

# United States Patent

Sato

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[54] **AUTOMATICALLY OPENABLE AND CLOSABLE UMBRELLA**

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Apr. 21, 1970 Japan.....45/34199

[52] U.S. Cl.....135/24, 135/26  
[51] Int. Cl. ....A45b 25/14  
[58] Field of Search.....135/22-24

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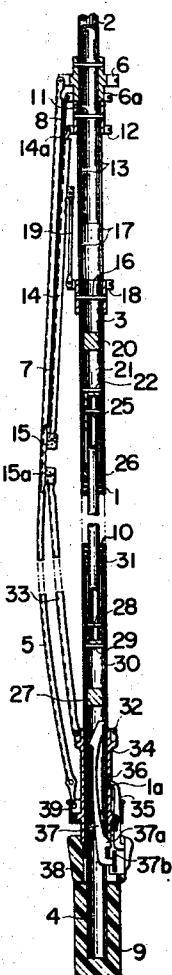
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[57]

## ABSTRACT

An improvement of an automatically openable and closable umbrella of the type comprising a shaft composed of relatively telescoping shaft members, rings mounted on said shaft and carrying inner ends of ribs, supporting spokes and tension springs for automatically closing the umbrella, a compression spring mounted within said shaft and adapted to extend the telescoping shaft members thereby to change the relative positions of said rings and automatically open the umbrella, and latches for controlling the operation of the tension and compression springs, wherein the improvement resides in the provision of a steppedly extensible rod assembly mounted within said shaft and adapted to steppedly allow the expansion of said compression spring in order to avoid abrupt one-stroke expansion of the spring which will cause an excessive shock to the structural elements of the umbrella.

3 Claims, 14 Drawing Figures



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FIG. 1

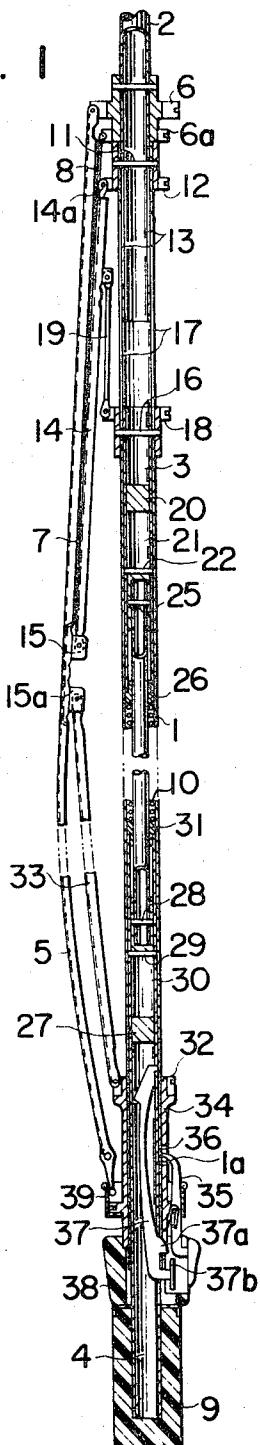
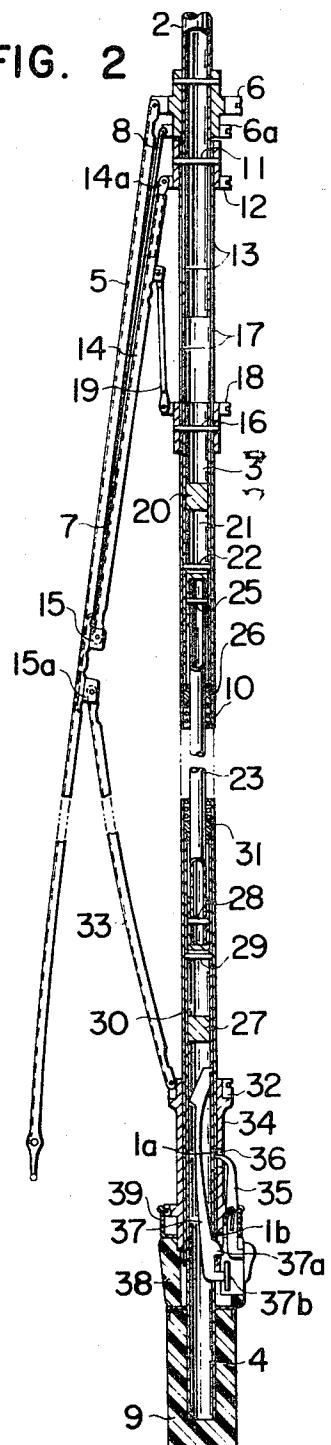


