Construction of home-made microphone using graphite lead

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Abstract: A simple microphone using graphite leads has been constructed in the present world. Microphone is one of the common sensor used for conversion of sound or voice into electric signal. To understand the basic principle of microphone, we have constructed a simple device using material available in the home. The main materials required includes pencil leads, empty cardboard, connecting wires, battery and earphone. After construction we have demonstrated its operation successfully. The work presented in this article is helpful to the students of school and colleges for making their exhibition project.

IndexTerms **- Graphite rod, Microphone, Sensor, exhibition project.**

1. INTRODUCTION

Microphone is invented by Scientist Emile Berliner in the year 1877 [1]. It was invented with the intension of its need in telephone [2]. Microphone is types of sensor which converts sound pressure variation into electrical signal. It has applications such as public address (PA) system, mobile phones, etc. There are different types of microphones, such as Condenser, electromagnetic, crystal, carbon, and ribbon microphone [3], according to the different applications we can use these microphones.in some applications miniaturized microphones are used. For instantce, MEMS (Micro Electro Mechanical System) [4] type microphones are used in smartphones because of their small size, reliability and cost.
In the present article we have constructed the home made microphone and its report is discussed. Article is divided into following sections, methods are discussed in section 2, experimental work is presented in section 3, and finally conclusion is discussed in section 4.

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2. METHODS

Microphone is made from some mechanical components that includes diaphragm, plastic or metal box and some sensing device. Some popular methods are discussed below:

2.1 Condenser microphone: It is constructed using two thin parallel metal plates [5] as shown in figure 1.

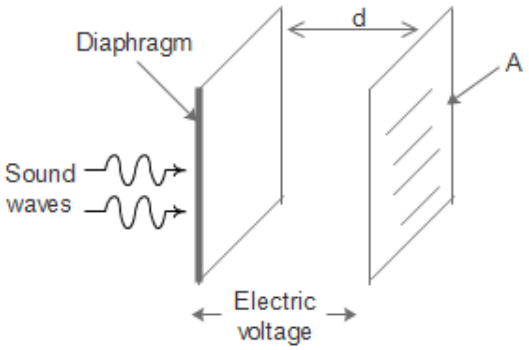

Figure 1. Constructional details of condenser microphone

Electric voltage is produced across the two plates when the sound waves hit the diaphragm. Electric voltage, v is given by equation 1.

$$v = \frac{q}{c} \quad (1)$$

Where, $c = \frac{\epsilon_0\ kA}{d}$, d= distance between plates, A= surface area, k = dielectric constant, ε_0= permittivity of free space.

2.2 Carbon Microphone

Construction of carbon microphone is shown in figure 2.

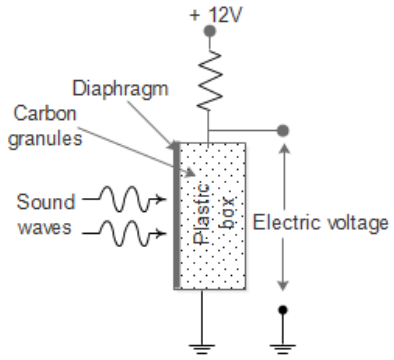

Figure 2. Construction of carbon microphone

It works on the principle of sound dependent resistance (SDR) as the sound waves strike diaphragm the pressure on the carbon granules is changed which causes variations in the electric signal amplitude.
Above two methods are simple but difficult to construct at home.

3. EXPERIMENTAL WORK

The construction of microphone developed in the present work is given in fig 3. It is one type of passive transducer i.e. it requires external electrical energy for its operation. When the sound waves hit to card board box then the assembly of graphite rod vibrates and produces varying electric signal. If such signal is applied to earphone then the electric signal is converted back into sound signal.

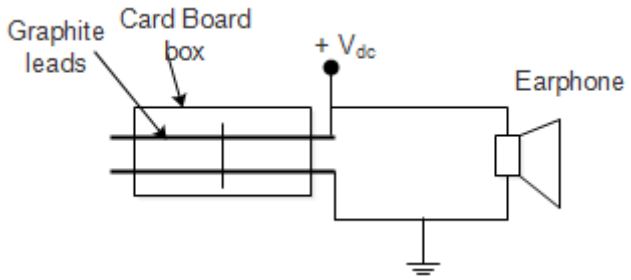

Figure 2. Construction of developed microphone

The homemade microphone is successfully tested for its directivity and we have noticed that its's characteristics is similar to the directional microphone with its polar pattern is cardioid shape as shown in figure 3.

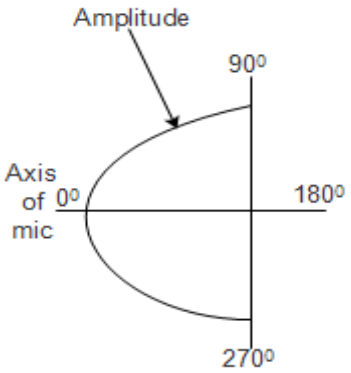

Figure 3. Directional characteristics curve of microphone

The actual view of experimental setup is as shown in figure 4.

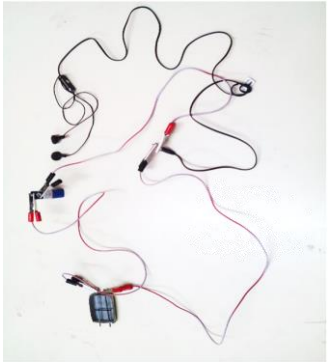

Figure 4.Actual view of microphone

4. CONCLUSION

A commercial microphone is a complex device and difficult to construct at home. They are available in market in variety of size and types. The carbon and condenser are the common types of microphones. Crystal microphone is used for precision application. The MEMS technology based microphone is used in mobile phones. We have constructed a simple graphite rod based microphone for understanding the principle of working of microphone. The homemade device is working satisfactorily and we have demonstrated it successfully. Though the work done is simple but it can be used as demonstration experiment for understanding the microphone.

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