

DESCRIPTION

SUNSHADE APPARATUS AND METHOD FOR ITS USE

Technical field

This invention relates to a sunshade apparatus and to a method for its use.

5 This invention relates to the sector of sunshade apparatuses, apparatuses composed of slatted blinds consisting of a plurality of sunshade elements (or slats) configured to screen a room from sunlight so as to allow controlling the amount of light entering the room where the sunshade apparatus is installed.

10 As used herein, the expression "sunshade apparatus" denotes a venetian blind, that is to say, an apparatus provided with horizontal slats which can be oriented horizontally. Venetian blinds can be retracted by lifting and stacking the slats.

Background art

15 These sunshade apparatuses are configured to move the sunshade slats in such a way as to vary their spacing. Typically, sunshade apparatuses are also configured to vary the tilt of the slats so as to dynamically adapt the sunshade to weather conditions and light in different seasons, thus allowing savings in terms of energy spent cooling (in summer, by
20 protecting building facades or room interiors from exposure to direct sunlight) and heating (in winter, by reducing heat loss). The slats usually have an elongate shape in one direction and their tilt is varied by rotating each slat about its longitudinal axis.

Generally speaking, prior art sunshade apparatuses are retractable, that is
25 to say, they can adopt intermediate configurations between a gathered configuration (where the spacing between the axes of rotation of the slats is at its minimum, the slats are retracted and their overall dimensions minimized) and an extended configuration (where the spacing between

the axes of rotation of the slats is at its maximum).

Such sunshade apparatuses are also provided with a pair of opposing side guides (a first and a second side guide) configured to guide the slats. For each slat, a first end is coupled to the first side guide and a second
5 end is coupled to the second side guide, in order to guide the slat in a direction of movement (said movement is essentially a translation movement).

Such sunshade apparatuses comprise a connecting mechanism (or pantograph), typically a ladder-like supporting structure configured to
10 connect the slats to each other and rotate them about their longitudinal axes. In other words, the pantograph connects the slats to each other and defines the spacing between the axes of rotation of the slats and is configured to allow simultaneous adjustment of the slatted blind.

These sunshade apparatuses generally comprise a lifting shaft coupled to
15 a motor and configured to move and orient the slats of the sunshade apparatus.

The lifting shaft has a lift pulley which is coupled to a lifting element: for example, a lift chain. The lift chain is connected to at least one slat, usually the distal slat remote from the lifting shaft (that is, the last or
20 lowermost slat), to move the slats in the direction of movement.

From the gathered configuration, moving the last slat away from the lifting shaft in the direction of movement when the lifting shaft is rotated in an extending rotation direction causes the other slats, connected by means of the pantograph, to be dragged along with it and to be spaced further and
25 further apart until the sunshade apparatus reaches the extended configuration.

Prior art sunshade apparatuses may have a lifting element with an open or closed loop configuration. In a sunshade apparatus with an open loop lifting element, the lifting element has a first end and a second end. The
30 first end is usually connected to the last slat, whilst the second end is connected to a counterweight which balances the overall weight of the

slats. An example of a sunshade apparatus comprising an open loop lifting element is described in patent document US4324284A.

In a sunshade apparatus with a closed loop lifting element, the lifting element is coupled to a first and a second lift pulley, one of which is connected to the lifting shaft. To move the slats in the direction of movement when the lifting shaft is rotated, the lifting element is usually connected to the last slat. An example of a sunshade apparatus comprising a closed loop lift chain is described in patent document EP1936102B1.

Other examples of sunshade apparatus are disclosed in patent documents DE2034321 and WO2011/099078.

The pantograph is usually coupled to the lifting shaft by means of a tilt element: for example, a tilt chain. Typically, the tilt element is fixed to the pantograph at points proximal to the lifting shaft. The coupling between the tilt chain and the lifting shaft usually comprises a second pulley (or tilt pulley), or a rocking element, mounted on the lifting shaft.

It should be noted that the lifting shaft has the twofold function both of imparting the motion, by means of the lift chain, by which the slats are driven in the direction of movement and of varying the tilt of the slats by means of the tilt element connected to the pantograph. This may lead to several problems.

For example, patent document US4324284A describes a sunshade apparatus with an open loop lifting element, where the tilt element is connected to a rocker located on the lifting shaft. In passing from the gathered configuration to the extended configuration, the rocker is immediately set in rotation until reaching a predetermined angular position where the rocker stops. The predetermined angular position corresponds to a predetermined slat tilt. When the extended configuration is reached, a further rotation of the lifting shaft in the extending direction activates a release mechanism which disengages the rocker and allows a further rotation of the slats until reaching a closed configuration, where the slats

form a substantially flat surface.

The release mechanism, described in patent document CH565935, comprises a pin which locks the rocker when the predetermined angular position is reached. When the extended configuration is reached, a limit stop element, included in the lift chain, actuates a lever which disengages the pin, thus releasing the rocker and allowing the slats to close.

The solution described above has some disadvantages, however.

For example, slat tilt beyond the predetermined angular position is permitted only after the sunshade apparatus has reached the extended configuration, where the release mechanism is activated by the limit stop element. The same applies to the closing of the slats, which is possible only in the extended configuration. This limits the flexibility of the sunshade.

Furthermore, the complexity of the release mechanism limits the reliability of the sunshade described in patent document US4324284A, whose complete closure depends entirely on the action of the limit stop element which disengages the pin.

