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Research paper

Design of cigarette disposal blower and automatic freshner using mq-5 sensor based on atmega 8535 microcontroller

M. Miftakul Amin[1], M. Azel Aji Nugratama[1], Andino Maseleno[2*], Miftachul Huda[3], Kamarul Azmi Jasmi[3]

[1]Politeknik Negeri Sriwijaya Palembang, Sumatera Selatan, Indonesia
[2]Department of Information Systems, STMIK Pringsewu, Lampung, Indonesia
[3]Universiti Teknologi Malaysia, Malaysia
**Corresponding author E-mail:andimaseleno@gmail.com*

Abstract

Design is an important thing in this research. This design includes the specifications of the components contained in the circuit and how the circuit works. In the early stages, component selection is done as needed. After getting the required components, the next step is the design and manufacture of tools. This design is intended to learn the circuit and work system tool that will be made. The purpose of making this tool is design and make blower smoke and auto fragrance disposal using MQ-5 sensor based microcontroller ATMega 8535. The benefits of making smoke disposal and auto fragrance blower using MQ-5 sensor based microcontroller ATMega 8535 is to dispose cigarette smoke and automatically fragrances the room to prevent the build-up of cigarette smoke in a room and to help minimize the dangers of cigarette smoke for passive smokers so that the air circulation in the room keeps going well.

Keywords: *Cigarette disposal; automatic freshner; microcontroller*.

1. Introduction

For smokers, smoking cigarettes are like basic necessities. A day without smoking will make the body feels unfit, the mind is difficult to concentrate and the mouth feels sour. An addict is even willing to change his morning breakfast with just a cigarette and a cup of coffee. Smoking has become a very common and widespread practice in society. The dangers of smoking on the health of the body have been researched and proven by many people. The harmful effects of smoking are well known. Many studies have shown that smoking habits increase the risk of diseases to develop such as heart disease and blood vessel disorders, lung cancer, oral cancer, laryngeal cancer, oesophageal cancer, bronchitis, high blood pressure, impotence and pregnancy disorders and fetal defects. In fact, the habit of smoking to divert from stress and emotional pressure, it is more difficult for them to escape from this habit compared to smokers who have no depression background.
In addition to cause various diseases, smoke of cigarette also causes a loss of healthy air, humans need a healthy air to boost immunity. with these abilities, the body will be better able to deal with virus attacks. Another benefit is to reduce respiratory diseases since it activates the movement of the nostril hairs, widening the airways, maintaining normal blood circulation, reducing respiratory rate, and increasing the ability to absorb and utilize oxygen.
Air pollution is a quite severe environmental problem for the world, which affects the environment and disrupts human health factors [1]. Cigarette smoke is the main cause of most air pollution, especially in the room that is very disturbing and has impact on human health. Inhaling cigarette smoke can potentially cause lung damage, heart disease, and for children will encounter cough, runny nose, and sore throat and lung diseases.
Various efforts have been made to minimalize the harmful effect of cigarette smoke for passive smokers, among others by making stickers or banners that bans smoking, putting no-smoking area, non-smoking area is a room or arena declared prohibited for production, sales, advertising, promotion, or use of cigarette. Even the government has made a regional regulation for no-smoking area. However, the method is proven to be less than effective because there are still one or two people who smoke in the place regardless of the rules.
Based on the background, as for the formulation of the problem is how to design and make smoke disposal and automatic freshener using MQ-5 sensor based on microcontroller ATMega 8535. In this research the authors provide limitations of the problem to just designing and making smoke disposal and auto-fragrance blower using MQ-5 sensor based on microcontroller ATMega 8535 which serves as a tobacco smoke in the room.

2. Literature Review

2.1 AVR ATMega8535 Architecture

AVR is a series of 8-bit CMOS microcontroller made by Atmel [2], based on RISC architecture (Reduced Instruction Set Computer). Almost all instructions are executed in one clock cycle. AVR has 32 general-purpose registers, flexible timer or counter with compare mode, internal and external interrupt, UART serial, programmable Watchdog Timer, and power saving mode. Some of them have internal ADC and PWM. AVR also has an In-System Programmable Flash on-chip that allows program memory to be reprogrammed in the system using SPI serial connection. AVR chip used for this final project is ATMega8535. ATMega8535 is a low-power 8-bit CMOS microcontroller based on enhanced RISC architecture. Most instructions are done on one clock cycle, AT-

Mega8535 has a throughput close to 1 MIPS per MHz, it makes system designer optimize power consumption versus process speed.

