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Air Purifier and Humidifier Using Water as the Filter

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ABSTRACT: Air pollution has crossed all bounds in 2021. WHO estimates that around 7 million people die every year from exposure to polluted air. The spread of air pollution is so high that about 91% of the world population is exposed to air pollution. Well, this also means that the air you breathe in your house is polluted. To counter this issue, we here develop a mini air purifier with that does not use expensive filters but rather uses water as an air filter. Also, it acts as an air humidifier and can be used as oil diffuser too which helps you relax and also kills certain bacteria and viruses present in the air. The system makes use of 2 x high power low noise centrifugal fans that are used to suck in air through a protection mesh. The pulled air is then passed through a water tank situated at the bottom of the purifier. The air passed through water gets auto purified as water traps dust, fungi, bacteria etc in the water. The resulting air rising through the water is a high humidity cool air. Also added essential oils to the system allow for humidifying the area/room with essential oils which are researched to kill certain types of bacteria fungi in air and help humans relax. Also, some essential oils are researched to provide various health benefits when inhaled.

KEYWORDS: Air purifier, Humidifier, Filter.

I. INTRODUCTION

Many countries and larger cities in the world are struggling with severe air pollution today. Factories, vehicles and use of non-renewable energy pollutes the air around the cities. In China and India this is a major problem, the polluted cities in these countries are home to more than 1 billion citizens. The solution that peoples use to clean the indoor air in the polluted areas are called air purifiers. It is a device that most people that are affected by poor air quality keep in their homes and offices. The air purifier's function is usually to create an airflow in the home by suction from a fan inside the device. The air then passes through some sort of filter media which traps the polluted particles, and out comes clean air. However, most air purifiers on the market today are using a so-called HEPA filter, which need replacement every few months and consume a lot of energy. This solution is rather costly and is not suitable for everyone, since one of the most important factors to customers when buying an air purifier is the price. An air purifier is also a part of the furnishings in a home, which also makes the aesthetic design of the air purifier important.

The most common problem during the summer season is pollution, dust, and allergies. With increase in the number of pollutants in the air, there is an increase in the demand for air purifiers. These air purifiers can be used in offices, homes, commercial places, and if their efficiency is high, then they can also be used outdoors. Air purifier is a device used to remove contaminants like dust particles, cloth fibres etc. present in the air. These devices are claimed to be beneficial to people having allergies, and asthma. The commercially graded air purifiers are manufactured as either small stand-alone units or larger units that can be affixed to an air handler unit (AHU) or to a heating ventilation and air-conditioning

(HVAC) unit found in the medical, industrial, and commercial industries. Air purifiers may also be used in industry to remove impurities such as CO₂ from air before processing. A standard air purifier consists of various types of filters, and filter levels to remove the contaminants from the surrounding air.

II.LITERATURE REVIEW

HEPA filters were originally classified as topsecret, developed by the US Atomic Energy Commission to protect soldiers from radioactive particles on the battlefield. During World War II, scientists involved in the Manhattan Project used HEPA masks to guard against contaminants from the atomic bomb. Although these early HEPA masks couldn't possibly protect people from atomic radiation, the research spawned the HEPA filter, which provided protection against chlorine gas, mustard gas, and flame throwers. It was not until the 1960s that specifications were standardized and the term HEPA or "High Efficiency Particulate Air" was officially coined by the Department of Energy (DOE). As defined by the DOE, HEPA filters remove at least 99.97% of dust, pollen, mold, bacteria and any airborne particles with a size of 0.3 microns at 85 liters per minute. From the beginning, HEPA filters were employed to filter out highly hazardous aerosols, toxic carcinogens, radio active particles, and biohazardous contaminants.

In Germany, brothers Klaus and Manfred Hammes purchased a patent for a simple airfiltration system. Using a fiberglass pad attached with small magnets to the air outlet of a residential oil oven, the Hammes brothers were able to filter soot from the air. In 1963, the Hammes brothers simple but effective filter became the first air cleaner to be utilized in homes across Germany. In the same year, US Congress passed the Clean Air Act of 1963 to set standards for the reduction of air pollution through fuel emissions standards. Although it was not Congress first attempt at reducing air pollution, the Clean Air Act of 1963 alerted scientists and consumers of the need to protect our lungs from pollutants such as perfumes, building materials, chemicals, pesticides, and allergens.