Some prior art sunshade apparatuses comprise a connecting structure – for example a lifting carriage – for connecting the lifting element to the last slat and allow the sunshade apparatus to pass from the gathered configuration to the extended configuration. In one example mentioned in patent document US4324284A, the lifting carriage comprises a first and a second part separated by a spring. When the extended configuration is reached, the lifting carriage comes into contact with a limit stop element. A further rotation of the lifting shaft in the extending direction causes the spring to be compressed until bringing together the first and second parts of the lifting carriage, guaranteeing contact of the last slat on a supporting surface and preventing the slats from being lifted manually (in other words, constituting an anti-burglary system). The security of the anti-burglary system, however, depends on the spring which separates the first and second parts of the lifting carriage and whose rigidity and reliability

diminish on account of mechanical fatigue caused by frequent use.

Disclosure of the invention

The aim of this invention is to provide a sunshade apparatus and a method for its use to overcome the above mentioned disadvantages of the prior art.

More specifically, this invention has for an aim to provide a sunshade apparatus and a method for its use which are particularly simple and reliable.

A further aim of this invention is to provide a sunshade apparatus and a method for its use which are particularly secure and robust.

These aims are fully achieved by the sunshade apparatus of this invention as characterized in the appended claims.

More specifically, the sunshade apparatus according to the invention comprises a plurality of slats, preferably elongate in one direction.

Each slat is tiltable about its longitudinal axis, preferably parallel to the direction in which the slat is elongate. Preferably, the longitudinal axes of the slats are parallel to each other.

Each slat has a first and a second end which are operatively coupled to a first and a second lateral guide, configured to guide the slats along a direction of movement (translation). Preferably, the direction of movement is perpendicular to the longitudinal axes of the slats.

It should be noted that, in this description, the spacing between the sunshade slats is the spacing between the axes of rotation of the slats themselves.

The sunshade apparatus comprises a connecting mechanism (or pantograph) configured to connect together the slats and rotate them about their longitudinal axes. Preferably, the connecting mechanism is a ladder-like structure.

The sunshade apparatus also comprises a lifting shaft coupled to a motor. Preferably, the axis of rotation of the lifting shaft is parallel to the

longitudinal axes of the slats.

It should be noted that the sunshade apparatus is made up of two mirror-symmetrical parts, both connected to the lifting shaft: the first part is connected to the first end of the slats and the second part is connected to the second end of the slats. For brevity, this description applies to the first part, it being understood that the second part is constructionally similar (mirror-symmetrical), unless otherwise specified. Preferably, the first and second parts are driven by the same lifting shaft.

A first lift pulley is mounted on the lifting shaft. A second lift pulley, connected to the frame and idle, is coupled to the lift pulley by means of a lifting element – for example, a cable, a belt or, preferably, a lift chain – in a closed loop configuration.

The lifting shaft is connected to the last or lowermost slat, distal from the lifting shaft. This connection allows the slats, which are connected to each other by the connecting mechanism, to be moved in the direction of movement when the lifting shaft is rotated.

The sunshade apparatus according to the invention is configured to adopt intermediate configurations between a gathered configuration (where the slat spacing is at its minimum, the slats are retracted and their overall dimensions are minimized) and an extended configuration (where the slat spacing is at its maximum).

In an example embodiment, the sunshade apparatus comprises a tilt pulley connected to the connecting mechanism to actuate it in order to modify the tilt of the slats. The tilt pulley is operatively connected to the lifting shaft by means of a clutch, so that a rotation of the lifting shaft in a first direction causes the tilt pulley to rotate up to a configuration of maximum or minimum tilt of the slats and a further rotation of the lifting shaft in the first direction causes the tilt pulley to slip on the clutch.

It should be noted that this solution allows varying slat tilt in a simple and reliable manner when the sunshade adopts any configuration which is intermediate between the gathered configuration and the extended

configuration.

In an example embodiment, in the gathered configuration of the sunshade apparatus, the slats are in the configuration of maximum tilt (or open configuration) where at least a portion of a surface defined by the slat lies in a plane substantially perpendicular to the direction of movement. In a configuration of minimum tilt (or closed configuration), at least a portion of the surface defined by the slat lies in a plane belonging to a bundle of planes generated by the direction of movement. It should be noted that the configurations of maximum and minimum slat tilt are essentially arbitrary. In the example illustrated, in the configuration of minimum tilt, the slats lie in substantially horizontal, parallel planes, whereas in the configuration of maximum tilt, the slats lie in a substantially vertical plane. In this example, the slats, in passing from the configuration of minimum tilt to that of maximum tilt, perform a rotation through approximately 90 degrees. Slat rotations through different angles – for example greater than 90 degrees – between the configurations of minimum and maximum tilt are also imaginable, however.

Preferably, the tilt pulley is idle relative to the lifting shaft and is connected to the first lift pulley through the clutch interposed between the tilt pulley and the first lift pulley.

Preferably, the clutch comprises an annular friction element which defines at least one contact surface perpendicular to the longitudinal axis of the lifting shaft. In an example embodiment, the sunshade apparatus comprises a coupling spring configured to press the tilt pulley against the annular friction element. In other words, the coupling spring is configured to apply pressure on the at least one contact surface.

In an example embodiment, the sunshade apparatus comprises a stroke limit stop element which rotates as one with the tilt pulley. The stroke limit stop element is configured to stop the tilt pulley from rotating when at least one predetermined angular stroke limit position is reached.

Preferably, the stroke limit stop element is configured to stop the tilt pulley

from rotating when at least two predetermined angular stroke limit positions are reached: a first angular stroke limit position, corresponding to the configuration of maximum slat tilt and a second angular stroke limit position, corresponding to the configuration of minimum slat tilt.

5 Preferably, a rotation of the lifting shaft in an extending rotation direction causes a movement of the slats in the direction of movement, between a gathered configuration and an extended configuration, and causes a corresponding rotation of the slats about their longitudinal axes in the closing rotation direction, from the configuration of maximum tilt to the
10 configuration of minimum tilt.