FIG. 2



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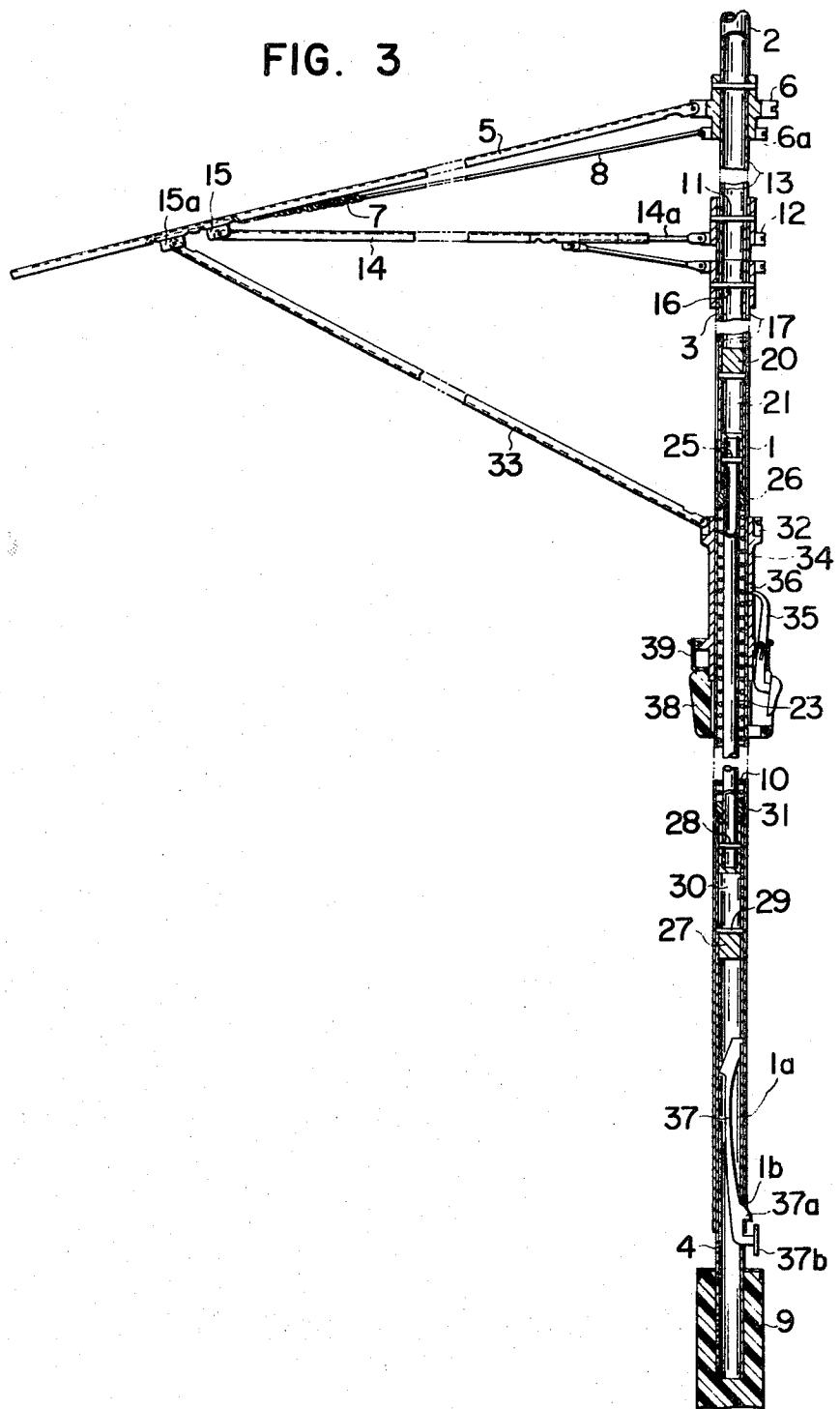
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FIG. 3



