

Non-Photovoltaic Solar Power Device

Critical Design Requirements

For this product, there are three critical design requirements. First and foremost, it must be able to provide the user with 20 W at 12 V continuously. “Continuously” is defined for the scope of this product as being able to run during sunlight and forty consecutive hours without any. Secondly, the device must be simple and manageable, requiring only two people of high-school level education to assemble, operate and maintain. Third and finally, the product must make use of at least two reused/recycled (originally used or intended for use in another application) in its operation.

Description

This product will concentrate sunlight using a reflective parabolic dish onto the hot chamber of a Stirling engine. This engine will then drive a generator to produce electricity. The current produced by the generator will be fed through a power management system which will connect the generator, batteries and load. This system will be contained on a microprocessor and be able to determine the load requirements and from where (the generator or the batteries) to satisfy it. Any excess power will be used to recharge the batteries. To ensure the dish is always facing the sun, two “drinking bird” type equalizers (see sketches) and a ball and socket joint will be utilized. It is easy to assemble, weatherproof, and the only required maintenance will be periodically cleaning the dish and perhaps replacing batteries.

Key Features

- Stirling Engine – this engine runs on a temperature differential between hot and cold chambers (in the configuration used here, there is one chamber with a hot and cold side) by expanding and contracting the gas inside
- “Drinking bird” equalizers – these devices will ensure the dish is always pointed at the sun
- Power management chip – this processor will determine how to use the produced power
- Reflective parabolic dish – this dish will focus sunlight onto the hot end of the Stirling engine
- Car batteries – these batteries will be used to satisfy the load on cloudy days and at night and will be recharged in sunlight

Intelligent Features

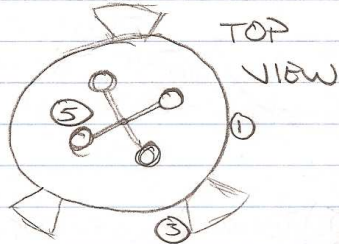
The power management system will sense the load on the system and the power coming in from the generator. It will then determine if the batteries need to be used to meet the load or if there is excess power enough to recharge them and route power accordingly.

INDV. TIME: 3 HRS.



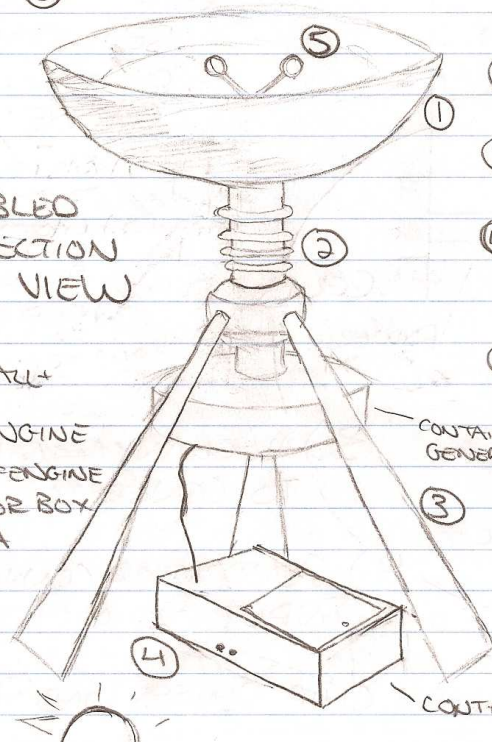
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Individual Concept Memo Sketches



NON-PV SOLAR
POWER DEVICE
IN 5 DISTINCT PARTS

ASSEMBLED PROJECTION VIEW



- ① REFLECTIVE PARABOLIC DISH
- ② ENGINE/GENERATOR ASSEMBLY
- ③ SCREW-IN SUPPORTS (3)
- ④ BATTERY/MICROCHIP HOUSING + LOAD INTERFACE
- ⑤ "DRINKING BIRD" TRACKING ASSEMBLY

ASSEMBLY:

- SCREW LEGS INTO BALL + SOCKET JOINT
- PLACE DISH OVER ENGINE
- ATTACH ⑤ TO TOP OF ENGINE
- CONNECT GENERATOR BOX TO BATTERY BOX VIA INSULATED WIRE

