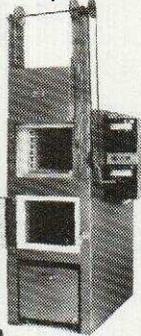


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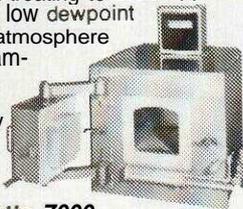
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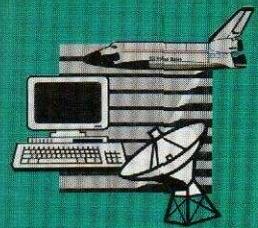
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Technology Today

Alan J. Pierce



Noise + anti-noise = silence

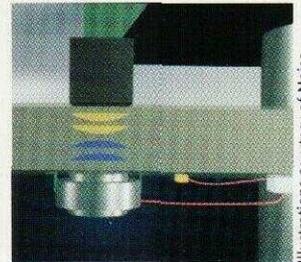
A NEW noise-cancellation technology is finding its way into nonmilitary products. To cancel the noise of large machines, special microphones at critical points in the environment guarantee that an on-board noise-cancellation computer analyzes all the noise the machine generates. The computer then generates sound waves that mirror all frequencies in the offensive sound. Speakers then broadcast this new noise, which is the exact opposite of the original sound, at the same intensity as the original noise. The joining of the two sounds actually equals silence. Figure 1 graphically shows the cancellation effect of noise joining with anti-noise.

Since research into noise-cancellation technology has been going on for a number of years, it is believed that "whisper mode" on military equipment already exists. An example might be a system that cancels the mechanical noise

of a tank to allow it to move unheard through a battle area. The degree of silence that can be reached with this technology seems to be specifically related to physical size of the noisy equipment and the processing power of the noise-canceling computer.

How does an automobile muffler's noise-abatement system differ from this new noise-cancellation technology? An automobile muffler is designed to shift the frequency and amplitude of part of the sound wave that is traveling through its buffers. This phase shift causes partial noise cancellation.

To under-



Illustrations courtesy of Noise Cancellation Technologies, Inc.

Figure 1

stand the noise-abatement principle of a muffler, imagine a platoon of marching soldiers crossing a bridge. Since every soldier is in perfect step with the unit, the vibrations of the footsteps hit the bridge as an amplified wave that causes the bridge to shake. The vibrations, if strong enough, could actually cause the bridge to fail. If the soldiers are not in step, the vibrations of their footfalls will have a canceling effect leading to a much smaller stress on the bridge. The "outer step" noise at work in a car muffler has the same cancellation quality as out-of-step military feet.

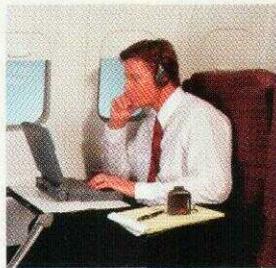


Photo 1

The preferred method of removing noise pollution from our environment would be to cancel noise at its source. A number of companies and research-oriented universities are performing research into silencing large machines. Research at Noise Cancellation Technologies, Inc., of Stamford, CT, is but one of many programs that government agencies and private corporations are now supporting.

Industrial applications of this technology include noise abatement of ma-

chines, duct systems, vacuum systems, and airplane cabins. Noise Cancellation Technologies, Inc., and Active Noise Vibration Technologies, Inc., of Phoenix, AZ, are marketing a headset consumer application of this technology. Both manufacturers produce a Walkman-style headset

(Photo 1) that can cancel unwanted noise. These units can lower the sound of a jet plane to a whisper while not affecting the decibel level of voice communication. If your goal is to silence the world around you, these units will not meet your expectations, as they "filter" sound rather than eliminating it.

Recalling the Facts

1. Describe how an automobile muffler noise-abatement system operates.
2. Describe how electronic noise-cancellation systems produce anti-noise.
3. Noise pollution is all around us. List 10 sites that you believe would benefit from this technology. 

Alan J. Pierce is an associate professor, Department of Technology, Elizabeth City (NC) State University.

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