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RESEARCH ARTICLE

DC BLOWER MOTOR OPERATED COOLER WITH SOLAR PANEL

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ABSTRACT

Cooler with solar panel for residential Cooling is very important During the summer as well as in the life to maintain the food, fish, many items at constant temperature to avoide the bad effect of virouses. But air cooling is very importanant part during the summer for a man. Cooling process employs the different method to cool the air. Today air cooling methods are very expensive for AC coolers, air conditioning, fans and dehumidifiers. To running these products required Ac supply/electrical. The generation of electrical power ultimately responsible for hot and humid environments which causes global warming. Air conditioning, refrigeration, air cooling system are rapidly increased due to hot and humid condition that provide us a relaxed and comfortable life. But these products and source are not available every time in the home and villages. DC bettery and Solar power system are more suitable for the purpose. Solar and Dc system being considered as one of the path towards more sustainable energy system. Blower motors are used in this cooler for fan and water pump which gives us cooled air. This projects and research of DC and industrial application.

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INTRODUCTION

Energy consumption for cooling and air conditioning has increased rapidally last few years due to population growth, increased living standard of life to maintains the food and to maintain the physical condition of laboratries at constant temperature and comfort demand. High demand of electricity demand of electricity grid faces the danger of overload which would cause essential severe. Distruption and severe economic operated impact. A solar and dc air conditioning is one of the solution provide air cooling to overcome the summer high demand of supply and provide comfort condition for the human body. In summer and humid condition felt uncomfortable because of hot weather and heavy humidity. So it is necessary to maintain thermal comfort condition and cooling. Need for such a source which is abundantly available in nature which does not impare a bad effect on earth solar energy is the more power full renewable energy resources which overcome the all problem of supply. Solar energy technologies can provide electrical generation by heat engine or photovoltaic means space heating and cooling in active and passive solar bending. Potable water via distillation and disinfection day lighting, hot water, thermal energy for cooling and high temperature process heat for industrial purposes. Sunlight can be converted into electricity using photovoltaics (PV).

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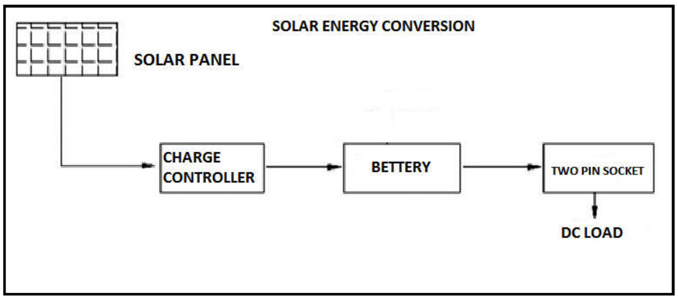
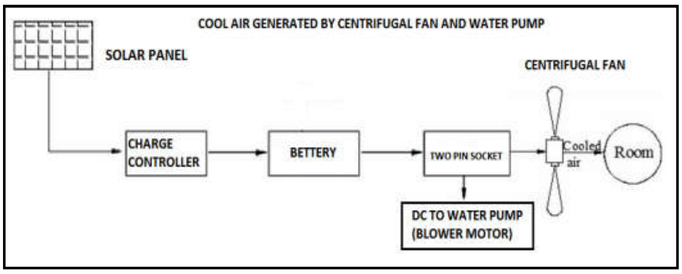
Need of renewable energy

Today energy crises became the major problem in world. So it is necessary that one must be move to renewable energy so that energy crises may be overcome. Renewable energy is energy generated from natural resources—such as sunlight wind, rain, tides and geothermal heat—which are renewable (naturally replenished). In 2006, about 18% of global final energy consumption came from renewable, with 13% coming from traditionalbiomass, suchaswood-burning. Hydroelectricity was the next largest renewable source, providing 3%, followed by solar hot water/heating, which contributed 1.3%. Modern technologies, such as geothermal energy, wind power, solar power, and ocean energy together provided some 0.8% of final energy consumption. Climate change concerns coupled with high oil prices, peak oil and increasing government support are driving increasing renewable energy legislation, incentives and commercialization. European Union leaders reached an agreement in principle in March 2007 that 20 percent of their nations' energy should be produced from renewable fuels by 2020, as part of its drive to cut emissions of carbon dioxide, blamed in part for global warming. Investment capital flowing into renewable energy climbed from $80 billion in 2005 to a record $100 billion in 2006.