2.2 MQ-5 Gas Sensor

MQ-5 is a semiconductor sensor used to detect gas. An important material of MQ-5 is tin dioxide (SnO2), which has very low conductivity in clean air [3]. This gas sensor has not only a sensitivity to propane and butane gas but also other types of natural gas, such as cigarette smoke and alcohol. These sensors can also be used to detect flammable gases such as methane, so MQ-5 sensors are widely used in fire early warning applications. Table 1 shows the specifications of the MQ-5 sensor.

Table 1: MQ-5 Sensor Specification

Model Number	MQ-5
Sensor Type	Semiconductor
Sensing Resistency	10 kΩ - 60kΩ
Gas Detection	Isobutane, Butane, LPG
Concentration	300 – 1000ppm

3. Related Works

Research conducted by Sahu [4] has observed the use of MQ-3 sensors to detect the presence of alcohol in the vehicle. This research is very useful to prevent the occurrence of accidents caused by drivers driving the vehicle in a drunken condition due to the influence of alcohol. If the detected alcohol level exceeds a predetermined threshold, the vehicle engine will stop automatically, and the Global Positioning System (GPS) module will be active and provide vehicle location information to a previously registered GSM number. Similarly, research conducted by Rao [5] uses MQ-3 sensors to detect the presence of alcohol in vehicles. This study aims to avoid accident caused by motorists who consume alcohol while driving. If the alcohol level exceeds a predetermined threshold, the vehicle engine will be reduced in speed. In addition to human factors, vehicle accidents can also be caused by leakage of gas in vehicles [6]. This study uses the MQ-5 gas sensor to detect the presence of gas in the vehicle, so that the window glass can be automatically opened, if the gas level exceeds the set threshold and the information is displayed on the LCD screen.

The research that has been done by Kishore [7] uses gas sensor to control air pollution caused by motor vehicle emissions as well as industrial processing waste. Smoke sensor is used to detect carbon monoxide (co gas) from vehicle, if the detected level of pollution exceeds the level permitted by the government, the microcontroller will activate the buzzer and display air pollution level on the LCD screen. In addition, this research will also send a text message to a service center using GSM module.

The presence of internet of things (IOT) technology also encourages the use of such technology to be applied in controlling air quality and detecting pollution caused by motor vehicles and industry both outdoors [8-12] or indoors [13]. Dangerous gases such as Carbon Monoxide (CO) and Carbon Dioxide (CO2) can be detected using a wireless sensor network (WSN), and it is possible to build a system capable of monitoring and controlling airborne levels in urban areas. Information obtained from the sensor can be distributed through IOT technology and accessed using web-based technology.

MQ-2 and MQ-6 sensors are used to detect gas leakage in home security systems [14-19], if the gas level exceeds a predetermined threshold, the system will provide information using notifications in the form short message services (SMS), then the gas pressure can be lowered to avoid the occurrence of fire. Likewise, the MQ-5 sensor is used to detect a variety of harmful gases such as propane, butane, carbon monixide (CO), cigarette smoke, alcohol and so on [20, 21], the resulting system can detect harmful gases and create an early warning system in the form buzzer. Due to the importance of research on the detection of these gases, subsequently emerging some researches that do development by using mobile applications using smartphones [22].

To avoid accidents caused by fire, several studies have also been conducted. The use of the MQ-5 sensor used by Sharma [23] is to avoid the fires caused by LPG gas leaks. This research generates a fire warning and sends information using SMS to a number that has been registered in the system. Fire alarm system for fire prevention has also been conducted [24-26], using MQ-5 sensors to detect the presence of gas, and use the camera to take picture and display information on the screen. GSM Module and GPS module are also added to provide fire location information. IOT technology is also used to detect fires [27], MQ-5 sensor is used to detect the presence of gas, and GSM module is used to provide information to the parties concerned to cope with fires.

4. Tool Design

4.1. Objectives of tool design

The purpose of device designation is to get a good system from the created device. With the design of this tool which is the completion phase of the final report should be done systematically and interrelated so as to produce a device with good specifications.

