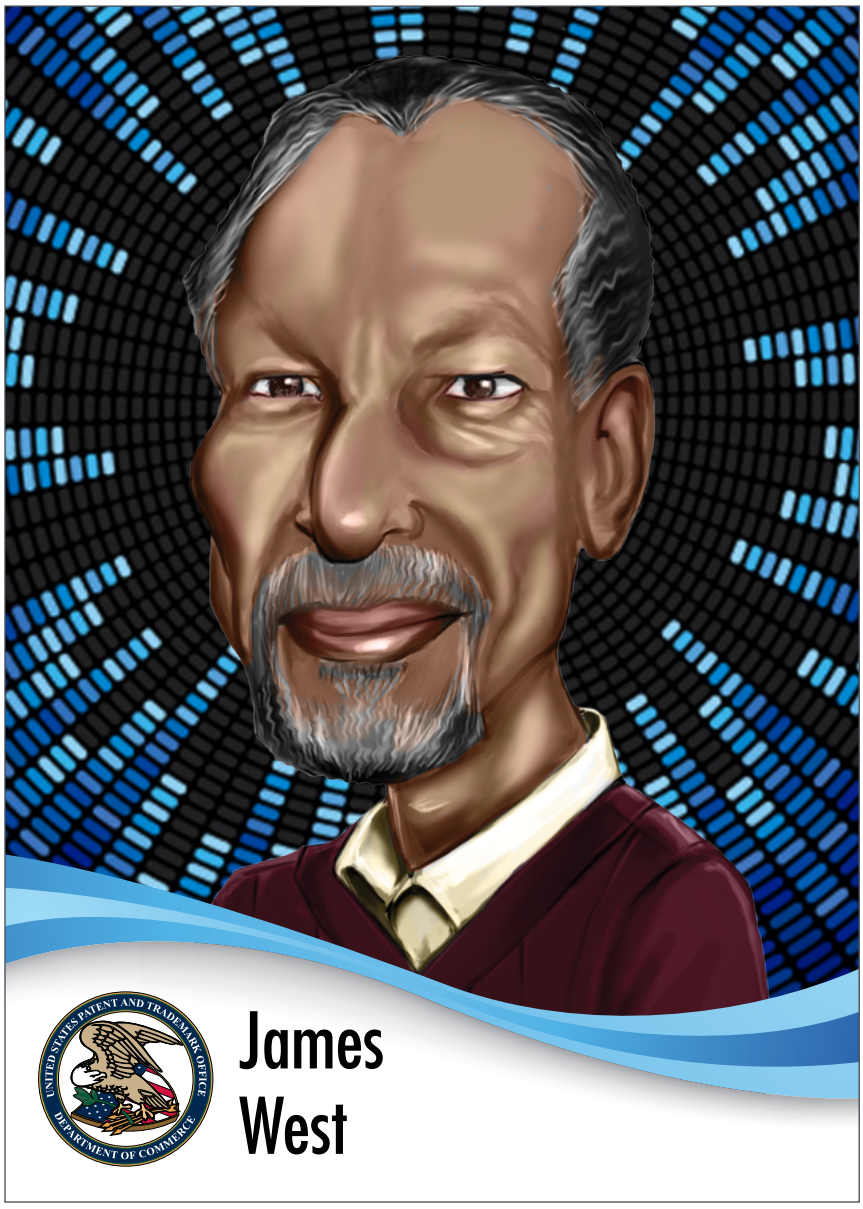
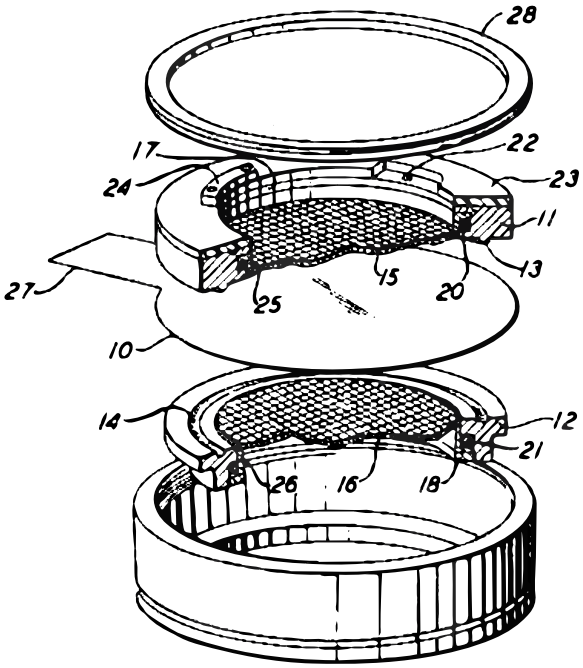
How Well Does Sound Travel Through Different Mediums?

