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Rollable Flexible Solar Collector with Air or Liquid as Heat Carrier and Programmable Sun Protection for Lawns and Other Plants

Description

My invention is based on the further development of solar thermal collectors, so that they can serve as sun protection for plants in addition to heat generation. There are many solutions for rolled-up solar collectors, sun protection, covers, or components thereof, with additional functions, such as:

- CN000201248602Y - Roller blind collector,
- DE000002645072A1 - Solar light collector with a twin-wall base,
- DE000029814421U1 - Rollable solar hose mat for the ground,
- EP000002803893B1 - Flexible PET tube for heat transfer for a collector,
- US000008991049B2 - Inflatable or liquid-fillable collector hose,
- WO002012136710A1 - Lawn grid with piping for a heat transfer medium,
- WO002018015882A1 - Fixed cover for a pool, rollable on one side.

The existing solutions fulfill their respective functions but are not intended for programmed coverage of lawns or fields. In times of climate change, lawns or plants in fields are increasingly drying out or "burning," and enormous amounts of water are additionally needed to prevent this. The invention described in claim 1 prevents or reduces plant burning, uses less water, and the generated heat can be stored or used directly.

An Exemplary Embodiment:

The rolled-up flexible solar collector should have a highly sunlight-absorbing, e.g., black, film underside and a transparent film top side. The two films should be connected or welded together, e.g., at stabilizing points or in a serpentine pattern, and thus—as stated in claim 11—represent a solar collector film. Due to the appropriate positioning of the connection or welding points, circulation of the heat carrier is also possible when the solar collector film is partially unrolled (claim 12). The solar collector film can have air, water, or other heat transfer fluids as the heat carrier. For example, liquid-filled (flat) hoses in serpentine tracks

are possible but not as space-saving when rolled up. The width of the film should match that of a lawn area or, in the case of a field, have the maximum producible width. The roller shutter box of the solar collector film is either on the ground or, for aesthetic reasons—as shown in claim 2—(mostly) in the ground. The box is equipped, according to claim 3, with a control unit and sensors for sunlight, wind, and possibly rain. When there is no to moderate sunlight, strong wind, heavy rain, during personal use of the lawn (sitting, playing, mowing), fieldwork, and also according to pre-programmed times, the flexible solar cells are rolled up. Additionally, sensors (according to claim 13) constantly compare the temperature of the heat carrier with the temperature of the heat storage. If the temperature of the heat carrier is lower than that of the heat storage with a programmable difference, the heat carrier is reintroduced into the solar collector film. Control by sensor data (programming, e.g., via an app or computer program) is optimized for the respective conditions and is shown in claim 4. Depending on the environment, there are various designs and combinations, as shown in claim 5, to enable smooth rolling out and rolling in of the flexible solar cells (here, as an example, for a lawn area):

- On one side is the roller shutter box; on the other side of the lawn is a motor with a combined steel-electric cable installed, which unrolls the film.
- The beginning of the solar collector film has a stabilizing (metal or plastic) bar at the start, on which electromotorized (spiked) wheels are attached.
- Tracks are installed on the sides of the lawn areas for easier rolling out.
- Spacers are attached to the ground or the solar collector film.
- The solar collector film is unrolled from the roller shutter box via one or more guide rollers at the end of the lawn so that the tubular motor unrolls the solar collector film while simultaneously winding up the traction cable.
- Roller shutter boxes are on both sides of the lawn area for rolling up and down, where one half of the film is transparent or made of rain- and sun-permeable fine mesh or fabric, and the other half consists of solar collector film.
- Two electromotorized spiked wheels unroll the film, and the tubular motor in the roller shutter box rolls the solar collector film back up.
- The roller shutter box moves with (spiked) wheels over the lawn and unrolls the film, with the start of the film anchored. To roll up the solar collector film, the box moves back in the opposite direction.
- With compressed air in channels at least at both ends and in the solar collector film, unrolling can also be done without motors.

Ideally, for lawns, a very lightweight solar collector film with air as a heat carrier, simply lying on the lawn and effectively providing shade, would be best. Flat hoses are also not easy to roll up, and (residual) water as a heat carrier would remain between the film layers even when the solar collector film is rolled up.

The flexible solar collector does not have nearly the efficiency of specialized solar collectors but has the great advantage of being able to use a very large area inexpensively.

Since flexible solar collector films can only be produced up to a certain size, it makes sense, according to claim 6, to combine several units behind and next to each other, where motors and boxes can also be combined. Depending on the conditions, the solar collector film area should have holes for rain and be partially permeable to sunlight, as shown in claim 7. If the price of the solar collector film is too high considering the usable area, part of the roll can be replaced by a cheaper film or fabric, as shown in claim 8. Houses or greenhouses can be heated, according to claim 9, by a direct line via a heat exchanger to a large heat storage (e.g., hot water tank in the ground) in the cold season. The electric motors are powered, as shown in claim 10, by batteries/rechargeable batteries that are charged by solar cells, among other things, on the roller shutter box. The electricity for the heat carrier pump(s) should be used directly from solar cells, as higher pump performance also makes sense with strong sunlight (claim 14). During the rolling up of the solar collector film, the heat carrier is pumped into an intermediate storage tank or simply air is released (claim 15).

