FOLDING UMBRELLA HAVING ELECTRICALLY OPERATED OPENING AND CLOSING MECHANISM

FIELD OF THE INVENTION

This invention relates to the field of electrical hand held umbrellas.

BACKGROUND OF THE INVENTION

There are two main canopy types used in hand held umbrellas: one includes a plurality of full length radial ribs (i.e. extending in one piece each from the center of the canopy to the canopy circumference) which allow the canopy to be folded with its radius lines lying in full length adjacent and parallel to the umbrella stick. The other includes a plurality of partial length ribs i.e. which do not extend in one piece from the center of the canopy to the canopy circumference, but rather comprise at least one rib segment of a length about a half the length of a radius line or less, allowing the canopy to be folded twice or more along its radius lines.

Non-telescopic umbrellas having folding canopy of the first type are sometimes called "walking stick umbrellas" because their post together with the handgrip may be the length of a walking stick, and according to various umbrella designs may actually be used as a walking stick. In umbrellas of the second type however, the post is regularly made telescopic, such that when the canopy is folded it is possible to reduce the length of the post to match the length of the folded canopy.

Umbrellas having a canopy of the second type (hereinafter referred to as "multifold umbrellas") can also be divided into two main groups. One group includes manually operated folding umbrellas, and the other includes so called "automatic umbrellas". The so called automatic umbrellas are actually automatic only in the opening direction, since their automation is commonly achieved by releasing the energy of a compressed spring which pushes the canopy ribs open, and which (according to some of the various designs of automatic umbrellas) also drives the telescopic post open. Once the spring of an automatic umbrella is released (i.e. to drive the umbrella open), no further automation is available, and the spring must be retracted manually when folding the umbrella.

Apart from the problem of having the automation in the opening direction only, the spring loaded umbrellas are also uncomfortable and sometimes also dangerous because of the uncontrolled release of the spring.

While in the first mentioned type the length of the folded umbrella cannot be less than the length of a rib (assuming that the umbrella stick is, or otherwise could be shortened to, the length of a rib), in the second type of umbrellas the length of the folded umbrella may be a fraction of a rib length e.g. half, one third or a quarter of a full length rib, according to the number of segments comprised in a rib, and assuming that the umbrella stick can be shortened to the length of a rib segment. Normally, in both types the actual length of a folded umbrella includes also the length of a handgrip located at the bottom of the stick and protruding beyond the folded canopy, as well as the length of an upper plug located at the upper end of the stick for securing and closing the top of the canopy.

For several decades efforts have been made to develop umbrellas that can be opened automatically, and many of such umbrellas can be found in the markets worldwide. Their automation is based on the force of a compressed spring or springs that can be released (by pressing a triggering button) for simultaneously driving a canopy and a telescopic stick of the umbrella from a closed to an open state. When closing the umbrella manually, the spring is retracted by the hand force of the user and is thereby activated for another automatic opening. The advantage of such umbrellas is that they can be opened automatically by single hand operation. A disadvantage is that they cannot be closed automatically, and that they require both hands of the user for closing the umbrella and retracting the spring. Another disadvantage is that the operation of the spring is uncontrolled and once triggered it cannot be stopped e.g. when triggered accidentally, or in order to avoid hitting people in the vicinity or causing damage to the owner. The sudden expansions of the rib and of the stick are unpleasant to the user and unsafe if not performed very carefully.

U.S. Patent Publication No. 2003/0131875 discloses an umbrella, intended to allow automatic closing of the umbrella, including its telescopic stick, by single hand operation without clamping or otherwise securing the handle of the umbrella. As noted above, this cannot be achieved in umbrellas incorporating automatic closing with automatic opening function. However, it should be noted that in order to allow fully

automatic closing of the canopy and the telescopic shaft, US2003/0131875 gives up the automatic opening function of the umbrella.

It will also be appreciated that whenever umbrella automation is based on the force of a compressed spring, full automation cannot be achieved, since it will always be required to retract the spring by user hand force for additional operation.

It has therefore been realized that a fully automated open and closed umbrella mechanism can be achieved only by the use of mobile energy storage other than a spring so as not to require manual power for recharging. Such energy storage may be a container of compressed gas, or e.g. an electrical battery, which can be replaced or recharged after a number of opening and closing operations.

U.S. Patent No. 5,291,908 discloses in Figs. 5 to 20 thereof two embodiments of fully automated open and closed umbrella, wherein the canopy and the post are folded simultaneously. However, its ribs cannot be folded twice, and thus the folded umbrella cannot become shorter than the full length of a rib even though the shaft is shortened during folding. Moreover, the shaft of the umbrella has slots on opposite sides along most of its wall length (shown as 41 and 45 in Fig. 19), wherein a first pair of slots made in the upper part of the telescopic post is needed to allow connection between the donut collar (37) and the drive mechanism inside the shaft and while another pair of slots made in the lower part of the telescopic post is required to allow insertion of the lower part telescopically into the upper part through part 16 shown in Fig. 5 thereof.

Since umbrellas are naturally used in water environment, there appears to be need in umbrella post that as much as possible protects the mechanism accommodated thereof from water penetration. Penetration of water and of dust or dirt may be harmful to mechanical parts as well as to electrical component, and to their proper operation. U.S. Patent No. 6,543,464 avoids the need for such slots along the shaft as explained in column 7 lines 8-10. However, the umbrella shaft is at its maximal length when the canopy is closed as shown in Fig. 25 of U.S. Patent No. 6,543,464, while in the open state of the canopy the shaft is at its most shortened state.

