

THE MODERN REFRIGERATOR SYSTEM FOR BUSY PEOPLE

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Abstract - Nowadays the people are very busy in their work schedule. Because of this they are careless while handling their home appliances. It consumes more power due to their carelessness. This paper deals with reducing the power consumption in refrigerator. This paper comes under the domain of embedded system and wireless sensor network. The aim of this paper is to reduce the power consumption and to control the global warming. Presently, refrigerator ranks second in the overall power consumption (13.7%). The modern energy efficient model uses only 350kWh. It can save up to \$158 a year in electricity costs. If the fridge door opens for a long time, it absorbs heat from outside thus increasing the power consumption. The global warming is one of the major concerns for the world. The refrigerator is one of the major causes for global warming because it also releases chloro-fluoro carbon in the atmosphere. Often opening and closing the door will release more amount of chloro-fluoro carbon. This project is going to give the solutions for the above problems. The sensor signal is used to trace the object in the device space. If there is no change in the signal flow, then the door will close automatically. The modification in the circuit & the microcontroller chips are performing their operation in the new version. Thus by using this project we can save the power and control the global warming.

Key Words: CMOS Sensor, Alarm, Stepper Motor, Refrigeration.

1. INTRODUCTION

A refrigerator (commonly referred to as a fridge) is a common household appliance that consists of a thermally insulated compartment and a heat pump. This transfers the heat from the inside of the fridge to its external environment. So that the inside of the fridge is cooled to a temperature below the ambient temperature of the room. The main usage of this fridge is food storage. In developed countries the people work decreasing the reproduction rate of bacteria. This device is thus used to reduce the rate of spoilage of foodstuffs.

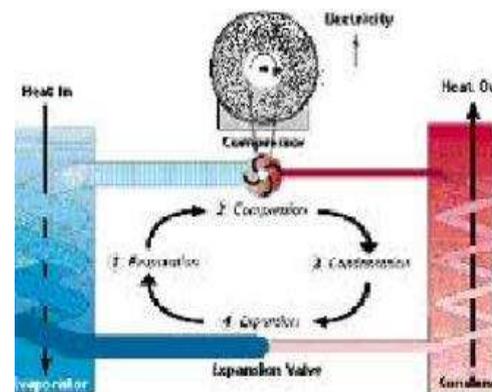
2. TECHNICAL EXPLANATION

2.1 TEMPERATURE RANGE

A refrigerator maintains a temperature few degrees above the freezing point of water. Optimum temperature range for perishable food storage is 3 to 5 degree Celsius. The freezer is also maintaining the same temperature below the freezing point of the water is called the freezer. The Refrigerator is referred as an icebox.

2.2 VAPOUR COMPRESSION CYCLE

A vapour compression cycle is having the following things



1. Condenser
2. Expansion valve
3. Evaporator
4. Compressor

A vapour compression cycle is used in most household refrigerators and freezers. In this cycle a circulating refrigerant such as R134a enters a compressor as low pressure vapour at or slightly above the temperature of the refrigerator interior. The vapour is compressed and exits the compressor as high-pressure superheated vapour. The superheated vapour travels under pressure through coils or tubes compressing the condenser which are passively cooled by exposure to air in the room. The condenser cools the vapour which liquefies. As the refrigerant leaves the condenser, it is still under pressure but is now only slightly above room temperature. This liquid refrigerant is now only slightly above the room temperature. This liquid refrigerant is forced through a metering or throttling device also known

as an expansion valve (essentially a pinhole sized constriction in the tubing) to an area of much lower pressure.

The sudden decrease in pressure results in explosive like flash evaporation of the portion of the liquid. The latent heat absorbed by this flash evaporation is drawn mostly from adjacent still-liquid refrigerant a phenomenon known as "auto-refrigeration". This cold and partially vaporized refrigerant continues through the coils or tubes of the evaporator unit. A fan blows air from the refrigerator or freezer compartment across these coils or tubes and the refrigerant completely vaporizes, drawing further latent heat from the box air. This cooled air is returned to the refrigerator or freezer compartment and so keeps the box air cold.