An "inventor card" exploration activity inspired by U.S. Patent No. 3,118,022 (James West & Gerhard Sessler co-inventors)



West is a scientist, an engineer, and an inventor. His work with electret foil microphones and techniques revolutionized the telephone and recording industries. Over 90%of the more than 2 billion microphones produced today are based on technology he helped develop.

FIG. 1



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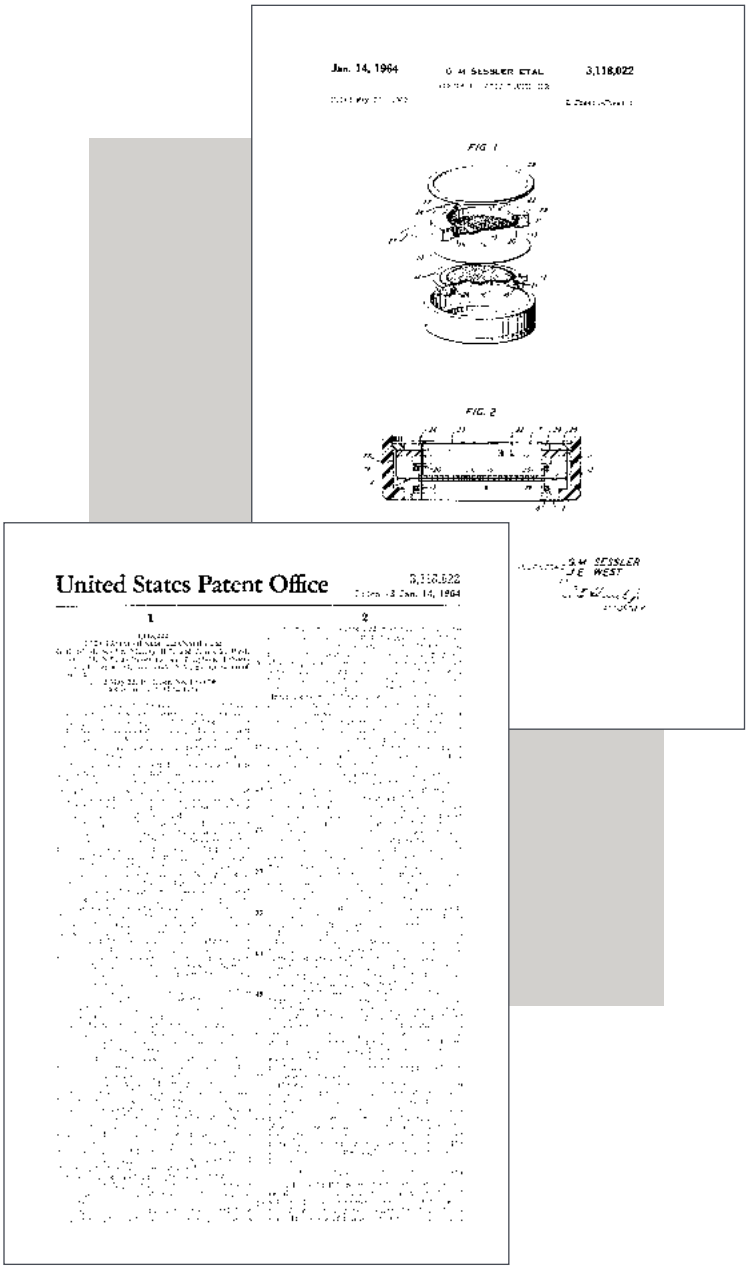
From Idea to Invention!

