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Automatic Air Fan Controller for Air Conditioner

Krishna kamble[1], Yashwant Kamble[2], Yash Shinde[3], Omkar Waygaonkar[4], Yogesh Patil[5]

Department of Electronics and Telecommunication Engineering[1-5]

Vishweshwarayya Abhiyantriki Padvika Mahavidyalaya, Almala, India

Abstract: *The Automatic Air Fan Controller for Air Conditioners is a smart system designed to enhance the energy efficiency and user comfort of air conditioning units. This system integrates temperature and humidity sensors to automatically adjust the fan speed based on the ambient environment. By optimizing the fan's operation, the controller ensures that the air conditioner operates at peak efficiency, reducing energy consumption while maintaining a comfortable indoor climate. Additionally, the system includes a user-friendly interface that allows for manual override and customization of settings. This innovation offers significant potential for reducing electricity bills and extending the lifespan of air conditioning units by minimizing unnecessary wear and tear. Through its automated adjustments, the controller contributes to a more sustainable and efficient cooling solution, making it suitable for both residential and commercial applications*

Keywords: Automatic Air Fan Controller

I. INTRODUCTION

Air conditioners (ACs) have become an essential part of modern life, providing comfort in both residential and commercial spaces by maintaining a controlled indoor environment. However, conventional air conditioning systems often operate with fixed fan speeds, leading to inefficient energy consumption and suboptimal performance. The fan speed in traditional AC units either runs at a constant rate or is manually adjusted, which may not always align with the room's current needs, resulting in unnecessary energy use and fluctuating comfort levels. The Automatic Air Fan Controller for Air Conditioner aims to address these limitations by introducing a system that automatically adjusts the fan speed based on real-time environmental factors such as room temperature and humidity. Using sensors, the controller continuously monitors these parameters and adjusts the fan's operation to optimize both cooling performance and energy efficiency. This ensures that the air conditioner operates only when needed, reducing electricity usage while maintaining an ideal indoor climate.

The implementation of such a system is not only energy-efficient but also contributes to the longevity of the air conditioning unit by reducing the strain of running the fan at unnecessary speeds. Furthermore, with the ability to integrate with smart home systems, users can control the system remotely, adding convenience and flexibility. In essence, this project seeks to create a smarter and more sustainable way of using air conditioning technology to improve comfort, reduce energy The Automatic Air Fan Controller functions by utilizing temperature and humidity sensors integrated with an air conditioning system. The system works through a feedback loop that continuously monitors environmental conditions and adjusts the fan speed accordingly to maintain an optimal and energy-efficient cooling process. The primary components and their roles in the operation of the system are as follows:

II. METHODOLOGY

the sensors and adjusts the fan speed as needed. If the room cools down, the system may reduce the fan speed to save energy. Conversely, if the room heats up, the fan speed will increase. **Energy Efficiency Temperature Sensors**: These are placed inside the room and often near the evaporator coil. They measure the air temperature in the room.**Humidity Sensors**: Humidity levels can also be detected, and high humidity may require higher fan speeds to ensure proper airflow for dehumidificaThe fan speed is adjusted based on the temperature and humidity readings. When the room is cooler, the fan speed can be lowered to ensure quieter operation. When the room is hotter or more humid, the fan will automatically increase its speed to increase cooling efficiency.In some systems, the fan speed is also adjusted based on

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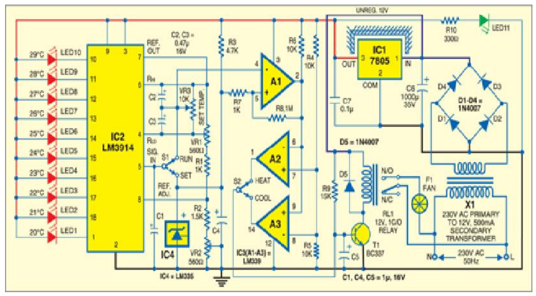
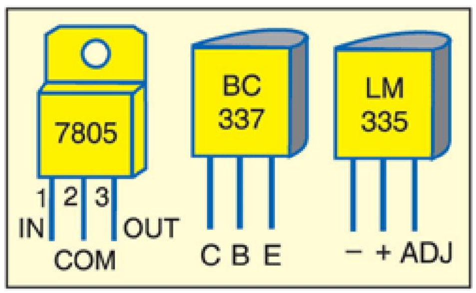
the load on the compressor. For instance, when the compressor is running at full capacity, the fan speed may increase to optimize heat exchange.**Central Controller**: The air conditioner's internal controller (such as a microcontroller or a smart system) processes data from the temperature and humidity sensors and decides the optimal fan speed.

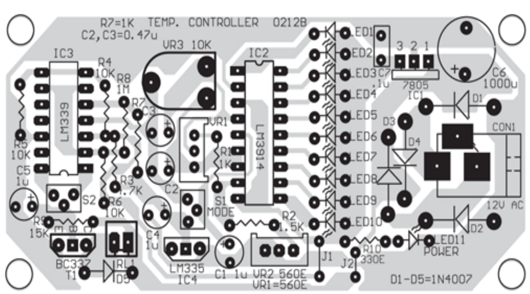
III. BLOCK DIAGRAM



IV. COMPONENTS USED



Power for the circuit is derived from mains supply. The 230V, 50Hz AC mains is stepped down by transformer X1 to deliver a secondary output of 12V, 500 mA. The transformer output is rectified by a full- wave rectifier comprising diodes D1 through D4, filtered by capacitor C6 and regulated by IC 7805. Capacitor C7 bypasses ripples in the regulated supply.IC LM3914 is configured for bar-graph mode by connecting its pin 9 to 5V supply. It functions both as the temperature and set-point indicator, depending on whether switch S1 is in RUN or SET position, respectively. A highly stable internal reference voltage is generated at pin 7 using resistor combination R1-R2 and presets VR1 and VR2. This voltage is directly fed to the upper end of the internal voltage divider chain at pin 6. Pin 4, the lower end of the internal voltage divider chain, is connected to the wiper of preset VR1. The voltage difference between pins 4 and 6 determines the range of temperature control.



