



(43) International Publication Date
30 December 2009 (30.12.2009)

PCT

(10) International Publication Number
WO 2009/156331 A2

(51) International Patent Classification: Not classified

(21) International Application Number:
PCT/EP2009/057609

(22) International Filing Date:
18 June 2009 (18.06.2009)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
MI2008A001172 27 June 2008 (27.06.2008) IT

(71) Applicant and

(72) Inventor: WILLIAMS, Reginald, Ian [GB/IT]; Via
Rimembranze 16, I-20024 Garbagnate Milanese MI (IT).

(74) Agents: PIZZOLI, Antonio et al.; Società Italiana
Brevetti S.p.A., Via Carducci 8, I-20123 Milano MI (IT).

(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ,
CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO,

DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,
HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP,
KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD,
ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI,
NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD,
SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT,
TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM,
ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ,
TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE,
ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV,
MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR),
OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML,
MR, NE, SN, TD, TG).

Published:

— without international search report and to be republished
upon receipt of that report (Rule 48.2(g))

(54) Title: SOLAR ENERGY GENERATOR

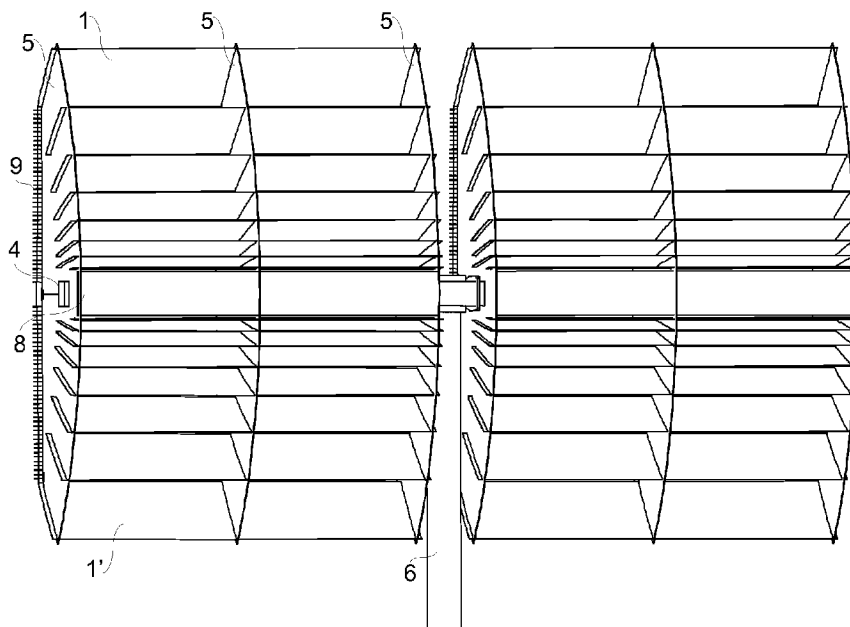


Fig.1

(57) Abstract: Solar energy generator, which comprises a plurality of concave mirrors (1,1') suitable for reflecting, in an operative position in which they are oriented toward the sun, the solar rays (2) toward a collector (3), wherein in an ideal operative position the solar rays (2), before they are reflected by the concave mirrors (1,1'), are parallel to a reference axis (R) passing across the collector (3), wherein in this ideal operative position the concave mirrors (1,1') are arranged between the source of the solar rays (2) and the collector (3) so as to reflect most of the solar rays (2) toward the collector (3) with angles (a) comprised between 80° and 180°.



WO 2009/156331 A2

SOLAR ENERGY GENERATOR

The present invention relates to a solar energy generator, and in particular to a generator which can be used for producing thermal and/or electric energy.

5 WO 2005/116534 discloses a solar energy generator, which comprises a plurality of concave mirrors suitable for reflecting, in an ideal operative position in which they are perfectly oriented toward the sun, the solar rays toward a collector arranged between the source of the solar rays and the concave mirrors, so that most of the solar rays are reflected toward the collector with acute angles.