All inventions start with ideas, but what you do with those ideas can make all the difference in the world. What ideas do you think sparked the invention of the electret foil microphone?



In order to develop the idea for the electret foil microphone into an actual invention the inventors had to understand the concept of "sound" and how it travels.

Hands-on Activity: How Well Does Sound Travel Through Different Mediums?

Materials:

* Plastic sandwich bag
* Water
* Wooden block
* Pencil/Pen

Instructions

* Blow into the sandwich bag and quickly seal it to create a puffed bag of air. Cover one ear with your hand and the other ear with the bag of air. Have an assistant tap the bag with a pencil. How does it sound?
* Now fill the bag with water and seal it. Hold the water-filled bag against one ear while covering the other ear with your hand. Have an assistant tap this bag with a pencil. How does it sound?
* Finally hold a wooden block over one ear while covering the other ear with your hand. Have an assistant tap the block with the pencil. How does it sound? Compare and discuss observations.

What is sound?

Sound is a type of energy made by vibrations. These vibrations create sound waves which move through mediums such as air, water and wood. When an object vibrates, it causes movement in the particles of the medium. This movement is called sound waves, and it keeps going until the particles run out of energy. If your ear is within range of the vibrations, you hear the sound. Our ears vibrate in a similar manner to the original source of the vibration, allowing us to hear many different sounds.

Electroacoustic transducers

Microphone — An acoustic-to-electric transducer or sensor that converts sound into an electrical signal.

Electret Microphone — A type of condenser microphone, which uses a permanently charged material called electret. An electret is a stable dielectric material with a permanently em-bedded static electric charge. The name comes from electro-static and magnet. Foil electret type was invented using a thin metallized Teflon foil. Due to their good performance and ease of manufacture, hence low cost, the vast majority of microphones made today are electret microphones. Most cell-phones and headset microphones are electret type. Electret mi-crophones are also used in hearing aids and talking toys.

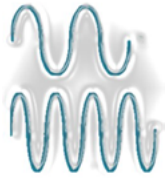
Design and improvements to electro acoustic devices

New 'Out of This World' Space Stethoscope Valuable Here on Earth, Too - "A team of students at the Johns Hopkins University's Whiting School of Engineering has designed a new stethoscope that they believe will deliver accurate heart- and body-sounds to medics who are trying to assess astronauts' health on long missions in "noisy spacecraft." "The students worked under the guidance of James West, a Johns Hopkins research professor in electrical and computer engineering and co-inventor of the electret microphone used in telephones and in almost 90 percent of the more than two billion microphones produced today." (2013, May 20).

Test Your Sound IQ

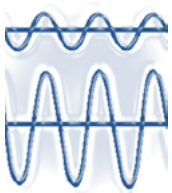
Sound Waves

* Low-Frequency Sound Wave: Low pitch



* High-Frequency Sound Wave: High pitch

* Low Volume Sound Wave: Lower amplitude



* High Volume Sound Wave: Larger amplitude

1. Can sound travel under water?
2. Does sound travel faster through water or through the air?
3. Does sound travel faster through wood or through the air?
4. Is there sound on the moon?
5. What is the speed of sound?

Answers

1. Yes, sound can travel under the water.
2. It moves four times faster through water than through air.
3. It moves about thirteen times faster in wood than air.
4. No, there is no sound in space. Sound needs something to travel through; matter, air, liquid, solid wood.
5. Sound travels through air at 1,120 feet (340 meters) per second.