4.2. Block diagram of the system

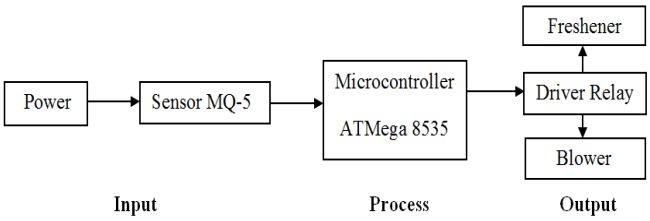

Fig.1: Block diagram of cigarette smoke disposal and auto fragrances

Figure 1 describes the design of the smoke cigarette exhaust and automatic fragrance using microcontroller ATMega 8535 consists of three parts, namely input devices, microcontrollers, and output devices. In the input device there is a sensor which is the source of commands for the microcontroller. The type of sensor is the MQ-5 sensor. Furthermore, the output device there are blowers and fragrances to get rid of cigarette smoke and scent the room, because the discussion on this final report is limited to design and make the smoke and carburetor removal tool using MQ-5-based ATMega 8535 microcontroller that serves to dispose cigarette smoke and freshens the room.

4.3. Components and tools

In making this tool there are several components required, the most decisive is the completeness of components and the layout of components. The components and tools needed and used in the manufacture of a series of smoke and fragrance disposal equipment can be seen in tables 2 and 3.

Table 2: List of Components

No.	Component Name	Amount
1	ATMega 8535 Microcontroller	1 piece
2	Regulator IC 7805	1 piece
3	Resistor 1k ohm	6 pieces
4	Relay	2 pieces
5	Capacitor elco 1000 uf	2 pieces
6	Capacitors elco 1 uf	1 piece
6	1N4004 Diodes	4 pieces
6	Led Red	1 piece
7	Green Led	4 pieces
8	Transformer	1 piece
9	Pin Header	As needed
10	Socket IC	1 piece
11	Sensor MQ-2	1 piece
12	Transistor S9014	2 pieces
13	Pushbutton	1 piece

Table 3: List of tools

No.	Tool and Material	Amount
1	Board for Box	Sufficiently
2	PCB boards	1 piece
3	Solder	1 piece
4	Tin to taste	Sufficiently
5	Tin Suction	1 piece
6	Drill	1 piece
7	Drill Bits	1 piece
8	Sandpaper	1 piece
9	Multimeter	1 piece
10	Shot Glue	1 piece
11	Rainbow Cable	Sufficiently
12	Power Cables	1 piece
13	solution of Ferric Chloride	Sufficiently
14	Scissors	1 piece
15	Trim pieces	1 piece
16	Thinner	Sufficiently
17	Permanent Markers	1 piece
18	Iron	1 piece
19	Blowers	1 piece
20	Fragrances	1 piece
21	Cutter	1 piece
22	Saws	1 piece
23	Acrylic	Length = 47 cm, Width = 45 cm
24	Cable sleeve	Sufficiently
25	Lotfet	Sufficiently

5. Design Method

In the manufacture of a tool, designing is an important thing to do. The design stage is a stage that starts from observation, analyzing, operating, until the attempt to make the tool works well. At this design stage, it is a basic thing to determine whether the tool is made to work properly or not, if done well then the tool designed will work as expected. In the designing of the Cigarette Smoke disposal blower Device and Auto Fragrance Using MQ-5 Sensor Based Microcontroller ATMega 8535 consists of the stage of hardware design, mechanical design, and software design.

5.1. Electronic Design (Hardware)

The hardware design stage is related on determining the specifications of either the components and the equipment, PCB board layout, installation of components, soldering, until the operation of the tool.

5.1.1. Circuit Scheme

Tools that used to make a whole circuit are ATMega 8535 microcontroller circuit, driver relay, and power supply.

1. ATMega 8535 Microcontroller circuit

In Figure 2 series of microcontroller ATMega 8535 can be known that component of microcontroller IC need few additional component that enable microcontroller work. Components include the resistor as a pull up (always connected vcc) which serves to auto reset the microcontroller, without this resistor microcontroller will be reset condition. In addition to connecting the resistor, the reset pin on ATMega 8535 is also connected with a push button switch as a reset button on the minimum system. Installation on the push button is installed parallel with 1 uf elco to avoid bounching on the switch when the switch is pressed. Microcontroller circuit is also equipped with pin downloader on microcontroller, also provided I/O data channel that connects microcontroller with sensor, led indicator, relay/blower and fragrances.