MATERIALS AND METHODS



Cool air generated by centrifugal fan and water pump



Solar panel

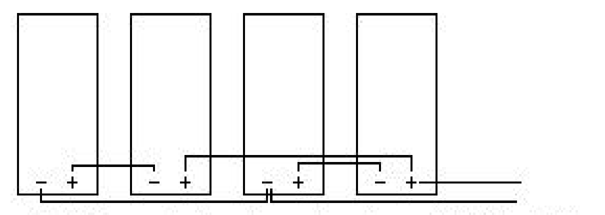
One can think that the Einestein's photo electric effect become so useful today's life when it was discovered. The major use of this principle is in electronic industries especialy in generation of electricity by solar energyl. Using solar power to produce electricity is not the same as using solar to produceheat. Solar thermal principles are applied to produce hot fluids or air. *Photovoltaic* principles are used to produce electricity. A solar panel (PV panel) is made of the natural element, silicon, which becomes charged electrically when subjected to sun light. Solar panels are directed at solar south in the northern hemisphere and solar north in the southern hemisphere (these are slightly different than magnetic compass north-south directions) at an angle dictated by the geographic location and latitude of where they are to be installed. Typically, the angle of the solar array is set within a range of between site-latitude-plus 15 degrees and site-latitude-minus 15 degrees, depending on whether a slight winter or summer bias is desirable in the system. Many solar arrays are placed at an angle equal to the site latitude with no bias for seasonal periods. This electrical charge is consolidated in the PV panel and directed to the output terminals to produce low voltage (Direct Current) - usually 6 to 24 volts. The most common output is intended for nominal 12 volts, with an effective output usually up to 17 volts. A 12 volt nominal output is the reference voltage, but the operating voltage can be 17 volts or higher much like your car alternator charges your 12 volt battery at well over 12 volts. So there's a difference between the reference voltage and the actual operating voltage. The intensity of the Sun's radiation changes with the hour of the day, time of the year and weather conditions. To be able to make calculations in planning a system, the total amount of solar radiation energy is expressed in hours of full sunlight per m^2, or Peak Sun Hours. This term, Peak Sun Hours, represents the average amount of sun available per day throughout the year. It is presumed that at "peak sun", **1000 W/m²** of power reaches the surface of the earth. One hour of full sun provides **1000 Wh per m² = 1 kWh/m²** - representing the solar energy received in one hour on a cloudless summer day on a one-square meter surface directed towards the sun. To put this in some other perspective, the United States Department of Energy indicates the amount of solar energy that hits the surface of the earth every +/- hour is greater than the total amount of energy that the entire human population requires in a year. Another perspective is that roughly 100 square miles of solar panels placed in the south western U.S. could power the country. The daily average of Peak Sun Hours, based on either full year statistics, or average worst month of the year statistics, for example, is used for calculation purposes in the design of the system. To see the average Peak Sun Hours for your area consult the solar maps in the solar calculator section of the Sun force website. So it can be concluded that the power of a system varies, depending on the intended geographical location. Folks in the north eastern U.S. will need more solar panels in their system to produce the same overall power as those living in Arizona. Sun force's technical support representatives can advise you on this if you have any doubts about your area. The output of a solar panel is usually stated in watts, and the wattage is determined by multiplying the rated voltage by the rated amperage. The formula for wattage is VOLTS times AMPS equals WATTS. So for example, a 12 volt 60 watt solar panel measuring about 20 X 44 inches has a rated voltage of 17.1 and a rated 3.5 amperage. V x A = W17.1 volts times 3.5 amps equals 60 watts If an average of 6 hours of peak sun per day is available in an area, then the above solar panel can produce an average 360 watt hours of power per day; 60w times 6 hrs. = 360 watt-hours. Since the intensity of sunlight contacting the solar panel varies throughout the day, we use the term "peak sun hours" as a method to smooth out the variations into a daily average. Early morning and late-in-the-day sunlight produces less power than the mid day sun. Naturally, cloudy days will produce less power than bright sunny days as well. When planning a system your geographical area is rated in average peak sun hours per day based on yearly sun data. Average peak sun hours for various geographical areas is listed in the above section.

Solar panels can be wired in series or in parallel to increase voltage or amperage respectively, and they can be wired both in series and in parallel to increase both volts and amps.

Series wiring refers to connecting the positive terminal of one panel to the negative terminal of another. The resulting outer positive and negative terminals will produce voltage the sum of the two panels, but the amperage stays the same as one panel. So two 12 volt/3.5 amp panels wired in series produces 24 volts at 3.5 amps. Four of these wired in series would produce 48 volts at 3.5 amps.

Parallel wiring refers to connecting positive terminals to positive terminals and negative to negative. The result is that voltage stays the same, but amperage becomes the sum of the number of panels. So two 12 volt/3.5 amp panels wired in parallel would produce 12 volts at 7 amps. Four panels would produce 12 volts at 14 amps.