The cool air in the refrigerator or freezer is still warmer than the refrigerant in the evaporator. Refrigerant leaves the evaporator, now fully vaporized and slightly heated, and returns to the compressor inlet to continue the cycle.

The most fridge/freezers with the exception of manual defrost models and/or cheaper models utilize what appear to be two thermostats. Only the freezer compartment is properly temperature controlled. When the freezer gets too warm, the thermostat starts the refrigeration process and a fan also starts. The air is circulated around the freezer. During this time, the fridge is also getting colder. The fridge temperature control knob is only controlling amount of air that actually flows into the fridge via a damper system. This means that the fridge may become too warm. However because only enough air is partitioned off to the fridge compartment, the freezer usually re-acquires the set temperature quickly unless the door is opened, either in the fridge or the freezer, the fan stops straight away to prevent excessive frost build up on the freezer's evaporator coil (because this coil is technically cooling two areas) when the freezer reaches the temperature, the unit cycles off, no matter what temperature the fridge is at. Some people recommend setting the fridge to max and the freezer to a point where your fridge food won't freeze.

2.3 VORTEX TUBE

The vortex tube also known as the Ranque-Hilsh vortex tube, is a mechanical device that evaporates a compressed gas into hot and cold streams. It has no moving parts.



Pressurized gas is injected tangentially into a swirl chamber and accelerated to a high rate of rotation. Due to the conical nozzle at the end of the tube only the outer shell of the compressed gas is forced to return in an inner vortex of reduced diameter within the outer vortex.

2.4 MAGNETIC COOLING

Magnetic refrigeration is a cooling technology based on the magneto caloric effect. This technique can be used to attain extremely low temperatures (well below 1 K) as well as the ranges used in common refrigerators depending on the design of the system.

2.4 AUTOMATIC ALERTS

A power failure warning, alerting the user by flashing a temperature display. The maximum temperature reached during the power failure may be displayed along with information on whether the frozen food has defrosted or may contain harmful bacteria. The status indicator is used to notify the user when it is time to change the water filter.

2.6 ALARM

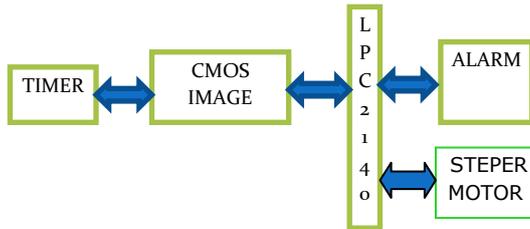
The new technology came to indicate the user that the door is opened more than some specified time. Now days the timer is set into the refrigerator door. The program is written for that timer is "if the door is opened more than 1 minute means the timer will send a message to the circuit". The circuit will pass a current to the alarm to ring-up the alarm in the fridge door. So that the user can able to hear the alarm sound and they will close the door.

3. THE MODERN REFRIGERATOR SYSTEM

This modern refrigerator contains one important feature. It can close the door automatically without the user of the system. The timer will take an important part in this refrigerator system. It will start to count the time from when the user opened the door. The alarm is also set into the refrigerator door. The timer and the alarm will follow the technology which is used in the existing system.

The drawback in the existing stem is it will ring-up the alarm until the user close the door. There is no time period for this process. But the modern refrigerator will overcome the problem in this existing system. It will stop the alarm sound if the user didn't close the door for 5 minutes. After that it will sent a message to the circuit like the door is opening more than 5 minutes. The circuit is designed under the recent microcontroller chip program. It will work accurately.

