

### **STEP ONE: Identify the purpose**

The purpose of this project is to learn how the fan works to create a useful, functioning system in order to achieve the overall goal of cooling a room or person down. There are many areas of research that our group would like to focus on. One of these areas would be the components of the motor which would be electrical engineering. With the skill of knowing how the motor is put together, we can figure out how the fan works from the inside to control the fan blades themselves. We also want to research the outer layer design to see if it makes any difference with the efficiency of the fan. Is it more efficient or less efficient than today's fan given that this fan is many years old?

### **STEP TWO: Develop a hypothesis**

There are two main systems of the fan; the electrical and the mechanical. The mechanical system is there to provide structural support as well as actually cause the components to move. The electrical system is there to send information through wires and also power the fan as a whole.

### **STEP THREE: Disassembly**

The disassembly of the fan started with separating the fan itself from the base. After that, the plastic cover of the motor had to be cut off in order to be able to access the motor and transformer. The main component the manufacturers chose to hold this product together is metal Phillips-head screws. After the motor has been separated from the base, the chassis of the motor can be split into two parts, which reveals the electromagnets and axle that is attached to the fan blades. After the fan itself has been completely disassembled, the base can be unscrewed to reveal the spring loaded switches which determine the speed of the fan. After all that has been disassembled, the fan has been disassembled to the final components and it cannot be further taken apart.

### **STEP FOUR: Analyze the elements**

Functional analyze

- Base
  - Keep the fan standing upright.
- Different modes
  - Allows the user to switch between high and low settings.
- Stand
  - Allow the fan to have some height, rather than just being on the floor.
- Motor
  - Electronically moves the blade on the axle/shaft creating air movement.
- Crank
  - Allows rotation of the blade. (Back and forth)
- Blade
  - Moved by the motor, moves air
- Goard
  - Protects blade from being hit by another object

## Structural Analysis

- Starting from the base up
  - There was a cover/guard holding together the base of the fan. Once you unscrew that it's led to another plastic cover, which holds the spring loaded switches for different modes. Also carrying a lot of the electrical elements up into the motor. Then running up into the stand of the fan some electrical wires to connect to the big motor perched on top. On the motor, was a capacitor, connecting the copper coils formed in a circular motion. The motor works, by sending current through opposing pairs of magnets to create a rotating magnetic field. Which causes the axle to rotate spinning the blade.

## Material Analysis

- Base guard
  - hard plastic. Cheap but still protects the wires
- Base
  - more hard plastic to hold the wire housing and spring loaded switches
- Switches
  - Made with steel springs, these switches help the user to change between different modes
- Electrical Wiring
  - Copper wires that run up into the motor
- Physical motor
  - Copper Wiring
  - Hardened String
  - Steel Chasse
  - Steel Axle
  - Possibly Iron
- Blade
  - More hard plastic
- Cage
  - Steel used to make sure nothing hits the blades while it is running.
- Seal
  - The same material the cage. Just to make sure the cage stays intact around the blade.

## Manufacturing Analysis

- How we assume it was manufactured, as they made all the molds for the guards and the blades. Then they built their motor and all the switches were installed to set the motor speed at different rates to get different levels from the fan. Then the crank was added on for rotation of the blades. Once the blades of the fan were put on the axel. The cage was sealed on with a clamp to make sure it stays on.

## Separation Methods

- In order to separate this fan, all you need is a screwdriver and some scissors.

## **STEP FIVE: Prepare the report**

**STEP SIX: Product Redesign**

There is a lot that could be changed about this fan. First of all, the motor itself could be made to be more efficient by putting more current through it so the blades can move faster creating the perfect amount of cool air for your home. Another idea could be changing the material of the blade to make it more efficient like having it be made out of aluminum or carbon fiber. This will make sure that the blades will not bend making the blades more sturdy and reliable to create more flowing air. This fan is pretty old so these changes have been made to create more efficiency in the newer models of table fans.