CONTENT

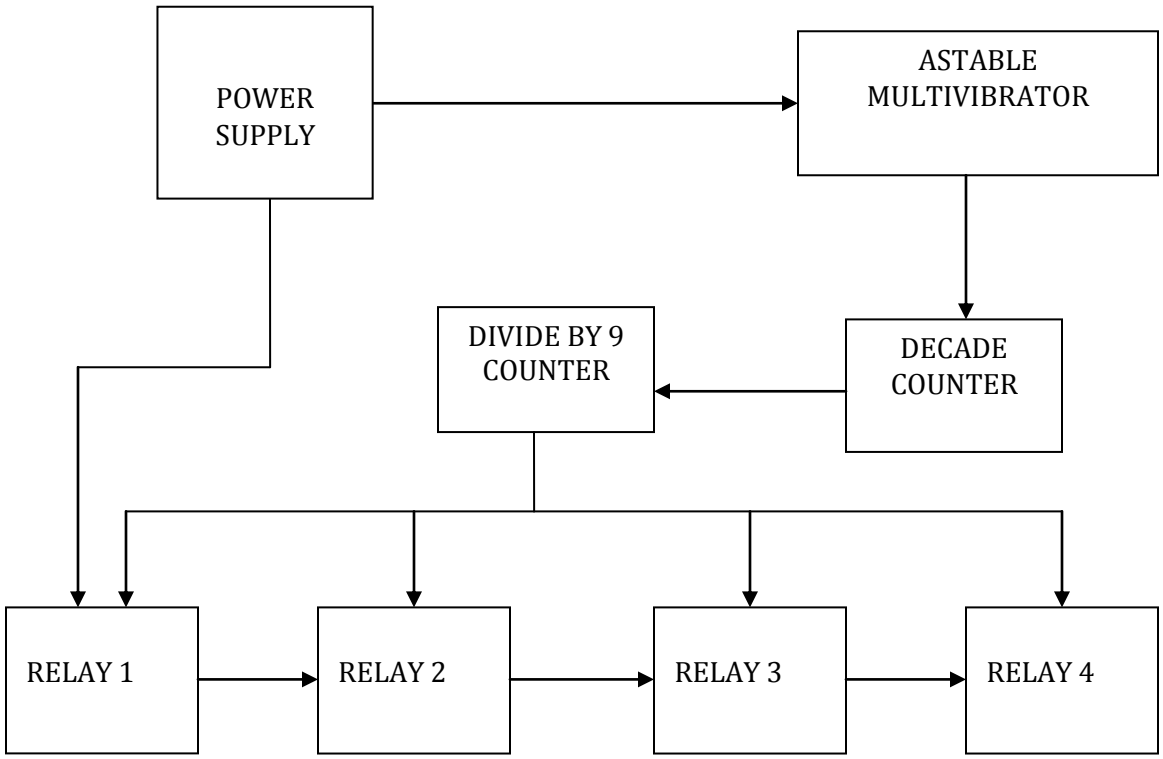
INTRODUCTION

This is a device to control the speed of fan and coolers automatically. The device presented here makes the fan run at a full speed for pre determined time. This speed is decreased to medium after some time and to slow then onwards after a period of 8 hours, the fan or cooler is switched off.

The circuit consist of IC1 (555 Timer IC) which is used as an astable multi vibrator used to generate clock pulses. These are fed to decade dividers or counters formed by IC2 and IC3 (IC CD4017B). These ICs act as divide by 10 and divide by 9 counters respectively. The values of capacitor C1 and resister R1 and R2 are adjusted so that the final output of IC3 goes high after 8 Hours.

So during summer nights the temperature is quality high but as time passes temperature starts dropping. So it is required to reduce the speed of a fan or cooler after particular periods. By using this device these reducing can be done automatically. This also makes the reduced conception of power.

BLOCK DIAGRAM



BLOCK DIAGRAM DISCRIPTION

The block diagram is shown above the important parts consist of a 555 Timer IC and 1 divide by 9 and divide by 10 counter and relays. Each block in the block diagram is explained in detail in below.

Astable Multivibrator

In this block diagram Astable multivibrator which is used as a pulse generator circuit it's high and low state are both unstable. It provides clock pulses for the working of the decade counter1. The output of the multivibrator toggles with the low and high continuously, infect generating a train of pulses.

