

Technical Description: Solar Panels

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Paper Outline:

History: What is a Solar panel? Who created it?

Body 1: Design? What is used? Its creation?

Body 2: What is its Purpose? What does it do?

Body 3: What are its advantages and disadvantages? Who does it affect?

Conclusion: Overall connections

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Brief History of Solar Panels:

It all started when Edmond Becquerel, a young physicist working in France, discovered in 1839 the photovoltaic effect, a process that produces a voltage or current when exposed to light or radiant energy. Decades later, the French mathematician Augustin Mouchet was inspired by the physicist's work. He began patenting solar-powered engines in the 1860s. From France to the United States, inventors inspired by mathematician patents filed patents for photovoltaic devices as early as 1888. Back in 1883, New York inventor Charles Fritz created the first solar cell by coating selenium with a thin layer of gold. Fritz reported that the selenium module produced a "continuous, constant, and considerable power" current. This cell achieved an energy conversion rate of 1-2%. Most modern solar cells operate at 15-20% efficiency. So, Fritz developed a low-impact solar cell, which nevertheless marked the beginning of the innovation of photovoltaic panels in America. Named after the Italian physicist, chemist, and pioneer of electricity and energy Alessandro Volta, photovoltaic is a more technical term for converting light energy into electricity, and the term photovoltaic used interchangeably.

Figure 1.

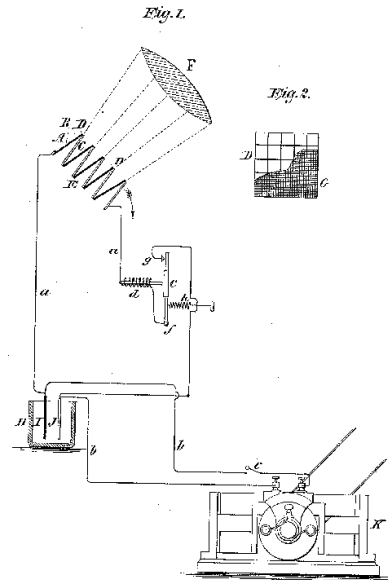
(No Model.)

E. WESTON.

APPARATUS FOR UTILIZING SOLAR RADIANT ENERGY.

No. 389,124.

Patented Sept. 4, 1888.



WITNESSES:
Gustav Dietrich
Edgar Goodwin

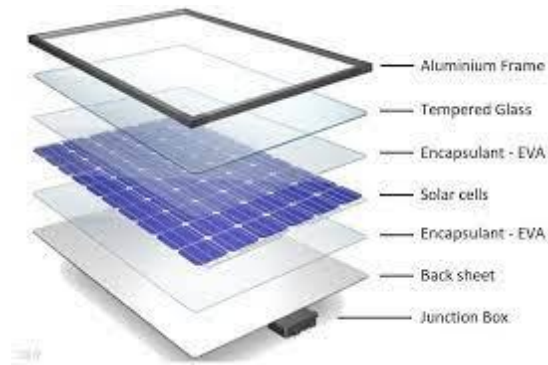
INVENTOR:
Edward Weston
BY *Paul Benjamin*
ATTORNEY.

U.S. PATENT OFFICE

Body 1: Design? What is used? Its creation?

Solar panel technology is evolving rapidly with increased efficiency and lower prices, resulting in a significant increase in demand. Despite significant advances in technology, the basic structure of solar panels has not changed much over the years. Most solar panels consist of a series of crystalline silicon cells sandwiched between a glass plate on the front and a polymer plastic back sheet on the back, held in an aluminum frame.

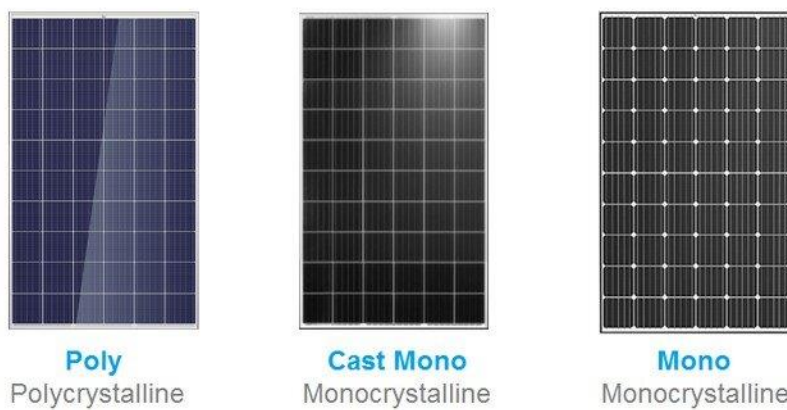
Figure 2.