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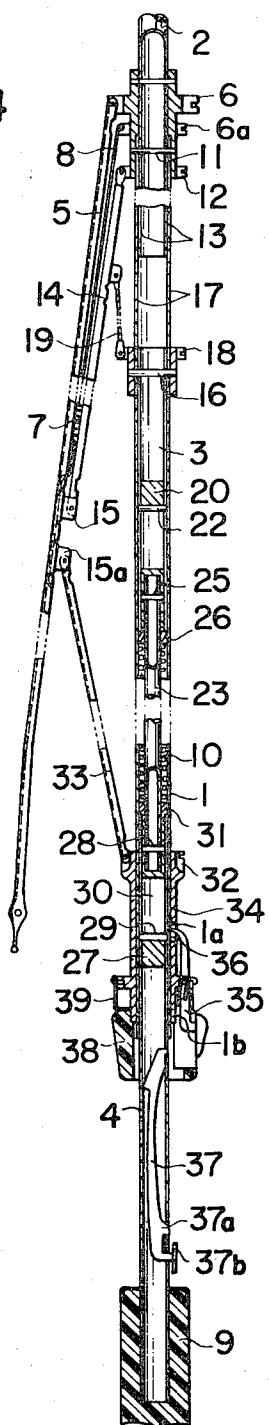
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FIG. 4



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FIG. 6

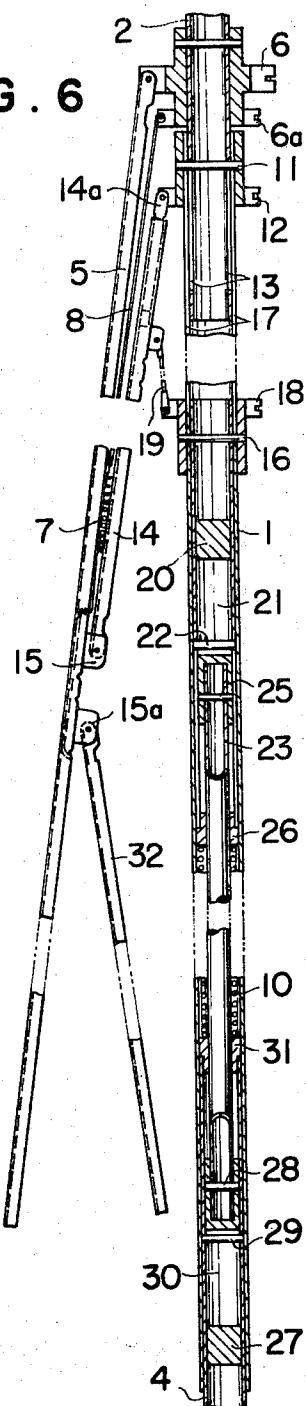
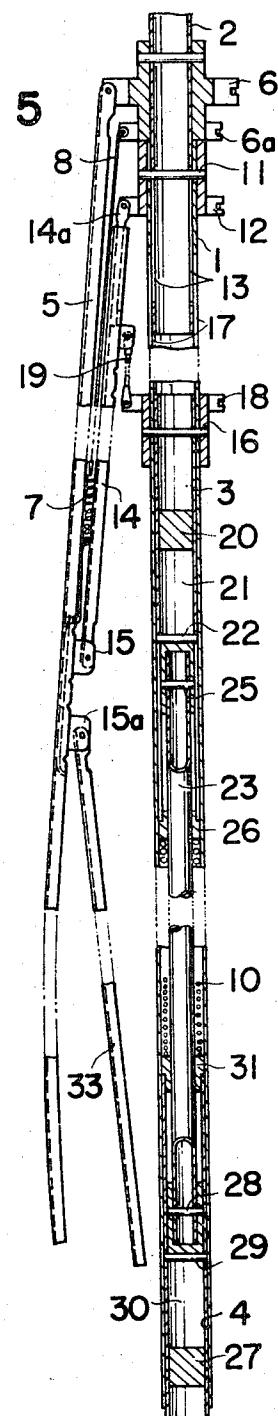