Decade counter1

It accepts the output from the astable multivibrator as clock pulse. And the counter starts counting when there is a output at the astable output.

Decade Counter2

It accept the output from the decade counter1 and counter start counting till there is an output from the decade counter1 and it act as a divide by 9 counter.

Relay

This device simply acts as an electronic switch. When the output from the decade counter 2 reaches the relay terminal it will control the speed of the fan or cooler by switching of relays.

CIRCUIT DIAGRAM.

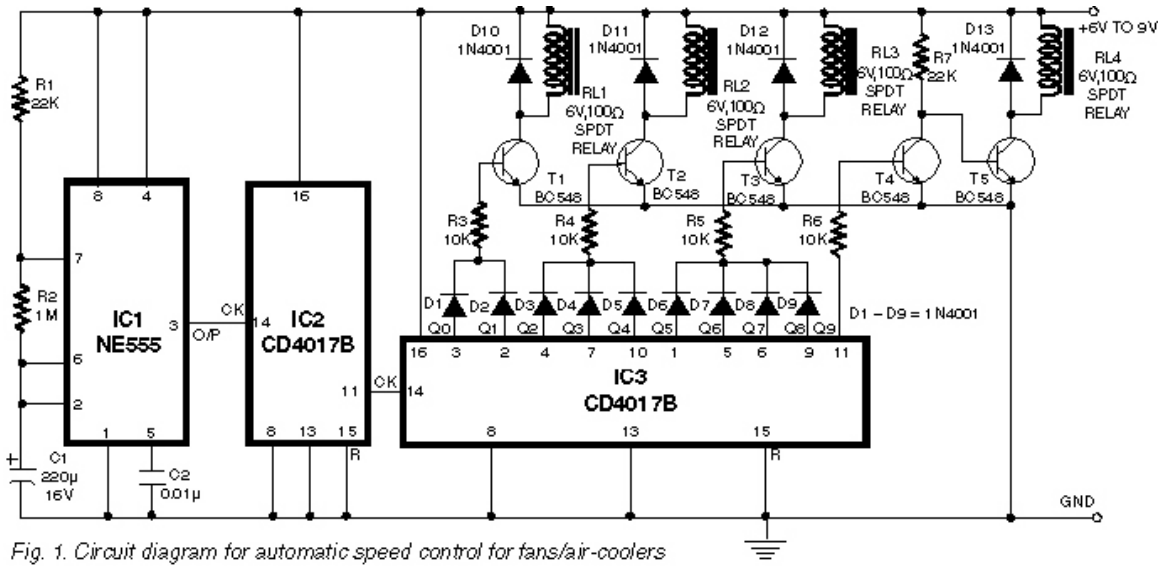


Fig. 1. Circuit diagram for automatic speed control for fans/air-coolers

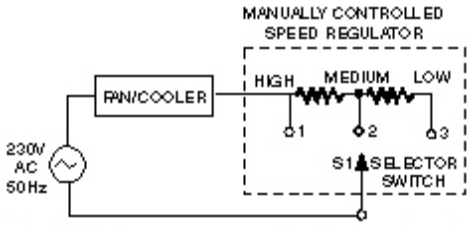


Fig. 2. Existing arrangement for fan speed control

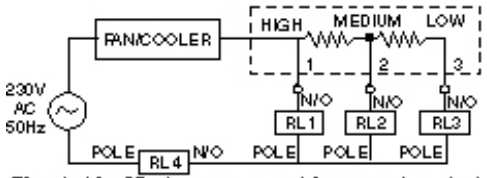


Fig. 3. Modified arrangement for speed control

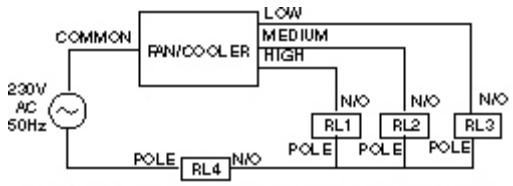


Fig. 4. Speed-control arrangement for cooler with different windings for various speeds

IC 4017 DECADE COUNTER

The M74HC 4017 is a high speed CMOS decade counter divider fabricated with silicon gate C2 MOS Technology. The M74HC 4017 is a five stage Johnson counter with 10 decoded outputs. Each of the decoded outputs is normally low and sequentially goes high on the low to high transition of the clocked input. Each output stays high for 1 clock period of the low to high after output 10 goes slow, and can be used in conjunction with the clock enable (CKEN) to cascade several stages. The clock enabled input disables counting when in the high stage. A clear (CLR) input is also provide which when taken high sets all the decoded outputs low. All inputs are equipped with protection circuit against static discharge and transient excess voltage.