Preferably, the lifting shaft is coupled to the motor to rotate at a first speed, in a condition of driving the lifting shaft on the tilt pulley, and at a second speed greater than the first, in a condition of slipping of the tilt pulley relative to the lifting shaft.

15 It should be noted that this solution allows varying slat tilt in a simple and precise manner.

In an example embodiment, the sunshade apparatus comprises a connecting structure for connecting the lifting element to the last slat.

Preferably, the sunshade apparatus comprises a motor stop device and
20 an activating element configured to activate the stop device to inhibit motor operation.

Preferably, the motor is controlled through an electronic card. The electronic card is connected to the stop device. Preferably, the electronic card is programmed to keep the motor in an inhibited state for a
25 predetermined length of time in response to a stop signal from the stop device. In an example embodiment, the electronic card is programmed to restart the motor in reverse direction (for example towards the slat gathered configuration) at the end of the predetermined length of time.

Preferably, the connecting structure defines a clearance, along the
30 direction of movement, between the lifting element and the last slat, so that the last slat is movable between a first and a second position along

the direction of movement, relative to a stretch of the lifting element to which it is connected, in order to activate the activation element.

Preferably, the activation element is movable between a deactivated configuration and an active configuration in response to a relative movement of the last slat relative to the lifting element in the direction of gathering the plurality of slats.

Preferably, the connecting structure comprises a lifting carriage fixed to the last slat and movably connected to the lifting element to define the aforementioned clearance.

In an example embodiment, the stop device comprises an emitter and a receiver defining an optical path. The activation element, in changing from the deactivated configuration to the active configuration, interrupts the optical path to inhibit operation of the motor. Preferably, the emitter and the receiver are at fixed positions relative to the first and second lateral guides, aligned along the direction of movement and are spaced by a distance which is greater than or equal to the distance between the first and second lift pulleys.

It should be noted that this solution increases the security of the sunshade apparatus, stopping the movement of the slats in the event of a relative movement of the last slat relative to the lifting element in the gathering direction, caused for example by the slats colliding against an obstacle.

In an example embodiment, the sunshade apparatus comprises a proximity sensor configured to detect the presence of the last or lowermost slat at a stroke limit position, distal from the lifting shaft, corresponding to the extended configuration of the sunshade apparatus. Preferably, the stop device is connected to the proximity sensor to prevent inhibiting the motor when the sunshade apparatus adopts the extended configuration.

Preferably, the proximity sensor is connected to an anti-burglary alarm system configured to come into operation in the event of an attempt to move the slats manually.

In an example embodiment, the lifting element has an active half loop, to which the last slat is connected, and a passive half loop. The active half loop has a first stretch included between the first lift pulley, connected to the last slat by means of the connecting structure, and a zone of connection of the lifting element. The first stretch of the active half loop is tensioned by the weight of the slats when the last slat is in the aforementioned first position relative to the lifting element. A second stretch of the active half loop, included between the second lift pulley and the zone of connection of the lifting element, is tensioned by the motor when the last slat is in the aforementioned second position relative to the lifting element.

It should be noted that this solution allows opposing manual movement of the sunshade slats and thus constitutes a simple and effective anti-burglary system.

According to a further aspect of this description, also defined is a method of using a sunshade apparatus comprising a lifting shaft connected to a motor and kinematically connected to a plurality of slats, pivoted about their longitudinal axes for tilting between a configuration of minimum tilt and a configuration of maximum tilt, and coupled to a first and a second lateral guide to move along a direction of movement between a gathered configuration and an extended configuration. The method comprises the following steps:

- moving the slats between the gathered configuration and the extended configuration;

- tilting the slats between the minimum and maximum tilt configurations, by means of a tilt pulley,

wherein a rotation of the lifting shaft in an extending rotation direction causes movement of the slats towards the extended configuration and tilting of the slats towards the minimum or, vice versa, maximum tilt configuration, and a rotation of the lifting shaft in a gathering rotation direction causes movement of the slats towards the gathered

configuration and tilting of the slats towards the maximum or, vice versa, minimum tilt configuration;

- moving and simultaneously tilting the slats, until reaching the configuration of minimum or maximum tilt of the slats, with the lifting shaft driving the tilt pulley;

- moving the slats without varying the tilt, when the slats are in the minimum or maximum tilt configuration and movement is towards the extended or gathered configuration, respectively, or vice versa, wherein the rotation of the lifting shaft causes the tilt pulley to slip relative to the lifting shaft.

More specifically, if the sunshade apparatus comprises an activation element configured to inhibit operation of the motor, the method of using the sunshade apparatus comprises a step of inhibiting the operation of the motor in response to a relative movement of the last slat relative to the lifting element along the direction of movement in the direction of gathering the plurality of slats.

Preferably, the inhibiting step comprises stopping the motor for a predetermined length of time. In an example embodiment, the inhibiting step is followed (after the predetermined length of time) by a step of restarting the motor, preferably in the direction of rotation opposite to its direction prior to stopping.

Preferably, the step of moving the slats between the gathered configuration and the extended configuration corresponds to a first angle of rotation of the lifting shaft and the step of tilting the slats between the maximum and minimum tilt configurations corresponds to a second angle of rotation of the lifting shaft. Preferably, the second angle of rotation is smaller than the first angle of rotation by at least one order of magnitude.

According to an example embodiment, this description provides a method of using a sunshade apparatus. More specifically, the sunshade apparatus is an apparatus comprising a plurality of slats coupled to a first and a second guide to move along a direction of movement between a gathered

configuration and an extended configuration. The sunshade apparatus comprises a lifting shaft which is connected to a motor, and a lifting element trained in a closed loop around a first pulley connected to the lifting shaft and around a second pulley. The lifting shaft is coupled to the last or lowermost slat, distal from the lifting shaft.