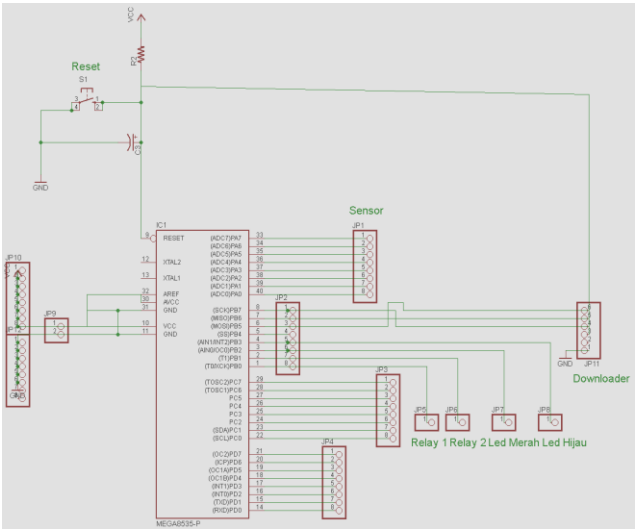

Fig.2: ATMega 8535 Microcontroller Circuit

2. Power supply circuit

Figure 3 is a figure of the power supply circuit, the power supply circuit consists of several components that are connected to each other as a supplier of electrical energy for all circuits. From Figure 3, it can be observed that the circuit power supply consists of transformer, stepdown 220 v to 12 v. The output of the transformer which is still AC current will be rectified through the rectifier diode. It will be filtered by capacitor C1. In order to meet the needs of voltage values for the microcontroller and sensor, 7805 regulator IC is used to adjust the voltage requirement of 5 v.

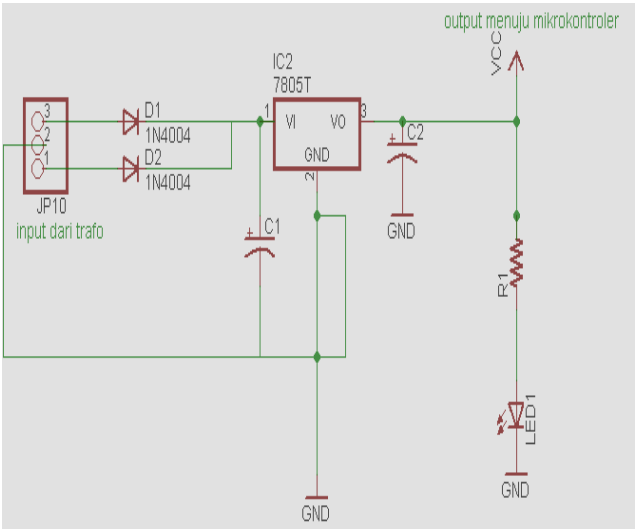

Fig.3: Power Supply Circuit

3. Relay Circuit

Figure 4 is a drawing of a relay circuit, the relay circuit serves as an electronic switch to control on/off. The relay driver circuit requires a transistor that serves as a controller for the relay.

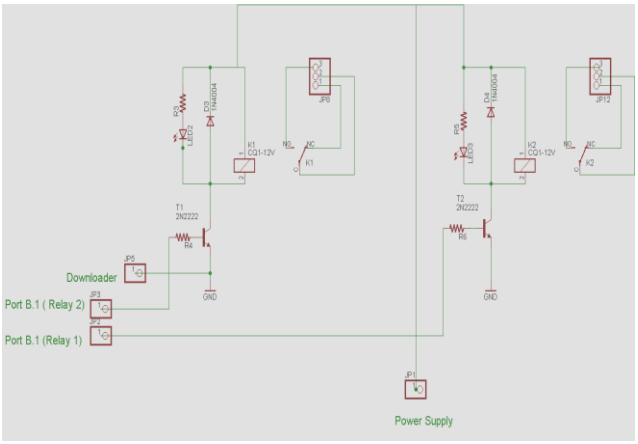

Fig.4: Relay Circuit

4. A Whole Circuit

Figure 5 is a describing of complete circuit. From this figure, the initial conditions of the circuit can be seen when it is being flowed with 220 v of power that will go to the transformer. The transformer circuit serves as an adjustable voltage level from 220 v to 12 v. Voltage with 12 v then flowed to the relay that will serve to trigger the relay's activity. When the microcontroller provides the activation logic. 7805 regulator IC circuit is needed to adjust the voltage values that will need the sensor and microcontroller. Figure 6 shows overall circuit layout.