10 If the generator is not in its ideal operative position, for example due to a malfunction of the sun aiming system, the solar rays can be reflected by the concave mirrors beyond the collector, with remarkable safety problems, especially when the generator is used in domestic or anyway uncontrolled environments.

It is therefore an object of the present invention to provide a generator free from
15 said disadvantages. Said object is achieved with a generator, whose main features are disclosed in the first claim, while other features are disclosed in the remaining claims.

Thanks to the particular arrangement of the concave mirrors, the generator according to the present invention allows to prevent the reflection of the solar rays outside the generator, even if the latter is not in the ideal operative position, so as to
20 increase its safety.

The particular arrangement of the concave mirrors also allows to reduce the wind drag of the generator.

The generator can further be provided with screens suitable for preventing the reflection of the solar rays toward other concave mirrors and/or behind the generator, so
25 as to further improve its safety. One of these screens preferably comprises a plurality of fins, so as to further decrease the wind drag of the generator.

The concave mirrors are preferably arranged so as to be separated by a plane substantially parallel to a reference axis parallel to the solar rays, so as to optimize the concentration of the solar rays toward the collector.

30 Further advantages and features of the generator according to the present invention will become clear to those skilled in the art from the following detailed and

- 2 -

non-limiting description of an embodiment thereof with reference to the attached drawings, wherein:

- figure 1 shows a perspective view of the generator;
- figure 2 shows a schematic side view of the generator of figure 1 in a first
5 operative position; and
- figure 3 shows a schematic side view of the generator of figure 1 in a second operative position.

Referring to figures 1 and 2, it is seen that the generator according to the present invention comprises in a known way a plurality of concave mirrors 1, 1' suitable for
10 reflecting, in an operative position in which they are oriented toward the sun, solar rays 2 toward a collector 3. In an ideal operative position, shown in figure 2, solar rays 2, before they are reflected by concave mirrors 1, 1', are parallel to a reference axis R passing across collector 3. A first support structure, for example comprising a crossbar 4 and a plurality of lateral panels 5, allows to rotate concave mirrors 1, 1' around a
15 substantially horizontal axis so as to change their zenithal angle, while a second support structure, for example comprising a vertical upright 6, allows to rotate concave mirrors 1, 1' around a substantially vertical axis, so as to change their azimuthal angle.

According to the invention, concave mirrors 1, 1' are arranged between the source of solar rays 2 and collector 3 so as to reflect in their ideal operative position most of
20 solar rays 2 toward collector 3 with angles α comprised between 80° and 180° , in particular comprised between 90° and 170° . The concavity of concave mirrors 1, 1' is turned toward reference axis R. The concave mirrors are grouped in at least two opposing series 1 or 1' of mirrors, so that the concavity of one series is turned toward the other, and vice versa.

25 A first screen 7 is arranged between the two series of concave mirrors 1, 1' for preventing the reflection of solar rays 2 from one series of mirrors to the other, and vice versa. First screen 7 is arranged along reference axis R and comprises at least one partition wall. Crossbar 4 is crossed by reference axis R, is substantially perpendicular to the latter and crosses first screen 7. A solar panel 8 is arranged along reference axis R
30 on the opposite side with respect to collector 3, so that first screen 7 is arranged between solar panel 8 and collector 3. Solar panel 8 comprises at least one photovoltaic cell and

- 3 -

is substantially perpendicular to reference axis R. A second screen 9 is arranged behind collector 3 for preventing the reflection of solar rays 2 beyond collector 3. Second screen 9 comprises a plurality of fins substantially parallel to reference axis R. Concave mirrors 1, 1' have a substantially rectangular shape and are bent for obtaining cylindrical sectors. Two adjacent concave mirrors 1 or 1' of one series are arranged so as to be separated by a plane P substantially parallel to reference axis R, two rectilinear edges of two adjacent concave mirrors 1 or 1' of one series being this arranged on plane P. Furthermore, a plane T passing on the outer rectilinear edges, namely the ones more distant from collector 3, of two adjacent concave mirrors 1 or 1' of one series coincides substantially with the plane perpendicular to the tangent (t) of the curvature by the outer edge of the most distant concave mirror 1 or 1' from reference axis R, so that solar rays 2 are reflected by concave mirrors 1, 1' toward reference axis R.