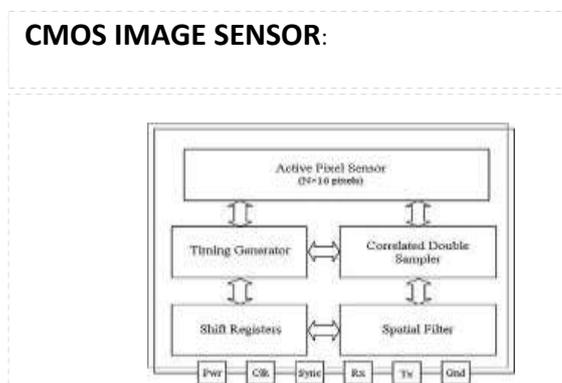
BLOCK DIAGRAM



Now the refrigerator door will start to do some process according to the coding that is written by the programmer inside the circuit. The sensor source is set into the refrigerator door. The source will produce the CMOS-Image sensor. The sensor signal will pass from one side to another side of the door. If there is no object in between the door means there will not be any distraction in the signal flow. The analyser is fit in the refrigerator door it will analyse whether is there any changes in the signal flow.

So the program will run based upon the analyser result. If there is no change in the signal flow means the door will close automatically. If some objects or the user is taking some things from the fridge or standing in front of the door means there is some distraction will happen in the signal flow. The CMOS-Image sensor will track the object image in the device space.

The code for the analyzer operation will be as following:



Program:

If (the signal from the source= the signal from the destination)

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{
  printf ("close the door");
}
Else
{
  printf("don't close the door some object is there");
}
  
```

So the program will run based upon the analyser result. If there is no change in the signal flow means the door will close automatically. If some objects or the user is taking some things from the fridge or standing in front of the door means there is some distraction will happen in the signal flow. The CMOS-Image sensor will track the object image in the device space. The analyzer will show the result like distraction in the signal flow then the source will stop producing the sensor signal.

The timer will also stop sending the messages to the circuit. The timer will work under "for loop" condition. The condition statement will have a some specified time period to start-up the timer to count the time again. The process will be continued until the object or the user will move from the device space.

4. IMPORTANCE OF THIS SYSTEM

The fridge door is opened for a long time means the electricity power and the cost is also wasted. It will produce

WORKING



the CFC. We all are known it will cause a major problem in the ozone layer. Due to this the human being and the animals will get some new and unknown skin diseases. The temperature of the globe is also will increase to peak level. The ice tubes will become water and it will increase the sea water level. Basically the government is spending more money to produce the electricity power. People are very fast

in their work so they forgot to concentrate on these home appliances.

An increasingly important environmental concern is the disposal of old Refrigerators initially because of the frozen coolant damaging the ozone layer. But as the old generation of refrigerators disappears it is the destruction of CFC-bearing insulation which causes concern. Modern refrigerator usually use a refrigerant called HFC-134a (1, 1, 1, 2- Tetrauroethane) which does not deplete the ozone layer, instead of Freon. An R-134a is now becoming very uncommon in Europe. The main refrigerator now used is R-600a or Isobutene. Thus refrigerant is naturally occurring and therefore has a smaller effect on the atmosphere if released. There have been some reports of refrigerator exploding, if the refrigerator leads and comes into contact with a spark.

ADVANTAGES

- 1.The cost of the CMOS-Image sensor is too low
- 2.The efficiency of this CMOS-Image sensor is high
- 3.It will reduce the electricity cost
- 4.It will control the Global warming

5. CONCLUSION

This project deals with the problem of using more electricity power by the people who is not handling their home appliances properly. The electricity cost is reduced. The global warming is controlled. The rank of the refrigerator using the electricity power is increased from second position to higher in order.

6. FUTURE WORK

The future work in this project is in the analyser side. After getting the result from the analyser the door will start to close automatically. But suddenly the user or any object came in between the fridge then the door will not stop the process of closing. It will affect the human being so the research is going on to overcome this problem.

REFERENCES

1. Wireless sensor network – International journal, may2013.
2. Basic functioning of refrigerator- Wikipedia