Solar panels use solar, or PV cells made from crystalline silicon wafers like the wafers used to manufacture computer processors. Silicon wafers are either polycrystalline or monocrystalline and are manufactured using a variety of manufacturing processes. Multicrystalline wafers, on the other hand, are slightly less efficient and are produced using multiple cleaning processes followed by a simpler and cheaper casting process. Recently, cast single crystals or cast single cells have gained popularity. The reason is a more cost-effective casting process to produce cast mono cells, like that of polycrystalline silicon cells.

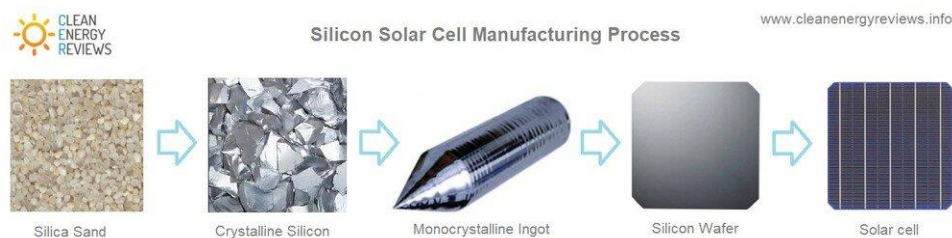
- Monocrystalline silicon cells - Highest efficiency and highest cost
- Cast monocrystalline cells - High efficiency and lower cost
- Polycrystalline silicon cells - Lower efficiency and lowest cost

Figure 3.



Manufacturing conventional silicon-based solar cells requires a variety of processes, starting with a raw material called quartzite, a type of quartz sandstone. First, quartzite, also known as quartz sand, is converted to metallic silicon by combining carbon and quartzite in an electric arc furnace. This process takes place at very high temperatures and yields 99% pure silicon. The next step is to convert the metallic silicon to pure polysilicon. This uses either a chemical cleaning process called the Siemens process, or reinforced metal silicon using a low-cost metal process (UMG-Si). The polysilicon is then doped with trace amounts of boron or phosphorous to make it p-type or n-type silicon. At this stage, the polycrystalline silicon can be melted and cast into large rectangular blocks and sliced thin using the diamond wire cutting process to produce polycrystalline or polycrystalline wafers.

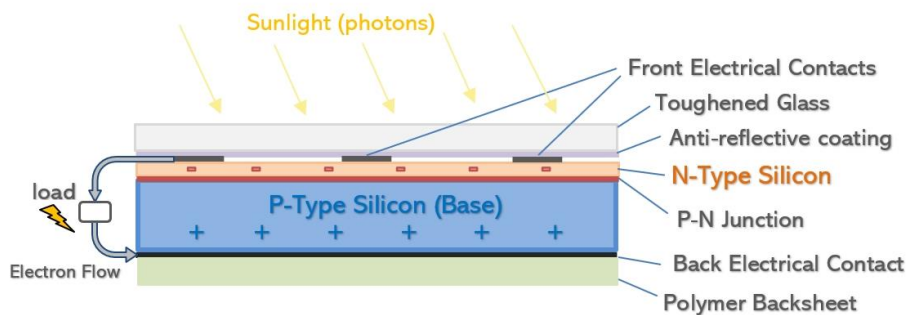
Figure 4.



Stated in the reading are the steps:

- Silica sand is purified in an arc furnace to create 99% pure silicon
- 99% silicon is further refined close to 100% pure silicon
- The silicon is doped with boron or phosphorous (P-type or N-type)
- The doped silicon is melted and extracted into a crystalline ingot
- The round ingot is diamond wire-cut into thin square wafers
- The thin base wafer is coated with an ultra-thin layer of either P-type or N-type silicon to form the PN-junction.
- An anti-reflective layer and metallic fingers are added to the cell surface
- Flat ribbon busbars (as shown) or thin wire (MBB) busbars are added

Solar panels are manufactured from six key components detailed below and assembled with great precision in our advanced manufacturing facility. This article will focus on panels made from crystalline silicon solar cells. This is because it is the most popular and best solar technology today. Other photovoltaic technologies are available, such as: B. Thin film and screen-printed cells. However, they are of limited use or are still in development. Figure 5.