FEATURES

Wide supply voltage range: 3V to 15V

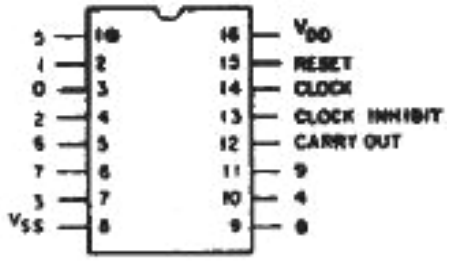
High noise immunity: 0.45V

Medium speed operation: 5 MHz

Low power: 10Micro W

Fully static operation

Pin Connection



IC 555 Timers

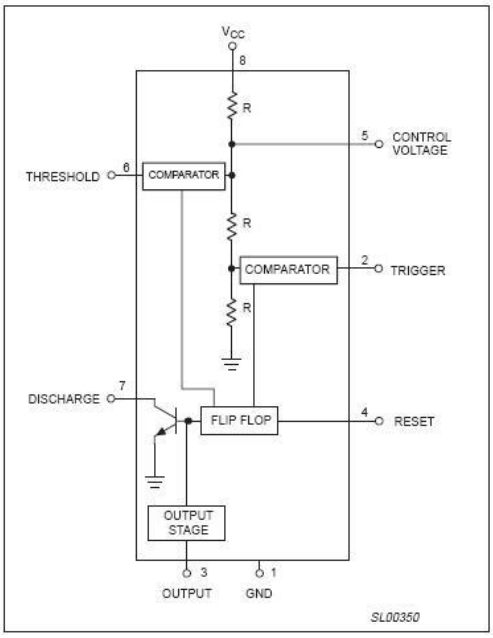
The 555 timer is an extremely versatile integrated circuit which can be used to build lots of different circuit. The simplicity of the timer in conjunction with its ability to produce long time delays in a verity of applications, has curved many designers from mechanical timers, op amp, and various discrete circuits into the ever increasing ranks of timer users.

TIMER FUNCTIONAL BLOCK DIAGRAM

Pin out of 555 IC

The 555 timer consist of two voltage comparators, a by stable flip flop , a discharge transistor, and a resister divider network. The resistive divider network is used to set the comparator levels. Since all 3 registers are of equal value, the threshold comparator is referenced internally at 2/3 of supply voltage level and trigger comparator is referenced at 1/3 of supply voltage. The outputs of comparators are tied to the bi stable flip flop. When the trigger voltage is mode below 1/3 of the supply, the comparator changes state and sets the flip flop driving the output to the high state. The threshold pin normally monitors the capacitor voltage of the RC timing network. When the capacitor voltage exceeds 2/3 of the supply the threshold comparator resets the flip flop which in turn drives the output to a low state. When the output is in allow state, the discharged transistor is on there by discharging the external timing capacitor. Once the capacitor is discharges, the timer will await another trigger pulse, the timing cycle have been completed.

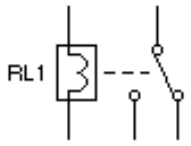
555 timer integrated timer is used for generating accurate time delays or oscillation. This will provide time delay ranging from micro seconds to hours. Maximum operating frequency is in excess of 500KHz. Outputs is TTL compactly. The 555 timer can b used with supply voltage in range +5V to +18V and can drive load up to 200mA



Features

1. Turn off less than 2 micro second
2. Operate in both astable and mono stable modes
3. High output current
4. Adjustable duty cycle
5. Temperature stability of .005 % per^0 C