The method comprises the following steps:

- preparing a connecting structure defining a clearance, along the direction of movement, between the lifting element and the last slat, so that the last slat is movable between a first and a second position along the direction of movement, relative to a stretch of the lifting element to which it is connected;
- activating an activation element in response to a movement of the last slat from the first to the second position in a direction towards the lifting shaft;
- stopping and inhibiting the motor in response to the activating action.

Preferably, the step of activating the activation element entails interrupting an optical path parallel to the direction of movement. More specifically, if the sunshade apparatus comprises an emitter and a receiver, the optical path is generated between the emitter and the receiver which are located at fixed positions relative to the first and second lateral guides and spaced by a distance which is greater than or equal to the distance between the first and second lift pulleys.

If the sunshade apparatus comprises a proximity sensor, the method of using a sunshade apparatus comprises the following further steps:

- detecting the presence of the last or lowermost slat at a stroke limit position, distal from the lifting shaft, corresponding to the extended configuration of the sunshade apparatus;
- reversing the logic of the stop device so as to prevent the motor from being inhibited when the sunshade apparatus adopts the extended configuration independently of activation of the activation element.

Brief description of the drawings

This and other features of the invention will become more apparent from the following description of a preferred embodiment of it, illustrated purely by way of non-limiting example in the accompanying drawings, in which:

- 5 - Figure 1 is a perspective view, with some parts cut away in order to better illustrate others, showing a sunshade apparatus according to a first example embodiment of the invention;
- Figure 2 shows a section of the sunshade apparatus of Figure 1, in a front view, with some parts cut away in order to better illustrate others,
10 with the slats in the maximum tilt configuration;
- Figure 3 shows a side view of the sunshade apparatus of Figure 2, with some parts cut away in order to better illustrate others;
- Figure 4 shows the sunshade apparatus of Figure 2 through the section labelled IV-IV in Figure 2, with some parts cut away in order to better
15 illustrate others;
- Figure 5 shows a section of the sunshade apparatus of Figure 1, in a front view, with some parts cut away in order to better illustrate others, with the slats in the minimum tilt configuration;
- Figure 6 shows a side view of the sunshade apparatus of Figure 5, with
20 some parts cut away in order to better illustrate others;
- Figure 7 shows the sunshade apparatus of Figure 5 through the section labelled VII-VII in Figure 5;
- Figure 8 shows the sunshade apparatus of Figure 3, with the activation element in the active configuration.

25

Detailed description of preferred embodiments of the invention

With reference to the accompanying drawings, the numeral 1 denotes a sunshade apparatus according to this description.

- More specifically, the sunshade apparatus 1 according to the invention
30 comprises a plurality of sunshade slats 2 (or slats 2), which make up a slatted blind. Preferably, the slats 2 are elongate in a longitudinal

direction.

The sunshade apparatus 1 is configured to space the sunshade slats 2 from each other and to vary their tilt. Preferably, the tilt of the slat 2 is varied by rotating the slat 2 about the longitudinal axis. Still more preferably, the longitudinal axes of the slats 2 making up the slatted screen are parallel to each other. It should be noted that, in this description, the spacing between the sunshade slats 2 is the spacing between the axes of rotation of the slats 2 themselves.

The sunshade apparatus 1 is configured to adopt intermediate configurations between a gathered configuration (where the spacing of the slats 2 is at its minimum, the slats 2 are retracted and their overall dimensions are minimized) and an extended configuration (where the spacing of the slats 2 is at its maximum).

Each slat 2 has a first and a second end which are operatively coupled to a first and a second lateral guide, respectively. The first and second lateral guides are configured to guide the slats 2 along a direction of movement (translation).

It should be noted that the sunshade apparatus 1 is made up of two mirror-symmetrical parts: the first part is connected to the first end of the slats 2 and the second part is connected to the second end of the slats 2. For brevity, this description applies to the first part, it being understood that the second part is constructionally similar (mirror-symmetrical), unless otherwise specified.

The sunshade apparatus 1 comprises a connecting mechanism 7 (or pantograph 7) configured to connect together the slats 2 and rotate them about their longitudinal axes. Preferably, the connecting mechanism 7 is a ladder-like load-bearing structure.

The connecting mechanism 7 comprises a plurality of levers 7a which are coupled to each other to rotate relative to each other. The pantograph 7 is configured to connect the slats 2 to each other and to define their spacing. The pantograph 7 is also configured to allow adjusting the tilt of the slats 2

simultaneously.

The connecting mechanism 7 comprises a plurality of movement elements 4 by which the slats 2 are moved and, in use, each of the elements 4 is integrally coupled to one end of a slat 2. The coupling between a movement element 4 and one end of the slat 2 is accomplished preferably by means of a locking element 23 configured to lock the slat 2 to the movement element 4. Preferably, each slat 2 comprises at least one guide 5, integral with the slat 2. The guide 5 extends along a longitudinal direction. The locking element 23 can be slidably coupled to the at least one guide 5 so as to be movable along the longitudinal direction between a position of non-interference with the respective movement element 4 and a coupling position where it is locked to the respective movement element 4.

Preferably, the locking elements 23 are removably coupled to the at least one guide 5. Preferably, each of the locking elements 23 for locking the slat 2 is provided with a protuberance configured to be coupled to the at least one guide 5. Still more preferably, each locking element 23 is provided with locking means for locking to the respective movement element 4, configured to allow the locking element 23 to be permanently fixed to the respective movement element 4 in a longitudinal locking direction, and comprising at least one tooth which is elastically deformable during coupling to the respective movement element 4 in the above mentioned locking position.