Referring to figure 3, it is seen that when the generator is not in its ideal operative position, namely when reference axis R is not aligned with solar rays 2, the latter are reflected by concave mirrors 1, 1' also toward screens 7 and 9, with angles α also less than 80° .

Possible modifications and/or additions may be made by those skilled in the art to the hereinabove disclosed and illustrated embodiment while remaining within the scope of the following claims.

CLAIMS

1. Solar energy generator, which comprises a plurality of concave mirrors (1, 1') suitable for reflecting, in an operative position in which they are oriented toward the sun, the solar rays (2) toward a collector (3), wherein in an ideal operative position the solar rays (2), before they are reflected by the concave mirrors (1, 1'), are parallel to a reference axis (R) passing across the collector (3), characterized in that in this ideal operative position the concave mirrors (1, 1') are arranged between the source of the solar rays (2) and the collector (3) so as to reflect most of the solar rays (2) toward the collector (3) with angles (a) comprised between 80° and 180°.

2. Generator according to the previous claim, characterized in that the concavity of the concave mirrors (1, 1') is turned toward the reference axis (R).

3. Generator according to one of the previous claims, characterized in that the concave mirrors (1, 1') are grouped in at least two opposing series of mirrors, so that the concavity of one series (1) is turned toward the other (1'), and vice versa.

4. Generator according to the previous claim, characterized in that a first screen (7) is arranged between the two series of concave mirrors (1, 1') for preventing the reflection of the solar rays (2) from one series of mirrors (1) to the other (1'), and vice versa.

5. Generator according to the previous claim, characterized in that the first screen (7) is arranged along the reference axis (R) and comprises at least one partition wall.

6. Generator according to one of the previous claims, characterized in that two adjacent concave mirrors of one series (1, 1') are arranged so as to be separated by a plane (P) substantially parallel to the reference axis (R).

7. Generator according to the previous claim, characterized in that the concave mirrors (1, 1') have a substantially rectangular shape and are bent for obtaining cylindrical sectors, two rectilinear edges of two adjacent concave mirrors of one series being thus arranged on said plane (P).

8. Generator according to one of the previous claims, characterized in that a plane (T) passing on the outer rectilinear edges of two adjacent concave mirrors of one

- 5 -

series (1, 1') coincides substantially with the plane perpendicular to the tangent (t) of the curvature by the outer edge of the most distant concave mirror (1, 1') from the reference axis (R).

9. Generator according to one of the previous claims, characterized in that a
5 solar panel (8) is arranged along the reference axis (R) on the opposite side with respect to the collector (3).

10. Generator according to one of the previous claims, characterized in that a second screen (9) is arranged behind the collector (3) for preventing the reflection of the solar rays (2) beyond the collector (3).

10 11. Generator according to the previous claim, characterized in that the second screen (9) comprises a plurality of fins.