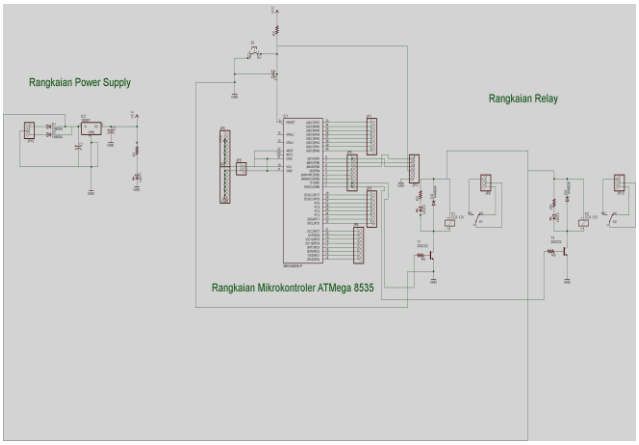

Fig.5: Overall Circuit

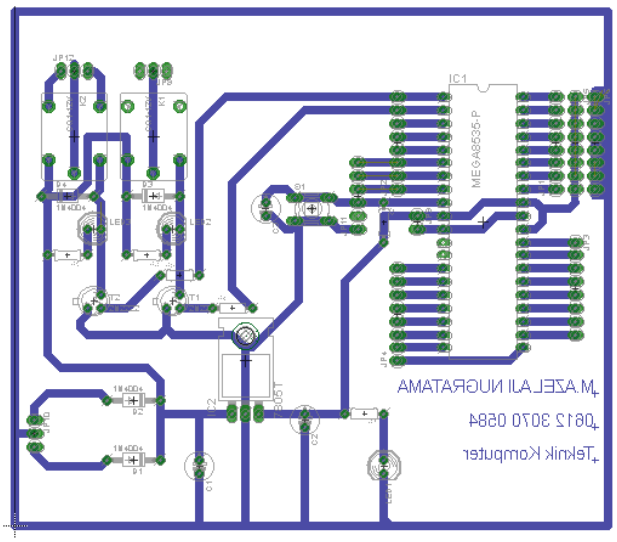

Fig.6: Overall Circuit Layout

5.1.2. Steps to manufacture the device

Making and printing PCB board layout (Print Circuit Board) is done by rubbing the layout on the PCB board, then dissolved with Ferri Chloride solution. The tools and materials required in the manufacture and printing of layouts on PCB boards for circuits are:

1. Electric Drill
2. PCB layout
3. PCB Board
4. Iron
5. Ferri Chloride
6. Smooth Sandpaper
7. Solder
8. Tin Suction
9. Tin
10. Permanent Markers
11. Cutter
12. Saws

5.1.2.1. PCB Creation and Printing Steps

1. PCB layout

First, make a PCB layout on a special paper then stick it to the PCB for ironing. After the layout is printed on the PCB, check first whether there is a broken path or not. If there is a line break use a permanent marker on the broken line. If there is no broken path, it can be continued to the PCB dissolution process.

2. PCB dissolution

PCB dissolution process is removing the copper layer on PCB using Ferri Chloride (FeCl3) solution. Then the PCB is cleared by sanding the layout on the PCB so that the ink on the surface is lost. Then check if there is a broken line or not, if there is no broken path, proceed to PCB drilling stage according to the location of its components.

3. Drilling

Drilling is hollowing out the layout results on the PCB. The parts on the PCB are the components.

4. Component Installation

It is the stage of installation of all components used such as resistors, sockets, headers, etc. on the PCB that has been drilled. Once the components are installed, all these components can be soldered. For component installation please note the following:

1. Polish PCB path with lotfet
2. Coat PCB with lead
3. Clean the rest of the lotfet with thinner
4. Check the path with multimeter
5. Prepare the components to be installed, clean the PCB, and solder the required components.

5.2. Mechanical Design

After completion in the selection stages of components, tools and materials. Then we can plan the production, which consists of Box Measuring. Measuring the box is done to find out the size of the box that will be required to be the place of PCB board that contains components, blowers, fragrances and power supply.

To perform mechanical construction can be done several stages namely as follows:

1. Measurement Stage

At this stage, all of the acrylic board material is measured in accordance to the specification. Size must fit for every other side.

2. Cutting Stage

At this stage, all the materials that have been measured are then cut in accordance with the one used

3. Hole Making Stage

After all materials are cut off, then mark it for the holes for power cables, sensors, blowers, led indicators, and holes for the nut.

4. Stage of Merger
The next stage is to join the pieces of the board by riveting it to a box shape in order to place the circuit, blower, sensors, fragrances and transformers.

5. Assembling Stage
The last stage is to install and adjust the layout of the circuit, blower, fragrances, sensors, and transformers.