In the gathered configuration, the slats are in the configuration of maximum tilt (or open configuration) where at least a portion of a surface defined by the slat 2 lies in a plane substantially perpendicular to the direction of movement. In a configuration of minimum tilt (or closed configuration), at least a portion of a surface defined by the slat 2 lies in a plane belonging to a bundle of planes generated by the direction of movement.

The sunshade apparatus 1 comprises a lifting shaft 6 coupled to a motor

13.

Preferably, the first and second parts making up the sunshade apparatus 1 are driven by the same lifting shaft. Preferably, the axis of rotation of the lifting shaft is perpendicular to the direction of movement and parallel to the longitudinal axes of the slats.

A first lift pulley 8 is coupled to the lifting shaft 6 and is connected to a second lift pulley 8a by means of a lifting element 9 – for example, a cable, a belt or, preferably, a lift chain – in a closed loop configuration. The lifting element 9 is connected to at least one slat 2. Preferably, the lifting element 9 is connected to the slat which is distal from the lifting shaft 6 (that is, the last or lowermost slat 2a), to move the slats 2 in the direction of movement when the lifting shaft 6 is rotated.

In passing from the gathered configuration to the extended configuration, the lifting shaft 6 rotates in an extending rotation direction to move the last slat 2a, and the slats 2 connected thereto by means of the connecting mechanism 7, along the direction of movement, away from the lifting shaft 6.

In passing from the extended configuration to the gathered configuration, the lifting shaft 6 rotates in a gathering rotation direction to move the last slat 2a, and the slats 2 connected thereto by means of the connecting mechanism 7, along the direction of movement, towards the lifting shaft 6.

The rotation of the lifting shaft 6 in the extending rotation direction causes the last slat 2a to move from a first stroke limit position, proximal to the lifting shaft 6, to a second stroke limit position, distal from the lifting shaft 6. It should be noted that in the extended configuration, the slats 2 are positioned at a maximum spacing permitted by the connecting mechanism 7.

Preferably, the second lift pulley 8a, is positioned in proximity to the second stroke limit position of the last slat 2a.

The sunshade apparatus 1 comprises a tilt pulley 11, connected to the connecting mechanism 7 to actuate it in order to modify slat tilt. The tilt

pulley 11 is coupled to the connecting mechanism 7 by means of a tilt element 12 – for example, a cable, a belt or, preferably, a tilt chain. Preferably, the tilt element 12 is fixed to the connecting mechanism 7 at points proximal to the lifting shaft 6.

5 The tilt pulley 11 is operatively connected to the lifting shaft 6 by means of a clutch 14, so that a rotation of the lifting shaft 6 in a first direction causes the tilt pulley 11 to rotate up to a configuration of maximum or minimum tilt of the slats 2. A further rotation of the lifting shaft 6 in the first direction causes the tilt pulley 11 to slip on the clutch 14.

10 Preferably, the tilt pulley 11 is idle relative to the lifting shaft 6 and is connected to the first lift pulley 8 through the clutch 14 interposed between the tilt pulley 11 and the first lift pulley 8.

Preferably, the clutch 14 comprises an annular friction element which defines at least one contact surface perpendicular to the longitudinal axis of rotation of the lifting shaft. In an example embodiment, the sunshade apparatus 1 comprises a coupling spring 22 configured to press the tilt pulley 11 against the annular friction element. In other words, the coupling spring 22 is configured to apply pressure on the at least one contact surface.

15 20 In an example embodiment, the sunshade apparatus 1 comprises a stroke limit stop element 15 (or tooth 15), which rotates as one with the tilt pulley 11. The stroke limit stop element 15 is configured to stop the tilt pulley 11 from rotating when at least one predetermined angular stroke limit position is reached.

25 30 Preferably, the stroke limit stop element 15 is configured to stop the tilt pulley 11 from rotating when at least two predetermined angular stroke limit positions are reached: a first angular stroke limit position, corresponding to the configuration of maximum tilt of the slats 2 and a second angular stroke limit position, corresponding to the configuration of minimum tilt of the slats 2.

In the specific embodiment illustrated, a rotation of the lifting shaft 6 in a

first direction causes the stroke limit stop element 15, integral with the tilt pulley 11, to move to an angular stroke limit position where further rotation of the tilt pulley 11 in the first direction is prevented.

When rotation of the tilt pulley 11 is prevented, the clutch 14 generates slipping which allows the lift pulley 8 to continue rotating without driving the tilt pulley 11, thus preventing excessive strain from being applied to the tooth 15 which has reached an angular stroke limit position.

A movement of the slats 2 between the gathered configuration and the extended configuration corresponds to a first angle of rotation of the lifting shaft 6. A change in the tilt of the slats 2 between the maximum and the minimum tilt configuration of the slats 2 corresponds to a second angle of rotation of the lifting shaft 6. Preferably, the second angle of rotation is smaller than the first angle of rotation by at least one order of magnitude.

In the specific embodiment illustrated, in the gathered configuration, the slats 2 are retracted and arranged in the maximum tilt configuration. In other words, in the gathered configuration, the slats 2 adopt the open configuration. The tooth 15 is at a first angular stroke limit position. A rotation of the lifting shaft 6 in the extending rotation direction causes rotation of the tilt pulley 11 and of the tooth 15 connected thereto.

Preferably, a rotation of the tilt pulley 11 through an angle less than or equal to a full angle causes the tooth to move from the first to the second predetermined angular stroke limit position, corresponding to the closed configuration of the slats 2. Still more preferably, a rotation of the tilt pulley 11 through an angle less than or equal to a flat angle causes the tooth to move from the first to the second predetermined angular stroke limit position, corresponding to the closed configuration of the slats 2.

