

SOLAR POWER SYSTEM

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The invention relates to a solar power system. More particularly, the invention relates to a solar power system with multiple heat-exchange modules, wherein each heat-exchange module has the capability of making a turbulence of the heat-exchange fluid in the heat-exchange space sufficiently.

Description of Related Art

[0002] In recent years, petrochemical energy gradually dried up, and the petrochemical energy will cause the Earth environmental pollution increasingly serious, and therefore, the utilization of natural energy or renewable energy has become importantly.

[0003] Therefore, many experts have begun to study a variety of renewable energy applications, wherein solar energy is the most viable natural energy. Under the current power has increasingly widespread use of solar power transforming device, the urgent needs in shortage of the exhaustible energy and environmental consciousness gradually, the use of solar power transforming devices is increasingly important. But, poor photoelectric transforming efficiency of solar power generation system could not provide the power effectively.

SUMMARY OF THE INVENTION

[0004] The invention is directed to a solar power system with a heat exchanger that increases the contacting area between the fins and heat exchanging fluid substantially, and

results in heat exchange operation efficiently, thereby greatly enhance the photoelectric transforming efficiency of the solar power system.

[0005] The invention is directed to a solar power system with multiple heat exchangers connecting with each other for further rising the temperature of the heat-exchange fluid gradually to save energy.

[0006] In the invention, a solar power system is provided. The solar power system is suitable for transforming sunlight to an electric power. The solar power system includes multiple heat-exchange modules, a heating unit, a power-generating device, a power-transforming device, a power storage, and a fluid channel. Each heat-exchange module includes a heat exchanger, a base, and a heat-focusing device. The heat exchanger includes a first heat-exchange set and a second heat-exchange set. The first heat-exchange set includes multiple first heat-exchange fins. Each first heat-exchange fin has a first body and at least a first extending portion disposed at one side of the first body. Each first extending portion extends from the first body toward a first direction. The second heat-exchange set includes multiple second heat-exchange fins. Each second heat-exchange fin has a second body and at least a second extending portion disposed at one side of the second body. Each second extending portion extends from the second body toward a second direction. The first direction is opposite to the second direction. The first heat-exchange set and the second heat-exchange set are connected along a first axis, and the first heat-exchange fins and the second heat-exchange fins are staggered along a second axis. A heat-exchange space is formed between the first heat-exchange set and the second heat-exchange set, and a heat-exchange fluid is flowed through the heat-exchange space.

[0007] From the above, the heat exchanger is disposed on the base. The heat-focusing

device is placed at the base, and is suitable for receiving sunlight and focusing to the heat exchange. One end of the heating unit is connected with the heat-exchange modules. The heating unit makes the heat-exchange fluid flowed out of the heat-exchange modules to have a phase transfer. One end of the power-generating device is connected with the other end of the heating unit, and the heat-exchange fluid with the phase transfer is suitable for driving the power-generating device to produce a mechanical energy. The power-transforming device is connected to the power-generating device, and is suitable for transforming the mechanical energy into a electric power. The power storage is connected to the power-transforming device, and the electric power is stored in the power storage. The fluid channel is communicated among the heat-exchange space of each heat exchanger, the heating unit, and the power-generating device.

[0008] In one embodiment of the present invention, the first heat-exchange fin further includes a first connecting portion, the first connecting portion extends from the first body toward the first direction, the second heat-exchange fin further includes a second connecting portion, the second connecting portion extends from the second body toward the second direction, when the first heat-exchange set and the second heat-exchange set are connected along the first axis, the first connecting portions of the first heat-exchange fins and the second connecting portions of the second heat-exchange fins are connected with each other, and the first heat-exchange fins are arranged with interval along the second axis, the second heat-exchange fins are arranged with interval along the second axis.

[0009] In one embodiment of the present invention, the area that the first extending portion extends from the first body toward the first direction is larger than the area that the first connecting portion extends from the first body toward the first direction, the area that the

second extending portion extends from the second body toward the second direction is larger than the area that the second connecting portion extends from the second body toward the second direction.

[0010] In one embodiment of the present invention, the first heat-exchange set and the second heat-exchange set include multiple third heat-exchange fins respectively, the third heat-exchange fin is disposed between two adjacent first heat-exchange fins, the third heat-exchange fin is disposed between two adjacent second heat-exchange fins, and each third heat-exchange fin has a third body and a third connecting portion, each first body and the third body of the adjacent third heat-exchange fin are overlapped, each second body and the third body of the adjacent third heat-exchange fin are overlapped, when the first heat-exchange set and the second heat-exchange set are connected along the first axis, the first extending portion of the first heat-exchange set is connected to the third heat-exchange fin of the second heat-exchange set in the extending direction of the first extending portion, the second extending portion of the second heat-exchange set is connected to the third heat-exchange fin of the first heat-exchange set in the extending direction of the second extending portion.

[0011] In one embodiment of the present invention, the first heat-exchange set and the second heat-exchange set includes multiple fourth heat-exchange fins respectively, the fourth heat-exchange fins are disposed at two sides of the first heat-exchange set and the second heat-exchange set respectively, and a closed heat-exchange space is formed among the first heat-exchange fins, the second heat-exchange fins, and the third heat-exchange fins.

[0012] In one embodiment of the present invention, the heat exchanger further includes multiple seals disposed among the adjacent of the first heat-exchange fins, the second

heat-exchange fins, and the third heat-exchange fins, and are disposed between two adjacent fourth heat-exchange fins.

[0013] In one embodiment of the present invention, the heat exchanger further includes a inlet channel and a outlet channel, communicated with the fluid channel, the outlet channel of each heat exchanger is suitable for connecting the inlet channel of the another heat exchanger, and the inlet channel and the outlet channel are communicated with the heat-exchange space for the flow of the heat-exchange fluid, the inlet channel and the outlet channel are disposed at two opposite corners of the heat-exchange space along the first axis.

[0014] In one embodiment of the present invention, the heat-focusing device is a Fresnel Lens.

[0015] In one embodiment of the present invention, the heat-exchange modules are constituted of multiple series arrangements, the series arrangements are connected by a parallel type.

[0016] In one embodiment of the present invention, the projection area of the first extending portion of each first heat-exchange fin in the second heat-exchange fin is not overlapped with the second extending portion of the second heat-exchange fin, the first extending portion of the first heat-exchange set and the second extending portion of the adjacent second heat-exchange set are staggered in the heat-exchange space, the heat-exchange space is located between the first body of the first heat-exchange set and the second body of the adjacent second heat-exchange set.

[0017] In one embodiment of the present invention, the first extending portions of the first heat-exchange set are arranged in the corresponding first body along a third axis, the second extending portions of the second heat-exchange set are arranged in the corresponding second

body along the third axis, the projection area of the first extending portion of each heat-exchange set in the second heat-exchange fin of adjacent another heat-exchange set is located between two adjacent second extending portions, and an interval is formed between the first extending portion and two adjacent second extending portions, each first body and each second body are vertical structures, and each first extending portion and each second extending portion are rectangular sheet arrangements extended from the vertical structures.

[0018] In one embodiment of the present invention, the projection area of the first extending portion of each first heat-exchange fin in the second heat-exchange fin is overlapped partly with the second extending portion of the second heat-exchange fin, the heat-exchange space is located between the first body of the first heat-exchange set and the second body of the second heat-exchange set.