FIG. 5



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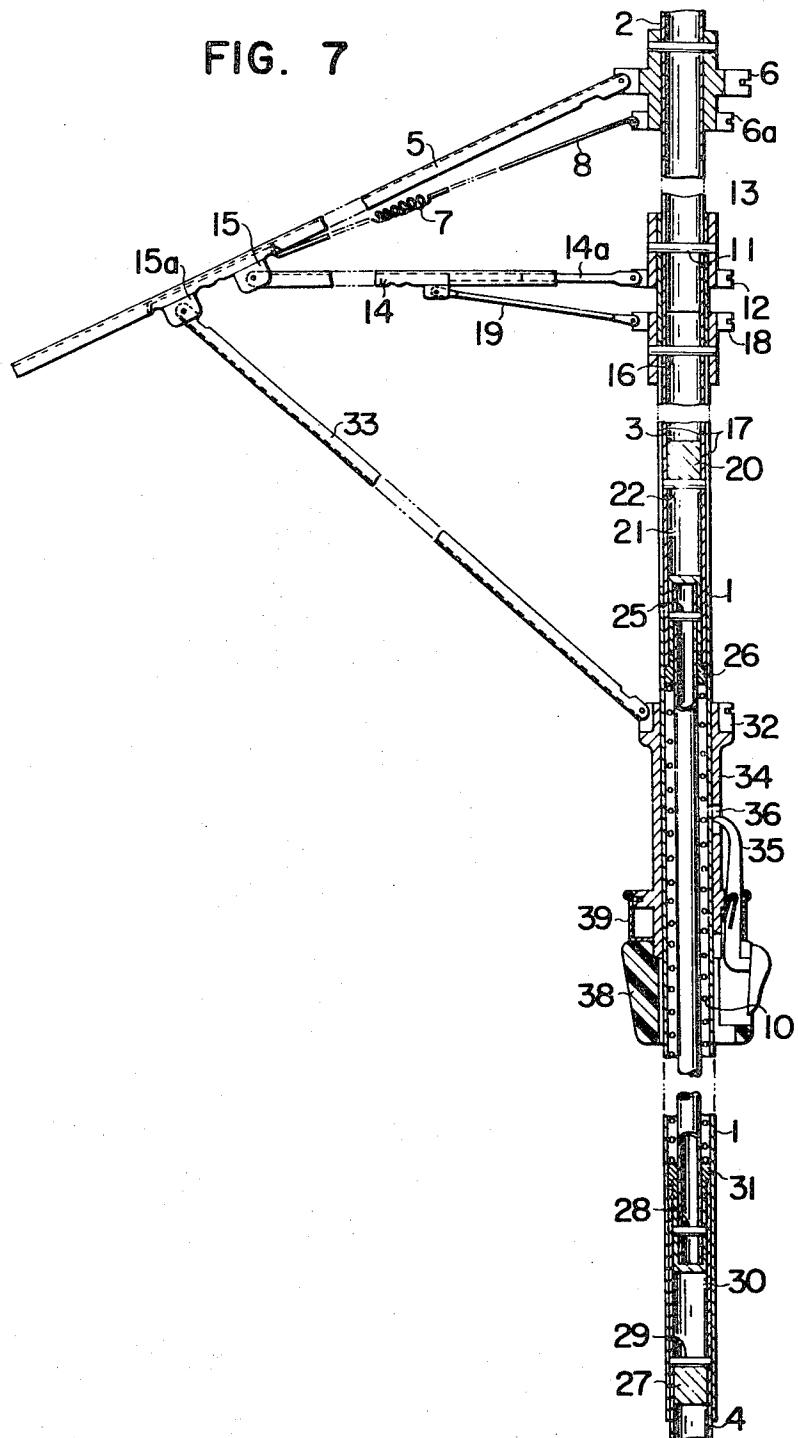
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FIG. 7



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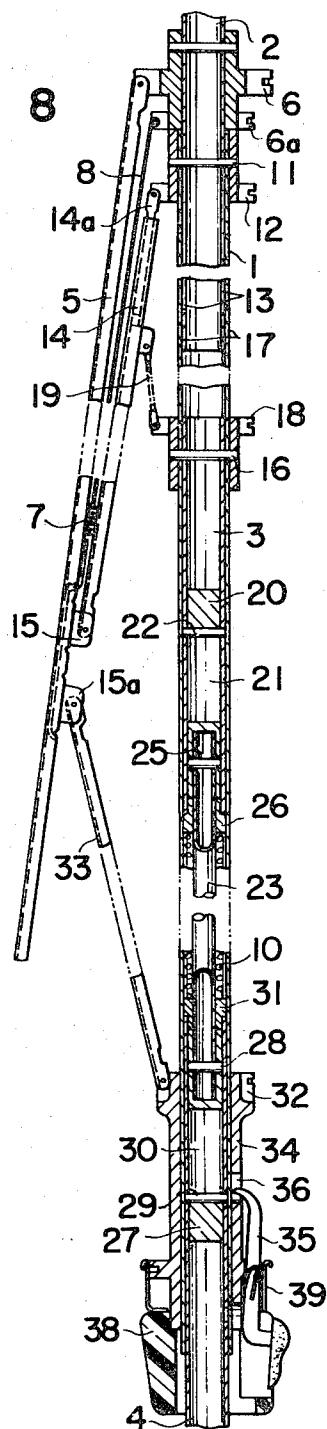
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FIG. 8