GB 2228674 discloses several embodiments of electrical umbrella comprising flexible driving means. In some embodiment (described by Figs 1 – 14 and 19 - 20 of GB 2228674) the umbrella has a non-foldable umbrella post. In the other embodiment, (Figs 15 – 18 of GB 2228674), the electrical umbrella is shown as having a double-

section telescopic post. As can be understood from the description in GB 2228674, this embodiment absolutely lacks reproducibility.

Indeed, the umbrella comprises a post having upper 1' and lower 1" telescopic sections movable respective to one another by means of a screw drive 60, and is challenged at moving the canopy nest plate 6 by means of a flexible driving means 22. Referring to Figs 15 and 16 of said publication, it can be appreciated that the flexible driving means 22 is connected on a first end to a block 61, and on a second end to a nut 62 fixed to the lower end of the upper telescopic section 1'. Studying the mechanism, it can be appreciated that on the one hand a distance between block 61 and nut 62 is changeable by rotation of screw rod 60, while on the other hand, the length of the flexible driving means 22 between its first end secured to block 61 and its second end secured to nut 62, is fixed. The lack of reproducibility of this configuration is associated with the following: While the distance between the two ends of the flexible driving means 22 changes during telescopic movement of the post due to the dynamic change in the distance between block 61 and nut 62, there is no respective change in the length of the flexible driving means itself. Assuming the length of the flexible driving means 22 matches the shortest available distance between block 61 and nut 62, the flexible driving means 22 would become loosen (thus loosening hold of the nest plate 6) when the distance between block 61 and nut 62 increases during respective movement of the telescopic sections. Alternatively, assuming the length of the flexible driving means 22 matches the longest available distance between block 61 and nut 62, the flexible driving means 22 would either prevent change in the distance between block 61 and nut 62 (thus preventing respective movement of the telescopic sections) or would tear. This problem has not been identified by GB 2228674, and a way for compensating the length of flexible driving means against said dynamic change in the distance between block 61 and nut 62 has not been disclosed.

DE 3737347 illustrates a telescopic umbrella which no longer needs to be closed by hand, but can be closed by a battery-operated electric motor which is accommodated in the umbrella handle, whereas the umbrella is opened by means of springs which were tensioned during the closing of the umbrella by the motor. Similar to the above-mentioned US 5,291,908, the mechanism utilizes slots 8 in the upper part of the post 7 so as to allow connection between the outer collar 3 and the drive mechanism inside the

post. As far as the disclosure of DE 3737347 can be understood, the slots 8 are spiral about the length of the hollow cylinder 7 which forms an upper part of the umbrella post. Folding the umbrella is divided into two separate stages. In the first stage, both parts of the umbrella post, namely the hollow cylinder 7 and the shaft 2, are to be rotated simultaneously. No means are disclosed to prevent the canopy of the umbrella to rotate, and thus eliminate respective movement between the canopy and the cylinder 7. Also, there is no disclosure of how the cog wheel 11 operates, and whether and how it can affect the rotation of the hollow cylinder 7, in which it is accommodated. Also, it cannot be understood from the disclosure to what part of the umbrella the ropes 5 are connected at their upper end, and what function they fulfill in the operation. One cannot understand from the disclosure where the springs, which are responsible for the forces needed to close the umbrella are located, what stretches them during the closing operation, and how they are incorporated in the entire mechanism. Moreover, is cannot be understood whether the motor should be activated at all for opening the umbrella, or is the umbrella is opened solely by the force of the springs.

Although attempts to provide automatically operated umbrellas have been addressed in the patent literature, and manually operated multifold canopy umbrellas exist in the market, there appears to be a need in the art to provide an electrical umbrella having a "multifold canopy" that may be fully opened and closed automatically.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a fully automated open and closed multifold umbrella, having simultaneous folding both the umbrella stick and the canopy.

This object is realized in accordance with the invention by an automatic open and closed multifold canopy umbrella comprising:

a telescopic stick comprising a first telescopic section and a second telescopic section;

an electrical motor located in a handgrip of the umbrella;

a runner moveable along the first telescopic section;

a drive shaft operatively coupled to the electrical motor and extending along at least a part of the stick and having a nut connected to said first telescopic section such

that the stick can be shortened or extended upon rotation of the drive shaft in one of two respective directions of rotation;

a runner driving mechanism coupled to the runner and to the second telescopic section for moving the runner along the first telescopic section at the same time that the first telescopic section moves relative to the second telescopic section;

a multifold canopy comprising:

a plurality of angularly spaced ribs or upper rib levers pivotally connected to an upper connection hub located at an end of the first telescopic section remote from said handgrip; and

a plurality of rib struts angularly spaced and pivotally connected about the runner;

whereby when the drive shaft is rotated in a first direction the stick is extended and the runner moves upwardly and opens the multifold canopy, and when the drive shaft is rotated in an opposite direction, the stick is shortened and the runner moves downwards and closes the multifold canopy.

The plurality of angularly spaced ribs is utilized in canopy embodiments of the kind having direct connection of the ribs to the upper connection hub. The angularly spaced upper rib levers are utilized in canopy embodiments of the kind having the ribs connected to the upper connection hub through upper rib levers, i.e. which are positioned from above the ribs.

According to a preferred embodiment of the present invention the runner driving mechanism comprises:

an upper cord passing through said end of the first telescopic section and anchored at one end to a first end of the second telescopic section and anchored at an opposite end to the runner; and

a lower cord passing through a second end of the first telescopic section remote from said first end thereof and anchored at one end to the first end of the second telescopic section and anchored at an opposite end to the runner.

Accordingly, the telescopic sections are provided with spacers for spacing an outer wall of the first telescopic section from an the inner wall of the second telescopic section and allowing said cord to be accommodated therein without interfering with telescopic motion between the two telescopic sections. Another option is wherein the

telescopic sections is provided with a longitudinal indentation for spacing an outer wall of the first telescopic section from an the inner wall of the second telescopic section allowing said cord to be accommodated therein without interfering with telescopic motion between the two telescopic sections.