III.OBJECTIVE OF THE WORK

Objective of the Air Purifier and Humidifier Project using Water as a Filter:

- **Improve indoor air quality:** The primary objective of the air purifier and humidifier project is to improve indoor air quality. The device will filter out harmful pollutants such as dust, smoke, pollen, and allergens from the air and release clean, fresh air.
- **Increase humidity levels:** The project aims to increase the humidity levels in indoor environments to a healthy range of 40-60%. By using water as a filter, the device will add moisture to the air, which is essential for respiratory health and can help alleviate symptoms such as dry skin, sore throat, and dry cough.
- **Reduce respiratory problems:** The air purifier and humidifier project using water as a filter will help reduce respiratory problems such as asthma, allergies, and other breathing difficulties. The device will filter out pollutants from the air and add moisture to the environment, creating a healthier atmosphere for people to breathe in.
- **Energy efficiency:** The project aims to be energy-efficient by using minimal power to operate. The device will use a water filter, which is a more sustainable and environmentally friendly solution compared to traditional air filters that require regular replacement.
- **Easy maintenance:** The air purifier and humidifier project using water as a filter aims to be easy to maintain. The water filter can be easily cleaned and refilled, reducing the need for frequent replacements.
- **User-friendly:** The project aims to be user-friendly with easy-to-use controls and a simple design. The device will have adjustable settings for humidity levels and fan speed, allowing users to customize the environment to their preference.



- **Portable:** The air purifier and humidifier project using water as a filter aims to be portable and convenient. The device will be lightweight and compact, making it easy to move from one room to another.
- **Affordable:** The project aims to be affordable and accessible to a wide range of consumers. By using water as a filter, the device will be cost-effective in the long run as it eliminates the need for frequent filter replacements.

IV.METHODOLOGY OF PROPOSED SURVEY

Fabrication is an important industry that involves cutting, manipulating and assembling materials to produce desired structures. And while different fabrication companies use different techniques, **most rely on three basic processes: cutting, bending and assembling.**

1) Cutting

The first process of fabrication is cutting. During this process, the metal fabrication company cuts one or more pieces of raw metal for use in the creation of a new metal structure or product. Whether it's steel, aluminum, iron or any other common type of metal, though, cutting metal requires special tools. Some metal fabrication companies use torches to cut metal, whereas others numerical control (CNC) machines involving lasers or water jets. When finished, the company will have clean, appropriate-sized sheets or sections of metal with which to work

2) Bending

After cutting raw metal, metal fabrication companies must bend it. Again, there are different ways to bend metal after cutting it. Some metal fabrication companies hammer the metal sheets or sections into the desired shape. Hammering can be done by hand, or it can be done using a machine (power hammering). Recently, though, many metal fabrication companies have begun using press brakes to bend their metal. This heavy industrial machine automatically presses metal sheets and sections into a specific shape when engaged. It essentially clamps the metal between a punch die, forcing the metal into the desired shape.

3) Assembling

The third and final process of metal fabrication is assembling. As the name suggests, this process involves assembling the metal sheet or sections into the desired finished product. Assembling is typically performed via welding, though other steps may be included in the process as well. In addition to welding, for example, metal fabrication companies may crimp seams, apply screws or other fasteners, and apply glue. After assembling the metal, the company will finalize the product before shipping and selling it to its customers.

Metal fabrication is a driving force behind the country's ever-growing manufacturing sector. Although there are countless machines and techniques used by metal fabrication companies, must rely on a three-step process that consists of cutting, bending and assembling. These three processes allow metal fabrication companies to transform raw metal materials into new products.

V.DESIGN CONSIDERATION

Several structural design considerations should be taken into account for economical and efficient manufacturing. Many of these apply to other joining methods, and all apply to both subassemblies and the complete structure.

