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Compressor Less Solid State Mini Refrigerator with Thermoelectric Cooling Technology Powered By Solar Energy

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ABSTRACT:

In Today's world global warming is being increasing year by year. There are many reasons like pollution, deforestation, water contamination, etc...In coming years the major problem before us is depletion of ozone layer which is caused by the release of CFC's. Some of the equipment which causes this effect is refrigerators, AC's. In this project we are mainly focusing on a solution to control this problem we have focused on refrigerators which releases CFC's. Here we are designing a mini solar based refrigerator which is cheaper as well as eco-friendly.

Solar-powered refrigerators are most commonly used in the developing world to help mitigate poverty and climate change. By harnessing solar energy, these refrigerators are able to keep perishable goods such as meat and dairy cool in hot climates, and are used to keep much needed vaccines at their appropriate temperature to avoid spoilage. The portable devices can be constructed with simple components and are perfect for areas of the developing world where electricity is unreliable or non-existent. Other solar-powered refrigerators were already being employed in areas of Africa which vary in size and technology, as well as their impacts on the environment. The biggest design challenge is the intermittency of sunshine (only several hours per day) and the unreliability (sometimes cloudy for days). Either batteries (electric refrigerators) or phase-change material is added to provide constant refrigeration.

LITERATURE REVIEW

As we know that, the physical principles upon which modern coolers are based actually date back to the early 1800's, although commercial modules were not available until almost 1960. The first important discovery relating to thermoelectricity occurred in 1821 when a German scientist, Thomas Seebeck, found that an electric current would flow continuously in a closed circuit made up of two dissimilar metals provided that the junctions of the metals were maintained at two different temperatures. Seebeck did not actually comprehend the scientific basis for his discovery, however, and falsely assumed that flowing heat produced the same effect as flowing electric current. In 1834, a French watchmaker and part time physicist, Jean Peltier, while investigating the "Seebeck Effect," found that there was an opposite phenomenon whereby thermal energy could be absorbed at one dissimilar metal junction and discharged at the other junction when an electric current flowed within the closed circuit.

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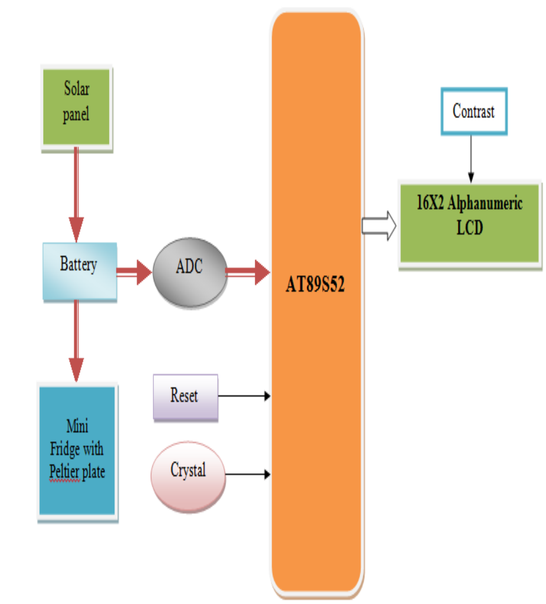
Proposed system

Block Diagram:

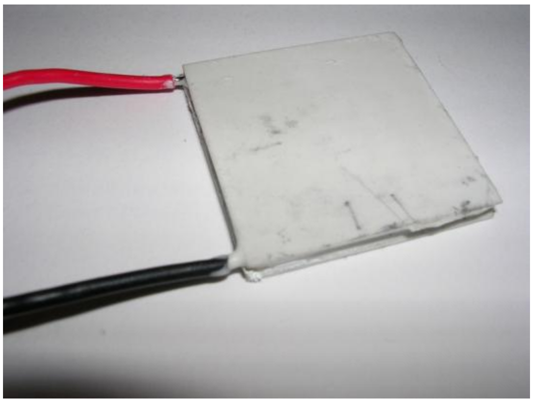


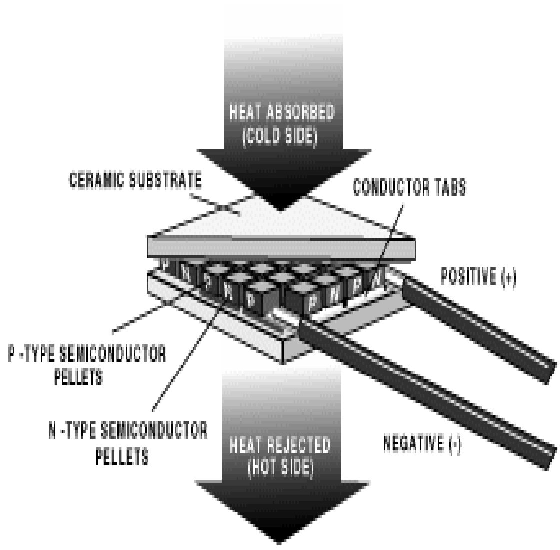
Here we are using Micro controller (AT89S52) allows dynamic and faster control. Liquid crystal display (LCD) makes the system user-friendly. In this project we are using solar panels for charging a Lead Acid Battery (12V, 1.2 Amp hrs), a pelteir thermoelectric device when connected to battery generates cool effect and hot effects depending on the mode required by the user. Since we are using this for fridge we need only cool mode. A peltier thermoelectric device is connected to the battery to generate cooling effect.

We need to display the voltage for that we are using ADC0808 which is given to the controller. For this ADC we are giving a clock pulses through 555 timer to perform its operation.

Peltier Cooler

Thermoelectric heat pumps that will produce a temperature gradient that is proportional to an applied current.