Preferably the multifold umbrella of the present invention is provided with an override arrangement for allowing manual operation of the umbrella. For example, according to one preferred embodiment the runner comprises a first part connected to the rib struts and a second part (according to the embodiment described in the detailed description chapter is termed "runner skeleton") connected to the runner driving mechanism and being removably attached to the first part, so that on separating the first and second parts of the runner, the rib struts can be moved manually, and thus the canopy can be opened and closed manually.

According to various preferred embodiments of the present invention the multifold canopy is comprised of rib sections and/or struts made of and formed through aluminum casting.

According to yet various preferred embodiments the casting is made by injecting process of polymer-aluminum powder.

According to other embodiments the ribs or struts are made from composite materials. According to further embodiments they are aluminum-made and are formed through aluminum extrusion process, the preferred average wall thickness of which is about 1 millimeter or more.

According to various preferred embodiment of the present invention the multifold canopy includes rib sections and/or struts made of aluminum having a wall thickness of between 0.8 and 1.6 millimeter.

According to various preferred embodiments of the present invention the umbrella includes a battery compartment located inside the handgrip.

According to yet further embodiments the battery compartment is in electrical communication with a jack adapted for receiving a plug of a power source for recharging the batteries.

According to various preferred embodiments the battery compartment is withdrawably located inside the main handgrip and can be removed for replacement with a similar withdrawable battery compartment having fresh batteries.

According to various preferred embodiments of the present invention the electrical umbrella is further comprising load recognition circuit which stops the motor (by disconnecting the battery power) upon recognition of increase in the motor current beyond a predetermined threshold. According to the preferred embodiment of the present invention the load recognition circuit is used not only to protect the motor but also to automatically stop the motor once the canopy reaches its fully opened state or once the canopy reaches its fully closed state, wherein in both states the motor is physically being blocked from continuing its revolve which in turn causes an increase in the motor current, thus activates the load recognition circuit which in turn disconnects the power from the motor. According to various embodiments, the electrical circuit of the umbrella is designed such that each activation of the load recognizing circuit (that in normal circumstances is equivalent to the termination of a fully opening or of a fully closing operations of the umbrella) inverts the polarity of the power connection to the motor, such that in the next user activation the motor will revolve in an opposite direction respective to its last operation. By means of this arrangement the umbrella may be provided with only one switch for both opening and closing operations, which automatically switches its role after each operation.

According to various embodiments of the present invention the umbrella is further comprising location recognizer means allowing for fast locating of the umbrella. The location recognizer means is comprised of a first and a second electronic circuits, the first one is attached to or located inside the umbrella, and the second one is held by the user, wherein an alarm or a beep sound is generated (a) upon the lost of communication between the two circuits (in such a case the alarm will occur at the circuit held by the user) , or (b) upon an activation command generated by the user in order to locate the umbrella (in such a case the alarm will occur at the circuit attached to the umbrella). Preferably, each umbrella will have its unique identification code such that one can locate and recognize his own umbrella from a plurality of similar umbrellas. The location recognizer circuit is preferably powered by an inherent battery, i.e. separately from the main umbrella battery, in order to enable locating the umbrella even in cases where the main battery is empty. Accordingly, the location recognizer circuit can be placed in the top portion of the umbrella, near the lifting center and distantly from the handle of the umbrella where the main battery is located.

A concealed department can be designed at the top portion of the umbrella from above the upper connection hub, for placing miniature electronic circuits useful for various utilities, such as location identifier which activates alarm when losing RF connection (according to other embodiments ultrasonic connection) with a corresponding circuit held by the user (useful also as anti theft alarm) or such as umbrella identifier which turns on a blinking LED light (according to other embodiments a beep sound, or a combination of sound and light) when called by a remote controller held by the user in order to locate the umbrella and/or identify it between other similar umbrellas; or such as emergency light that can be activated by a remote controller held by the user; or such as safety blinking light useful for notating the user when walking in the dark. Such utility electronic circuits can be powered by an inherent miniature batteries, or through wires passing along the hollow pole of the umbrella.

According to various embodiments the umbrella is provided with decorative illumination e.g. through LEDs. Such light may be distributed over the canopy through optic fibers.

According to various preferred embodiments the umbrella of the present invention is provided with a battery recharger having integral power plug concealed inside the handgrip and may be pulled up, opened or unfolded for connecting to a wall outlet.;

According to various preferred embodiments the umbrella of the present invention is cooperative with a remote controller through wireless communication means situated at a concealed compartment, preferably from above the upper connection hub.

The umbrella may further have voice or sonic alarm indicative of various abnormal states that may occur during its use, and that are recognizable by its sensors and its electronic utility circuits.

According to various preferred embodiments the handgrip is cushioned or having a padding protection against downfall damages.

According to various embodiments the umbrella of the present invention is further comprising folding or pull out foots accommodated in the handgrip and useful for positioning of the umbrella uprightly.

Thus, according to the invention, the stick and canopy may be folded simultaneously (in the context of the present invention simultaneous closing of the umbrella stick and canopy concerns a simultaneous starting and ending of the folding and of the opening of both, such that one should not have to await full folding of the canopy past the end of stick folding, or vice versa), and which the total length of the folded umbrella is less than the full length of a canopy rib. This and other objects of the present invention such as to reduce weight of the mechanism, to avoid unnecessary weight from the upper part of the umbrella, to allow for an un slotted umbrella stick, and furthermore, will become more apparent from the following chapters of this invention.

