

German utility model no. DE202019103039U1

## Rollable Flexible Solar Cells with Programmable Sun Protection for Lawns and Other Plants

### Description

My invention is based on the further development of flexible solar cells, so they can serve as sun protection for plants in addition to generating electricity. There are many solutions for rolled or folded solar cells with additional functions, such as:

- CN000107947719A, portable blind,
- CN000207410271U, built-in blind,
- DE102009052442A1, rigid foldable panels,
- KR102018044656A, rollable flexible solar cells,
- US020090014130A1, photovoltaics as an awning,
- US020140224434A1, rollable solar cells with motor,
- WO002013089909A1, inflatable frame for deployment,
- WO002017061968A1, unfolded behind a boat,
- WO002019003168A1, rigid foldable panels on wheels,
- WO002019041368A1, flexible solar cells for vehicles and on fabric.

The existing solutions fulfill their respective functions but are not intended for lawns or fields. In times of climate change, lawns or plants in fields are increasingly drying out or "burning," and huge amounts of water are needed to prevent this. The invention described in claim 1 results in fewer or no plants burning, less water being used, and the generated electricity can be fed into the power grid, charge batteries, or be consumed directly.

### An Exemplary Embodiment:

The rolled-up flexible solar cells have, for example, the width of a lawn or, in the case of a field, the maximum producible width. The roller shutter box of the solar cell film is either on the ground or, for aesthetic reasons—as shown in claim 2—(mostly) in the ground. The box, according to claim 3, is equipped with a control unit and sensors for sunlight, wind, and possibly rain. For example, when there is no to moderate sunlight, strong wind, heavy rain, for personal use of the lawn (sitting, playing, mowing the lawn), field work, and also

according to pre-programmed times, the flexible solar cells are rolled up. The control based on 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 different designs and combinations, as shown in claim 5, to allow the smooth rolling out and rolling in of the flexible solar cells (here, as an example, for a lawn):

- 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 that unrolls the film.
- The beginning of the solar 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 lawns for easier rolling out.
- Spacers are attached to the ground or the solar film.
- The solar film is unrolled from the roller shutter box via one or more guide rollers at the end of the lawn, so the tubular motor unrolls the solar film and simultaneously winds up the traction cable.
- Roller shutter boxes are on both sides of the lawn 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 is solar film.
- Two electromotorized spiked wheels unroll the film, and the tubular motor in the roller shutter box rolls the solar 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 film, the box moves back in the opposite direction.
- Ideally, a very lightweight solar film simply lying on the lawn would be best for lawns.

Since the flexible solar cell films can only be produced up to a certain size, according to claim 6, it makes sense to combine several units behind and next to each other, where motors and boxes can also be combined. Depending on the conditions, the solar film area should have holes for rain and be partially permeable to sunlight, as shown in claim 7. If the price of the solar film is too high considering the usable area, a part of the roll can be replaced by a cheaper film, as shown in claim 8. Houses or greenhouses can be cooled according to claim 9 by a direct line to a voltage converter with an attached air conditioning system (other existing devices can also be powered by electricity). This is particularly efficient as the electricity is produced locally and also results in stronger cooling with increased sunlight. As shown in

claim 10, the electric motors are powered by rechargeable batteries that are charged by the solar film.

## Claims

1. Rollable flexible solar cells with programmable sun protection for lawns and other plants, characterized in that the rolled-up solar 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 film based on the corresponding sensor data.

2. Rollable flexible solar cells with programmable sun protection for lawns and other plants, according to claim 1, characterized in that the roller shutter box of the solar cell film is either installed on the ground or (mostly) in the ground.

3. Rollable flexible solar cells with 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 cells with 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 cells with 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 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 film; and/or one or more guide rollers are at the end of the area, and the tubular motor unrolls the solar 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 film; and/or two electromotorized spiked wheels unroll the film, and a tubular motor in the roller shutter box rolls the solar film back up; and/or the roller shutter box has its own electromotorized (spiked) wheels, with the start of the film anchored.

6. Rollable flexible solar cells with 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 cells with programmable sun protection for lawns and other plants, according to one of the preceding claims, characterized in that the solar film has holes and is partially permeable to sunlight.

8. Rollable flexible solar cells with programmable sun protection for lawns and other plants, according to one of the preceding claims, characterized in that a part of the roll is replaced by a cheaper film.

9. Rollable flexible solar cells with programmable sun protection for lawns and other plants, according to one of the preceding claims, characterized in that the solar film has a line to a voltage converter with an attached air conditioning system or other devices connected.

10. Rollable flexible solar cells with programmable sun protection for lawns and other plants, according to one of the preceding claims, characterized in that the electric motors are powered by rechargeable batteries that are charged by the solar film.

No figures.