DEVICES COLLECTING SUNLIGHTS

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Annotation: In this article, the geometrical design of a paraboloid concentrator that concentrates sunlight to a single focal point is considered. Such solar concentrators are distinguished by their convenience and ease of application in the public and agricultural sectors.

Key words: Parabola, paraboloid, solar concentrator, focal length, surface, size of focal length, mirror, temperature, radiation.

Wide use of alternative energy sources is in accordance with the priority goals and tasks of energy security of each country and is one of the rapidly developing areas of the energy sector. In the future, the use of renewable energy sources is undoubtedly necessary to ensure energy, environmental, economic security and sustainable development of the energy sector in the Republic of Uzbekistan. A prerequisite for preserving natural resources and protecting the environment for future generations is the development of renewable and alternative energy sources.

This article provides information on a solar kitchen designed for home use, especially for making tea or cooking for a small family. the device consists of a concentrator in the form of a paraboloid, which consists of a large number of mirrors. The base of the solar concentrator is made of gypsum (alabaster) [1-4]. Since gypsum is a substance that hardens within 1-2 minutes after being mixed with water, the mold used to create a paraboloid shape was cut from a metal plate to make it simpler, lighter and easier to move. For this, a drawing of a parabola with a focal length of 70 is drawn on a metal plate. In the process of cutting a parabola-shaped mold from a metal plate according to a parabola drawing, accurate work in millimeter order is required, otherwise the mold may not meet the requirements [3-6].

Regarding the geometric shape of the paraboloid, we first determine that it is circular (neither elliptical nor hyperbolic), that is, a spherical paraboloid can be formed by the rotation of a parabola about its axis. The only remaining parameter is the focal length, which serves to define the parameters of the circular paraboloid.

Determines how wide or narrow it is. An analytical circular paraboloid can be represented in the Deckard coordinate system [7-9].

We see drawings of different parabolas of different focal lengths with a single axis of symmetry [Fig. 1].

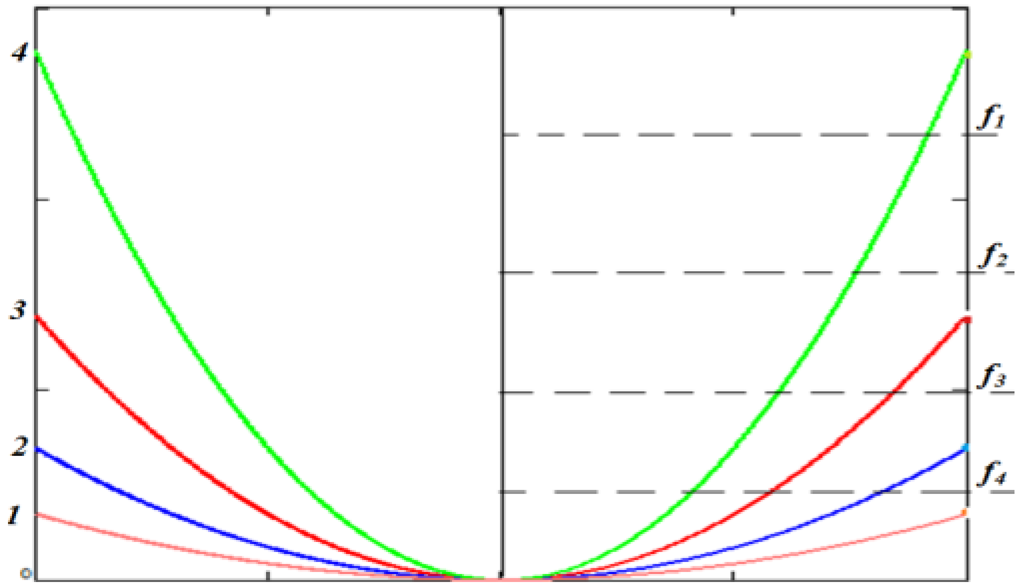

Figure 1: Array of parabolas with different focal lengths

The proposed device is designed for household work, especially for making tea or cooking for a small family. The device consists of a paraboloid concentrator and is cast from gypsum. Since gypsum is a substance that hardens within 1-2 minutes after being mixed with water, the mold used to create a paraboloid shape was cut from a metal plate to make it simpler, lighter and easier to move. We know the equation of drawing a parabola with its coordinates when the central point F is given [10-11].

$$y = \frac{x^2}{4f}$$

If the values of X are matched to the values of Y, it is possible to assign appropriate points to each pair of X and Y values in the rectangular coordinate system. A drawing of a parabola with a focal length of 70 cm is drawn on a metal plate [12-15]. This parabola is shown in Figure 2 below.