Claims

1. Rollable flexible solar collector with air or liquid as a heat carrier and programmable sun protection for lawns and other plants, characterized in that the rolled-up solar collector film is housed in a roller shutter box with a tubular motor, or the roller shutter box itself is electromotorized, and the control unit gives the signal to unroll the solar collector film based on the corresponding sensor data.
2. Rollable flexible solar collector with air or liquid as a heat carrier and programmable sun protection for lawns and other plants, according to claim 1, characterized in that the roller shutter box of the solar collector film is either installed on the ground or (mostly) in the ground.
3. Rollable flexible solar collector with air or liquid as a heat carrier and programmable sun protection for lawns and other plants, according to one of the preceding claims, characterized in that the roller shutter box is equipped with a control unit and sensors for sunlight, wind, rain, and a clock.
4. Rollable flexible solar collector with air or liquid as a heat carrier and programmable sun protection for lawns and other plants, according to one of the preceding claims, characterized in that the sun protection is controlled by the sensor data (programming via an app or computer program) and/or by a clock.
5. Rollable flexible solar collector with air or liquid as a heat carrier and programmable sun protection for lawns and other plants, according to one of the preceding claims, characterized in that on one side of the area is the roller shutter box, on the other side an electric motor with a combined steel-electric cable is installed; and/or the beginning of the solar collector film has a stabilizing (metal or plastic) bar at the start, on which electromotorized (spiked) wheels are attached; and/or tracks are installed on the sides of the areas; and/or spacers are attached to the ground or the solar collector film; and/or one or more guide rollers are at the end of the area, and the tubular motor unrolls the solar collector film while simultaneously winding up the cable; and/or roller shutter boxes are on both sides of the lawn area, where one half of the film is transparent or made of rain- and sun-permeable fine mesh/fabric, and the other half is solar collector film; and/or two electromotorized spiked wheels unroll the film, and a tubular motor in the roller shutter box rolls the solar collector

film back up; and/or the roller shutter box has its own electromotorized (spiked) wheels, with the start of the film anchored; and/or the solar collector film has channels for compressed air at least at both ends.

6. Rollable flexible solar collector with air or liquid as a heat carrier and programmable sun protection for lawns and other plants, according to one of the preceding claims, characterized in that several units are combined behind and next to each other, where motors and roller shutter boxes can then be combined.

7. Rollable flexible solar collector with air or liquid as a heat carrier and programmable sun protection for lawns and other plants

, according to one of the preceding claims, characterized in that the solar collector film has holes and is partially permeable to sunlight.

8. Rollable flexible solar collector with air or liquid as a heat carrier and programmable sun protection for lawns and other plants, according to one of the preceding claims, characterized in that part of the roll is replaced by a cheaper film or fabric.

9. Rollable flexible solar collector with air or liquid as a heat carrier and programmable sun protection for lawns and other plants, according to one of the preceding claims, characterized in that the solar collector film has a line via a heat exchanger to a large heat storage.

10. Rollable flexible solar collector with air or liquid as a heat carrier and programmable sun protection for lawns and other plants, according to one of the preceding claims, characterized in that the electric motors are powered by batteries/rechargeable batteries that are charged by solar cells, among other things, on the roller shutter box.

11. Rollable flexible solar collector with air or liquid as a heat carrier and programmable sun protection for lawns and other plants, according to one of the preceding claims, characterized in that two films (a highly sunlight-absorbing, black film underside and a transparent film top side) are connected or welded together at stabilizing points or in a serpentine pattern, thus representing a solar collector film.

12. Rollable flexible solar collector with air or liquid as a heat carrier and programmable sun protection for lawns and other plants, according to one of the preceding claims, characterized in that the appropriate positioning of the connection points allows circulation of the heat carrier even when the solar collector film is partially unrolled.

13. Rollable flexible solar collector with air or liquid as a heat carrier and programmable sun protection for lawns and other plants, according to one of the preceding claims, characterized in that additional sensors constantly compare the temperature of the heat carrier with the temperature of the heat storage. If the temperature of the heat carrier is lower than that of the heat storage with a programmable difference, the heat carrier is reintroduced into the solar collector film.

14. Rollable flexible solar collector with air or liquid as a heat carrier and programmable sun protection for lawns and other plants, according to one of the preceding claims, characterized in that the electricity for the heat carrier pump(s) is used directly from solar cells.

15. Rollable flexible solar collector with air or liquid as a heat carrier and programmable sun protection for lawns and other plants, according to one of the preceding claims, characterized in that during the rolling up of the solar collector film, the heat carrier is pumped into an intermediate storage tank or simply air is released.

16. Rollable flexible solar collector with air or liquid as a heat carrier and programmable sun protection for lawns and other plants, according to one of the preceding claims, characterized in that the electricity for the heat carrier pump(s) is used directly from solar cells.

No figures.