Since umbrellas are sometimes may be manufactured through separate manufacturing entities, each manufacturing separate of the entire device, it is therefore being noted that the present invention concerns also a mechanism for automatic open and closed multifold canopy umbrellas manufactured separately from the multifold canopy, comprising:

a telescopic stick comprising a first telescopic section and a second telescopic section;

an electrical motor located in a handgrip of the umbrella;

a runner moveable along the first telescopic section and having a plurality of angularly spaced connection joints adapted to pivotally receiving a plurality of lower rib struts of a multifold canopy;

an upper connection hub located at an end of the first telescopic section remote from said handgrip and having a plurality of angularly spaced connection joints adapted to pivotally receiving a plurality of ribs or upper rib levers of a multifold canopy;

a drive shaft operatively coupled to the electrical motor and extending along at least a part of the stick and having a nut connected to said first telescopic section such that the stick can be shortened or extended upon rotation of the drive shaft in one of two respective directions of rotation;

a runner driving mechanism coupled to the runner and to the second telescopic section for moving the runner along the first telescopic section at the same time that the first telescopic section moves relative to the second telescopic section;

whereby when the drive shaft is rotated in a first direction the stick is extended and the runner moves upwardly such that it is capable of fully opening a multifold canopy to be connected between the upper connection hub and the runner, and when the drive shaft is rotated in an opposite direction, the stick is shortened and the runner moves downwards such that it is capable of closing a multifold canopy to be connected between the upper connection hub and the runner.

Accordingly, it is also being noted that the present invention concerns also a multifold canopy to be associated with the mechanism for automatic open and closed multifold canopy, the multifold canopy is characterized by comprising canopy ribs struts or levers made of aluminum and manufactured through aluminum extrusion process or through polymer-aluminum powder injecting process. The wall thickness of said components is not less than about 0.8 millimeter, and preferably not less than about 1 millimeter. The upper limit of the wall thickness is not greater than about 1.6 millimeter, and preferably not greater than 1.5 millimeter.

Glossary

In the context of the present invention, the term "multifold canopy" refers to umbrella canopies that could be folded at least twice, i.e. such that the length of the folded canopy is nearly half or less the full length of a canopy rib.

Stick, shaft, post and pole, are all equivalent names for the telescopic hollow rod connected at its upper end to the canopy and having at its lower end a hand grip to be gripped by a user hand.

In the context of the present invention the term "telescopic section" refers to one of at least two sections from which the stick of the umbrella is constructed and provided with telescopic folding abilities.

Runner, rider, collar, are all equivalent names for the element moving along the umbrella stick for driving the canopy open and closed through a plurality of struts connecting between it and between a corresponding plurality of canopy ribs.

Helical drive, threaded drive, drive shaft, are all equivalent names for a revolving rod extending along a telescopic section of the stick and driven by an electrical motor of the umbrella in one direction when the umbrella is to be opened and in the counter direction when the umbrella is to be closed.

In a canopy frame "struts" are the parts that support the ribs, and "ribs" are the parts which are in direct contact with the canopy cloth and to which the canopy cloth is connected and could be tensed by when the umbrella is open. In the context of the present invention when referring to relative locations of components of the invented umbrella e.g. "upper", "lower", "top", "bottom", they are considered with respect to an umbrella oriented with the canopy up and the handgrip down.

BRIEF DESCRIPTION OF THE DRAWINGS

In order to understand the invention and to see how it may be carried out in practice, preferred embodiments will now be described, by way of non-limiting example only, with reference to the accompanying drawings, in which:

Fig. 1 is a vertical cross section view along the telescopic umbrella stick and related parts, according to one embodiment of the present invention, with the telescopic stick situated in nearly its full opening.

Fig. 2 is a vertical cross section view along a first telescopic section of the telescopic stick illustrated in Fig. 1

Fig. 3 is a vertical cross section view along a second telescopic section of the telescopic stick illustrated in Fig. 1

Fig. 4 is a vertical cross section view along the telescopic umbrella stick and related parts illustrated in Fig.1, with the telescopic stick situated in closed state.

Fig. 5 is a perspective view of a part of override mechanism according to one embodiment of the present invention.

Fig. 6 is an underneath view over a horizontal cross section of an upper telescopic section according to the one of the embodiments of the present invention with the runner skeleton of Fig. 5 and with cord protector, in position on the telescopic section.

Fig. 7 is an underneath view over a horizontal cross section of the cord protector illustrated in Fig. 6.

Fig. 8 is an underneath view over a runner being part of override mechanism according to one embodiment of the present invention.

Fig. 9 is a horizontal cross section view of a first and a second telescopic sections according to one preferred embodiment of the present invention with cord protector and with a cord accommodated thereof.

Fig. 10 is a vertical cross section view along the telescopic umbrella stick and related parts, according to a triple telescopic section stick embodiment of the present invention, with the three part telescopic sections of the stick situated in fully opening state.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

Fig. 1 illustrates a vertical cross sectional view of a preferred embodiment of the mechanism for automatic open and close umbrellas according to the present invention. The mechanism comprises telescopic umbrella stick **1** comprising two telescopic sections **2** and **3**, a runner **4** moveable along an upper portion of the stick **1** and having a plurality of angularly spaced connection points **5** adapted to receiving a respective plurality of canopy lower struts i.e. supporting the canopy ribs from below, (not illustrated in this Fig.) pivoting about the connection points **5**, a helical drive shaft **6** of a length similar to that of one telescopic section, and a mechanism for converting the rotation of an electrical motor **7** connected at a lower end of the telescopic umbrella stick **1** into a linear telescopic motion of the upper (in the claims referred to as "first") telescopic section **3** with respect to the lower (in the claims referred to as "second") telescopic section **2** in correlation with linear motion of the runner **4**.