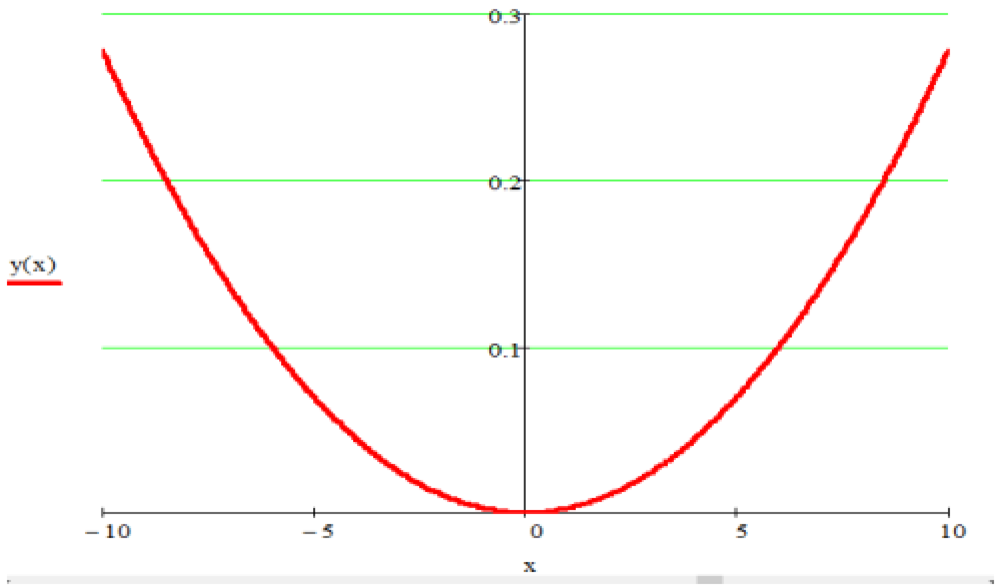

Figure 2. A drawing of a parabola with a focal length of 70 cm.

There are several ways to draw a parabola, and we will consider some of them. Let's assume that the point M lies on the parabolic line Lp. In this case MF= MD Figure 3.

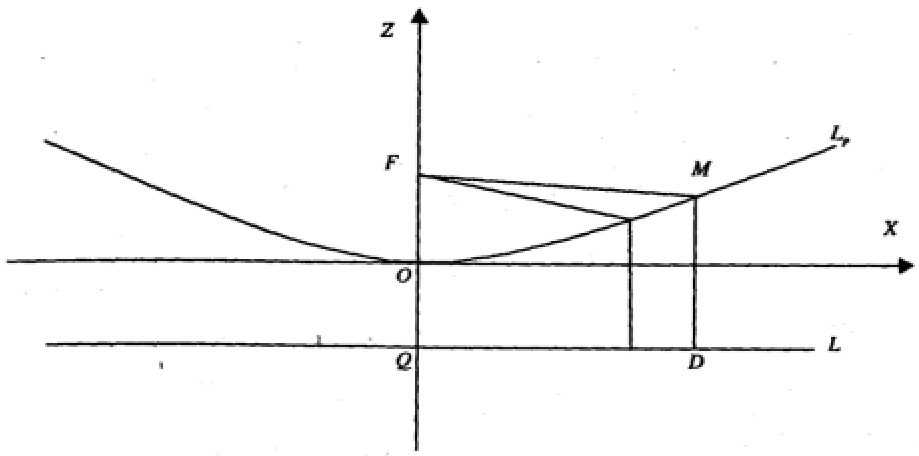

Figure 3. The process of drawing a parabola line.

From the equation to determine the parabolic focus distance

$$X^2 = 4f \cdot Y$$

Or $$x^2 = 2p \cdot Y$$

Here, p=FQ is the distance from the focal point of the parabola to the standard line; f=0F=p/2 is the focus distance of the parabola; F is the central point of the parabola; 0 is the tip of the parabola.

A straight line through the central point and the tip of the parabola is the main axis of the parabola.

$$\tan\psi = \frac{x_0}{f - \frac{x_0}{4f}}$$

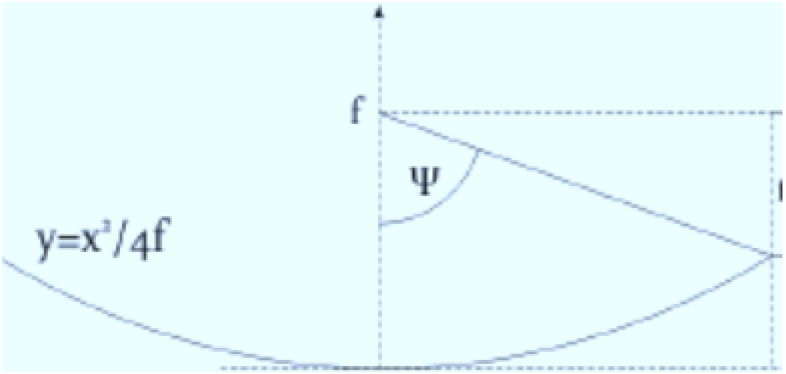

Figure 4: Representation of an angle in the intersection circle of a paraboloid

The time taken to boil 0.5 liters of water in the device and the dynamics of temperature change are considered.

Figure 5. A real view of a paraboloid whose surface is covered with 5x5 cm mirrors.

Conclision

Information on the creation technology of the paraboloid solar kitchen was presented to obtain and analyze the results. In the process of making the device, some information was given about the raw materials used and suggestions were made.

Additional information about the technology of creating the device using the literature was given. Thermal technical parameters of the device were analyzed in the process of conducting experiments on the broken device. We calculate the relationship between the time and temperature of 0.5 liters of water until it boils. It is recommended to further improve the device and start production for its use in agriculture.

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