Potentiometer VR3 connected between pins 4 and 6 of IC2 provides temperature setting depending on the position of switch S1. The comparator inside IC2 compares the voltage at pin 5 with the voltage difference across pins 4 and 6, and incrementally turns on LED1 through LED10 at every tenth of the temperature range. Current driven through the LEDs is regulated and programmable, thus eliminating the need for resistorsThe temperature control function is performed by

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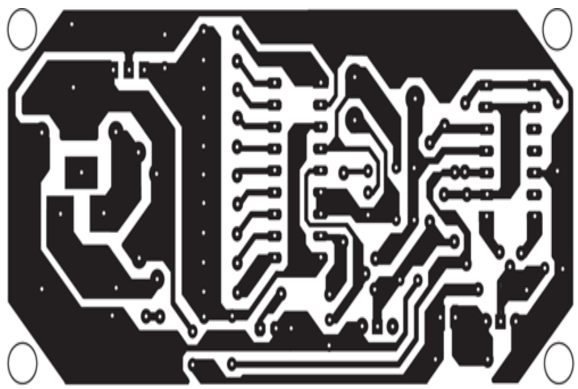
comparator IC LM339. This IC uses only three of the four independent precision comparators operating off a single power supply. Comparator A1 is wired as a non-inverting comparator with hysteresis. R6 is used as a pull-up resistor for comparator A1, while resistors R7 and R8 provide a hysteresis voltage. The inverting input of A1 at pin 4 is connected to the wiper of potentiometer VR3.The output of comparator A1 goes high when the voltage at its non-inverting input is greater than the voltage at the inverting input. Comparators A2 and A3 act as inverting and non-inverting buffers, respectively. Resistors R4 and R5 form a voltage divider which provides reference voltage at pins 7 and 8 for comparators A2 and A3, respectively. Mode switch S2 is used to select the output of A2 (pin 1) or A3 (pin 14). Pole of switch S2 is connected to the base of transistor T1. The base of transistor T1 is driven into saturation via resistor R9, which is connected to unregulated 12V supply. Relay RL1 is connected to the collector of T1. Therefore T1 acts as a switch for relay RL1. Diode D5 across the coil of relay acts as a free-wheeling diode. The motor of the AC fan is connected to the circuit through relay contacts. Thus relay switches the fan on or off. Temperature sensor IC LM335 acts as a zener diode. Its breakdown voltage is directly proportional to the absolute temperature at 10 mV/ºK. Resistor R3 limits the current



fan controller for ACs is shown in Fig. 3 and its component layout in Fig. 4. Assembling the circuit on a PCB minimises time and assembly errors. Use bases for ICs LM3914 and IC LM339. Enclose the assembled circuit in a suitable cabinet. On the PCB, provide suitable connectors for switches S1 and S2 and potentiometer VR3 to extend these out from the cabinet through cable.The sensor is brought out from the cabinet with a two-core cable. LED1 through LED10, switches S1 and S2, and potentiometer VR3 are mounted on the front panel of the cabinet. LED1 through LED10 are marked with calibrated temperature values.

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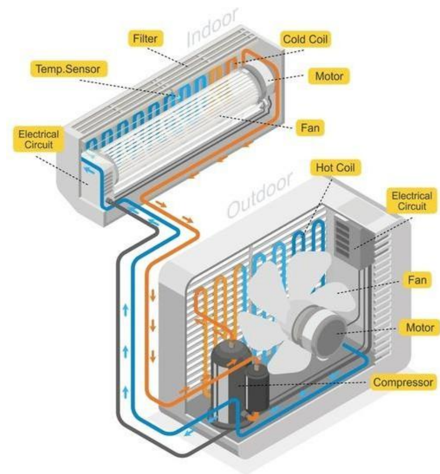
V. CIRCUIT DIAGRAM



VI. RESULT

The system will adjust the fan speed based on the room temperature. This means the fan will run at lower speeds when the room is cool, reducing the overall energy consumption. You won't waste power running the fan at high speeds when it's unnecessar. The automatic fan controller maintains a consistent room temperature by increasing fan speed when it's too warm and reducing it when the temperature cools down, ensuring that your space remains comfortable without constant manual adjustments. With a dynamic fan speed control, the fan will operate more quietly at lower speeds when control, the fan will operate more quietly at lower speeds when the cooling demand is less, resulting in a more peaceful environment, especially during nights or when the cooling need is minimal.By running the fan at optimal speeds rather than constantly at full power, wear and tear on the fan motor is reduced, potentially increasing its lifespan.

VII. CONCLUSION

The Automatic Air Fan Controller for Air Conditioner system offers an innovative and effective solution for optimizing air conditioning and fan performance based on real-time environmental conditions. By automatically adjusting fan speeds according to temperature and humidity levels, this system ensures energy efficiency, improved comfort, and cost savings in various applications such as homes, offices, industries, hospitals, and more. This system plays a critical role in maintaining an optimal indoor climate while reducing electricity consumption and extending the lifespan of both the fan and air conditioning units. It prevents unnecessary overcooling, minimizes wear and tear on equipment, and contributes to lowering operational costs. Moreover, its ability to function autonomously allows for hands free operation, reducing the need for constant manual intervention.

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