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Solar Powered Fan Cap For Outdoor Workers

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Abstract: This investigation explores the solar cap benefits to its users. The reason behind the main focus on this is because it is very commonly used in summer and in sports game like golf, cricket, and badminton. Even the people who are working outdoors, tourists and those who are willing to climb mountain basically prefer a cap for preventing from huge sunshine. Particularly in summer to prevent from sunstroke solar cap is the best gift as it lowers the temperature and make facial condition sound. The novel design is also fun for kids and beneficial to all kind of ages. This type of solar cap with fan technology is an efficient & intelligent way to prevent face from high temperature. By the use of solar cap, one will get to meet the desire cooling to the face by the use of renewable energy.

Keywords: Solar Panel; Cap; Renewable energy; Blade; Motor.

I. INTRODUCTION

Most of the country's economy depends on the energy sector [1,2]. Every country gives more focus on utilization of solar energy instead using fossil fuels [3]. The world is facing major issues like huge reduction of fossil fuels on daily basis. So, solar harvesting devices like solar cell and solar photovoltaic that are capable of producing electricity by utilization of solar energy should be used. The aim is particularly on summer days, the users will get more relaxed - they can feel cool and make them more efficient by cooling their head and face. We all know each and every work will not be complete in the home or in the office, so in some cases even during summer workers have to do their work under any certainty of weather condition that cases caps will give them some respite.

Manual labor work in hot temperature causes of water and salt imbalance in their body. Even in construction industry, there is a lack of protection, which can be fulfilled by this cap. This cap can will provide safety and will make them relax and thus making this research idea more beneficial. The degree of comfort also depends on metabolic rate of any person – under the influence of high temperature, a huge increase in sweating and evaporation can also be noticed to maintain adequate body temperature [4]. Basically agriculture, construction, traffic warden of each street, firefighting people can be more beneficial if they will use innovative solar cell applied cap; otherwise overall output of the worker will be reduced [5,6]. Extended periods spent outside without cap may affect a lot to the workers because there is direct sun rays fall on the whole body. So solar panel with small fan based cap is required by each individual those who spend extended periods throughout the whole day [7]. Definitely if anybody is exposed directly to the sunrays or sun's greatest intensities, which in long run will affect their health [8].Now a days there are more number of applications are developed by using solar panel. Applications like light designing in the interior during the day time and led lighting in the street by using promising green natural solar energy [9]. Both physically and emotionally this type of cap can be called as fancy look [10].

Different research on this is already there, few of them being the solar smart cap for cost effectiveness and user friendliness [11], smart cap for visual guidance system [12] and many more.

II. PROPOSED CONCEPT

This cap has a small solar panel fitted on top and also it connected to a small fan on the hood. The fan is mounted through a hole in the cap. So when the fan runs one will get lot of cool air right on the face and get some how relaxed. If there will be no sunlight to the solar panel of the cap then the fan stops to rotate. This is because the fan which is getting all energy from the solar panel and the solar panel which will get all energy from the sun. As everybody knows as sun is the ultimate source of energy. Basically in sunny days this type of solar cap can provide much cooler temperature as compared to the other seasons throughout of the year. Solar fan in the cap has several advantages like environmentally friendly, also good for preventing sunstroke, high sensitivity as well as weight less equipment. It works according to the surrounding sun intensity and is also low cost equipment. Basically maximum people of industry, sports people, and common people prefer cap for safety purpose. By use of the solar cap one can harness all the energy and also reduce the carbon footprint and indirectly help to save the planet.

As for the small experiment or polycrystalline solar panels range is hundred to hundred fifty in Indian rupee. For a small battery recharge these types of solar panels are enough to produce LED glow. So for producing more solar power based electricity, people have to take initiative to utilize maximum open space for use of solar

panels. Here the small cap with small solar cell can have the potential to run the blades of the fan and provides relaxations to the person wearing it. Here the solar panel itself plays an important role as it converts every single photon of light from the sun into electrical energy. Basically use of solar panel and getting the electric energy is one type of roof application. One can wear such panel on the cap and take maximum advantages from it.

In the market, these type of hats or caps are available and the figure is shown in Fig. 1 and Fig. 2. For Outdoor Sports, Cycling the requirement is more.

Fig 1. Solar power cap with air fan [13]

Solar panels have the potentials to generate sustainable green energy.

Fig 2. Side views Solar power cap with air fan [13]

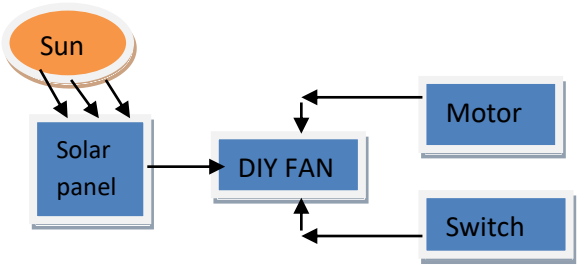

Fig 3. Solar power cap basic components

III. RESULTS AND DISSCUSSION

When the sun just comes out and shines on the panels that time the fan spins. By wearing this cap on the head it makes one feel cool and provides comfort to the person wearing. It actually works pretty well when relying on the sun. This work performance is very strong especially when the sun is in full force and the spinning at that period will be extremely fast. There is a little bit noise from the fan but it is a tolerable also it does not annoy anyone rather all have to appreciate the cooling effect as it makes the face a pretty cool.