Box Front view can be seen in figure 7, box side view can be seen in figure 8, and box rear view is in figure 9.

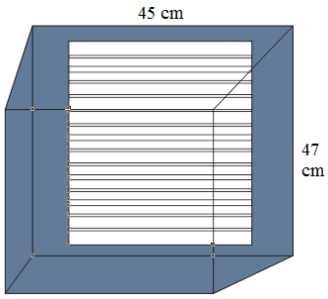

Fig.7: Box front-view

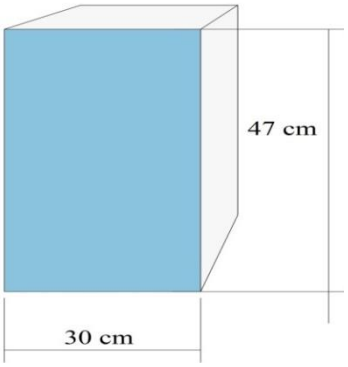

Fig.8: Box side-view

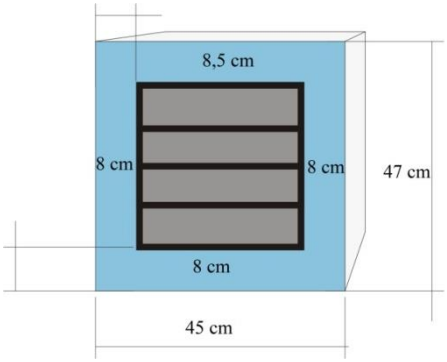

Fig.9: Box rear-view

5.3. Software Design
5.3.1 System Flowchart
The general workings of this cigarette smoke disposal and fragrances device can be seen through Flowchart. The flowchart can be seen in Figure 10.

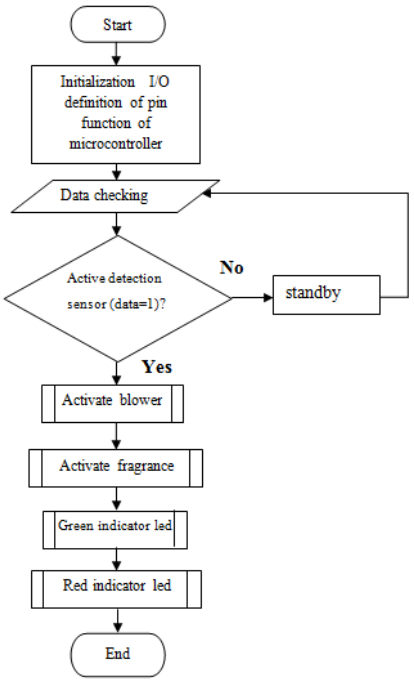

Fig.10: Flowchart System of Smoke Disposal and fragrances device

At this stage the port function is assigned to the micro according to the function of the input and output. Input consists of the MQ-5 sensor on the ADC input, the output consists of blowers and fragrances. In the process of input data taken from the MQ-5 sensor conducted comparation process results data from read sensors to the reference data or referenced minimum value to activate the load if the conditions met the load of blowers and fragrances will be activated.

5.3.2 Flowchart Program

Flowchart begins with start command followed by configuration and initialization input output configuration part is port status setting whether as input or output. The output assignment is performed on port B as the blower and fragrance controller while port A is used as the ADC input originating from the MQ-5 senor. The next procedure of sensor data input compared with reference as reference to activate the load if the sensor exceeds the reference value will be activated blower and fragrances are connected with port B.

6. Conclusion

The power source of the mesh electricity is connected through the socket, there will be a process of decreasing the voltage level from 220 v to 12 v DC by the power supply circuit. The designed circuit has a voltage requirement of 12 v and 5 v. A voltage with 12 v is required for the relay component whereas the microcontroller and sensor require 5v voltage. To adjust the voltage level at 5 v then used a 7805 regulator IC.
Response of the tool begins when the activation of the detection of objects of cigarette smoke by the sensor MQ-5. When detecting the presence of cigarette smoke on the MQ-5 sensor will result in a change of digital logic from the initial state in Low condition to high logic when it detects the object and when the MQ-5 sensor has finished detecting cigarette smoke then the 2nd relay will activate and spray fragrances. The microcontroller as the main control unit of the appliance will process the input state by activating the blower as a load through the activation of the relay. The load connected to 220 v through the relay eventually gets an electric current flow because the normally open contact on the relay becomes connected.

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