

# Bevel Geared Mechanism for Portable 360° Pedestal Air Cooler

Franklin Manoah S K, Abdul Kadar J, Hemanth V, Aravind Raj P and Dr.M.Muthukumaran

**Abstract---** *The main aim of this project is to reduce the quantity of air coolers used to cover a large area, reduce the amount of power consumed and to cover 360° surroundings. The use of four air coolers can be reduced by this one 360° Geared Portable Air cooler. It is a combination of a modified pedestal fan with the principle of evaporative cooling. It can be done by mechanical-electrical setup with a single motor being used to drive three sets of fan blades using bevel-pinion gear setup. Traditional pedestal fan cannot cover 360° surrounding. Evaporative coolers can cover 360° surrounding but they are heavy, occupies lot of space and consumes more energy in doing so. This paper addresses about the 360° Geared Portable Air cooler which dismisses all those drawbacks. It covers 360° surrounding, highly efficient, frees up a lot of space and it is easily portable.*

**Keywords** –Blades, Impeller, Swamp.

## I. INTRODUCTION

A mechanical fan is a machine which is used to create flow within a fluid, typically a gas such as air. A fan consists of a rotating arrangement of vanes or blades which act on the air. The rotating assembly of blades and hub is called as an impeller, or a rotor, or runner. Usually, it is contained within housing or case. This may direct the airflow or increase safety as it prevents objects from contacting the fan blades. Most fans are powered by electric motors, but other sources are also used such as hydraulic motors, internal combustion engines, hand cranks and solar power.

Fans have evolved their way into modern air coolers. They work on the principle of evaporative cooling. Evaporative cooling is a type of environment cooling techniques that cools the surrounding air using water evaporation technique. It is used in large IT facilities and

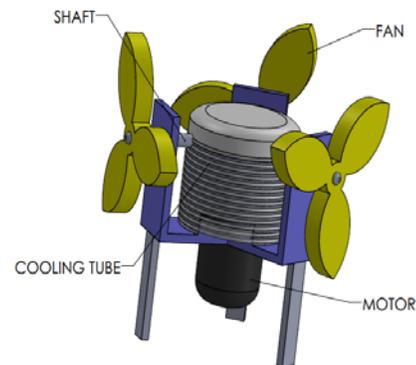
data center to provide air cooling or conditioning services. Evaporative cooling is also called as swamp cooling, desert cooling and wet air cooling. An evaporative cooler is a device that cools the air by evaporation of water.

## II. COMPONENTS USED

The components used for the construction of 360° Geared Portable Air Cooler are

- AC Motor,
- Bevel-pinion gears
- Shafts
- Bearing
- Mounting stand
- Housing
- Aluminium sheet metal
- Water tube
- Fan blades
- Safety grill

## III. DESIGN



## IV. FABRICATION



Franklin Manoah S K, UG Scholar, Department of Mechanical Engineering, SNS College of Engineering, Coimbatore.

Abdul Kadar J, UG Scholar, Department of Mechanical Engineering, SNS College of Engineering, Coimbatore.

Hemanth V, UG Scholar, Department of Mechanical Engineering, SNS College of Engineering, Coimbatore.

Aravind Raj P, UG Scholar, Department of Mechanical Engineering, SNS College of Engineering, Coimbatore.

Dr.M.Muthukumaran, Associate Professor, Department of Mechanical Engineering, SNS College of Engineering, Coimbatore.

DOI:10.9756/BJIEMS.8365

S.NO	PART NAME	QUANTITY
1	AC MOTOR	1
2	BEVEL GEAR	1
3	PINION GEAR	3
4	FAN BLADES	3
5	WATER TUBE	1

#### V. SPECIFICATIONS

- Specifications of motor
  - Voltage - 220V
  - Watts - 50w
  - Ampere - 0.5 amps
  - Type - AC motor
  - Rpm - 1000
- Specifications of gears
  - Bevel
    - Quantity - 1
    - Diameter - 50mm
    - No of teeth - 32
    - Material - Mild steel
  - Pinion
    - Quantity - 3
    - Diameter - 25mm
    - No of teeth - 17
    - Material - Mild steel
- Specifications of bearings
  - Model - 6000z
  - Type - Aluminium Composite
- Specifications of shafts
  - Quantity - 3
  - Diameter - 10mm
  - Length - 80mm