RELAY

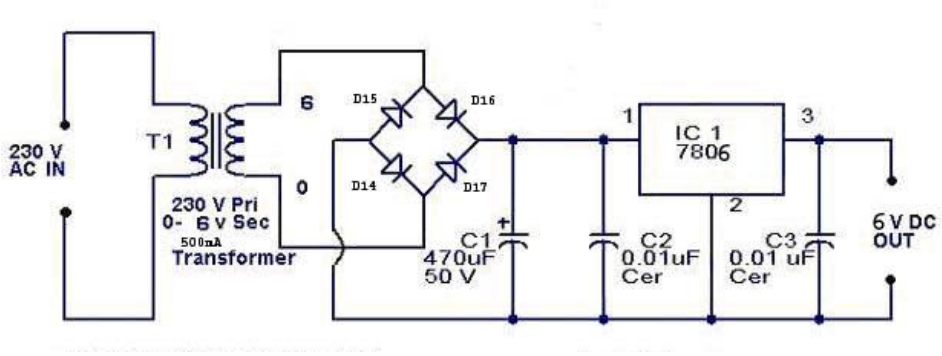


Relay, specialized electrical switch by means of which a high power device can be controlled by a device of much lower power. It consists of an electromagnetic coil and mechanical switch contacts that are pushed and pulled by the electromagnet. The electromagnet requires a current of only a few hundred mille Amps, produced by only a few volts, where as the contacts may be subjected to hundreds of volts and tens of amps may pass through them. The switch therefore enables a small electrical current and voltage to control a much larger current and voltage. Many smart switches and electronic circuits cannot with stand large electrical current (often more than 1Amp) and would be unable to control, for example a car head lamp bulb, which requires a current of many amps. This may be archived by placing a relay between the small switch on the car dash board and high powered head lamp bulb. Relay coils are available for a wide range of voltages, and some are designed to control many different switch contacts simultaneously.

POWER SUPPLY DESCRIPTION

The circuit of the power supply is shown above. The AC main stepped down by transformer to deliver the secondary input of 6 volt, 500 mA. The transformer output is rectified by a bridge rectifier comprising diode D_{14} to D_{17} filtered by capacitor C_3 and regulated by an IC to provide regulated 6 volt supply. The capacitor C_4 and C_5 , by passes any ripples in the regulated output.

Power supply circuit



WORKING

The circuit for the automatic speed controller for fans and coolers is shown in the figure. It has been designed to reduce the amount of electric power. In the circuit diagram IC1 (555 timer IC) act as an astable multivibrator. It is used to generate clock pulses. The pulses are fed to a decade divider counter, which is formed by IC2 and IC3. These ICs act as divide by 10 counters and divide by 9 counter respectively. The values of capacitors C1, resister R2 and R2 are so adjusted that the final output of IC3 goes high about 8hours.

The first two outputs of IC3 (Q0 and Q1) are connected (0 Red) via diode D1 and D2 to the base of the transistor T1. Initially output Q0 is high and there for relay RL1 is energized. It remains energized when Q1 becomes high. The method of connecting the gadget of the fan or cooler is given in the figure.

Initially the fan shall get A/C supply directly so it shall be run at high speed. When the output Q2 becomes high and Q1 becomes low, relay RL1 is turned off and relay RL2 is turned on. The fan gets A/C through a resistance and its speed drops to medium. This continues until output Q4 is high. When Q4 goes low and Q5 goes high, relay RL2 is activated thus the fan run at low speed.

Throughout the process, pin 11 of the IC is low, so T4 is cut off, thus keeping T5 in saturation and relay RL4 is on. At the end of the cycle, when pin 11(Q9) becomes high T4 get saturated and T5 is cut off. Relay RL4 is switched off, thus switching of the fan or cooler.