[0019] In one embodiment of the present invention, the first extending portion has multiple first guiding channel structures, the second extending portion has multiple second guiding channel structures, each first guiding channel structure of the first heat-exchange set and each second guiding channel structure of the adjacent second heat-exchange set are overlapped partly, each first guiding channel structure of the heat-exchange set and each second guiding channel structure of the adjacent another heat-exchange set are communicated to form the heat-exchange space.

[0020] In one embodiment of the present invention, the first guiding channel structure of the first heat-exchange set are communicated with at least four adjacent second guiding channel structures of the adjacent second heat-exchange set simultaneously, at least two of the adjacent second guiding channel structures are arranged along the first axis, at least two of the adjacent second guiding channel structures are arranged along another axis vertical to

the first axis

[0021] In one embodiment of the present invention, the first guiding channel structures are constituted of three first guiding channel arrangements, the second guiding channel structures are constituted of three second guiding channel arrangements, one of the first guiding channel arrangements of the first heat-exchange set is overlapped with the second guiding channel arrangements of the adjacent second heat-exchange set simultaneously, each first guiding channel structure of the first guiding channel arrangements is communicated with the second guiding channel structure of each second guiding channel arrangement of the adjacent second heat-exchange set simultaneously, the first guiding channel arrangement and the second guiding channel arrangement include two trilateral guiding channel arrangements and one quadrilateral guiding channel arrangements respectively, the trilateral guiding channel arrangements are disposed at two sides of the quadrilateral guiding channel arrangement.

[0022] In one embodiment of the present invention, each first body and each second body are vertical structures, and each first extending portion is a first mesh structure, the second extending portion is a second mesh structure, the first mesh structure and the second mesh structure are extended from the vertical structures, the solid portion of the first mesh structure of the first heat-exchange set is staggered with the solid portion of the second mesh structure of the adjacent second heat-exchange set.

[0023] In one embodiment of the present invention, the first heat-exchange set further includes a heat-exchange plate, the first heat-exchange fins are arranged with interval on the heat-exchange plate, the second heat-exchange set further includes another heat-exchange plate, the second heat-exchange fins are arranged with interval on another heat-exchange plate, and the sunlight is focusing to the heat-exchange plate of the first heat-exchange set.

[0024] In one embodiment of the present invention, the power-generating device is a steam driving device, and the phase transfer is change from liquid phase to gas phase.

[0025] As described in the embodiments of the invention, in the invention of the solar power system, the heat exchanger is constituted of a first heat-exchange set and a second heat-exchange set mainly. A heat-exchange space is form between two adjacent heat-exchange set, wherein multiple staggered fins are disposed in the heat-exchange space. The design of the fins makes a turbulence of the heat-exchange fluid in the heat-exchange space sufficiently. In detail, the heat-exchange fluid flowed in the heat-exchange space is forced to be confluent or separated by the fins of two adjacent heat-exchange sets when the heat-exchange fluid flows into the heat exchanger. This increases the contact area between the heat-exchange fluid and fins substantially, and increases the rate of the heat-exchange process of the heat-exchange fluid.

[0026] In addition, the heat-exchange modules in the invention are arranged with contacting. For example, the heat-exchange modules are constituted of multiple series arrangements, and the series arrangements are connected by a parallel type. Therefore, the heat exchangers connecting with each other can rise the temperature of the heat-exchange fluid gradually to a high temperature state. Thus, just need to heat the described heat-exchange fluid with high temperature status by the heating unit slightly if a high temperature steam is required to drive the power equipment. The steam is applied to drive the power equipment to produce a mechanical energy. The mechanical energy is transformed to an electric power. Furthermore, in addition to have the effect of saving energy, the photo-electric conversion efficiency of the solar power system is upgraded substantially.

[0027] Other features and advantages of the invention will be further understood from the

further technological features disclosed by the embodiments of the invention wherein there are shown and described embodiments of this invention, simply by way of illustration of best modes to carry out the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0028] The accompanying drawings are included to provide a further understanding of the disclosure, and are incorporated in and constitute a part of this specification. The drawings illustrate embodiments of the disclosure and, together with the description, serve to explain the principles of the disclosure.

[0029] FIG. 1 is a schematic view illustrating the solar power system according to one embodiment of the present invention.

[0030] FIG. 2 is a schematic view illustrating the heat-exchange module depicted in FIG. 1.

[0031] FIG. 3A is a schematic view illustrating the heat exchanger according to one embodiment of the present invention.

[0032] FIG. 3B is a cross sectional view taken along plane L1-L3 illustrating the heat exchanger depicted in FIG. 3A.

[0033] FIG. 4A is a partial exploded view illustrating the heat exchanger depicted in FIG. 3A.

[0034] FIG. 4B is a partial exploded view illustrating the heat exchanger depicted in FIG. 3A in another viewpoint.

[0035] FIG. 5 is a exploded view illustrating the partial first heat-exchange set and the partial second heat-exchange set depicted in FIG. 4A.

[0036] FIG. 6A is a schematic view illustrating the partial first heat-exchange set depicted

in FIG. 4A.

[0037] FIG. 6B is a schematic view illustrating the assembly of the partial second heat-exchange set, the inlet channel, and outlet channel depicted in FIG. 4B.

[0038] FIG. 7A is a schematic view illustrating the assembly of the first heat-exchange fin of the first heat-exchange set and one second heat-exchange fin of the second heat-exchange set depicted in FIG. 5.

[0039] FIG. 7B is a schematic view illustrating the assembly of the first heat-exchange fin of the first heat-exchange set and another second heat-exchange fin of the second heat-exchange set depicted in FIG. 5.

[0040] FIG. 8 is a cross sectional view taken along plane L2-L3 illustrating the heat exchanger depicted in FIG. 3A.

[0041] FIG. 9 is a cross sectional view illustrating the heat exchanger according to another embodiment of the present invention.

[0042] FIG. 10A is a schematic view illustrating the assembly of the first heat-exchange fin of first heat-exchange set and the second heat-exchange fin of the second heat-exchange set depicted in FIG. 9.

[0043] FIG. 10B is a schematic view illustrating the assembly of the heat-exchange fins depicted in FIG. 10A.

[0044] FIG. 10C is a schematic view illustrating the assembly of the first heat-exchange fin of the first heat-exchange set and another second heat-exchange fin of the second heat-exchange set depicted in FIG. 9.

[0045] FIG. 10D is a exploded view illustrating the first heat-exchange fin and the second heat-exchange fin depicted in FIG. 10B in another viewpoint.

[0046] FIG. 11 is a schematic view illustrating the internal design of the heating unit according to one embodiment of the present invention.

DESCRIPTION OF EMBODIMENTS

[0047] Other features and advantages of the invention will be further understood from the further technological features disclosed by the embodiments of the invention wherein there are shown and described embodiments of this invention, simply by way of illustration of best modes to carry out the invention.

[0048] FIG. 1 is a schematic view illustrating the solar power system according to one embodiment of the present invention. FIG. 2 is a schematic view illustrating the heat-exchange module depicted in FIG. 1. Referring to FIG. 1 and FIG. 2, the solar power system S of the present embodiment is suitable for transforming sunlight to an electric power. The solar power system S includes multiple heat-exchange modules 1, a heating unit 2, a power-generating device 3, a power-transforming device 4, a power storage 5, and a fluid channel 6. Each heat-exchange module 1 includes a heat exchanger 10, a base 20, and a heat-focusing device 30. The heat-focusing device 30 is Fresnel Lens, for example. In the present embodiment, each heat exchanger 10 has a heat-exchange space, and the heat-exchange space is suitable to flow for the heat-exchange fluid (about definition of the heat-exchange space, will have a detail description in following). In addition, the heat exchanger 10 is disposed on the base 20, and the heat-focusing device 30 is placed at the base 20.