1. The device should be suitable for local manufacturing capabilities.
2. The attachment should employ low-cost materials and manufacturing methods.
3. It should be accessible and affordable by low-income groups, and should fulfill their basic need for mechanical power
4. It should be simple to manufacture, operate, maintain and repair.
5. It should be as multi-purpose as possible, providing power for various agricultural implements and for small machines used in rural industry.
6. It should employ locally available materials and skills. Standard steel pieces such as steel plates, iron rods, angle iron, and flat stock that are locally available should be used. Standard tools used in machine shops such as hacksaw, files,

punches, taps & dies; medium duty welder; drill press; small lathe and milling machine should be adequate to fabricate the parts needed for the dual-purpose bicycle.

7. It should make use of standard parts wherever possible.

8. The device should adapt easily No permanent structural modification should be made

9. Excessive weight should be avoided, as durability is a prime consideration.

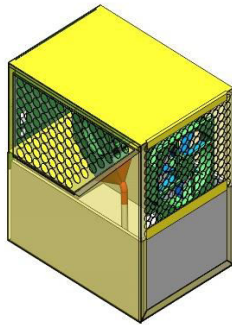


Fig.1 isometric view of purifier

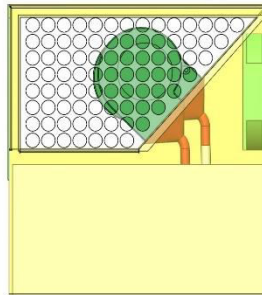


Fig.2 side view of the purifier

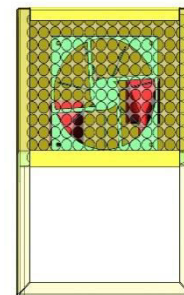


Fig.3 back view of purifier

VI.FABRICATION PROCESS

Metal fabrication is taking a raw material, typically sheets of metal and other flat materials, through a series of processes to create a finished end product. Virtually every industry relies on metal fabrication to operate efficiently, create the tools they need, develop products, etc. As you can see, it is a very broad industry that helps the entire world run.

fabrication is the process of manufacturing sheet metal and other flat materials to make them conform to specific shapes. The process starts with sheet metal around a quarter of an inch thick or less. At this thickness, the sheet metal and other flat materials is pliable enough to assume different shapes. Using this metal, fabricators alter the sheet to create a specific shape. This takes place through cutting, stamping, shaping, folding and welding. Another related practice is custom fabrication, meaning the creation of new custom parts using novel combinations of these processes.

All this work is completed by metal fabricators — highly skilled specialists who are trained to cut and manipulate metal with a surgeon's precision to the desired shape. These fabricators often work out of large-scale manufacturing operations or specialized fabrication shops. The shops themselves vary widely, offering general fabrication services or specialized fabrication for medical and IT industries.

Sheet metal and other flat materials fabrication may require additional parts to be added during the process, including but not limited to.

VII.WORKING PRINCIPLE

An air purifier and humidifier that uses water as a filter typically works on the following principle:

Air intake: The device has an air intake vent that draws in the surrounding air, containing dust, pollen, smoke, and other impurities.

Water filtration: The first line of filtration occurs when the air passes through a water curtain or a series of water droplets. The water droplets in the filter trap and absorb larger particles, such as dust and pet dander, and remove them from the air.

Humidification: The filtered air then moves through a humidifying unit that uses a water reservoir or a wick filter to add moisture to the air, which helps to alleviate dryness in the air and reduce static electricity.

Evaporation: The filtered air and moisture are then circulated through the device's internal fan, where it passes over an evaporative filter. The filter is usually made up of porous material that absorbs the water and releases it into the air as a fine mist or vapor.

Air output: The final step is the release of clean, moist air back into the room, which helps to improve air quality and provide relief for respiratory issues and dry skin. Maintenance: To maintain optimal performance, the water filter needs to be regularly cleaned or replaced to prevent mold and bacteria buildup, which can adversely affect air quality.