The relative telescopic motion between the upper telescopic section **3** and the lower telescopic section **2** is achieved by the movement of tube nut **19** along the drive shaft **6**. This movement is due to an inner threading of the tube nut (represented by double doted lines along its length) matching the outer threading of the drive shaft. The tube nut **19** is fixed to the upper telescopic section **3** through extension tube **20** and through extension tube holder **17**. The drive shaft **6** is rotatably linked to the lower telescopic section **2** through the motor **7** (in the context of the present invention "motor" includes any gearing arrangement designed to transmit its power) the handgrip **10** and the hand grip connector **11**. Since the drive shaft **6** is linked to the lower telescopic section **3** while the tube nut **19** is connected to the upper telescopic section **2**, the rotation of the drive shaft generates relative linear motion between the two telescopic

sections. The direction of the relative linear motion is determined according to the rotation direction of the drive shaft.

The linear motion of the runner **4** is achieved by a runner driving mechanism coupled to the runner and to the second telescopic section for moving the runner along the first telescopic section at the same time that the first telescopic section moves relative to the second telescopic section;

According to the illustrated embodiment the runner driving mechanism is comprised of an upper cord **8** extending between the runner **4** to which one end of the upper cord is anchored, and between the upper end of the lower telescopic section **2** to which a second end of the upper cored is anchored at a connection point **22**; and at least one lower cord **9** extending between the runner **4** to which a first of its two ends is anchored and between the upper end of the lower telescopic section **2** to which a second end of the lower telescopic cord is anchored at the connection point **22**;

In this Fig. the stick **1** is situated nearing a full opening of the umbrella. The lower telescopic section **2** of the stick is almost fully drawn out of the upper telescopic section **3**, and the runner **4** is nearing its upper most position near the top end of the upper telescopic section **3**. A further rotation of the drive shaft **6** in the course of opening of the umbrella (which depends on the direction of its threading represented by the doted lines along its length, and thus shall be assumed, for the purpose of the current description, as being the clockwise direction) will result in linear telescopic motion of the lower telescopic section **2** away from the top of the umbrella i.e. in the direction indicated by arrow **A**, simultaneously with linear motion of the runner **4** along the upper telescopic section **3** toward the top of the umbrella i.e. in the direction indicated by arrow **B**.

The revolving direction of the motor (and accordingly of the drive shaft) is selected by the user through electrical switch capable of replacing the polarity of the electrical voltage supplied to the motor **7** from the batteries (that are preferably located at the lower end of the handgrip not shown in the figures).

The linear motion of the runner **4** along the upper telescopic section 3 is achieved by a full loop cord mechanism comprising an upper cord **8** anchored to the runner **4** and extending between the runner **4** and between the upper part of the lower

telescopic section **2** through an upper pulley **13**, and further comprising a lower cord **9** anchored to the runner **4** and extending between the runner **4** and between the upper part of the lower telescopic section **2** through a lower pulley **113** situated at aperture **24** made in the lower end of the upper telescopic section **3** and providing a free passage to the lower cord **9**. The aperture and the cored are preferably protected by a cover (not shown) attached to the outer wall of the upper telescopic section **3**. According to the illustrated embodiment the aperture **24** is the sole opening through the wall of the umbrella stick. It can be appreciated that the electrical and mechanical components accommodated inside the stick **1** are well protected from dust dirt and water. It should be noted that in the illustrated embodiment, both the upper cord **8** and the lower cord **9** are secured to a common connection point **22** located in the top of the lower telescopic section **2**. It is therefore appreciated that the configuration may be such that the upper cord **8** and the lower cord **8** are both respective parts of one single cord looped about the length of the upper telescopic section **3** and secured to the upper part of the lower telescopic section **2** in a mid point of the cord such as to divide the cord to substantially two equal parts secured on their opposite ends to the runner **4**.

As can be appreciated, movement of the lower telescopic section **2** downwardly in the direction indicated by arrow A will result in increasing the distance between the upper pulley **13** and the cord connection point **22** at the top of the lower telescopic section **2**, which in turn will result in pulling of the upper cord **8** following the connection point **22** about the pulley **13**, thus lifting the runner **4** toward the upper end of its path along the upper telescopic section **3.**

On the other hand, movement of the lower telescopic section **2** upwardly in the direction indicated by arrow **B** will result in increasing the distance between the lower pulley **113** and the cord connection point **22** at the top of the lower telescopic section **2**, which in turn will result in pulling of the lower cord **9** following the connection point **22** about the pulley **113**, thus lowering the runner 4 toward the lower end of its path along the upper telescopic section **3**.

According to various preferred embodiments of the present invention the electrical motor 7 of the umbrella is connected to the battery through automatic load detection circuit which automatically disconnects the motor from the battery upon recognition of predetermined increase in the motor current that may be associated with

irregular load with which the motor complies. This load detection function is utilized to automatically stop the motor when the umbrella reaches its fully open and fully closed positions, wherein the runner and the telescopic stick are reaching the dead end of their movement paths thus resulting in a substantial increase in the motor current due to the sudden resistance of the moving parts against further motion.

In the illustrated embodiment the lower telescopic section **2** ends with a flange **23** (in the context of the present invention referred to also as "spacer") at its upper end, and the upper telescopic section **3** ends with a flange **21** (in the context of the present invention referred to also as "spacer") at its lower end. Due to these flanges a gap is created in the overlapping area between the two telescopic sections, which allows the lower cord **9** to freely extend in between, regardless of mutual movement between the two telescopic sections. The flanges **21** and **23** are not necessarily formed from the same piece of material of the respective telescopic sections **3** and **2** as it seems to be in the illustrated embodiment. They could be as well formed as separate rings having inner diameter matching the outer diameter of one telescopic section and outer diameter matching the inner diameter of the other telescopic section, fixed at the ends of the telescopic sections to form the illustrated flanges.