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FIG. 11

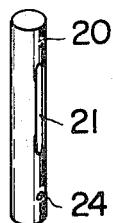


FIG. 9



FIG. 13



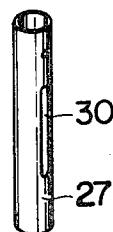
FIG. 14



FIG. 10



FIG. 12



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## AUTOMATICALLY OPENABLE AND CLOSABLE UMBRELLA

This invention relates to an automatically openable and closable umbrella, and more particularly, an improvement of an automatically openable and closable umbrella such as disclosed in U.S. Pat. application No. 59,389, filed on July 30, 1970.

In the abovementioned patent application, there has been disclosed an automatically openable and closable umbrella comprising a shaft having a tubular outer shaft member slidably housing therein upper, intermediate and lower inner tubular shaft members, a first ring fixed to an upper portion of said upper inner shaft member and pivotally carrying ribs and tension spring means for closing the umbrella, said spring means each being connected at one end to an intermediate portion of each of the ribs and at the other end to the ring at a position spaced from the pivotally mounting position of the ribs, a second ring fixed to the outer shaft member below said first ring and pivotally carrying first supporting spokes for supporting the ribs when they are opened, a third ring slidably mounted on said outer shaft member below said second ring and pivotally carrying connecting rods for said supporting spokes, a fourth ring slidably mounted on said outer shaft member below said third ring and pivotally carrying second supporting spokes for restricting the ribs when they are closed, a first compression spring for opening the umbrella mounted within said outer shaft member and retained between said intermediate and lower inner shaft members, a second compression spring for opening the umbrella mounted on said outer shaft member and retained between said third ring and a ring washer which is slidably mounted on said outer shaft member and connected with said intermediate inner shaft member to be co-slidable therewith along said outer shaft, a first latch adapted to selectively engage said fourth ring with said outer shaft member, and a second latch adapted to selectively engage said outer shaft member with said lower inner shaft member.

In the umbrella of the abovementioned prior art, automatic opening of the umbrella is effected by a combined action of the first and second compression springs upon unlatching of the first latch, which liberates the restriction of the fourth ring at its umbrella closing position. In this case, there is an advantage that the displacement of the third ring necessary to fully open the umbrella is partially undertaken by the expansion of the first compression spring and that of the second compression spring, whereby the dimensional limitation imposed on the springs is relatively moderate, or in other words, it is allowable to choose a relatively large total length of the spring means, and therefore, the required displacement of the third ring can be accomplished under a relatively constant spring force. However, the umbrella of this prior art includes the second compression spring which is exposed outside, and therefore, is inconvenient in the point that the exposed spring presents an uneven surface liable to catch alien materials.

If said second compression spring is dispensed with to avoid the abovementioned drawback by that the share of the required displacement undertaken by the second compression spring be covered by the first compression spring, the compression or expansion ratio of the first spring must be increased to provide a larger displacement with a predetermined level of spring force at the final stage of an enlarged expansion. In this case, however, there is a disadvantage that the highly compressed spring expands impulsively when the restriction imposed on it is liberated, whereby there is a danger that various parts of the umbrella are subject to a shock in opening of the umbrella and thereby to earlier fatigue.

Accordingly, it is the object of this invention to remove the abovementioned drawbacks in the umbrella of the prior art and to provide an improved automatically openable and closable umbrella.