[0049] The fluid channel 6 in the present embodiment is also provided to flow for the heat-exchange fluid. The fluid channel 6 is communicated among the heat-exchange space of

each heat exchanger 10, the heating unit 2, and the power-generating device 3. In the present embodiment, the heat-focusing device 30 of each heat-exchange module 1 is suitable for receiving the sunlight, and focusing sunlight to the heat exchanger 10. The temperature of the heat-exchange fluid flowed inside the heat exchanger 10 will rise by the effect of the heat-exchange of the heat exchanger 10.

[0050] Worth mentioning is that, multiple heat-exchange modules of the present invention can arrange with the type of array, for example. The heat-exchange module 1 is constituted of multiple series arrangements, and the series arrangements are connected by a parallel type. After the heat-exchange fluid flowing through the above connection and arrangement, and having a heat-exchange process with the corresponding heat exchanger, each series arrangement mentioned in the above can rise the temperature of heat-exchange fluid to a high temperature status in synchronization. In detail, due to each heat exchanger can rise the temperature of heat-exchange fluid flowed therein by the corresponding heat-focusing device 30, so that the temperature of the heat-exchange fluid will upgrade to a high temperature status with the amount of the heat exchangers which the heat-exchange fluid flows through. The high temperature status is, for example, the temperature approaching vaporization. In the present embodiment, the amounts of the heat-exchange modules showed in FIG. 1 are, for example, nine, but the present invention does not have any limitation. The design of rising the temperature of the heat-exchange fluid flowed in the heat-exchange module 1 gradually by connecting multiple heat-exchange modules 1 are all within the spirit and scope of this invention.

[0051] From the above, one end of the heating unit 2 in present embodiment is connected to the heat-exchange modules 1, and this makes the heat-exchange fluid flowed out the

heat-exchange modules 1 to produce a phase transfer. This is, the heating unit 2 can make the heat-exchange fluid with high temperature, for example, liquid be heated and vaporize, and further have a follow-up energy transfer process. In detail, in the present embodiment, one end of the power-generating device 3 is connected to the other end of the heating unit 2. Thus, the steam flowed out of the heating unit 2 is suitable for driving the power-generating device 3 to produce a mechanical energy. The power-transforming device 4 is connected to the power-generating device 3, and is suitable for transforming the mechanical energy to an electric power. The power storage 5 is connected to the power-transforming device 4, and is suitable for saving the electric power. Therefore, a power process with a excellent photoelectric transforming efficiency is completed. The excellent photoelectric transforming efficiency is produced by the heat exchanger with a excellent heat-exchange process, and the heat produced from sunlight can transform to heat-exchange fluid sufficiently. Next, the heat exchanger of the present invention is described in following.

[0052] FIG. 3A is a schematic view illustrating the heat exchanger according to one embodiment of the present invention. FIG. 3B is a cross sectional view taken along plane L1-L3 illustrating the heat exchanger depicted in FIG. 3A. FIG. 4A is a partial exploded view illustrating the heat exchanger depicted in FIG. 3A. FIG. 4B is a partial exploded view illustrating the heat exchanger depicted in FIG. 3A in another viewpoint. FIG. 5 is a exploded view illustrating the partial first heat-exchange set and the partial second heat-exchange set depicted in FIG. 4A.

[0053] Referring to FIG. 3A, FIG. 3B, FIG. 4A, FIG. 4B, and FIG. 5, the heat exchanger 10 of the present invention includes a first heat-exchange set 100 and a second heat-exchange set 200 mainly. The first heat-exchange set 100 and the second heat-exchange set 200 are

connected along a first axis L1, wherein the first heat-exchange set 100 and the second heat-exchange set 200 are assembled by multiple heat-exchange fins respectively (about the design and the placement of the heat-exchange fin will describe in following).

[0054] In addition, the heat exchanger 10 of the present embodiment further includes multiple fixing elements 14. The fixing elements 14 are fixed between the first heat-exchange set 100 and the second heat-exchange set 200 to make the first heat-exchange set 100 and the second heat-exchange set 200 contacting tightly.

[0055] Next, the flow path of the heat-exchange fluid within the heat exchanger 10 is described firstly. As shown in FIG. 3B, in the present invention, a heat-exchange space is formed between two adjacent of the first heat-exchange set 100 and the second heat-exchange set 200, and the present embodiment takes a heat-exchange space S1 formed between the first heat-exchange set 100 and the second heat-exchange set 200 for example. In the present embodiment, the heat-exchange fluid F with low temperature flows to the heat-exchange space S1, for example. The heat-focusing device is suitable for focusing the sunlight to a surface 10A of the heat exchanger 10 after receiving the sunlight. The heat produced by the focusing process can transmit to multiple heat-exchange fins of the heat exchanger 10, and then have a heat-exchange process with the heat-exchange fluid F having low temperature. The temperature of the heat-exchange fluid F with low temperature will rise obviously after flowing through the heat-exchange space S1.

[0056] FIG. 6A is a schematic view illustrating the partial first heat-exchange set depicted in FIG. 4A. FIG. 6B is a schematic view illustrating the assembly of the partial second heat-exchange set, the inlet channel, and outlet channel depicted in FIG. 4B. As shown in FIG. 6A and FIG. 6B, the flowing direction of the heat-exchange fluid is present in the short dotted

line. Referring to FIG. 6A and FIG. 6B, in the present embodiment, the heat exchanger 10 includes a inlet channel 18A and a outlet channel 18B. The inlet channel 18A and the outlet channel 18B of the present embodiment are communicated with the fluid channel 6. In addition, the inlet channel 18A and the outlet channel 18B is communicated with the heat-exchange space S1 for the communication of the heat-exchange fluid F.

[0057] In the present embodiment, the outlet channel 18A of each heat exchanger 10 is suitable for connecting with the inlet channel 18B of the adjacent another heat exchanger 10. Therefore, the heat-exchange fluid can flow through each heat exchanger 10 smoothly. The inlet channel 18A and the outlet channel 18B are, for example, disposed at the same side 10B of the heat exchanger 10, and disposed through the base 20. The side 10B is, for example, located at the surface of the second heat-exchange set 200. Another side 10A of the heat exchanger 10 is provided for the heat-focusing device to have a focusing process. Another side 10A is, for example, located at the surface of the first heat-exchange set 100. In addition, the inlet channel 18A and the outlet channel 18B are, for example, located at two opposite corners of the heat-exchange space S1 along the first axis L1. Thus, the heat-exchange fluid F flowed into the heat-exchange space S1 can flow through each heat-exchange fin of the heat exchanger 10 sufficiently. The heat-exchange fluid F with low temperature just flows into the heat-exchange space S1 from the inlet channel 18A, and flows out of the heat-exchange space S1 from the outlet channel 18B.

