

Portable Sound Wave Fire Extinguisher

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Abstract:- Fire is a severe hazard that can cause catastrophic damage to life and property. The present fire extinguishing techniques comes with many drawbacks. Present extinguishers are also not eco- friendly so there is a need to develop an alternate method to extinguish a fire. Portable sound wave extinguisher can be used as alternate to primitive extinguisher. The most important challenge to develop a sound wave extinguisher is to identify the right frequency to extinguish a fire. This study focus is to design and develop a portable extinguisher based on sound wave and identify the right frequency to extinguish fire.

Keywords:- Soundwave ,Fireextinguisher ,Frequency, Fire.

I. INTRODUCTION

1.1 Introduction to Fire:-

Fire is an outcome of exothermic chemical reaction, usually the combustion of hydrocarbon with oxygen, resulting in release of huge energy in form of heat, light and sound. Three basic components must be present to produce fire they are-

- Heat
- Fuel
- Oxygen

If any one of the basic element is not presents the fire will not happen beside 3 elements there is also a forth

element which is essential for continuation of fire once ignited this is known as "CHAIN REACTION". Once fire occur the burned substance produce lots of heat which tends to burn remaining fuel substance this reaction occurs again and again .which is called "chain reaction".

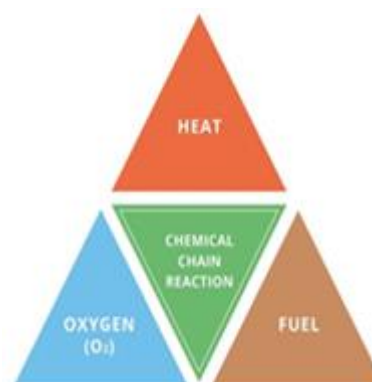


Figure 1.1: A flame tetrahedron

1.2 Characteristics of portable sound wave extinguisher

- It is environment friendly and does not harm nature
- Technology design and working principle is simple
- Cost efficient
- Nontoxic and chemical free
- Does not leave any residue
- Works on human hearable frequency

1.3 Sound Waves:-

Sound Waves play an important role while extinguishing fires. The waves break the chain reaction in the ongoing fire reaction with the help of strong pressure waves.

It pushes the oxygen away from the source of a flame and spread it over a larger surface area. These actions break the fire combustion triangle made up of heat, fuel and oxygen.

Sound is a mechanical pressure wave which has a potential to cause vibration in the entire medium they travel. These vibrations effect the burning of the material and manipulate oxygen surrounding the burning material as a result extinguishing the fire.

II. OBJECTIVE

1. To find out the frequency range that will be able to suppress a candle.
2. To design a portable sound based fire extinguisher.

III. METHODOLOGY

This experiment will be performed and observed in the frequency range of 50 – 80 Hz. The major goal of the experiment is to find the range of working frequency of sound which can neutralize the fire of a candle and record the time taken by the sound wave extinguisher at different frequency.

The methodology of developing a portable fire extinguishers system is explained in flowchart The most important equipment essential for the creation of the potable fire extinguisher is identified and purchased The setup is developed for investigate the optimum critical frequency followed with data analysis and documentation.

Requirements

- Speaker (250 watt)
- Amplifier (200 watt)
- Battery or power supply unit
- Camera
- Mobile
- Stopwatch
- Vortex Cannon
- Aux cable

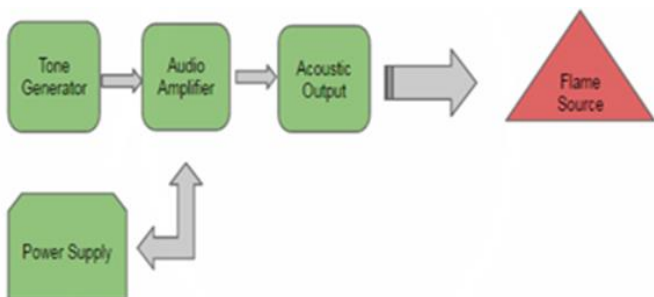


Figure 3.1. Design of portable fire extinguisher

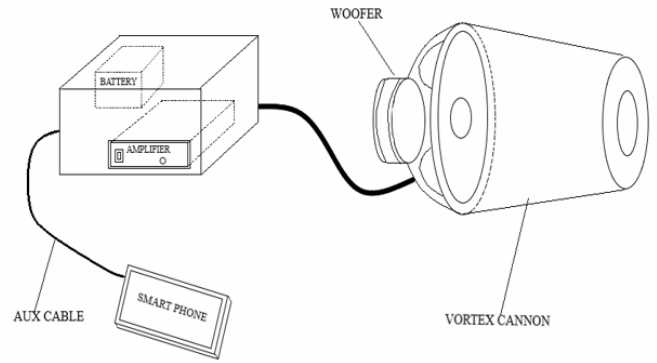


Figure-3.2. Demonstration of Setup

IV. EXPERIMENT & RESULT

The experiment was conducted to find the suitable range of frequency to extinguish a candle. While performing the experiment mobile phone was used to generate sound wave amplifier was used to adjust frequency stopwatch was used to record time. Recorded data is shown in table 1

Table 1: Frequency-Time Table of the Experiment performed

Frequency (Hz)	Time (sec)
50	2.2
52	2
54	1.8
56	1.7
58	1.6
60	1.4
62	1.3
64	1.1
66	0.95
68	0.8
70	0.5
72	0.4
74	0.6
76	0.8
78	1.1
80	1.4



Fig 4.1 Sequence of extinguishing of candle

From above results we can conclude that the optimum frequency for extinguishing a fire is between 70-76 HZ.

V. LIMITATIONS

- It requires power supply or battery to work
- Efficiency on larger fire such as wildfire or class A fossil fuel fire is questionable

VI. CONCLUSION

Extinguishing fire with portable sound based fire extinguisher is very innovative idea. Primitive extinguisher have many disadvantages associated with them such as CO₂ is an asphyxiate, so care should be exercised when using in confined spaces, ABC powder Can be messy, as it's a fine powder. Clean up can be costly and time-consuming, so consideration should be given where misuse/accidental use would be an issue. Portable sound wave extinguisher have many advantages such as its cheap residue free, Chemical free and can be used in confined space The sound wave extinguisher works by using sound waves—a type of pressure wave—to push oxygen away from the source of a flame and spread it over a larger surface area. These actions break the fire combustion triangle made up of heat, fuel, and oxygen, the three elements required for a fire to burn. In our experiment we found out suitable frequency range for extinguishing fire is 70-76 hz. Further research needs to be conducted in this topic to design a extinguisher for larger fire.

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