The abovementioned object is, according to this invention, accomplished by an automatically openable and closable umbrella comprising a shaft having a tubular outer shaft member

75 slidably housing therein upper, intermediate and lower inner tubular shaft members, a first ring fixed to an upper portion of said upper inner shaft member and pivotally carrying ribs and tension spring means for closing the umbrella, said spring means each being connected at one end to an intermediate portion of each of the ribs and at the other end to the ring at a position spaced from the pivotally mounting position of the ribs, a second ring fixed to the outer shaft member below said first ring and pivotally carrying first supporting spokes for supporting the ribs when they are opened, a third ring slidably mounted on said outer shaft member below said second ring and connected with said intermediate inner shaft member to be co-slidable therewith along said outer shaft member and pivotally carrying connecting rods, a fourth ring slidably mounted on said outer shaft member below said third ring and pivotally carrying second supporting spokes for restricting the ribs when they are closed, a compression spring for opening the umbrella mounted within said outer shaft member and held between said intermediate and lower inner shaft members, a first latch adapted to selectively engage said fourth ring with said outer shaft member, and a second latch adapted to selectively engage said outer shaft member with said lower inner shaft member, characterized by a guide rod assembly 10 mounted within said outer shaft member and connecting said intermediate and lower inner shaft members in a manner of steppedly allowing extension of the distance between said intermediate and lower inner shaft members caused by said compression spring.

20 30 In the following, this invention is described in the form of a preferred embodiment with reference to the accompanying drawings, in which:

FIG. 1 is a side elevation, partly in section, of the umbrella frame of this invention in its completely closed condition, 35 wherein beads formed at the tips of the ribs are engaged with a bead-anchoring ring;

FIG. 2 is a similar view as FIG. 1, showing a condition of the umbrella frame ready to be opened with the beads being released from the bead-anchoring ring;

40 FIG. 3 is a side elevation, partly in section, of the same umbrella frame, showing its opened condition;

FIG. 4 is a side elevation, partly in section, of the same umbrella frame, showing its automatically closed condition caused by releasing restricting engagement between the outer shaft member and the lower inner shaft member;

45 FIG. 5 is an enlarged view of the upper portions of the umbrella frame shown in FIG. 1;

FIG. 6 is an enlarged view of the upper portions of the umbrella frame shown in FIG. 2;

50 FIG. 7 is an enlarged view of the upper portions of the umbrella frame shown in FIG. 3;

FIG. 8 is an enlarged view of the upper portions of the umbrella frame shown in FIG. 4;

55 FIG. 9 is a perspective view of a guide rod adapted to be mounted within the outer shaft member along the axis thereof;

FIG. 10 is a perspective view of a coil spring adapted to be mounted around the guide rod;

60 FIG. 11 is a perspective view of a stopper core member adapted to be connected with the upper end of the guide rod;

FIG. 12 is a perspective view of a stopper core member adapted to be connected with the lower end of the guide rod;

FIG. 13 is a perspective view of a ring washer adapted to be mounted at a lower portion of the guide rod; and

FIG. 14 is a perspective view of a ring washer adapted to be mounted at an upper portion of the guide rod.

It is to be noted that like reference numerals indicate like or corresponding parts throughout the drawings.

Referring to the drawings, the shaft of the umbrella comprises, in combination, a tubular outer shaft member 1 slidably housing therein three tubular inner shaft members, i.e. an upper inner shaft member 2, an intermediate inner shaft member 3, and a lower inner shaft member 4. The upper inner shaft member 2 protrudes outwardly from the upper end of the outer shaft member 1. On a protruding portion of the

upper inner shaft member 2, there is fixedly mounted a first ring 6 pivotally carrying inner ends of ribs 5, while an auxiliary ring portion 6a integrally formed on the ring 6 carries inner ends of tension rods 8 each including a tension spring 7 adapted to be expanded to accumulate the force of restitution when the ribs 5 are spread at the time of opening the umbrella.

A lower portion of the lower inner shaft member 4 protrudes from the lower end of the outer shaft member 1, and is received in and secured to a central bore of a grip 9. The intermediate inner shaft member 3 is fully received in the outer shaft member 1, and a compression coil spring 10 is mounted between the intermediate inner shaft member 3 and the lower inner shaft member 4.

A second ring 12 is fixed to the upper end of the outer shaft member 1 by a pin 11, which in turn is received in elongated slits 13 formed in the upper inner shaft member 2 at diametrically opposite positions thereof. The second ring 12 pivotally supports inner ends of short auxiliary spokes 14a, which are respectively slidably received in tubular spokes 14 to constitute extensible supporting spokes. Outer ends of the spokes 14 are respectively pivotally connected to intermediate portions of the ribs 5 by way of fittings 15, which also pivotally mount outer ends of the spring 7.