Series/parallel wiring refers to doing both of the above - increasing volts and amps to achieve the desired voltage as in 24 or 48 volt systems. The following diagram reflects this. In addition, the four panels below can then be wired in parallel to another four and so on to make a larger array.



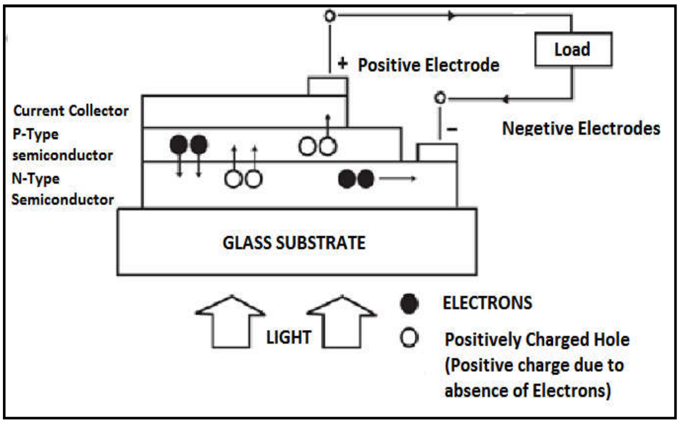
Two 12v/3.5A panels in series and two in parallel. This doubles the voltage and doubles the amps to make 24 volts and 7 amps.

Principle of solar power generation

The principle of power generation behind the solar cells consists of the utilization of the photovoltaic effect of semiconductors. When such a cell is exposed to light, electron-hole pairs are generated in proportion to the intensity of the light. Solar cells are made by bonding together p-type and n-type semiconductors. The negatively charged electrons move to the ntype semiconductor while the positively charged holes move to the p-type semiconductor. They collect at both electrodes to form a potential. When the two electrodes are connected by awire, a current flows and the electric power thus generated can be transferred to an outside application.

PV system sizing and installation

A photovoltaic system is an array of components designed to supply usable electric power for a variety of purposes. The sun delvers its energy to us in two main forms, heat and light. There are two main types of solar power systems, namely, solar thermal systems that convert heat to electricity, and solar PV systems that convert sunlight directly into usable direct current (DC) electricity. One or more DC to alternating current (AC) power converters which called inverters. PV cells are made from layers of semi-conducting material, usually silicon. When light shines on the cell it creates an electric field across the layers. The stronger the sunshine, the moreelectricity is produced. Groups of cells are mounted together in panels or modules that can be mounted on your roof. The peak sun hour is essential in order to know the number of PV modules to be installed. Before doing so, the power that can be assumed generated by the PV modules must be determined based on solar irradiance of the location. In order to make the system work efficiently, the inclination angle for the panels (Tilt angle) should be carefully selected. The optimum tilt varied from month to another and the collected solar energy depends on the optimum panel tilt for each month. It was found that the average optimum tilt angle at Madinah for the winter months is 37˚ and for the summer months is 12˚. So, the yearly average tilt panel is 23.5˚ which nearly corresponding to the latitude of Madinah site 24.5˚. After the material selection for PV panels, batteries, charge controller and inverter then using suitable basement, cabinets to protect the system, the frame for the panels designed at an optimum tilt angle, the system installed with the help of technical as shown in which explain the actual final cycle that includes the air conditioning unit and power supply system that can be used at any time; the system has been tested for 8 hours per day with a full capacity.



Battery charger

The function of charger is to regulate the voltage and current coming from the solar panel going to the battery. The battery is the key components in PV-SA systems as it act as energy back-up for the renewable energy systems. It also functions as storage devices for storing PV generated electricity during cloudy days and at night. In order to apply this system in AC load, the inverter is needed to convert the DC electricity generated by the PV panel into AC. The AC load is a common type of load and easily available with cheaper in price. As we mentioned previously, the purpose of charge controller is to regulate the current from the PV module to prevent the batteries from overcharging. A charge controller is used to sense when the batteries are fully charged and to stop, or decrease, the amount of current flowing to the battery. The solar energy is received by the PV module and transform into electrical energy. The electrical energy is then being regulated by charge control ler either by supplies it directly into the load or charges the batteries. As the electrical energy coming from the PV module is in DC.