Thanks to the clutch 14, a further rotation of the lifting shaft 6 in the extending rotation direction causes only the slats 2, which are in the closed configuration, to move away from the lifting shaft 6 in the direction of movement.

When the sunshade apparatus 1 adopts the extended configuration and

the slats 2 adopt the closed configuration, the tooth 15 is at the second stroke limit position. A rotation of the lifting shaft 6 and of the first lift pulley 8 in the gathering rotation direction causes the tilt pulley 11 to rotate and hence the tilt of the slats 2 changes from the closed configuration to the open configuration.

It should be noted that in the specific embodiment illustrated, a rotation of the lifting shaft 6 through an angle equal to a flat angle corresponds to the passage of the slats 2 from the closed configuration to the open configuration (and vice versa), causing a limited, almost imperceptible, movement of the slats 2 along the direction defined by the lateral guides. This allows, both in the extended configuration and in any configuration intermediate between the extended configuration and the gathered configuration, changing the tilt of the slats 2 with only an imperceptible movement of the slats 2 in the direction of movement.

When the slats 2 reach the open configuration, the tooth 15 is at the first angular stroke limit position and, thanks to the clutch 14, a further rotation of the lifting shaft 6 and of the lift pulley 8 in the gathering rotation direction causes only the slats 2, which are in the open configuration, to move towards the lifting shaft 6 along the direction of movement.

Preferably, the lifting shaft 6 is coupled to the motor 13 to rotate at a first speed, in a condition of driving the lifting shaft 6 on the tilt pulley 11, and at a second speed greater than the first, in a condition of slipping of the tilt pulley 11 relative to the lifting shaft 6.

In an example embodiment, the sunshade apparatus 1 comprises a connecting structure for connecting the lifting element 9 to the last slat 2a. The connecting structure defines a clearance, along the direction of movement, between the lifting element 9 and the last slat 2a, so that the last slat 2a is movable between a first and a second end position along the direction of movement, relative to a stretch of the lifting element 9 to which it is connected.

Preferably, the connecting structure comprises a lifting carriage 10, fixed

to the last slat 2a and movably connected to the lifting element 9 to define the aforementioned clearance. In an example embodiment, the lifting carriage 10 is fixed to the lifting element 9 and movably connected to the last slat 2a to define the aforementioned clearance.

5 At the first end position, or run position, the lifting carriage 10 supports the weight of the slats 2, and its coupling with the lifting element 9 produces a force which places under tension a first stretch of the lifting element 9 included, in the extending direction, between the first lift pulley 8 and the point of connection between the lifting carriage 10 and the lifting element
10 9. At the second end position, or stop position, the coupling between the lifting carriage 10 and the lifting element 9 places under tension (by effect of the motor 13) a second stretch of the lifting element 9, complementary to the first stretch and included, in the gathering direction, between the first lift pulley 8 and the point of connection between the lifting carriage 10
15 and the lifting element 9.

In the specific embodiment illustrated, the lifting carriage 10 comprises an activating element configured to inhibit motor operation. Preferably, the activation element is movable between a deactivated configuration and an active configuration in response to a relative movement of the last slat 2a
20 relative to the lifting element 10 in the gathering direction.

In the specific embodiment illustrated, the sunshade apparatus 1 comprises an optical stop device. Preferably, the optical stop device comprises an emitter 17 and a receiver 18, defining an optical path 19. Preferably, the activation element, in changing from the deactivated
25 configuration to the active configuration, interrupts the optical path 19 to inhibit operation of the motor 13. Preferably, the receiver 18 is connected to an electronic card 24 configured to inhibit the operation of the motor 13. Preferably, the emitter 17 and the receiver 18 are aligned along the direction of movement at fixed positions relative to a frame 3 of the
30 sunshade apparatus 1. Still more preferably, the emitter 17 and the receiver 18 are spaced, in the direction of movement, by a distance which

is greater than or equal to the distance between the first stroke limit position of the last slat 2a and the second stroke limit position of the last slat 2a.

In the specific embodiment illustrated, the lifting element 9 comprises a
5 pin 16 inserted in an oval hole 10a made on the carriage 10. A relative movement of the carriage 10 relative to the lifting element 9 in the gathering direction causes the pin 16, which is connected to the lifting element 9, to move from the run position to the stop position which are defined by the oval hole 10a. Preferably, the oval hole 10a is elongate in a
10 direction parallel to the direction of movement.

The sunshade apparatus 1 preferably also comprises a return spring (not illustrated), operatively interposed between the connecting structure and the last slat, for pushing the connecting structure (that is, the carriage) towards the lifting shaft.

15 In the specific embodiment illustrated, the emitter 17 is a source of electromagnetic radiation (for example, laser or infrared), connected to the frame 3 in proximity to the second stroke limit position of the last slat 2a. The receiver 18, aligned with the emitter 17 in a direction parallel to the direction of movement, is connected to the frame 3 in proximity to the
20 lifting shaft 6.

The pin 16, which connects the lifting element 9 to the lifting carriage 10, is connected to a stop lever 20. The stop lever 20, which is pivoted to the lifting carriage 10, is configured to pass by rotation from the deactivated configuration to the active configuration, corresponding respectively to the
25 run position and the stop position occupied by the pin 16 in the oval hole 10a.

During the movement of the slats 2 of the sunshade apparatus 1 from the gathered configuration to the extended configuration, or vice versa, the stop lever 20 adopts the deactivated configuration. The pin 16 occupies
30 the run position and supports the weight of the slats 2, keeping the first stretch of the lifting element 9 under tension.