As could be appreciated, shifting of the runner **4** along the telescopic section **3** changes the interval between the angularly spaced connection points **5** and between respective angularly spaced connection points **15** formed in an upper connection hub **14** affixed at the upper end of the umbrella stick **1**. The connection points **15** are for pivotally receiving canopy ribs or canopy upper struts (according to the type of multifold canopy to be used). The multifold canopy is designed such that when the interval between the connection points **15** and between the connection points **5** reaches its minimum (i.e. when the runner reaches a maximum height of its path along the upper telescopic section **3**), the canopy is fully opened, and such that when said interval reaches its maximum (i.e. when the runner reaches a minimum height of its path along the upper telescopic section **3**), the canopy completes its folding.

The upper connection hub holds also the upper pulley **13**, and permits a path for the upper cord **8** through appropriate aperture/s formed in the horizontal area of the connection hub for cord passage and cooperating with aperture **18** made in the extension tube holder **17** for the part of the upper cord **8** that is inside the upper telescopic section

3. The exact position of extension tube holder **17** inside the upper telescopic section **3** can be tuned by screw **16** in order to determine the path extent of drive shaft 6 through the tube nut **19**. Such determination has influence on the movement extent of the runner **4** and in turn on the tensioning measure of the canopy cloth. This is an optional function which is not necessarily required in the various embodiments of the present invention.

As could be appreciated, the extension tube **20** is plain to manufacture and may produced from relatively small amount of material in order to reduce weight, since it has no threading along its whole length, and needs no extra thickness as required when having threading along a hollow tube.

The illustrated embodiment describes one unit of full loop cord mechanism, however it is in the scope of the present invention a use of more then one unit cord mechanism situated and angularly spaced circumferentially about the telescopic stick. Furthermore, the use of the term "cord" does not come to exclude use of similar means such as belt, strip, chain, cable, rope, interwoven cable. Accordingly, in the context of the present invention the term "cord" concerns any other means capable of shifting the runner in a similar or equivalent manner. It should also be noted that in the context of the present invention the term "pulley" concerns any means allowing movement of the cord through its predetermined path. It is believed that a designer will prefer the use of such means which will reduce (as much as possible in a given budget) the friction between the cord and between the umbrella parts it should contact during its shifting.

Fig. 2 illustrates the upper parts of the umbrella mechanism illustrated by Fig. **1**, as if they are removed from the lower parts of the mechanism. In Fig. **2** the runner **4** and the cord parts **8** and **9** are situated with the runner in its lowermost position (corresponding to a closed state of the umbrella). In this position of the runner, the cord mid point **12** is located near the top of the telescopic section **3**. The illustrated mid point **12** has a ring shape as a means for facile connection of the upper and lower cord parts **8** and **9** to the connection point **22** (not illustrated in Fig. **2**, and could be observed however in Figs. 1 and 3). As could be appreciated, by governing the cord mid point **12** moving up and down along the inner wall of the upper telescopic section 3, the runner **4** could be governed respectively, i.e. down and up along the outer wall of the upper telescopic section **3**.

Fig. 3 illustrates the lower parts of the umbrella mechanism illustrated by Fig. **1**, as if they are removed from the upper parts illustrated in Fig. 2.

The cored connection point **22** is represented by a black dot. The cord mid point **12** is to be connected (to the flange/spacer **23**) at or near this connection point. According to the illustrated embodiment wherein there is a ring shape at the cord mid point **12**, it could be inserted into appropriate vertical groove made in the spacer **23** and secured by a horizontal crossing pin (represented by the black dot **22**) inserted through an appropriate horizontal aperture intersecting the vertical groove and through the ring formed at mid point **12** and located in the intersection area between the groove and the pin.

The way of connection of the upper cord and the lower cord may vary as a mater of design, and as a matter of the type of cord or of the spacer being used, without departing from the scope of the present invention. Accordingly, the cord is not necessarily formed as one unit including the upper cord and the lower cord, rather both may be formed as separate unit and may be connected to or near the upper end of the upper telescopic section in separate connection points and using connection method selected from a variety of the connection methods (including and not limited to nailing, tying, welding, gluing, sintering, winding, pressing or using thickened cord ends and inserting the cored through an aperture having a smaller diameter than the thickening) known to those who are skilled in the art of mechanical devices.

Fig. 4 illustrates the umbrella mechanism illustrated by Fig. 1, situated in a fully closed state of the umbrella, wherein the lower telescopic section **2** have reached its maximal height inside the upper telescopic section **3** and simultaneously the runner **4** have reached its minimal height on the runner **4**.

Fig. 5 illustrates a runner skeleton **25** formed to serve in override mechanism which allow for manual opening or closing of the canopy in case of low battery power. The runner skeleton **25** could be formed from a thin metal plate, and may be connected to un upper cord **80** and to a lower cord **90** by means of inserting the cord inside a thin tube **85** formed at an end of the runner skeleton, and by then pressing the tube **85** on the cored to be firmly gripped therein. The runner skeleton **25** is further comprising a protrusion **26** bent outwardly from its other end and having a transverse cut **27** in a mid

portion thereof. The positioning of the runner skeleton **25** on an upper telescopic section **30** is depicted in Fig. 6 illustrating a transverse cross section of same.