A third ring 18 is slidably mounted on the outer shaft member 1 and is connected with the upper end of the intermediate inner shaft member 3 by way of a pin 16 which diametrically penetrates the third ring 18 and the intermediate inner shaft member 3 and is slidably received in elongated slits 17 formed in the outer shaft member 1 at diametrically opposite positions thereof. The third ring 18 pivotally supports inner ends of connecting rods 19, the other ends of which are pivotally connected to proper portions of the supporting spokes.

A stopper core member 20, such as shown in FIG. 11, is slidably received in the intermediate inner shaft member 3. The stopper core member 20 is formed a longitudinal slit 21 and a bore 24. A pin 22 is passed through the slit 21 and fixed to the wall of the intermediate inner shaft member, whereby the stopper core member 20 is axially movable with respect to the intermediate inner shaft member 3 within the length of the slit 21. The stopper core member 20 is further formed an axial bore extending from the bottom surface thereof, into which is received the upper end portion of a guide rod 23, such as shown in FIG. 9, and is connected with the guide rod by a pin 25 penetrating the bore 24 of the stopper core member 20 and a corresponding bore 24a of the guide rod 23. At the lower end of the intermediate inner shaft member 3 is engaged a ring washer 26, through the central bore of which extends the guide rod 23 downward along the axis of the outer shaft member 1. The lower end of the guide rod 23 is received in an axial bore of a lower stopper core member 27 and is connected therewith by a pin 28. The stopper core member 27 may be the same element as the stopper core member 20 used in reversed position, and is mounted in the lower inner shaft member 4 by a pin 29 passing through its longitudinal slit 30 so that the stopper core member 27 is axially movable with respect to the lower inner shaft member 4 within the length of the slit 30. At the upper end of the intermediate inner shaft member 4 is engaged a ring washer 31, through the central bore of which extends the guide rod 23.

A strong compression coil spring 10 is mounted around the guide rod 23 between the ring washers 26 and 31.

A fourth ring 32 is slidably mounted on the outer shaft member 1 and pivotally carries inner ends of second supporting spokes 33, which, at the outer ends thereof are pivotally connected to fittings 15a mounted on the ribs 5 near the fittings 15. The fourth ring 32 is integrally formed with a tubular grip sleeve 34, which is also slidably mounted on the outer shaft member 1 and is provided with a spring-actuated latch 35 pivotally mounted at the lower end thereof. The tip of the latch 35 is so adapted as to be engaged into a small hole 1a formed at a lower end portion of the outer shaft member 1 through a corresponding through-opening 36 of the grip

sleeve 34 urged by a spring force thereby to hold the fourth ring 32 and the grip sleeve 34 at their lowest end positions as shown in FIG. 1.

Within the lower inner shaft member 4, there is provided a spring latch 37, a claw portion 37a of which is engaged into a hole 1b of the outer shaft member 1 to hold the outer shaft member in the latched position with respect to the lower inner shaft member. The claw portion 37a is disengaged from the hole 1b when a push button portion 37b of the latch is pushed by a finger, whereby the axial restriction between the outer shaft member 1 and the lower inner shaft member 4.

The latch 35 is disengaged when the umbrella is to be opened, and the latch 37 is disengaged when the umbrella is to be closed. A cover member 38 of a proper shape is provided to prevent a wrong operation of the latches 35 and 37.

The umbrella of the structure as described in the above operates as follows:

When a bead collector 39 is displaced from the position as shown in FIG. 1 downward to release the beads of the ribs 5, the ribs are slightly opened to take the position as shown in FIGS. 2 and 6. Then, by pushing the latch 35 thereby to disengage the tip of the latch 35 from the hole 1a of the outer shaft member, the fourth ring 32 (as well as the grip sleeve 34) is released from the restriction to its lowest position and can now move freely upward. Thus, the restriction applied to the compression spring 10 mounted within the outer shaft 1 and held between the intermediate and lower inner shaft members 3 and 4 is removed, and therefore, the spring 10 can now expand. Since in this case the umbrella is held by the grip 9, and the lower inner shaft member 4 as well as the outer shaft member 1 stationarily engaged with the lower inner shaft member 4 are held by the grip 9, the expansion of the compression coil spring 10 mounted between the upper and lower ring washers 26 and 31 urges exclusively the upper ring washer 26 upward thereby to lift the intermediate inner shaft member 3 through the outer shaft member 1.