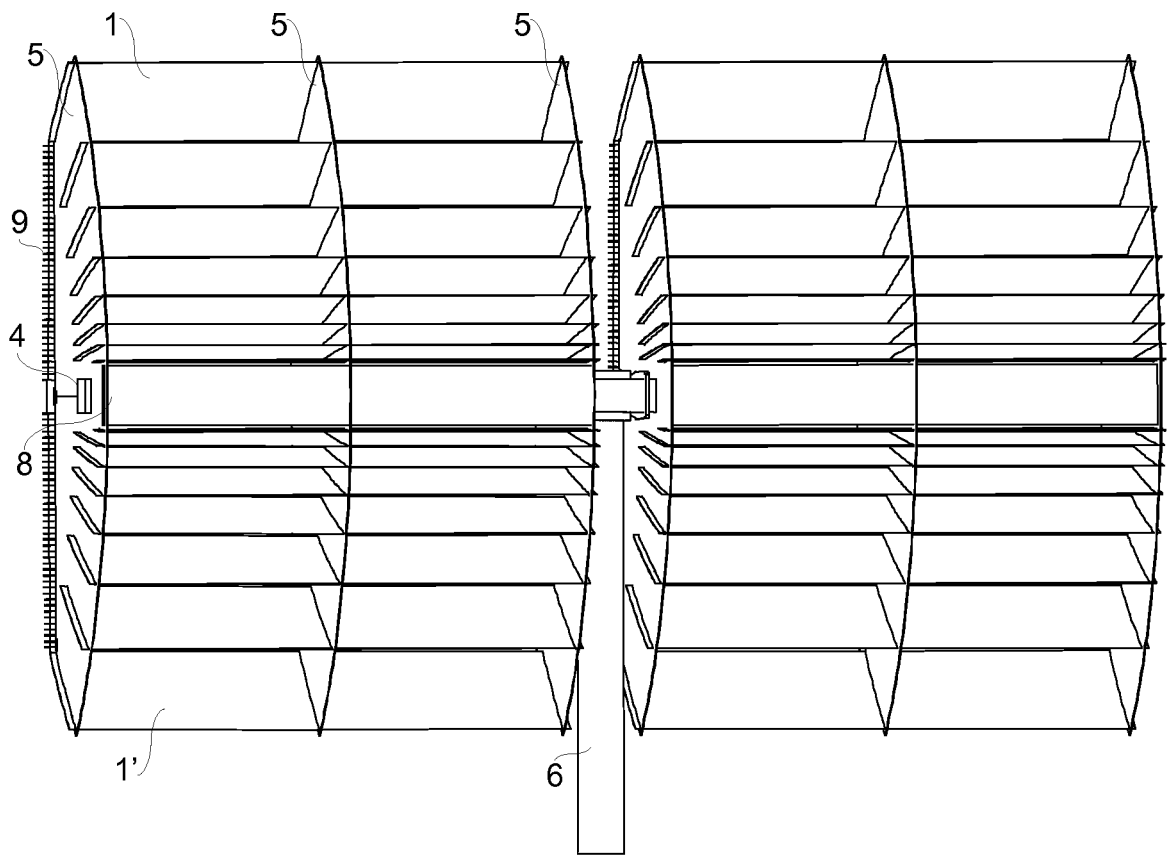


Fig.1

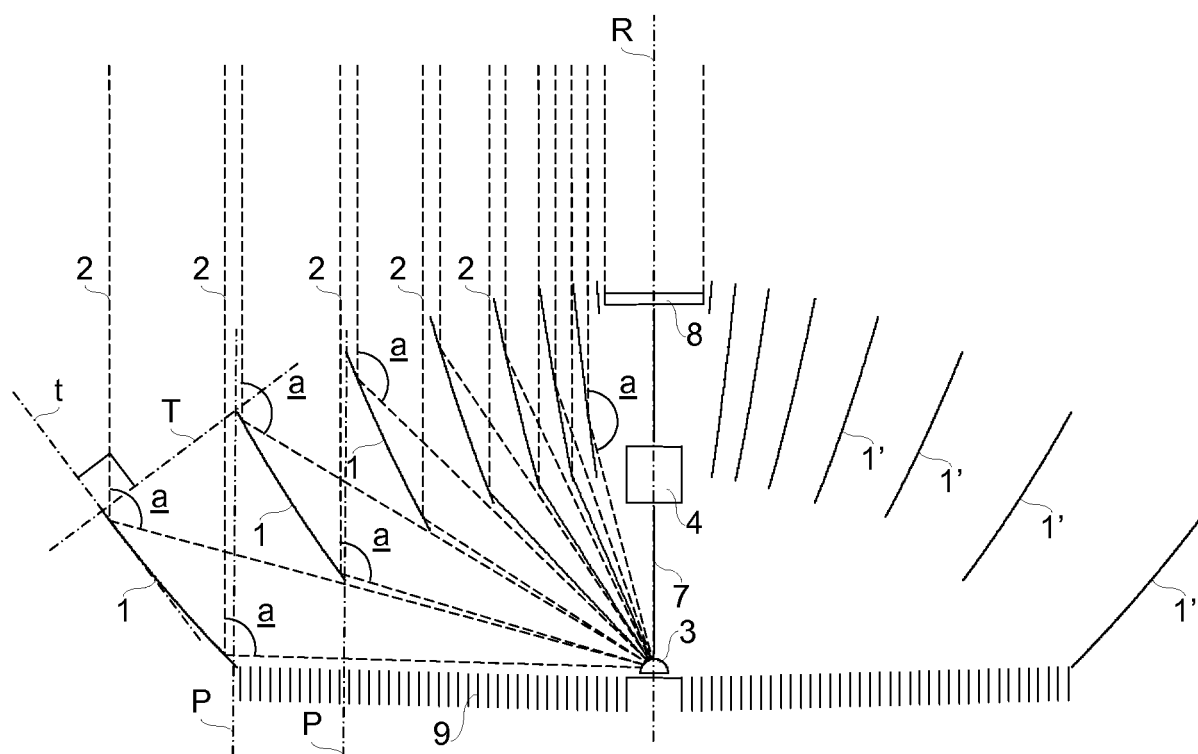


