



DESIGN AND IMPLEMENTATION OF AN AIR MULTIPLIER FAN

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ABSTRACT: In this paper we designed an Air Multiplier fan will help the patients and people to get fresh air with the help of HEPA (High Efficiency Particulate Air) Filter in its cylindrical base and it supplies constant flow of fresh air. We have designed and implemented the Air Multiplier fan (Radial) which has hidden blades in the cylindrical base (Axial), so that safer than the conventional fan. It multiplies the volume of in taken air automatically into 15 times that travels over an airfoil through suction process.

I. Introduction

In today's life, performance and noise are the two important factors of fans that are studied and considered. Typical conventional fans have big blades which may cause some defects such as dislodged of their shaft after long working time and the efficiency of fan decrease with larger blades. These fans are noisier and may circulate the dust particles into the surrounding air, which affect asthma patients and children Typical fans are divided into two types: axial (large volume displacement of air) and radial (stable air flow in an over pressure situation).

II. BLADELESS FAN STRUCTURE

The Air Multiplier (radial) multiplies the air that sucks in. The air enters through holes at the cylindrical base of the fan. A DC motor runs a impeller fan pushes air to the ring through the motor and blades that smooth the airflow. At the base of the fan, the air holes is wide. But air is accelerated, induced and entrained, this is the point at which the air is multiplied. The air outlet of the tube is titled 16° , so as air is forced out through the slit i.e. surrounding air is sucked through the base. The air flow is induced the air behind the fan to be pulled and also the air around the edge of the tube along too the same direction. This results the Air Multiplier can multiplied its initial air up-to 15 times of inlet. This type of fan uses consumes less electricity and generates less noise than the conventional fan.

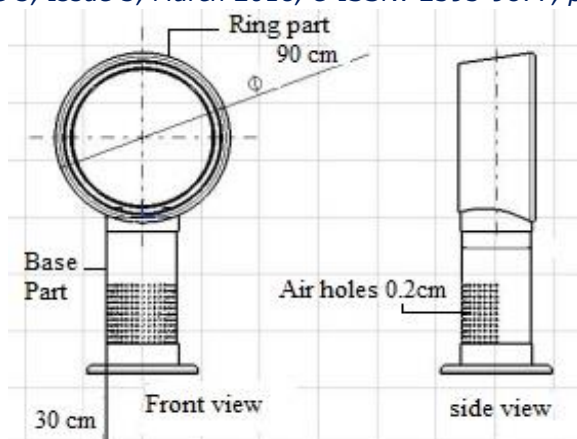


Figure 1

B. IMPELLER

Impeller is fabricated using the fiber or PVC material. This is the most important product in an air multiplier. Because it draw the air from the air holes and gives powerful airflow.

Mixed flow impeller i.e. it combines the technologies of turbo charges and jet engines.

Impeller contains asymmetrically aligned blades which is attached to the motor.

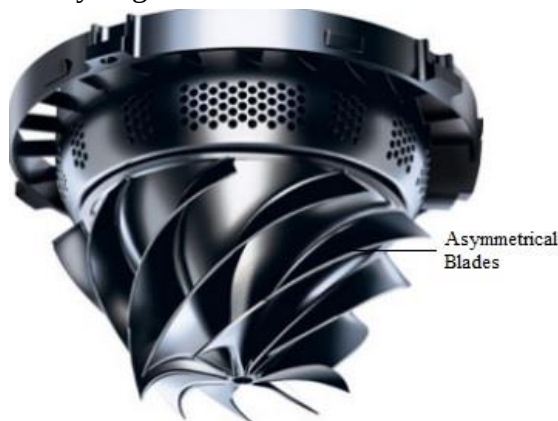


Figure 2

C. RING

For the upper part, the bucket was cut into two circular parts of 95mm and 100mm width. The two parts were mounted one on top of the other with a strip in between to maintain the gap through which air is circulated in upper portion.



Figure 3

The back peripheral side of the portion is covered with water pipe from which air is reflected and expelled out. The inner peripheral side was attached with a small circular part of 30mm width with spacers provided in between from where air is expelled out.