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HARDWARE MODULES
AT89S52
FEATURES

- Compatible with MCS-51® Products
- 8K Bytes of In-System Programmable (ISP) Flash Memory
– Endurance: 1000 Write/Erase Cycles
- 4.0V to 5.5V Operating Range
- Fully Static Operation: 0 Hz to 33 MHz
- Three-level Program Memory Lock
- 256 x 8-bit Internal RAM
- 32 Programmable I/O Lines
- Three 16-bit Timer/Counters
- Eight Interrupt Sources
- Full Duplex UART Serial Channel
- Low-power Idle and Power-down Modes
- Interrupt Recovery from Power-down Mode
- Watchdog Timer
- Dual Data Pointer
- Power-off Flag

LCD

LCD stands for Liquid Crystal Display. LCD is finding wide spread use replacing LEDs (seven segment LEDs or other multi segment LEDs) because of the following reasons:

- The declining prices of LCDs.
- The ability to display numbers, characters and graphics. This is in contrast to LEDs, which are limited to numbers and a few characters.
- Incorporation of a refreshing controller into the LCD, thereby relieving the CPU of the task of refreshing the LCD. In contrast, the LED must be refreshed by the CPU to keep displaying the data.
- Ease of programming for characters and graphics.

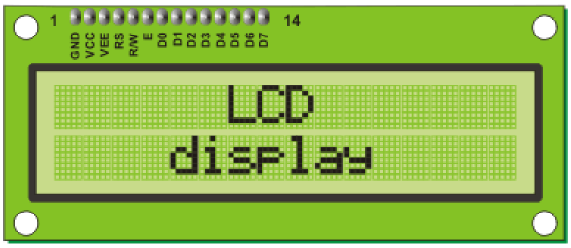
These components are "specialized" for being used with the microcontrollers, which means that they cannot be activated by standard IC circuits. They are used for writing different messages on a miniature LCD.

Command	RS	RW	D7	D6	D5	D4	D3	D2	D1	D0	Execution Time
Clear display	0	0	0	0	0	0	0	0	0	1	1.64mS
Cursor home	0	0	0	0	0	0	0	0	1	x	1.64mS
Entry mode set	0	0	0	0	0	0	0	1	I/D	S	40uS
Display on/off control	0	0	0	0	0	0	1	D	U	B	40uS
Cursor/Display Shift	0	0	0	0	0	1	D/C	R/L	x	x	40uS
Function set	0	0	0	0	1	DL	N	F	x	x	40uS
Set CGRAM address	0	0	0	1	CGRAM address						40uS
Set DDRAM address	0	0	1	DDRAM address							40uS
Read "BUSY" flag (BF)	0	1	BF	DDRAM address							-
Write to CGRAM or DDRAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0	40uS
Read from CGRAM or DDRAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	40uS

Solar panel

A solar panel (photovoltaic module or photovoltaic panel) is a packaged interconnected assembly of solar cells, also known as photovoltaic cells. The solar panel can be used as a component of a larger photovoltaic system to generate and supply electricity in commercial and residential applications.

Because a single solar panel can only produce a limited amount of power, many installations contain several panels. A photovoltaic system typically includes an array of solar panels, an inverter, may contain a battery and interconnection wiring.



Solar panels use light energy (photons) from the sun to generate electricity through the photovoltaic effect. The structural (load carrying) member of a module can either be the top layer or the back layer. The majority of modules use wafer-based crystalline silicon cells or thin-film cells based on cadmium telluride or silicon. The conducting wires that take the current off the panels may contain silver, copper or other conductive (but generally not magnetic) transition metals.

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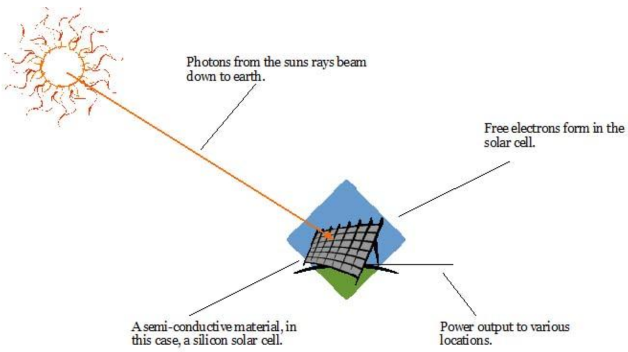
The cells must be connected electrically to one another and to the rest of the system. Cells must also be protected from mechanical damage and moisture. Most solar panels are rigid, but semi-flexible ones are available, based on thin-film cells.

Electrical connections are made in series to achieve a desired output voltage and/or in parallel to provide a desired current capability.

Separate diodes may be needed to avoid reverse currents, in case of partial or total shading, and at night. The p-n junctions of mono-crystalline silicon cells may have adequate reverse current characteristics that these are not necessary. Reverse currents waste power and can also lead to overheating of shaded cells. Solar cells become less efficient at higher temperatures and installers try to provide good ventilation behind solar panels.

The solar panel diagram below shows how solar energy is converted into electricity through the use of a silicon cell.



The below image is not a solar panel wiring diagram, if you need access to a wiring plan, you could consult a specialist electrician, or solar installer. In the diagram below, you can see how a solar panel converts sunlight into energy to provide electricity for a range of appliances.

This energy can be used for heating, through the use of solar hot water panels, or electricity through the use of regular solar cells.

APPLICATIONS OF SYSTEMS

1. It can be uses as remote place where electric supply is not available.
2. In restaurants /hotels
3. At public places
4. Laboratory, scientific instruments, computers and video cameras.
5. Medical and pharmaceutical equipment.
6. Military applications.

CONCLUSION

Thus our project concludes that solar energy systems must be implemented to overcome increasing electricity crisis. In this work, a portable solar operated system unit was fabricated and tested for the cooling purpose.

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