[0058] Herein, the configuration of the first heat-exchange set 100, the configuration of the second heat-exchange set 200, and the design and placement of each heat-exchange fin will describe in detail. In the present embodiment, multiple heat-exchange fins of the first heat-exchange set 100 mainly include multiple first heat-exchange fins 100A, and the third

heat-exchange fin 300A can dispose between two adjacent first heat-exchange fins 100A. Similarly, in the present embodiment, the heat-exchange fins of the second heat-exchange set 200 mainly include multiple second heat-exchange fins 200A, and the third heat-exchange fin 300A can disposed between two adjacent second heat-exchange fins 200A. Worth mentioning is that: the first heat-exchange fins 100A and the second heat-exchange fins 200A are staggered along the second axis L2 when the first heat-exchange set 100 and the second heat-exchange set 200 are connected along the first axis L1.

[0059] From the above, each first heat-exchange fin 100A has a first body 110A and at least a first extending portion 120A disposed at one side of the first body 110A. Each first extending portion 120A extends from the first body 110A toward a first direction D1. Each second heat-exchange fin 200A has a second body 210A and at least a second extending portion 220A disposed at one side of the second body 210A. Each second extending portion 220A extends from the second body 210A toward a second direction D2, wherein the first direction D1 is opposite to the second direction D2.

[0060] In addition, the first heat-exchange fin 100A further includes a first connecting portion 130A, wherein the first connecting portion 130A also extends from the first body 110A toward the first direction D1. The second heat-exchange fin 200A further includes a second connecting portion 230A, wherein the second connecting portion 230A also extends from the second body 210A toward the second direction D2. When the first heat-exchange set 100 and the second heat-exchange set 200 are connected along the first axis L1, the first connecting portions 130A of the first heat-exchange fins 100A and the second connecting portions 230A of the second heat-exchange fins 200A are connected. In the present embodiment, the third heat-exchange fin 300A also has a third body 310A and a third

connecting portion 330A. The third connecting portion 330A extends from the third body 310A. In the first heat-exchange set 100, the projection area of the third connecting portion 330A of the third heat-exchange fin 300A in the first heat-exchange fin 100A is overlapped with the first connecting portion 130A. Similarly, in second heat-exchange set 200, the projection area of the third connecting portion 330A of the third heat-exchange fin 300A in the second heat-exchange fin 200A is overlapped with the second connecting portion 230A.

[0061] In addition, the first heat-exchange set 100 and the second heat-exchange set 200 further include multiple fourth heat-exchange fins 400A respectively. Several of the fourth heat-exchange fins 400A are, for example, assembled into one set, and disposed at two sides of the first heat-exchange set 100 and the second heat-exchange set 200 respectively. The fourth heat-exchange fin 400A is, for example, a rectangular sheet. The extending width of the fourth heat-exchange fin 400A in the first axis L1 is, for example, the same as the extending width of the first connecting portion 130A or the extending width of the second connecting portion 230A in the first axis L1. In detail, the fourth heat-exchange fin 400A can cover the first heat-exchange fin 100A, the second heat-exchange fin 200A, and third heat-exchange fin 300A entirely. This makes a closed heat-exchange space S1 among the first heat-exchange fins 100A, the second heat-exchange fins 200A, and the third heat-exchange fins 300A.

[0062] The first heat-exchange fins 100A and the second heat-exchange fins 200A are, for example, tooth shape fins. The first body 110A, the second body 210A, and the third body 310A are, for example, vertical structures. When the first heat-exchange fins 100A and the third heat-exchange fins 300A are staggered along the second axis L2, the first body 110A of each first heat-exchange fin 100A and the third body 310A of the third heat-exchange fin

300A are overlapped. Similarly, when the second heat-exchange fins 200A and the third heat-exchange fins 300A are staggered along the second axis L2, the second body 210A of each second heat-exchange fin 200A and the third body 310A of the third heat-exchange fin 300A are overlapped. In addition, the first extending portion 120A and the second extending portion 220A are, for example, rectangular sheet arrangements. The first extending portions 120A are, for example, arranged in the corresponding first body 110A along a third axis L3. The second extending portions 220A are, for example, arranged in the corresponding second body 210A along the third axis L3. The first axis L1, the second axis L2, and the third axis L3 are, for example, vertical with each other.

[0063] In addition, the first extending portions 120A and the second extending portions 220A extend, for example, from vertical structures respectively. Because of the first heat-exchange fins 100A and the second heat-exchange fins 200A are staggered along the second axis L2, and the first extending portion 120A and the second extending portion 220A extend toward to the opposite direction, so that the extending portions of two adjacent heat-exchange sets are staggered to located in the heat-exchange space S1 when the first heat-exchange set 100 and the second heat-exchange set 200 are connected along the first axis L1.

[0064] In the present embodiment, the heat-exchange space S1 is located between the first body 110A of the first heat-exchange set 100 and the second body 210A of the adjacent second heat-exchange set 200. Worth mentioning is that: in the present embodiment, the projection area of the first extending portion 120A of the first heat-exchange set 100 in the second heat-exchange fin 200A of the adjacent second heat-exchange set 200 is not overlapped with the second extending portion 220A of the second heat-exchange fin 200A.

Further, the projection area of the first extending portion 120A of the first heat-exchange set 100 in the second heat-exchange fin 200A of the adjacent second heat-exchange set 200 is located between two adjacent second extending portion 220A, and has a interval d apart the adjacent of two second extending portion 220A.

[0065] In addition, the area that the first extending portion 120A extends from the first body 110A toward the first direction D1 is larger than the area that the first connecting portion 130A extends from the first body 110A toward the first direction D1. The area that the second extending portion 220A extends from the second body 210A toward the second direction D2 is larger than the area that the second connecting portion 230A extends from the second body 210A toward the second direction D2. When the first heat-exchange set 100 and the second heat-exchange set 200 are connected along the first axis L1, the first extending portion 120A of the first heat-exchange set 100 is connected to the third heat-exchange fin 300A of second heat-exchange set 200 in the extending direction D1. Similarly, the second extending portion 220A of the second heat-exchange set 200 is connected to the third heat-exchange fin 300A of the first heat-exchange set 100 in the extending direction D2. This is, in addition to execute a heat-exchange process by the heat-exchange fluid flowing through the heat-exchange fins in the heat-exchange space S1, the present embodiment also can execute a heat conduction between the first heat-exchange set 100 and the second heat-exchange set 200 by the connection of the heat-exchange fins. This makes the heat-exchange process with better efficiency, and the soaking effect will be more obviously.

[0066] In addition, the heat exchanger 10 of the present embodiment further includes multiple seals 16. The seals are, for example, disposed among the adjacent of the first heat-exchange fins 100A, the second heat-exchange fins 200A, and the third heat-exchange

fins 300A, and disposed between two adjacent fourth heat-exchange fins 400A. This cause a excellent joint between the fins. Further, a concave C is formed in front edge of the first connecting portion 130A of the first heat-exchange fin 100A, the second connecting portion 230A of the second heat-exchange fin 200A, and the third connecting portion 330A of the third heat-exchange fin 300A. In the first heat-exchange set 100, when the first heat-exchange fins 100A and the third heat-exchange fins 300A are staggered along the second axis L2, the concaves C of the fins are form a groove. Similarly, in the second heat-exchange set 200, when the second heat-exchange fins 200A and the third heat-exchange fins 300A are staggered along the second axis L2, the concaves C of the fins are also form a groove. Therefore, when first heat-exchange set 100 and the second heat-exchange set 200 are connected, the groove of the first heat-exchange set 100 and the groove of the second heat-exchange set 200 are connected with each other correspondingly, and a through groove is formed. The material of the seals 16 is, for example, silicon, and the seals 16 are suitable for filling therein. By the assistance of the fixing elements 14, there will be a excellent connecting relation between the first heat-exchange set 100 and the second heat-exchange set 200.