If a slat 2 of the sunshade apparatus 1 collides against an obstacle, the resulting relative movement of the lifting carriage 10 relative to the lifting element 9 in the gathering direction causes the pin 16 to move to the stop position.

5 The movement of the pin 16 to the stop position urges the stop lever 20 into the active position, where it interrupts the optical path 19 defined between the emitting device 17 and the receiving device 18. Interrupting the optical path 19 causes the motor 13 coupled to the lifting shaft 6 to stop.

10 Preferably, the sunshade apparatus 1 comprises a proximity sensor 21 configured to detect the distance of the last slat 2a from the second stroke limit position where the sunshade apparatus 1 adopts the extended configuration.

When the last slat 2a reaches the second stroke limit position, a further
15 rotation of the lifting shaft 6 causes the pin 16 to move from the run position to the stop position. At the second stroke limit position of the last slat, further movement of the lifting carriage 10 away from the lifting shaft is prevented. A further rotation of the lifting shaft 6 in the extending rotation direction causes the pin 16, which is connected to the lifting
20 element 9, to move from the run position to the stop position, thereby interrupting the optical path 19 by means of the stop lever 20.

The proximity sensor 21 is configured to detect when the last slat 2a reaches the second stroke limit position and to invert the logic of the optical stop device. In other words, when the extended configuration is
25 reached, interruption of the optical path 19 does not inhibit operation of the motor 13. The motor 13, remaining engaged, keeps the second stretch of the lifting element 9, between the first lift pulley 8 and the pin 16 in the gathering direction under tension, thereby opposing manual movement of the sunshade apparatus 1.

30 Preferably, the proximity sensor 21 is fixed relative to the frame 3 in proximity to the second stroke limit position of the last slat 2a.

The sunshade apparatus 1 according to the invention comprises an alarm device connected to the proximity sensor 21. The alarm device is activated when the proximity sensor 21 detects an attempt to move the sunshade apparatus 1 manually.

5 Preferably, the sunshade apparatus 1 comprises a first and a second optical stop device associated with the first and the second part of the sunshade apparatus 1, respectively.

According to a further aspect of this description, a method of using a sunshade apparatus 1 is also defined wherein a rotation of the lifting shaft
10 6 in the extending rotation direction causes movement of the slats 2 towards the extended configuration and tilting of the slats 2 towards the minimum or, vice versa, maximum tilt configuration, and a rotation of the lifting shaft 6 in a gathering rotation direction causes movement of the slats 2 towards the gathered configuration and tilting of the slats towards
15 the maximum or, vice versa, minimum tilt configuration. The method comprises the following steps:

- moving the slats 2 between the gathered configuration and the extended configuration;
- tilting the slats 2 between the minimum and maximum tilt configurations,
20 by means of the tilt pulley 11,
- moving and simultaneously tilting the slats 2, until reaching the configuration of minimum or maximum tilt of the slats 2, with the lifting shaft 6 driving the tilt pulley 11;
- moving the slats 2 without varying their tilt, when the slats 2 are in the
25 minimum or maximum tilt configuration and movement is towards the extended or gathered configuration, respectively, or vice versa, wherein the rotation of the lifting shaft 6 causes the tilt pulley 11 to slip relative to the lifting shaft 6.

Preferably, the method of using the sunshade apparatus 1 comprises a
30 step of inhibiting the operation of the motor 13, in response to a relative movement of the last slat 2a relative to the lifting element 9 along the

direction of movement, in the gathering direction.

Preferably, the step of moving the slats 2 between the gathered configuration and the extended configuration corresponds to a first angle of rotation of the lifting shaft 6 and the step of tilting the slats 2 between
5 the minimum and maximum tilt configurations corresponds to a second angle of rotation of the lifting shaft 6. The second angle of rotation is smaller than the first angle of rotation by at least one order of magnitude.

CLAIMS

1. A sunshade apparatus (1) comprising:
- a plurality of slats (2), each tilting about a respective longitudinal axis and having a first and a second end operatively coupled to a first and a second lateral guide, configured to guide the slats (2) along a direction of movement;
 - a connecting mechanism (7) configured to connect together the slats (2) and rotate them about their respective longitudinal axes;
 - a lifting shaft (6), coupled to a motor (13);
 - a first lift pulley (8), coupled to the lifting shaft (6), and a second lift pulley (8a);
 - a lifting element (9) connected to the first and the second lift pulley (8,8a), in a closed loop configuration, and connected to a last slat (2a), distal from the lifting shaft (6), to move the slats (2) in the direction of movement;
 - a tilt pulley (11), connected to the connecting mechanism to actuate it in order to modify the tilt of the slats (2),
- characterized in that the tilt pulley (11) is operatively connected to the lifting shaft (6) by means of a clutch (14), so that a rotation of the lifting shaft (6) in a first direction causes the tilt pulley (11) to rotate up to a configuration of maximum or minimum tilt of the slats (2) and a further rotation of the lifting shaft (6) in the first direction causes the tilt pulley (11) to slip on the clutch (14).
2. The sunshade apparatus (1) according to claim 1, wherein the tilt pulley (11) is idle relative to the lifting shaft (6) and is connected to the first lift pulley (8) through the clutch (14).
3. The sunshade apparatus (1) according to claim 2, wherein the clutch (14) is interposed between the tilt pulley (11) and the first lift pulley (8).
4. The sunshade apparatus (1) according to claim 2 or 3, wherein the clutch (14) comprises an annular friction element, defining at least one

surface of contact perpendicular to an axis of rotation of the lifting shaft (6), and wherein the sunshade apparatus (1) comprises a coupling spring (22) configured to apply pressure on the contact surface.