Solar panels are those devices that are utilized to ingest the sun's beams and convert them into power or intensity. The charger is really an assortment of sun-based (or photovoltaic) cells, which can be utilized to create power through photovoltaic impact. These cells are organized in a lattice-like example on the outer layer of sunlight-powered chargers. In this way, it might likewise be portrayed as a bunch of photovoltaic modules, mounted on a construction supporting it. A photovoltaic (PV) module is a bundled and associated get-together of 6×10 sun-oriented cells. About mileage, these boards are extremely solid. Sunlight-powered chargers break down very sluggishly. In a year, their viability diminishes something like one to two percent (on occasion, lesser). Most sunlight-powered chargers are made up of utilizing glass-like silicon sun-oriented cells. The establishment of sun-powered chargers in homes helps in fighting the unsafe discharges of ozone-harming substances and in this way diminishes dangerous atmospheric deviation. Sun-powered chargers lead to no type of contamination and are perfect. They likewise decline our dependence on petroleum derivatives (which are restricted) and conventional power

sources. Nowadays, sun-powered chargers are utilized in colossal electronic types of gear like number crunchers, which fill in for however long daylight is accessible. In any case, the main significant disadvantage of sunlight-powered chargers is that they are expensive. Likewise, sunlight-powered chargers are introduced outside as they need daylight to get charged. Sun powered charger innovation is progressing quickly with more noteworthy effectiveness and lower costs bringing about a tremendous expansion popular. In any case, despite the enormous progressions in innovation, essential sun powered charger development has not changed a lot throughout the long term. Most sun powered chargers are yet comprised of a progression of silicon translucent cells sandwiched between a front glass plate and a back polymer plastic back-sheet upheld inside an aluminum outline.

Solar panels are assembled in advanced manufacturing facilities using automated robotic equipment and sensors to place components with great precision. Manufacturing facilities must be exceptionally clean and controlled to prevent contamination during assembly.

Body 2: What is its Purpose? What does it do?

In our current climate of the world, we have been able to develop our ways of understanding, creating, and developing energy sources that would help us do everyday activities, such as communication, transportation, etc. that we do not see as something that requires lots of energy. However, some of these normal energy sources that we have tended to use other the years of technological development and discovery of added resources have become the main source of a global issue that we are all facing and is ever getting worse as more time is permitted. Global warming is the increase of global temperature due to Co₂ emissions used by cars, factories, and carbon-necessary machinery that has caused a blanket of Co₂ under the earth's atmosphere that traps the Sun radiation on the earth causing melting and high-water

levels. Now a solution to this has been brought to attention, why do not we use what is causing the issue as a weapon against global warming, this solution is Solar Panels.

Of all the advantages of solar panels, the most important is that solar energy is a truly renewable source of energy. Available in all regions of the world and available every day. Unlike other energy sources, solar energy never runs out. If the sun is there, solar energy will be available, so it will be available for at least 5 billion years before scientists say it will die. A portion of the required energy is covered by the electricity generated by the solar power generation system, which reduces the electricity bill. How much you can save on your bill depends on the size of your solar system and your electricity or heat consumption. For example, companies with commercial solar panels will benefit from this switch as it can cover most of their energy bills due to the large system size. In addition, you will not only save money on your electricity bill, but also can receive payment for the surplus energy you export to the grid via the Smart Export Guarantee (SEG). If you generate more power than you consume (considering that your solar system is connected to the grid). Solar power systems are usually maintenance-free. It only needs to be kept clean, so cleaning it a few times a year should be enough. If in doubt, you can always turn to professional cleaning companies that offer this service for around 25 to 35 euros. Most reputable solar panel manufacturers offer 20–25-year warranties.

However, some disadvantages are that the cost of acquiring a solar power system is high. This includes paying for solar panels, inverters, batteries, wiring and installation. That said, solar technology is constantly evolving, so we can expect prices to come down in the future. Solar energy can still be collected on cloudy or rainy days, but the solar system is less efficient. Solar panels rely on sunlight to effectively collect solar energy. Therefore, a few days of cloudy or rainy weather can have a noticeable impact on the energy system. We also must consider that we

cannot collect solar energy at night. On the other hand, if you want your hot water solution to work at night or in winter, you might want to consider a thermodynamic panel. Pollution associated with solar energy systems is much less than other energy sources, but solar energy can be associated with pollution. The transportation and installation of solar panels is associated with greenhouse gas emissions. In addition, the manufacturing process of photovoltaic power generation systems uses toxic substances and dangerous products that can indirectly affect the environment. Still, solar energy is far less polluting than other alternative energy sources.

Conclusion:

When introduced, sun-powered chargers are exposed to serious circumstances throughout the span of their 25+ year life. Outrageous varieties in temperature, mugginess, wind, and UV radiation can put a huge weight on a sun-powered charger. Luckily, most boards are very much designed to endure outrageous climates. In any case, a few boards can flop in many ways including water entrance, cell miniature cracks, and prompt corruption or PID. To this end, it is indispensable that sunlight-based chargers are fabricated utilizing unquestionably the greatest parts. In our other article, best sun powered chargers, we feature the main makers utilizing the greatest materials along with testing to the most noteworthy industry norms.

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