[0067] In another side, in the present embodiment, in order to execute the heat-exchange process effectively for the heat-exchange fluid F in the heat-exchange space S1, the seals 16 can be disposed in the connecting position which between the assembly of the first heat-exchange fins 100A, the second heat-exchange fins 200A, and the third heat-exchange fins 300A and the fourth heat-exchange fin 400A in addition to dispose in the connecting position which between two adjacent fourth heat-exchange fins 400A. This makes the heat-exchange space S1 be a closed space. The fixing elements 14 are disposed through the

fourth heat-exchange fins 400A of the first heat-exchange set 100 and the fourth heat-exchange fins 400A of the second heat-exchange set 200.

[0068] FIG. 7A is a schematic view illustrating the assembly of the first heat-exchange fin of the first heat-exchange set and one second heat-exchange fin of the second heat-exchange set depicted in FIG. 5. FIG. 7B is a schematic view illustrating the assembly of the first heat-exchange fin of the first heat-exchange set and another second heat-exchange fin of the second heat-exchange set depicted in FIG. 5. FIG. 8 is a cross sectional view taken along plane L2-L3 illustrating the heat exchanger depicted in FIG. 3A. As shown in FIG. 7A and FIG. 7B, the flowing direction of heat-exchange fluid is present in short dotted line. The area with short dotted line in FIG. 8 is the flowing area of heat-exchange fluid F in the heat-exchange space S1. Similarly, as shown in FIG. 8, the short dotted line present the flowing direction of the heat-exchange fluid.

[0069] For understanding the flowing path of heat-exchange fluid F in the heat-exchange space S1 clearly, in addition to refer the figures mentioned above, please refer to FIG. 7A, FIG. 7B, and FIG. 8. In the present embodiment, due to the inlet channel 18A and the outlet channel 18B are disposed at two opposite corners of the heat-exchange space S1 respectively, so that the heat-exchange fluid F with low temperature can flow to the heat-exchange space S1 through the inlet channel 18A, wherein the heat-exchange fluid F with low temperature will flow across the first extending portions 120A of the first heat-exchange set 100 and the second extending portions 220A of the adjacent second heat-exchange set 200 in the heat-exchange space S1 along the second axis L2 and the third axis L3.

[0070] Worth mentioning is that: when the heat-exchange sets are connected along the first axis L1, the first extending portion 120A of the first heat-exchange set 100 connects to the

third heat-exchange fin 300A of the second heat-exchange set 200 in the extending direction D1, the second extending portion 220A of the second heat-exchange set 200 connects to the third heat-exchange fin 300A of the first heat-exchange set 100 in the extending direction D2, and the first extending portions 120A of the first heat-exchange set 100 and the second extending portions 220A of the adjacent second heat-exchange set 200 are staggered in the heat-exchange space S1 where between the adjacent of two heat-exchange sets. Thus, in the flowing process of the heat-exchange fluid F from the inlet channel 18A to the outlet channel 18B, the heat-exchange fluid F be separated by first extending portion 120A (Referring to the short dotted line flowing direction shown in FIG. 7A, FIG. 7B, and FIG. 8), and continues flowing to the area around the second extending portion 220A, and the heat-exchange fluid F separated by the first extending portion 120A will be confluent after flowing pass the first extending portion 120A, and then be separated by the second extending portion 220A again. Thereafter, the heat-exchange fluid F flows to the area around another first extending portion 120A from the interval d between the first extending portion 120A and the second extending portion 220A, and be confluent after flowing pass the second extending portion 220A, then be separated by another first extending portion 120A again.

[0071] In short, in the flowing process of the heat-exchange fluid F from the inlet channel 18A to the outlet channel 18B, the heat-exchange fluid F is forced by the first extending portion 120A and the second extending portion 220A, and be confluent or separated continuously. This promotes the heat-exchange efficiency of the heat exchanger 10. Therefore, the heat exchanger 10 has a excellent heat-exchange efficiency, and the heat-exchange process can transform the heat produced by focusing process to the heat-exchange fluid effectively.

[0072] In another side, the second heat-exchange fin 200A is, for example, an inverted state of the first heat-exchange fin 100A. The inverted state is, for example, the state of the rotating 180 degrees of the first heat-exchange fin 100A along the first axis L1. Therefore, in the manufacturing process of the heat exchanger 10, the first heat-exchange fins 100A and the second heat-exchange fins 200A can be manufactured simultaneously by the stamping process. This increases manufacturing efficiency of products substantially.

[0073] FIG. 9 is a cross sectional view illustrating the heat exchanger according to another embodiment of the present invention. FIG. 10A is a schematic view illustrating the assembly of the first heat-exchange fin of first heat-exchange set and the second heat-exchange fin of the second heat-exchange set depicted in FIG. 9. FIG. 10B is a schematic view illustrating the assembly of the heat-exchange fins depicted in FIG. 10A. FIG. 10C is a schematic view illustrating the assembly of the first heat-exchange fin of the first heat-exchange set and another second heat-exchange fin of the second heat-exchange set depicted in FIG. 9. FIG. 10D is a exploded view illustrating the first heat-exchange fin and the second heat-exchange fin depicted in FIG. 10B in another viewpoint. As shown in FIG. 10A and FIG. 10B, the first heat-exchange fin 100B is overlapped with the second heat-exchange fin 200B. As shown in FIG. 10C, the second heat-exchange fin 200B is overlapped with the first heat-exchange fin 100B. In addition, as shown in FIG. 10B and FIG. 10C, the flowing direction of the heat-exchange fluid is present in short dotted line.

[0074] Referring to FIG. 9, FIG. 10A, FIG. 10B, FIG. 10C, and FIG. 10D, the first heat-exchange fin 100B and the second heat-exchange fin 200B of the present embodiment are similar to the first heat-exchange fin 100A and the second heat-exchange fin 200A of the above embodiment. When the first heat-exchange fins 100B and the third heat-exchange fins

described in above are staggered along the second axis L2, the first body 110B of each first heat-exchange fin 100B and the third body of the third heat-exchange fin are overlapped with each other. When the second heat-exchange fins 200B and the third heat-exchange fins are staggered along the second axis L2, the second body 210B of each second heat-exchange fin 200B and the third body of the third heat-exchange fin 300B are also overlapped. The heat-exchange space S2 is located between the first body 110B of the first heat-exchange set and the second body 210B of the adjacent second heat-exchange set similarly. Similarly, the heat-exchange fluid with low temperature flows through the heat-exchange space S2.

[0075] In addition, when the heat-exchange sets are connected with each other, the first extending portion 120B of the first heat-exchange set also connects to the third heat-exchange fin 300B of the second heat-exchange set in the extending direction of the extending portion 120B, the second extending portion 220B of the second heat-exchange set also connects to the third heat-exchange fin 300B of the first heat-exchange set in the extending direction of the second extending portion 220B. The difference between the present embodiment and the above embodiment is that: in the present embodiment, the projection area of the first extending portion 120B of the first heat-exchange set in the second heat-exchange fin 200B of the adjacent second heat-exchange set is overlapped with the second extending portion 220B of the second heat-exchange fin 200B partly.