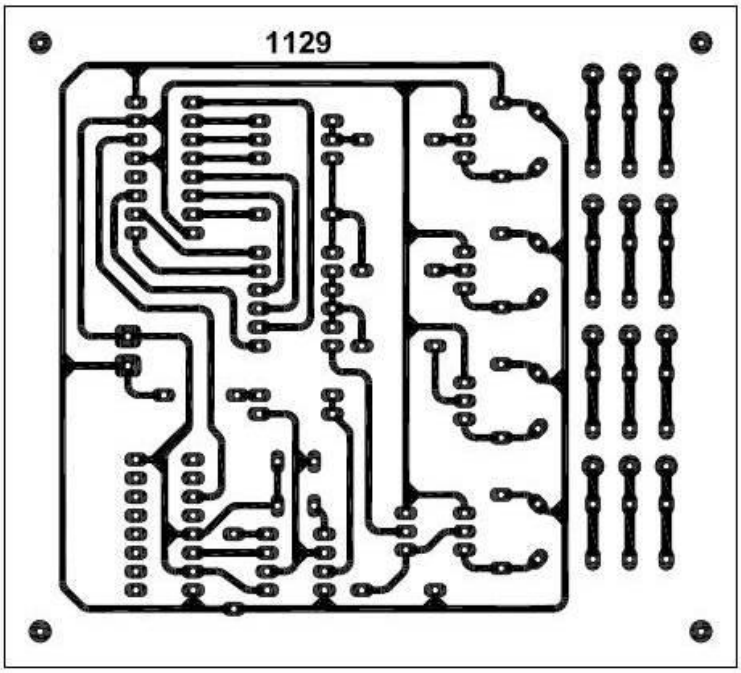
Using the given circuit the fan shall run at high speed for a comparatively lesser time when either of Q_0 or Q_1 output is high. At medium speed it will run for a moderate time period when any of three outputs(Q_2 to Q_4) is high, while at low speed it will run for a much longer time period when any of the four outputs(Q_5 to Q_8) is high.

It is possible to make the fan run at the three speeds for an equal amount of time by connecting three terminal decoded outputs of IC3 to each of the transistors T_1 to T_3. One can also get more than three speeds by using an additional relay transistor and associated components and connecting one or more outputs of IC3 to it.

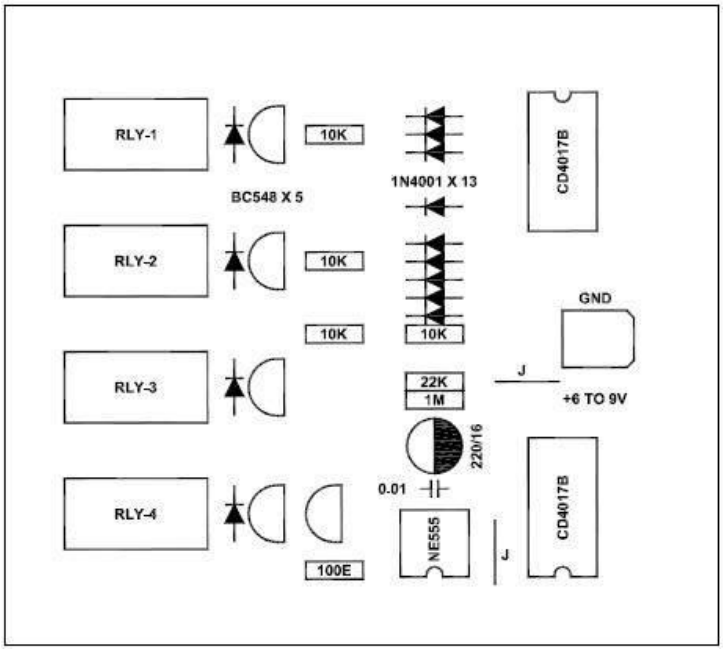
PRINTED CIRCUIT BOARD (PCB)

A flat board made of non conducting material, such as plastic or fiber glass, on which chips and other electronic components are mounted, usually in pre drilled holes designed to hold them. The components on a printed circuit board or, more specifically, the holes that hold them are connected electrically by pre defined conductive metal path ways that are printed on the surface of the board. The metal leads protruding from the electronic components are soldered to the conductive metal path ways to form a connection. A printed circuit board should be held by the edges and protect from dirt and static electricity to avoid damage.

PCB LAYOUT



COMPONENTS LAYOUT



APPLICATIONS

1. Used to control the speed of fans and coolers automatically.

2. This device can be used in bed rooms during night hours.

3. This device can be used as a power saving system for hotels and houses.

ADVANTAGES

1. No manual support is needed, it is fully automatic.

2. Electrical energy can be saved to a greater extent.

3. Only less power is needed for the operation.

4. Lifetime of fan or coolers can be increased.

CONCLUSION

The automatic speed controller for fans or coolers is used to control the speed automatically. We can also assign different time periods for each speed by designing the circuit to the need. By using this circuit the electric power can be saved to a greater extent and increase lifespan of fans and coolers

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