Fig. 6 illustrates in a horizontal cross sectional view an upper telescopic section **30** of a telescopic umbrella stick, with the runner skeleton **25** in position on the telescopic section. The upper cord **80** is seen at an end of the runner skeleton, while a protrusion **26** is located at the other end of the runner skeleton. This protrusion matches a corresponding groove (**32** of Fig. 8) formed in the runner (**40** of Fig. 8). The upper cord **80** as well as the lower cord (not seen) are protected and covered by a longitudinal protector **28** connected to the outer wall of the upper telescopic section **30**. The protector **28** is illustrated separately in **Fig. 7**, with the upper cord **80** positioned therein. The protector **28** may be formed from sheet metal, plastic, rubber, silicon, or any other acceptable material. It could also be formed as an integral part of the upper telescopic section. For example, both the upper telescopic section and the protector could be formed from aluminum through aluminum extrusion process.

Fig. 8 illustrates a bottom view of a runner **40** formed to serve in an override mechanism together with the runner skeleton **25** illustrated in Figs. **5** and **6**. The runner **40** comprises eight connection points **31** each adapted for receiving a canopy strut to be pivotally connected between two parallel arms of each connection point **31**. The pivoting ability may be achieved by a horizontal pin crossing between the parallel arms of each connection point **31** through appropriate aperture in an and of the strut located there, thus forming a hinge connection. The runner **40** has a groove **32** adapted to receive the protrusion **26** of the runner skeleton (**26** of Fig. 6), and further having an override actuator **29** which according to the illustrated embodiment is a screw having a wide head that could be easily operated by user fingers, however, according to other embodiments the actuator may be a spring biased button that is normally pressed and that can be pulled (or rotated a partial rotation then pulled, according to another variation of this embodiment) outwardly by a user and that has a tenon oriented toward the groove **32**. The screw (or the spring biased button) crosses the wall of the runner **40** through appropriate aperture formed in a height corresponding the location of the cut (**27** of Fig. 5) formed in the protrusion (**26** of Fig. 5), such that when the actuator **26** is fully inserted through the body of the runner **40**, its end (i.e. the inner end of the screw, or the tenon of the spring biased button according to said other embodiment) is inserted

into the cut **27** of the runner skeleton **26**, thus locking and securing together the runner **40** and the runner skeleton **25**. When both are locked together their operation is similar to that of the runner **4** of the embodiment illustrated in Fig. 1.

In case of a low battery, the user may actuate the actuator to remove its inner end out of the cut **27** made in the protrusion **26** for freeing the runner **40** from the runner skeleton **27**, then move the runner upwardly or downwardly along the umbrella stick in order to open or in order to close the canopy according to user preference. According to a variety of embodiments of the override mechanism the actuator **29** can be designed to allow for securing the runner **40** to the stick in the upper most position of the runner (e.g. when the actuator is a screw by tightening it to the stick, or e.g. when the actuator is spring biased by pressing it into an aperture formed in the stick for this purpose) such that the canopy remains open and the umbrella can thus be provisionally used until replacement or recharging of the empty battery.

The runner **40** is preferably dimensioned so as to completely hide the runner skeleton **25** when they are locked together by the actuator **29**. The runner skeleton **25** is preferably formed from a thin sheet metal such that when the runner **40** is moved manually during override situation there will remain a minimal gap between the inner wall of the runner and the outer wall of the upper telescopic section.

Fig. 9 illustrates in horizontal cross sectional view another embodiment of an upper and lower telescopic sections **300** and **200**, respectively. According to this embodiment there is no need in flanges or spacers in order to form a gap 202 for the cord between the two telescopic sections. This is due to the special internally oriented bending **201** made in the inner telescopic section which allow for cord passage of a cord **208**. It is appreciated that other forms of bending may be used as wall as a matter of design. It is also appreciated that an outwardly oriented bending may be formed in the outer telescopic section in order to achieve a gap between the two telescopic sections. According to another variation both outwards bending in the outer telescopic section and inwards bending in the inner telescopic section may be formed as well, in order to achieve the gap.

In this embodiment an integral cord protector **228** is formed in the outer wall of the outer telescopic section **300**. Both telescopic sections **200** and **300** are preferably made of aluminum through aluminum extrusion process. The cored can be connected to

a runner skeleton in a similar manner to that of Fig. 6, or may be connected to a runner of the embodiment of Fig. 1 through a connection piece **229**.

Fig. 10 illustrates another embodiment of the folding umbrella of the present invention. In this embodiment the telescopic umbrella stick is comprised of three telescopic sections, thus may be shortened more than that of the embodiment illustrated by Fig. 1. As will be appreciated a smaller length piece of the first (upper) telescopic section **3** and a corresponding smaller length piece of the second (lower) telescopic section **2** of the embodiment of Fig. 1 are provided with a third telescopic section **66** telescopically connected to a lower end of the second telescopic section **2** to form a three sections telescopic stick **100**. The third telescopic section **66** is connected to a handgrip **110** through hand grip connector **111**. Two part drive shaft comprising a first drive shaft member **106** having an outer threading on a widened end portion **105**, and a second drive shaft member **116** having an inner threading matching the outer threading of the first drive shaft member and further having an outer threading matching the inner threading of tube nut **19**, is operatively coupled to the electrical motor **7**.

The outer threading of the second drive shaft member **116** cooperates with the tube nut **19**, in a similar manner to the cooperation between drive shaft **6** and the tube nut **19** in the embodiment of Fig. 1. Accordingly, the cooperation between the runner driving mechanism and between the runner **4** and the second telescopic section **3**, remains the same as in the embodiment of Fig. 1, and thus the runner driving mechanism operates in a similar manner as in the embodiment of Fig. 1, and the first and the second telescopic sections are also cooperate in a similar manner as in the embodiment of Fig. 1. However, according to the present embodiment, another cooperation is achieve, that is a cooperation between the two parts **116** and **106** of the drive shaft, wherein a rotation of the threaded widened end portion **105** of the first drive shaft member inside the inner threading of the second drive shaft member **116** cause a respective telescopic movement between the second telescopic section **2** and the third telescopic section **66**, according to the rotation direction. As can be appreciated the third telescopic section **66** is thus moveable respective to the first and the second telescopic in correlation with the movement of its widened end portion **105** along the inner threading of the second drive shaft member **116**.