CONTAINS GENERATOR + FLYWHEEL

CONTAINS BATTERIES + MICROPROCESSOR

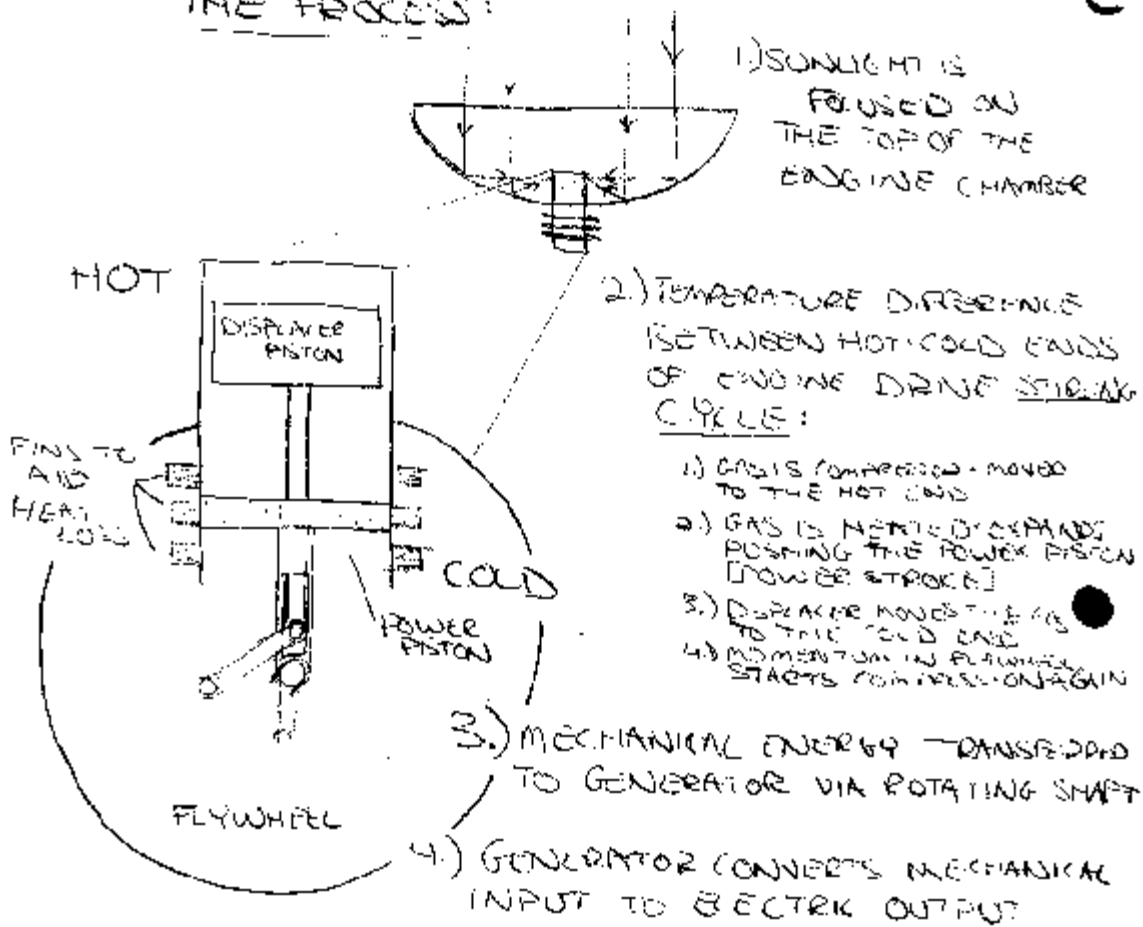


"DRINKING BIRD" EFFECT

⑤ CONSISTS OF TWO TUBES W/BULBS OF LIQUID. TO EQUILIBRATE PRESSURE, THE TUBES WILL ROTATE TO PROVIDE EQUAL RADIATION TO EACH BULB - THE MOVEMENT OF

LIQUID WILL TILT THE DISH, THUS TRACKING THE SUN ON TWO AXES (DATE OF YEAR + TIME OF DAY)

THE PROCESS:



- 5.) POWER MANAGEMENT CHIP SENSES LOAD • POWER FROM GENERATOR
- IF $P_G < P_{LOAD}$, MAKE UP DIFFERENCE WITH BATTERIES
 - IF $P_G > P_{LOAD}$, USE EXCESS TO RECHARGE BATTERIES

POSSIBLY RECYCLED COMPONENTS:

- DISH
- BATTERIES
- GENERATOR
- ALUMINUM CANS FOR DISPLACE PISTON + CRANK