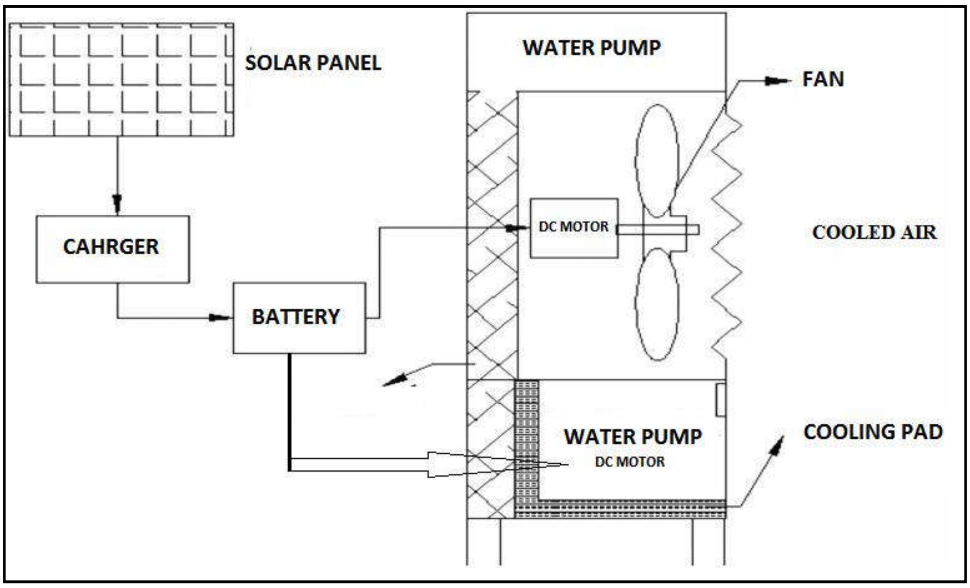
Battery

The Deep Cycle batteries used are designed to be discharged and then re-charged hundreds or thousands of times. These batteries are rated in Amp Hours (ah) - usually at 20 hours and 100 hours. Simply stated, amp hours refers to the amount of current - in amps - which can be supplied by the battery over the period of hours. For example, a 350ah battery could supply 17.5 continuous amps over 20 hours or 35 continuous amps for 10 hours. To quickly express the total watts potentially available in a 6 volt 360ah battery; 360ah times the nominal 6 volts equals 2160 watts or 2.16kWh (kilowatt-hours). Like solar panels, batteries are wired in series and/or parallel to increase voltage to the desired level and increase amp hours. The battery should have sufficient amp hour capacity to supply needed power during the longest expected period "no sun" or extremely cloudy conditions. A lead-acid battery should be sized at least 20% larger than this amount. If there is a source of back-up power, such as a standby generator along with a battery charger, the battery bank does not have to be sized for worst case weather conditions. The size of the battery bank required will depend on the storage capacity required, the maximum discharge rate, the maximum charge rate, and the minimum temperature at which the batteries will be used.

During planning, all of these factors are looked at, and the one requiring the largest capacity will dictate the battery size .One of the biggest mistakes made by those just starting out is not understanding the relationship between amps and amp-hour requirements of 120 volt AC items versus the effects on their DC low voltage batteries. For example, say you have a 24 volt nominal system and an inverter powering a load of 3 amps, 120VAC, which has a duty cycle of 4 hours per day. You would have a 12 amp hour load (3A X 4 hrs=12 ah). However, in order to determine the true drain on your batteries you have to divide your nominal battery voltage (24v) into the voltage of the load (120v), which is **5**, and then multiply this times your 120vac amp hours (**5** x **12 ah**). So in this case the calculation would be **60 amp hours** drained from your batteries - not the 12 ah. Another simple way is to take the total **watt- hours** of your 120VAC device and divide by nominal system voltage. Using the above example; 3 amps x 120 volts x 4 hours = 1440 watt-hours divided by 24 DC volts = 60 amp hours.

Lead-acid batteries are the most common in PV systems because their initial cost is lower and because they are readily available nearly everywhere in the world. There are many different sizes and designs of lead-acid batteries, but the most important designation is that they are deep cycle batteries. Lead-acid batteries are available in both wet-cell (requires maintenance) and sealed no-maintenance versions. AGM and Gel-cell deep-cycle batteries are also popular because they are maintenance free and they last a lot longer.

Solar air cooler with cooling pump working



Blower Motor

The above shown model consists of energy conversion unit, air cooler unit and water pump. As the electrical energy supplied to the fan from battery/socket, it starts to produce airflow to the room at the same time water passed through the cooling pads. Fan sucks the outside air through the cooling pads, so heat transfer occur between air and water. So the cool air enters into the room.

Technical Specification

Speed:
Voltage: 12V
Overall length:42/5" Motor Length: 37/8" Saft Length: 13/8"
Motor Diameter: 31/2" Saft Diameter: 5/16"

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