Accordingly, by rotation of the motor in a direction to open the umbrella, the three part telescopic stick **100** may be extended to a full length with the runner **4** in its maximal remote location from the handgrip **110**, and with the multifold canopy (not illustrated) opened, that is the situation illustrated in Fig. 10, and –

by rotation of the motor in the opposite direction the three part telescopic stick **100** may be shortened to a minimal length wherein the first and the second telescopic sections **3** and **2** are in a respective position to one another similar to that illustrated in Fig. 2, and wherein the third telescopic section **66** is in full insertion inside the second telescopic section with the first drive shaft member **66** inserted a maximal extent inside the second drive shaft member **116** such that its widened end portion **105** is close to the stop washer **126** located at an end of the second drive shaft member **116** (the stop washer **126** prevent escape of the second drive shaft member **116** from the tube nut **19**), with the runner **4** in its minimal remote location from the hand grip with the multifold canopy (not illustrated) closed.

CLAIMS:

1. An automatic open and closed multifold canopy umbrella comprising:

a telescopic stick comprising a first telescopic section and a second telescopic section;

an electrical motor located in a handgrip of the umbrella;

a runner moveable along the first telescopic section;

an upper connection hub located at an end of the first telescopic section remote from said handgrip;

a drive shaft operatively coupled to the electrical motor and extending along at least a part of the stick and having a nut connected to said first telescopic section such that the stick can be shortened or extended upon rotation of the drive shaft in one of two respective directions of rotation;

a runner driving mechanism coupled to the runner and to the second telescopic section for moving the runner along the first telescopic section at the same time that the first telescopic section moves relative to the second telescopic section;

a multifold canopy comprising:

a plurality of ribs or upper rib levers angularly spaced pivotally connected about the upper connection hub; and

a plurality of rib struts angularly spaced and pivotally connected about the runner;

whereby when the drive shaft is rotated in a first direction the stick is extended and the runner moves upwardly and opens the multifold canopy, and when the drive shaft is rotated in an opposite direction, the stick is shortened and the runner moves downwards and closes the multifold canopy.

2. The umbrella according to claim 1, wherein the runner driving mechanism comprises:

an upper cord passing through said end of the first telescopic section and anchored at one end to a first end of the second telescopic section and anchored at an opposite end to the runner; and

a lower cord passing through a second end of the first telescopic section remote from said first end thereof and anchored at one end to the first end of the second telescopic section and anchored at an opposite end to the runner.

3. The umbrella according to claim 2, wherein said telescopic sections are provided with spacers for spacing an outer wall of the first telescopic section from an the inner wall of the second telescopic section and allowing said cord to be accommodated therein without interfering with telescopic motion between the two telescopic sections.

4. The umbrella according to claim 1, wherein at least one of the telescopic sections is provided with a longitudinal indentation for spacing an outer wall of the first telescopic section from an the inner wall of the second telescopic section allowing said cord to be accommodated therein without interfering with telescopic motion between the two telescopic sections.

5. The umbrella according to any one of claims 1 to 4, wherein the runner comprises a first part connected to the rib struts and a second part connected to the runner driving mechanism and being removably attached to the first part, so that on separating the first and second parts of the runner, the rib struts can be moved manually.

6. The umbrella according to claim 1, wherein the multifold canopy is comprised of rib sections and/or struts made of and formed through aluminum casting.

7. The umbrella according to claim 1, wherein the multifold canopy includes aluminum-made rib sections and/or struts formed through injecting process of polymer-aluminum powder.

8. The umbrella according to claim 1, wherein the multifold canopy includes rib sections and/or struts made of and formed through aluminum extrusion process.

9. The umbrella according to claim 1, wherein the multifold canopy includes rib sections and/or struts made of aluminum having a wall thickness of between 0.8 and 1.6 millimeter.

10. The umbrella according to claim 1, further comprising an override arrangement for allowing manual operation of the umbrella.

11. The umbrella according to claim 1, further comprising a battery compartment located inside the handgrip.

12. The umbrella according to claim 1, further comprising a battery compartment located inside the handgrip in electrical communication with a jack adapted for receiving a plug of a power source for recharging the batteries.

13. The umbrella according to claim 1, further comprising a withdrawable battery compartment located inside the main handgrip.

14. The umbrella according to claim 1, further comprising overload detection circuit capable of disconnecting the battery power from the motor upon recognition of a motor current exceeding a predetermined threshold.

15. The umbrella according to claim 1, further comprising overload detection circuit capable of disconnecting the battery power from the motor upon recognition of a motor current exceeding a predetermined threshold, and further capable of inverting the polarity of the power connection to the motor.

16. The umbrella according to claim 1, further comprising at least one utility electronic or electric circuit selected from; (a) location detector; (b) emergency illumination; (c) safety illumination; (d) low battery alarm; (e) temperature measuring; (f) electronic watch; (g) anti-theft remote sensor; (h) decorative illumination; (i) battery recharger with integral power plug; (j) remote controller in wireless communication with certain electronic or electric circuits of the umbrella; (k) voice or sonic alarm; (l) a combination of at least two of 'a' to 'k'.

17. The umbrella according to claim 1, wherein the struts or the ribs of the multifold canopy are formed from aluminum or from composite material, and having an average wall thickness of about 1 millimeter or more.

18. The umbrella according to claim 1, wherein the handgrip is cushioned or having a padding protection against downfall damages.

19. The umbrella according to claim 1, further comprising folding or pull out foots accommodated in the handgrip and useful for positioning of the umbrella uprightly.