[0076] In detail, in the present embodiment, the first extending portion 120B has multiple first guiding channel structures 122, the second extending portion 220B has multiple second guiding channel structures 222, and the first guiding channel structures 122 of the first heat-exchange set are overlapped with the second guiding channel structures 222 of the adjacent second heat-exchange set partly. This is, the first guiding channel structures 122 of

the first heat-exchange set and the second guiding channel structures 222 of the adjacent second heat-exchange set are communicated to form the heat-exchange space S2.

[0077] Further, in the present embodiment, each first body 110B and each second body 210B are also, for example, vertical structures. The first extending portion 120B is a first mesh structure, and the second extending portion 220A is a second mesh structure. The first mesh structure and the second mesh structure extends from vertical structures. The solid portion of the first mesh structure of the first heat-exchange set and the solid portion of the second mesh structure of the adjacent second heat-exchange set are staggered to lap. This is, the empty portion of the first mesh structure of the first heat-exchange set and the empty portion of the second mesh structure of the adjacent second heat-exchange set are communicated, and the heat-exchange fluid is suitable for flowing through the communicating space.

[0078] From the above, the first guiding channel structures 122 are, for example, constituted of three first guiding channel arrangements A1, A2, A3, and the second guiding channel structures 222 are, for example, constituted of three second guiding channel arrangements B1, B2, B3. The first guiding channel arrangements A1, A2, A3 are arranged from the first body 110B toward the first direction D1 in sequence, and the second guiding channel arrangements B1, B2, B3 are arranged from the second body 110B toward the second direction D2 in sequence. When the heat-exchange sets are connected, one of the first guiding channel arrangements of the first heat-exchange set is overlapped with the second guiding channel arrangements of the adjacent second heat-exchange set simultaneously. In the present embodiment, the first guiding channel arrangements A2 of the first heat-exchange set (located at the first heat-exchange fin 100B) is overlapped with the second guiding channel

arrangements B1, B2, B3 of the adjacent second heat-exchange set (located at second heat-exchange fin 200B) simultaneously. Therefore, each first guiding channel structure 122 of the first guiding channel arrangements A2 is communicated with second guiding channel structures 222 of each second guiding channel arrangements B1, B2, B3 of the adjacent second heat-exchange set simultaneously.

[0079] In detail, the first guiding channel structure 122 of the first guiding channel arrangements A2 of the first heat-exchange set is communicated with at least four adjacent second guiding channel structures 222 of the adjacent second heat-exchange set simultaneously. At least two of the adjacent second guiding channel structures 222 (222A and 222B as shown in FIG. 10A and FIG. 10D) are arranged along the assembly axis of the heat-exchange sets (first axis L1). At least two of the adjacent second guiding channel structures 222 (222C and 222D as shown in FIG. 10A and FIG. 10D) are arranged along another axis (third axis L3) vertical to the assembly axis. The four adjacent second guiding channel structures 222A, 222B, 222C, and 222D are located at the second guiding channel arrangements B1, B2, B3 respectively.

[0080] In the present embodiment, the first guiding channel arrangements includes, for example, two trilateral guiding channel arrangements and one quadrilateral guiding channel arrangement. The second guiding channel arrangements includes, for example, two trilateral guiding channel arrangements and one quadrilateral guiding channel arrangement similarly. The trilateral guiding channel arrangements are disposed at two sides of the quadrilateral guiding channel arrangement. In the present embodiment, the trilateral guiding channel arrangements are first guiding channel arrangements A1 and A3, and the second guiding channel arrangements B1 and B3. The quadrilateral guiding channel arrangements are the

first guiding channel arrangement A2 and the second guiding channel arrangement B2. This is, when the heat-exchange set are connected, the quadrilateral guiding channel arrangement A2 of the first heat-exchange set (located at the first heat-exchange fin 100B) is communicated with the quadrilateral guiding channel arrangement B2 and two trilateral guiding channel arrangements B1 and B3 of the second heat-exchange fin 200B of the adjacent second heat-exchange set simultaneously. The first guiding channel structures 122 are, for example, the assembly of the diamond structures and the triangle structures. Similarly, the second guiding channel structures 222, for example, the assembly of the diamond structures and the triangle structures.

[0081] The same as the above embodiment, the heat exchanger 10' of the present embodiment also includes the inlet channel 18A and the outlet channel 18B (as shown in FIG. 9) for executing the transmitting process of the heat-exchange fluid. Worth mentioning is that: when the heat-exchange sets are connected along the first axis L1, the first extending portion 120B of the first heat-exchange set connects to the third heat-exchange fin of the second heat-exchange set in the extending direction D1 of the first extending portion 120B. The second extending portion 220B of the second heat-exchange set connects to the third heat-exchange fin of first heat-exchange set in extending direction D2 of the second extending portion 220B. The first extending portion 120B of each first heat-exchange set and the second extending portion 220B of the adjacent second heat-exchange set are overlapped and disposed in the heat-exchange space S2 where between the adjacent of two heat-exchange sets.

[0082] Therefore, in the flowing process of heat-exchange fluid F from inlet channel 18A to outlet channel 18B, the heat-exchange fluid F can be separated by the first extending

portion 120B (Referring to the flowing direction of short dotted line in FIG. 10B and FIG. 10C), and continues flowing to the area around the second extending portion 220B, and the heat-exchange fluid F separated by the first extending portion 120B will be confluent after flowing pass the first extending portion 120B, and then be separated by the second extending portion 220B again. Thereafter, the heat-exchange fluid F flows to the area around another first extending portion 120B from the communication of the second guiding channel structure 222 and the first guiding channel structure 122, and be confluent after flowing pass the second extending portion 220B, then be separated by another first extending portion 120B.

[0083] In short, in the flowing process of the heat-exchange fluid F from the inlet channel 18A to outlet channel 18B, the heat-exchange fluid F is forced by the first extending portion 120B and the second extending portion 220B, and be confluent or separated continuously. This promotes the heat-exchange efficiency of heat exchanger 10'. Therefore, the heat exchanger 10' has a excellent heat-exchange efficiency.

[0084] Worth mentioning is that: due to the first guiding channel structures 122 and the second guiding channel structures 222 of the present embodiment are, for example, the assembly of the diamond structure and the triangle structure, so that the side of the diamond structures and the triangle structures are obliquity structures. Therefore, in the present embodiment, when the heat-exchange fluid F with low temperature flows to the heat-exchange space S2 through the inlet channel 18A, the heat-exchange fluid F will flow through the first extending portion 120B of the first heat-exchange set and the second extending portion 220B of the adjacent second heat-exchange set located in the heat-exchange space S2 along the second axis L2 and the third axis L3. In addition, the heat-exchange fluid F further flows across each extending portion located in the

heat-exchange space S2 along the first axis L1.