D. AIR MULTIPLIER

Bladeless fan operation is mainly classified into the four stages. They are

- [1] Air is sucked in
- [2] Air is accelerated in the ring
- [3] Air is induced from behind
- [4] Air is entrained around the slit

Stage [1] Air is sucked in

Motor sucks 32 liters of air per second with the help of mixed flow impeller. Air is drawn from the air holes in the base. The suctioned air is send to the ring.



Figure 4

Stage [2] Air is accelerated in the ring

Suction air is accelerated in the ring and comes out through the slit that creating a powerful airflow. The air outlet of the tube is titled 16°, so as air is forced out through the slit



Figure 5

Stage [3] Air is induced from behind

As the air passes from the slit, it draws air from backside of the fan, this process is known as an inducement. This induced air, then combines with the air in front of the fan and gets accelerated. Hence the air comes out from of a 2mm slit and induced air is in the same direction.

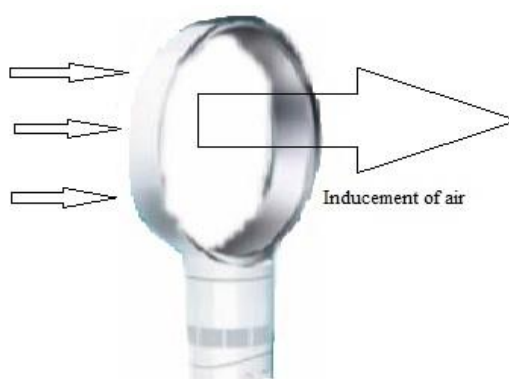


Figure 6

Stage [4] Air is entrained around the slit

Air in front of the fan is also added to the airflow from the slit, known a entrainment process. The air is sucked by the motor is through inlet. Then the output air from the ring is 15 times of the inlet.

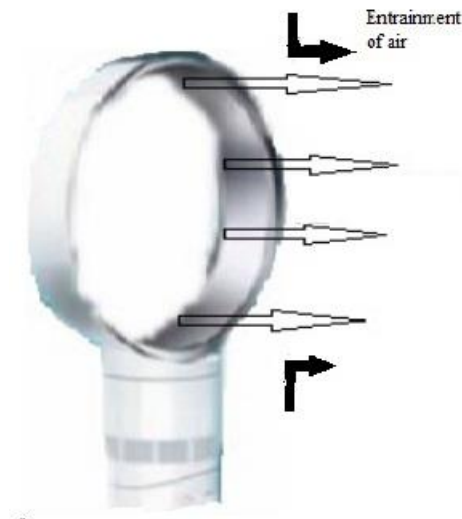


Figure 7

AMPLIFIED AIR

The figure 3.13 shows the entrained air with the volume of 1×15 times with the constant flow of air.

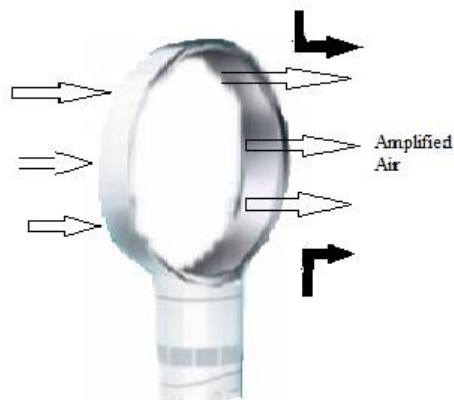


Figure 8

The velocities of air at different distance from the fan have been tabulated and shown below

S No	Distance (m)	Velocity of air from Bladeless Fan (m/s)
1	0.5	4.01
2	1.0	3.23
3	1.5	2.50
4	2.0	2.05
5	2.5	1.82

CONCLUSION

Thus the Design of the Ring is completed, which gives a smooth airflow and clean air. Use of polypropylene bucket as the material makes it light in weight and reducing its chances of breakage. It helps to reduce the price and with the help of HEPA (High Efficiency Particulate Air) filter in its cylindrical base, the fan supplies a constant flow of fresh air and has hidden blade in the cylindrical base and safer than the conventional fan. Finally the fan could amplify the volume of in taken air automatically about 15 times that travels over an airfoil through suction process.

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