}=4.7 μF, with $(RC)_{72}$=0.83 s and $(RC)_{73}$=1.1 s. For these parameters, the output **74** of timer **72** is a chaotic square wave with a power spectrum that has large peaks at 0.46 Hz and 0.59 Hz. The resulting chaotic wave is suitable for the excitation of the ½ Hz resonance.

A complex wave may be used for the joint excitation of two different sensory resonances. A simple generator of a complex wave, suitable for the joint excitation of the ½ Hz autonomic resonance and the 2.5 Hz cortical resonance, is shown in FIG. **7**. Timers **82** and **83** are arranged to produce square waves of frequencies f_1 and f_2 respectively, where f_1 is near 2.5 Hz, and f_2 is near ½ Hz. The outputs **84** and **85** of the timers are connected to the inputs of an AND gate **86**. The output **87** of the AND gate features a square wave of frequency f_1, amplitude modulated by a square wave of frequency f_2, as indicated by the pulse train **88**.

The very low frequency waves needed for the acoustic stimulation of the vestibular nerve may also be provided by a sound system in which weak subaudio pulses are added to audible audio program material. This may be done in the customary manner way of adding the currents from these signals at the inverting input of an operational amplifier. The amplitude of the pulses is chosen such that the strength of the resulting acoustic pulses lies in the effective intensity window. Experiments in our laboratory have shown that the presence of audible signals, such as music or speech, does not interfere with the excitation of sensory resonances.

The invention can also be implemented as a sound tape or CD ROM which contains audible audio program material together with subliminal subaudio signals. The recording can be done by mixing the audio and subaudio signals in the usual manner. In choosing the subaudio signal level, one must compensate for the poor frequency response of the recorder and the electronics, at the ultra low subaudio frequencies used.

The pathological oscillatory neural activity involved in epileptic seizures and Parkinson's disease is influenced by the chemical milieu of the neural circuitry involved. Since the excitation of a sensory resonance may cause a shift in chemical milieu, the pathological oscillatory activity may be influenced by the resonance. Therefore, the acoustic excitation discussed may be useful for control and perhaps treatment of tremors and seizures. Frequent use of such control may afford a treatment of the disorders by virtue of facilitation and classical conditioning.

In this as well as in the detuning method discussed before, an epileptic patient can switch on the acoustic stimulation upon sensing a seizure precursor.

Since the autonomic nervous system is influenced by the ½ sensory resonance, the acoustic excitation of the resonance may be used for the control and perhaps the treatment of anxiety disorders.

The invention can be embodied as a nonlethal weapon that remotely induces disorientation and other discomfort in targeted subjects. Large acoustic power can be obtained easily with acoustic monopoles of the type depicted in FIG. **3** or FIG. **12**. If considerable distance needs to be maintained to the subject, as in a law enforcement standoff situation illustrated in FIG. **8**, several monopoles can be used, and it then may become important to have phase differences between the acoustic signals of the individual monopoles arranged in such a manner as to maximize the amplitude of the resultant acoustic signal at the location **52** of the subject. Shown are four squad cars **53**, each equiped with an acoustic monopole capable of generating atmospheric pulses of a frequency appropriate for the excitation of sensory resonances. The relative phases of the emitted pulses are arranged such as to compensate for differences of acoustic path lengths **54**, such that the pulses arrive at the subject location **52** with substantially the same phase, resulting in constructive interference of the local acoustic waves. Such arrangement can be achieved easily by using radio signals between the monopole units, with the target distances either dialed in manually or measured automatically with a range finder. The subaudio acoustic signals can easily penetrate