If someone will sit in the shade then the fan is not going to work anymore. The main purpose is to relieve heat from the head and face by this innovative solar mounted cap.

To place the fan, the cap was cut in the front and on the top-most portion of the cap the solar panels were placed. Basically the panels will be used to capture light photons and provide electricity. Instead of fan one can mount for charger then it can help to charge our gadgets like tablets, cell phones and can be able to improve in the energy storage durability and longevity. If the solar panels are connected in series with the circuit connection then this will increase the voltage that will flow to the fan thus increasing the fan rpm or one can say the fan speed.

Normally the fan gets energy from electricity which is basically from the solar panels, where it converts solar energy. Depending upon the material of the fan the speed may vary. Normally blades of the fan are made plastic, so that it can be safe to the person who is wearing it. There may be the designer choice whether one will put a tiny switch or it automatically work for all the time.

Particularly in this type, one has to keep the cap on the head and the cap not only provides shade to the head, but also the fan arrangement also makes the person feel cool and sweet to the face.

A. Designs

There are so many manufactures who have made this type of solar cool cap system. But if someone places the solar cell over the larger area of the cap then it will generate more speed and better cooling system.

B. Prototype connection

The simple model can be implemented easily as shown in the Fig. 4. Here we are taking the larger solar panel but one can take as per the specific requirement. Figure 5 shows the connections.

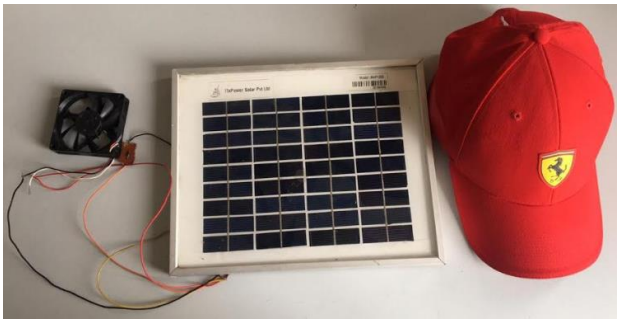

Fig 4. Solar power cap design components

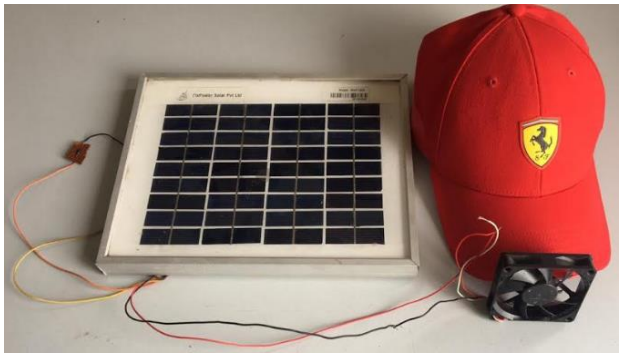

Fig 5. Solar power cap connection

One can easily place the fan inside the cap's front portion.

C. *Specification*

The table 1 shows the specification for the solar panel DIY and motor.

Solar Power Cap Required Element		
Solar Panel	*DIY Fan*	*DC Motor*
Current at maximum power at 0.28A	Model 280GL-0.4W	Operating 4.5 to 9 Volts
Rated power 5W	Work at 0.4 W	Loaded current 250 mA
Size 15 cm x 15 cm	Size 7cm x 7cm	Size 27.5 mm x 20mm x 15mm

Table 1. Required details for the design prototype

Solar power efficiency will be reduced if there is dirt on the panels. The tilt in orientation also affects the output – this may not produce adequate energy and can make the fan stop.

In solar panel the solar cell efficiency depends on basic equation (1).

$$\eta_{max} = (P_{max}/E * A_c) * 100\% \qquad (1)$$

where, E is the incident radiation flux and A_c area of collector and P is maximum power.

D. *Features*

Even though the wearable electronics is there in the solar cap, one can feel the coolness, even in the sunlight. This is one which looks fancy with good style and comfort.

E. *Potential applications*

Normally it does not require secondary power source as it collects energy only from the sun. Even if it only produce small amount of air but it is very useful and beneficial in hot weather. As there are no batteries used so it is easily go for a longer lasting, but only the person has to take care proper care of the cap. But for caring sense one only has to keep it in safe area not dump the other equipment on it. It also does not demand much care and maintenance.

Basically in summer, there will be deleterious outcome due to overexposed heat radiation. Sometimes people feel about heat stress, eye diseases and sun burns on the face. Although there are some protections available like some cream products and physically like umbrella but this solar cap with fan will be more effective than carrying an umbrella or some beauty cream. .

IV. CONCLUSION

For human body sunlight exposure was both positive and negative effects. All year round most of the outdoor workers work under severe summer conditions. Most of the agricultural workers focus their occupational heat stress which have effects their mental health condition, and simultaneously seen some physiological disorders. It is shown in some cases that people like to take few time to rest under some shade and due to this they take more time to complete their task.

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