[0085] From the above, in the present embodiment, the first heat-exchange fin 100B and the second heat-exchange fin 200B are suitable for connecting with the third heat-exchange fins and the fourth heat-exchange fins of the above embodiment similarly. The connecting relationships of the first heat-exchange fin 100B and the second heat-exchange fin 200B of the present embodiment and the third heat-exchange fins and the fourth heat-exchange fins of the above embodiment are the same. In addition, the effectiveness produced by relative elements in the present embodiment is also the same as the above embodiment. Therefore, the details will not be described herein again. In addition, the second heat-exchange fin 200B is, for example, an inverted state of the first heat-exchange fin 100B. The inverted state is, for example, the state of the rotating 180 degrees of the first heat-exchange fin 100B along the first axis L1. Therefore, in the manufacturing process of the heat exchanger 10', the first heat-exchange fin 100B and the second heat-exchange fin 200B can be manufactured simultaneously by the stamping process. This increases manufacturing efficiency of products substantially.

[0086] In the two embodiments described in above, one side of the assembly of the first heat-exchange fins and the third heat-exchange fins is the surface 10A of the heat exchanger, and the surface 10A is used for receiving the sunlight focused by the heat-focusing device. In other embodiments, the first heat-exchange fins also can be arranged in a heat-exchange plate with interval directly, and the heat-exchange plate of the heat exchanger can receive the sunlight focused by the heat-focusing device. Similarly, the second heat-exchange fin also can be arranged in another heat-exchange plate with interval directly. This is, without the third heat-exchange fins, the heat exchanger of the present invention also can provide a

excellent heat-exchange efficiency. The design that the first heat-exchange fin and the second heat-exchange fin in the heat-exchange space are staggered along a axis and the design that the fin makes the heat-exchange fluid with sufficient turbulence in the heat-exchange space are all within the spirit and scope of this invention, and the present invention does not have any limitation.

[0087] From the above, when the heat-exchange fluid flows through multiple heat exchangers described in above, the heat-exchange fluid can be a high temperature liquid, wherein the temperature is, for example, between 90~98℃. Therefore, in the present invention, the high temperature liquid can vaporize to be a steam by the heating unit 2 for driving the power-generating device 3 as shown in FIG. 1. The design of the heating unit 2 of the present invention be shown in FIG. 11 (FIG. 11 is a schematic view illustrating the internal design of the heating unit according to one embodiment of the present invention). Referring to FIG. 11, the heating unit 2 of the present embodiment also has a channel C1 for the heat-exchange fluid flowing. In addition, the heating unit 2 further has another channel C2 for another heat-exchange fluid flowing with high temperature. The heat-exchange fluid flowed through the channel C2 is, for example, oil or other appropriate fluids with higher boiling point. The temperature of the boiling point is, for example, larger than 300℃. Therefore, the high temperature heat-exchange fluid flowed through the channel C2 can vaporize the high temperature liquid flowed through the channel C1 to be a steam rapidly. The high temperature liquid is water, for example. Thus, the steam can drive the power-generating device 3 to execute a energy transforming process.

[0088] In a better embodiment of the present invention, the heat-focusing device 30 is a reflect-focusing lens wherein the diameter of the lens is 3.7 meter. The flux of water in the

fluid channel is 3000 cc/min, the initial temperature of the heat-exchange fluid is, for example, 29°C. The temperature of the heat-exchange fluid is, for example, 52.6°C when the heat-exchange fluid flows through the heat-exchange module in first time, wherein the temperature rises 23.6°C approximately. In the status, the heat-exchange fluid can absorb the heat energy 4940 W ($23.6 \times 3000 / 60 \times 4.1868$) approximately. For example, in Europe, America, and Japan, the energy required is about 7 billion kilowatt. If the solar power system of the present invention is adopted, just needs about 7 billion sets [(7 billion kilowatt/ 5 kilowatt) * 5 times of the annual sunlight hours)]. The reflect-focusing lens of the present embodiment requires an area about 10.75 square meters, about 500 sets per hectare. In other words, the installation of 50,000 sets in per square kilometer (100 hectares square is 1 square kilometers). Thus, 7 billion sets requires to approximately 140,000 square kilometers, about four Taiwan areas, and this just can supply energy needs of Europe, America, and Japan.

[0089] In addition, after promoting the thermos ability of the transmission process and adjusting the size of the pipeline, the heat absorbing ability of the solar power system of the present invention can upgrade substantially, and further reduce the disposing space of the solar power system.

[0090] To sum up, in the solar power system of the present invention, the heat exchanger is constituted of multiple heat-exchange sets, and a heat-exchange space is form between two adjacent heat-exchange set. The staggered fins are disposed in the heat-exchange space, and the design of fins makes a turbulence of the heat-exchange fluid in the heat-exchange space sufficiently. In detail, the heat-exchange fluid flowed in the heat-exchange space is forced to be confluent or separated by the fins of two adjacent heat-exchange set when the heat-exchange fluid flows into the heat exchanger. This increases the contact area between

the heat-exchange fluid and fins substantially, and increases the rate of the heat-exchange process of the heat-exchange fluid. A excellent heat-exchange efficiency can be achieved.

[0091] Therefore, when multiple heat-exchange modules are arranged in an appropriate way, the temperature of the heat-exchange fluid can rise up to the temperature that approaching vaporization. Therefore, by the assistance of a heating unit, the heat-exchange fluid can vaporize to be a steam rapidly. This is, the solar power system of the present invention can drive the power-generating device by applying the steam to produce a mechanical energy, and transform the mechanical energy to the electric power. Thus, the photoelectric transforming efficiency of the solar power system can be upgraded substantially. In addition to the design described in the above, the appropriate way is, for example, just the series arrangement, and the present invention does not have any limitation.

[0092] In addition, in the solar power system of the present invention, the heat-exchange fluid flowed out of the heat exchanger can store in a tank in advance. When the energy transforming process is required to execute, the heat-exchange fluid stored in the tank can flow through the heating unit to execute a vaporization to produce the mechanical energy.

[0093] Furthermore, due to the solar power system of the present invention includes heat-exchange modules having a excellent heat-exchange efficiency, and can rise the temperature of the heat-exchange fluid to a status that approaching vaporization gradually. Therefore, the heating unit of the present invention just needs short operation to vaporize the heat-exchange fluid. Compared to the general solar-power systems takes a long time to complete energy transforming process, the solar power system of the present invention can achieve the same purpose by the way of saving energy.

[0094] Although the invention has been described with reference to the above

embodiments, it will be apparent to one of the ordinary skill in the art that modifications to the described embodiments may be made without departing from the spirit of the invention. Accordingly, the scope of the invention will be defined by the attached claims rather than by the above detailed descriptions.

WHAT IS CLAIMED IS:

1. A solar power system, suitable for transforming sunlight to an electric power, comprising:

multiple heat-exchange modules, each heat-exchange module comprising:

a heat exchanger, including a first heat-exchange set and a second heat-exchange set, the first heat-exchange set includes multiple first heat-exchange fins, each first heat-exchange fin has a first body and at least a first extending portion disposed at one side of the first body, each first extending portion extends from the first body toward a first direction, the second heat-exchange set includes multiple second heat-exchange fins, each second heat-exchange fin has a second body and at least a second extending portion disposed at one side of the second body, each second extending portion extends from the second body toward a second direction, the first direction is opposite to the second direction, wherein the first heat-exchange set and the second heat-exchange set are connected along a first axis, the first heat-exchange fins and the second heat-exchange fins are staggered along a second axis, a heat-exchange space is formed between the first heat-exchange set and the second heat-exchange set, a heat-exchange fluid is flowed through the heat-exchange space ;

a base, the heat exchanger is disposed on the base ;

a heat-focusing device, placed at the base, suitable for receiving sunlight and focusing to the heat exchanger ;

a heating unit, one end is connected with the heat-exchange modules, and make the heat-exchange fluid flowed out of the heat-exchange modules to have a phase transfer ;

a power-generating device, one end is connected with the other end of the heating unit, and the heat-exchange fluid with the phase transfer is suitable for driving the power-generating device to produce a mechanical energy ;

a power-transforming device, connected to the power-generating device, and suitable for transforming the mechanical energy into a electric power; and

a power storage, connected to the power-transforming device, and the electric power is stored in the power storage; and

a fluid channel, communicating among the heat-exchange space of each heat exchanger, the heating unit, and the power-generating device.