5 5. The sunshade apparatus (1) according to any one of the preceding claims, wherein the rotation of the lifting shaft (6) in an extending rotation direction causes the slats (2) to move along the direction of movement, between a gathered configuration and an extended configuration, and causes a corresponding rotation of the slats (2) about their longitudinal axes in the closing rotation direction, from the configuration of maximum
10 tilt to the configuration of minimum tilt.

6. The sunshade apparatus (1) according to any one of the preceding claims, comprising a stroke limit stop element (15), which rotates as one with the tilt pulley (11) and which is configured to stop the tilt pulley (11) from rotating when at least one predetermined angular stroke limit position
15 is reached.

7. The sunshade apparatus (1) according to claim 6, wherein the stroke limit stop element (15) is configured to stop the tilt pulley (11) from rotating when at least a first and a second predetermined angular stroke limit position are reached, wherein the first angular stroke limit position
20 corresponds to the configuration of maximum tilt of the slats (2) and the second angular stroke limit position configuration corresponds to the minimum tilt of the slats (2).

8. The sunshade apparatus (1) according to any one of the preceding claims, comprising a connecting structure to connect the lifting element (9) to the last slat (2a), wherein the connecting structure defines a clearance
25 along the direction of movement, between the lifting element (9) and the last slat (2a), so that the last slat (2a) is movable along the direction of movement relative to a stretch of the lifting element (9) to which it is connected, between a first and a second end position.

9. The sunshade apparatus (1) according to claim 8, wherein the
30 connecting structure comprises a lifting carriage (10) fixed to the last slat

(2a) and movably connected to the lifting element (9) to define the clearance.

10. The sunshade apparatus (1) according to claim 8 or 9, wherein the connecting structure comprises an activating element, configured to inhibit
5 operation of the motor (13), movable between a deactivated configuration and an active configuration in response to a relative movement of the last slat (2a) relative to the lifting element (9) in a direction for gathering the plurality of slats (2), opposite to the extending direction.

11. The sunshade apparatus (1) according to claim 10, comprising an
10 optical stop device wherein an emitter (17) and a receiver (18) define an optical path (19), and wherein the activation element, when changing from the deactivated configuration to the active configuration, interrupts the optical path (19) inhibiting operation of the motor (13).

12. The sunshade apparatus (1) according to any one of the preceding
15 claims, wherein the lifting shaft (6) is coupled to the motor (13) to rotate at a first speed, in a condition of driving the lifting shaft (6) on the tilt pulley (11), and at a second speed greater than the first, in a condition of slipping of the tilt pulley (11) relative to the lifting shaft (6).

13. The sunshade apparatus (1) according to any one of the preceding
20 claims, wherein each slat (2) comprises at least one guide (5) integral with the slat (2) and extending along the longitudinal axis of the slat (2), and wherein the connecting mechanism (7) comprises a plurality of elements (4) for moving the slats (2), operatively associated with the first and second ends of the slats (2), in such a way that each slat (2) is coupled to
25 a first movement element (4), at the first end, and to a second movement element (4), at the second end, and wherein the apparatus comprises, for each slat, a first and a second locking element (23), configured to lock the slat (2) to the first and second movement element (4), respectively, and wherein the first and second locking elements (23) are slidably coupled to
30 the guide (5) to be movable along the longitudinal direction of extension of the slat, between a position of non-interference with the movement

element (4) and a position for coupling and locking to the respective movement element (4).

14. A method of using a sunshade apparatus (1) comprising a lifting shaft (6) connected to a motor (13) and kinematically connected to a plurality of slats (2), pivoted about their longitudinal axes for tilting between a configuration of minimum tilt and a configuration of maximum tilt, and coupled to a first and a second lateral guide to move along a direction of movement between a gathered configuration and an extended configuration, wherein the method comprises the following steps:

- moving the slats (2) between the gathered configuration and the extended configuration;

- tilting the slats (2) between the minimum and maximum tilt configurations, by means of a tilt pulley (11),

wherein a rotation of the lifting shaft (6) in an extending rotation direction causes movement of the slats (2) towards the extended configuration and tilting of the slats (2) towards the minimum or, vice versa, maximum tilt configuration, and a rotation of the lifting shaft (6) in a gathering rotation direction causes movement of the slats (2) towards the gathered configuration and tilting of the slats towards the maximum or, vice versa, minimum tilt configuration,

characterized in that it comprises the following steps:

- moving and simultaneously tilting the slats (2), until reaching the configuration of minimum or maximum tilt of the slats (2), with the lifting shaft (6) driving the tilt pulley (11);

- moving the slats (2) without varying the tilt, when the slats (2) are in the minimum or maximum tilt configuration and movement is towards the extended or gathered configuration, respectively, or vice versa, wherein the rotation of the lifting shaft (6) causes the tilt pulley (11) to slip relative to the lifting shaft (6).

15. The method according to claim 14, comprising a step of inhibiting the operation of the motor (13), in response to a relative movement of the last

slat (2a) relative to the lifting element (9) along the direction of movement, in the direction of gathering the plurality of slats (2).

5 16. The method according to claim 14 or 15, wherein the step of moving the slats (2) between the gathered configuration and the extended configuration corresponds to a first angle of rotation of the lifting shaft (6) and wherein the step of tilting the slats (2) between the maximum and minimum tilt configurations corresponds to a second angle of rotation of the lifting shaft (6), characterized in that the second angle of rotation is smaller than the first angle of rotation by at least one order of magnitude.

10 17. The method according to any of the claims from 14 to 16, wherein the tilt pulley (11) is idle relative to the lifting shaft (6) and is connected to the first lift pulley (8) through a clutch (14).