In summary, an air purifier and humidifier that uses water as a filter works by filtering the air through a water curtain, humidifying the air, and then evaporating the moisture to release clean, moist air back into the room. Regular maintenance is essential to ensure optimal.

VIII.ADVANTAGES

- A Low-Cost Purifier.
- No Expensive Filters Just Water.
- Quiet Operation.
- Easy Maintenance.
- Also acts as a Humidifier.
- Low Power Consumption.
- Easy To Use.
- Can be used as an Oil Diffuser.

IX.RESULT

Successfully we achieved the result of “Silent Air Purifier & Humidifier” to counter the breathing issue due to polluted air, we here develop a mini air purifier with that does not use expensive filters but rather uses water as an air filter.



Fig.4 Air purifier

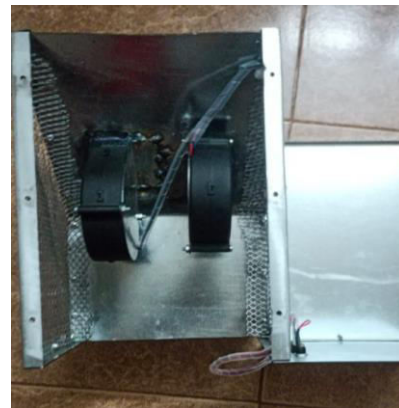


Fig.5 Inside of air purifier

X.CONCLUSION

The outcome of this project is a next generation air purifier with a new filter innovation. The new filter makes it possible to have a smaller housing compared with competitors but still having high performance. This means that it does not take up as much space and is easier for the user to move around from place to place inside the apartment; it is also equipped with a handle. The 360° Air is also easier to fit in more places in a home because its design does not restrict its position as much as competitors. That is, it has been given a round shape and have therefore no defined backside that needs to be placed



towards a wall. The uniform round shape allows more varieties of how it can be positioned in a home. The filter is cleanable and does not need to be changed. The filter also has a low pressure drop which results in less generated noise and lower energy consumption. All these advantages that is the outcome of the new filter innovation makes this a product that stands out from competitors and makes it easy to sell for sellers and should generate revenue for the brand owners. The air purifier is a product that solves the problem of bad indoor air quality. It is a problem that most of all have its effect on large cities and where the population is dense. Many cannot afford an air purifier and many have problem to cover the expenses of buying new filters. The 360° Air is a more socially sustainable than most competitors because it is cheaper in long term which results in more people being able to buy an air purifier that might be vital for their health. Even if the brand owners, manufacturers and sellers would not earn money from people regularly buying new filters, the 360° Air should still be economically sustainable because of the new filter innovation and its benefits that would attract more buyers. The fact that the 360° Air use less material than competitors will most likely also result in cheaper manufacturing. As mentioned before, the air purifier developed in this project is also more environmentally sustainable than competitors in the existing market.

XI. FUTURE WORK

Increase in vehicular population, severe construction activities, and industries are largely contributing to an increase in outdoor pollution across Indian cities. While most of us have taken control of the food and water intake, but the air we breathe is ignored completely. Respiratory symptoms, especially among children are on the rise which signals in the effects of toxins that are causing severe damage to the respiratory system. It is also evident from the increase in your trips to the doctor or medication. Breathing air clean and purified by Sharp air purifiers reduce the number of toxins entering our body, thereby decreasing the need for medication or taking days off from work. This is missing from most brand commitments since they are too occupied with reducing dust or other particles and have diverted from the actual need and benefits that a consumer expects. Currently, most Air Purifiers come with HEPA& Carbon Filters which can provide solution up to an extent and be going forward and as consumer awareness increases demand for higher technology marvels like Plasma cluster Ion Technology will be an accepted standard so as to get holistic solution towards Air Pollution. Also, confused messaging with respect to performance indicators of Air Purifiers i.e. in build Air Quality monitors which are inefficient in capturing complete constituents of Air Pollution and can only provide mental satisfaction to users by providing inconsistent readings (only on PM 2.5 which constitute only 25 percent of Indoor Air Pollution) will see an end.

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