2. The solar power system as recited in claim 1, wherein the first heat-exchange fin further includes a first connecting portion, the first connecting portion extends from the first body toward the first direction, the second heat-exchange fin further includes a second connecting portion, the second connecting portion extends from the second body toward the second direction, when the first heat-exchange set and the second heat-exchange set are connected along the first axis, the first connecting portions of the first heat-exchange fins and the second connecting portions of the second heat-exchange fins are connected with each other, and the first heat-exchange fins are arranged with interval along the second axis, the second heat-exchange fins are arranged with interval along the second axis.

3. The solar power system as recited in claim 2, wherein the area that the first extending portion extends from the first body toward the first direction is larger than the area that the first connecting portion extends from the first body toward the first direction, the area that the second extending portion extends from the second body toward the second direction is larger

than the area that the second connecting portion extends from the second body toward the second direction.

4. The solar power system as recited in claim 2, wherein the first heat-exchange set and the second heat-exchange set include multiple third heat-exchange fins respectively, the third heat-exchange fin is disposed between two adjacent first heat-exchange fins, the third heat-exchange fin is disposed between two adjacent second heat-exchange fins, and each third heat-exchange fin has a third body and a third connecting portion, each first body and the third body of the adjacent third heat-exchange fin are overlapped, each second body and the third body of the adjacent third heat-exchange fin are overlapped, when the first heat-exchange set and the second heat-exchange set are connected along the first axis, the first extending portion of the first heat-exchange set is connected to the third heat-exchange fin of the second heat-exchange set in the extending direction of the first extending portion, the second extending portion of the second heat-exchange set is connected to the third heat-exchange fin of the first heat-exchange set in the extending direction of the second extending portion.

5. The solar power system as recited in claim 4, wherein the first heat-exchange set and the second heat-exchange set includes multiple fourth heat-exchange fins respectively, the fourth heat-exchange fins are disposed at two sides of the first heat-exchange set and the second heat-exchange set respectively, and a closed heat-exchange space is formed among the first heat-exchange fins, the second heat-exchange fins, and the third heat-exchange fins.

6. The solar power system as recited in claim 5, wherein the heat exchanger further includes multiple seals disposed among the adjacent of the first heat-exchange fins, the

second heat-exchange fins, and the third heat-exchange fins, and are disposed between two adjacent fourth heat-exchange fins.

7. The solar power system as recited in claim 1, wherein the heat exchanger further includes an inlet channel and an outlet channel, communicated with the fluid channel, the outlet channel of each heat exchanger is suitable for connecting the inlet channel of the another heat exchanger, and the inlet channel and the outlet channel are communicated with the heat-exchange space for the flow of the heat-exchange fluid, the inlet channel and the outlet channel are disposed at two opposite corners of the heat-exchange space along the first axis.

8. The solar power system as recited in claim 1, wherein the heat-focusing device is a Fresnel Lens.

9. The solar power system as recited in claim 1, wherein the heat-exchange modules are constituted of multiple series arrangements, the series arrangements are connected by a parallel type.

10. The solar power system as recited in claim 1, wherein the projection area of the first extending portion of each first heat-exchange fin in the second heat-exchange fin is not overlapped with the second extending portion of the second heat-exchange fin, the first extending portion of the first heat-exchange set and the second extending portion of the adjacent second heat-exchange set are staggered in the heat-exchange space, the heat-exchange space is located between the first body of the first heat-exchange set and the second body of the adjacent second heat-exchange set.

11. The solar power system as recited in claim 10, wherein the first extending portions of the first heat-exchange set are arranged in the corresponding first body along a third axis, the second extending portions of the second heat-exchange set are arranged in the corresponding

second body along the third axis, the projection area of the first extending portion of each heat-exchange set in the second heat-exchange fin of adjacent another heat-exchange set is located between two adjacent second extending portions, and an interval is formed between the first extending portion and two adjacent second extending portions, each first body and each second body are vertical structures, and each first extending portion and each second extending portion are rectangular sheet arrangements extended from the vertical structures.

12. The solar power system as recited in claim 1, wherein the projection area of the first extending portion of each first heat-exchange fin in the second heat-exchange fin is overlapped partly with the second extending portion of the second heat-exchange fin, the heat-exchange space is located between the first body of the first heat-exchange set and the second body of the second heat-exchange set.

13. The solar power system as recited in claim 12, wherein the first extending portion has multiple first guiding channel structures, the second extending portion has multiple second guiding channel structures, each first guiding channel structure of the first heat-exchange set and each second guiding channel structure of the adjacent second heat-exchange set are overlapped partly, each first guiding channel structure of the heat-exchange set and each second guiding channel structure of the adjacent another heat-exchange set are communicated to form the heat-exchange space.

14. The solar power system as recited in claim 13, wherein the first guiding channel structure of the first heat-exchange set are communicated with at least four adjacent second guiding channel structures of the adjacent second heat-exchange set simultaneously, at least two of the adjacent second guiding channel structures are arranged along the first axis, at

least two of the adjacent second guiding channel structures are arranged along another axis vertical to the first axis.

15. The solar power system as recited in claim 13, wherein the first guiding channel structures are constituted of three first guiding channel arrangements, the second guiding channel structures are constituted of three second guiding channel arrangements, one of the first guiding channel arrangements of the first heat-exchange set is overlapped with the second guiding channel arrangements of the adjacent second heat-exchange set simultaneously, each first guiding channel structure of the first guiding channel arrangements is communicated with the second guiding channel structure of each second guiding channel arrangement of the adjacent second heat-exchange set simultaneously, the first guiding channel arrangement and the second guiding channel arrangement include two trilateral guiding channel arrangements and one quadrilateral guiding channel arrangements respectively, the trilateral guiding channel arrangements are disposed at two sides of the quadrilateral guiding channel arrangement.

16. The solar power system as recited in claim 12, wherein each first body and each second body are vertical structures, and each first extending portion is a first mesh structure, the second extending portion is a second mesh structure, the first mesh structure and the second mesh structure are extended from the vertical structures, the solid portion of the first mesh structure of the first heat-exchange set is staggered with the solid portion of the second mesh structure of the adjacent second heat-exchange set.

17. The solar power system as recited in claim 1, wherein the first heat-exchange set further includes a heat-exchange plate, the first heat-exchange fins are arranged with interval on the heat-exchange plate, the second heat-exchange set further includes another

heat-exchange plate, the second heat-exchange fins are arranged with interval on another heat-exchange plate, and the sunlight is focusing to the heat-exchange plate of the first heat-exchange set.

18. The solar power system as recited in claim 1, wherein the power-generating device is a steam driving device, and the phase transfer is change from liquid phase to gas phase.