Fig.2

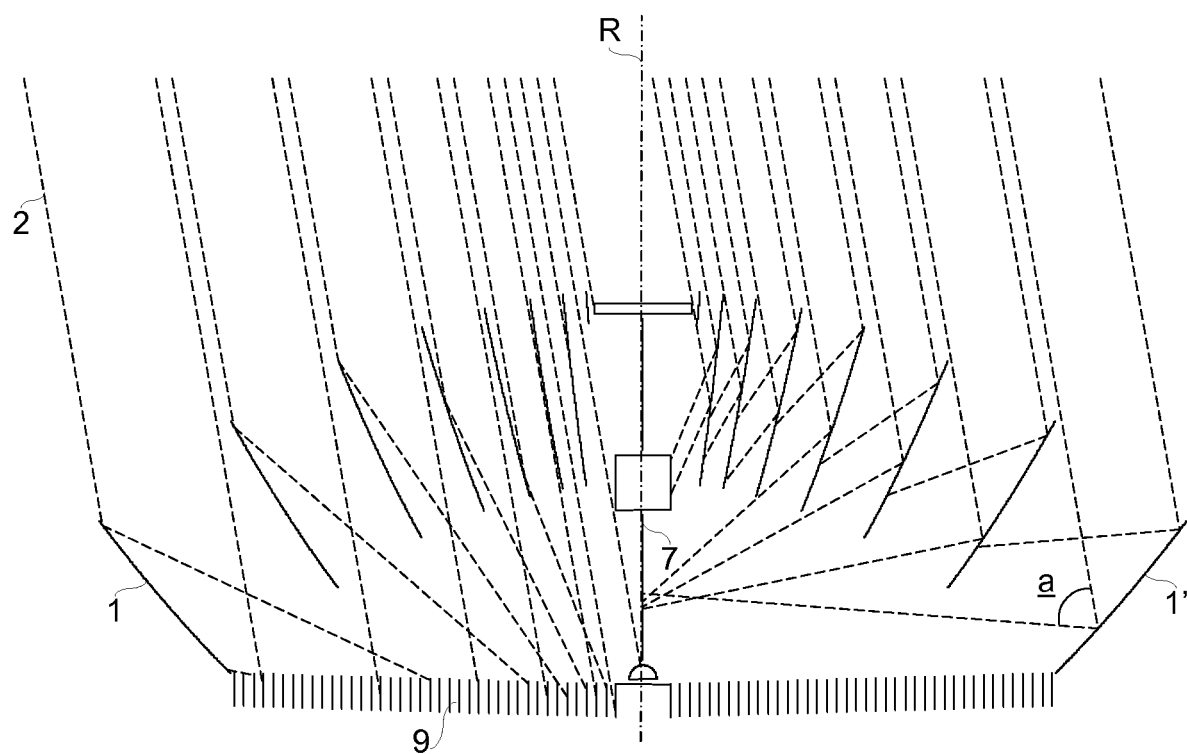


Fig.3