- Specification of water tube
  - Quantity - 1
  - Diameter - 10mm
  - Length - 10m

#### VI. EXPERIMENTAL SETUP

The working diagram of 360° Geared Portable Air Cooler is given below. The AC motor is mounted inside a mounting stand by means of screws and wood blocks. The shaft of the AC motor is coupled to the shaft connected to a bevel gear. This forms the base of the setup. Three pinion gears are aligned in an angle of 120° with each other. Each pinion is mated to the bevel at an angle of 90°. Shafts which are mounted to bearing are connected to each of the pinion gears. A sheet metal is used to cover the setup. Slots are drilled in the sheet metal for the shafts from the pinion gears. A water tube are wrapped around the sheet metal. Fan blades are attached to each of the shafts protruding outside. A steel or plastic grill is used to cover the whole setup to prevent from contact of the blades.

#### VII. WORKING METHOD

When the power supply is given, all the blades rotate simultaneously producing the flow of air throughout 360° direction. Water is poured into the water tube through the inlet. As a result the temperature of the air when passed through the water tube is reduced due to evaporative cooling. The fan sucks the air and blows it into the surroundings. Hence cool air is comes out of the fan.

#### VIII. ADVANTAGES LIMITATIONS AND APPLICATION

##### *Advantage*

- It can reduce the quantity of usage of normal air coolers.
- It can cover a large region of space.
- It can produce cooled air in 360° surrounding.
- Its efficiency is higher compared to the number of normal air coolers that are used to cover an area.
- It is portable.
- It is very easy to handle and repair.
- It can also be used as 360° pedestal fan if the water tubes are removed.
- It occupies less space.

##### *Limitations*

- It can be placed only at the centre.
- Angular movement of the fan is limited.
- It produces slight noisy vibrations.

##### *Application*

- It can be used in open halls and auditorium when they can afford a normal air cooler to cover the area.

- It can be used in manufacturing industries as it occupies less space and covers 360° surroundings.

#### IX. RESULT

The 360° Geared Portable Pedestal Air Cooler can produce cool air in 360° surroundings. It produces less noise and consumes very less power when compared to normal air coolers.

#### X. CONCLUSION

This project has lot of potential in the future. The 360° Geared Portable Pedestal Air Cooler will make a tremendous success in the current market as it is energy and cost efficient, suitable for all kinds of environment frees up a lot of space occupied by normal air coolers and pedestal fans.

The 360° Geared Portable Pedestal Air Cooler also has modern concerns. It is designed in a way to perform the required task with minimum maintenance and cost.

#### REFERENCES

- [1] "Electrical Men of the Times: Doctor Schuyler Skaats Wheeler". Popular Electricity and Modern Mechanics: 286–287. September 1914.
- [2] Cory, William (2010). Fans and Ventilation: A practical guide. Elsevier.
- [3] Paul Mortier. Fan or Blowing apparatus. US Pat. No. 507,445
- [4] Bryant Essick (1945). "Pad for evaporative coolers". U.S. patent 2391558
- [5] Zellweger, John (1906). "Air filter and cooler". U.S. patent 838602.
- [6] "History of Evaporative Cooling Technology". AZEVAP. 2005.
- [7] "Evaporative cooler/ Evaporative cooler". Waterlinecooling.com, 2013
- [8] Fancollectors.org – A Brief History of Fans Information Provided by Steve Cunningham – July 5, 2010.
- [9] Grondzik, Walter T.; Kwok, Alison G.; Stein, Benjamin; Reynolds, John S. (2010). Mechanical and Electrical Equipment. John Wiley & Sons
- [10] Maheshwari, G.P.; Al-Ragom, F.; Suri, R.K. (2001). "Energy-saving potential of an indirect evaporative cooler". Applied Energy. Elsevier. 69 (1): 69–76. doi:10.1016/S0306-2619(00)00066-0.