By the upward movement of the intermediate inner shaft member 3, the pin 22 fixed to the shaft member 3 moves upward through the slit 21 of the stopper core member 20 until the pin 22 abuts against the upper end of the slit 21. Thereafter, the stopper core member 20 is pulled upward by the intermediate inner shaft member 3 as a unit therewith. Since the stopper core member 20 is firmly connected with the guide rod 23, the latter is also pulled up together with the stopper core member 20. The upward movement of the guide rod 23 causes the same upward movement of the lower stopper core member 27 firmly connected with the guide rod 23, whereby the pin 29 passed through the slit 30 of the stopper member 27 and carried by the lower inner shaft member 4 traverses the length of the slit 30, until at last the pin 29 abuts against the lower end of the slit 30. By the upward movement of the intermediate inner shaft member 3, the third ring 18 connected with the intermediate inner shaft member 3 by the pin 16 is shifted upward with the pin 16 being guided through the slits 17. As the third ring 18 approaches the second ring 12, the connecting rods 19 are extended outward thereby to extend the spokes 14 and 14a outward. At the same time, the upper ends of the intermediate inner shaft member 3 abuts against the lower end of the upper inner shaft member 2 and urges the latter upward with the slits 13 thereof being guided by the pin 11 connecting the second ring 12 and the outer shaft member 1, whereby the first ring 6 is spaced from the second ring 12. By the cooperation of the abovementioned movements of the respective elements, the ribs 5 are extended outward to present the opened frame structure as shown in FIGS. 3 and 7, wherein the fourth ring 32 (as well as the grip sleeve 34) is pulled upward along the outer shaft member 1 by the second supporting spokes 33. Thus, the umbrella is automatically opened. In the opened condition, the tension spring 7 is extended via the tension rod 8 to accumulate the force of restitution.

When the umbrella is to be closed, the push button portion 37b of the latch 37 is pressed to disengage the claw portion

37a from the hole 1b of the outer shaft member 1, whereby the axial restriction between the outer shaft member 1 and the lower inner shaft member 4 is released. Therefore, the force of restitution of the spring 7 acts to pull the outer shaft member 1 upward with respect to the lower inner shaft member 4 while closing the ribs 5. The upward movement of the outer shaft member 1 causes a corresponding downward movement of the upper inner shaft member 2 with respect to the outer shaft member 1, and therefore, the first and second rings 6 and 12 approach to each other. At the same time, the spokes 14 and 14a are turned down, pushing the third ring 18 downward via the connecting rods 19. By the closing movement of the ribs 5, the fourth ring 32 is also pushed down via the supporting spokes 33 to take the position as shown in FIGS. 4 and 8. Thus, the tip of the latch 35 catches the hole 1a of the grip 34 and latches the fourth ring 32 in the closed position. In this condition, the compression coil spring 10 is in its extended loadless condition.

Next, the grip 9 is pressed upward to insert the lower inner shaft member 4 more into the outer shaft member 1, while compressing the spring 10, until the claw portion 37a of the latch 37 catches the hole 1b of the outer shaft member 1. Then, the umbrella is restored to the slightly opened condition as shown in FIG. 2.

From the foregoing, it will be understood that, in the automatically openable and closable umbrella according to this invention, it is made possible to use the compression coil spring 10 of such a high strength that it covers the combined operation of the first and second compression springs in the prior art as described in the opening by mounting the spring between the intermediate and lower inner shaft members 3 and 4, on the provision that the intermediate inner shaft member 3 is not pushed up at an abrupt stroke but is pushed up steppedly in such a manner that the intermediate inner shaft member 3 is first pushed up as much as the length of the slit 21 of the stopper core member 20, and secondly the intermediate inner shaft member 3 is pushed up together with the upper stopper core member 20, the guide rod 23 connected with the stopper core member 20 and the lower stopper core member 27 connected with the guide rod 23 as much as the length of the slit 30 of the lower stopper core member 27. In this manner of stepped expansion of the spring 10, though it is strong, it is avoided that the structural elements of the umbrella are subject to an excessive shock. Since it is avoided, according to this invention, to use such an outer compression coil spring that it provided around the outer shaft member of the umbrella of the prior art, the outside surface of the frame of the umbrella is simplified, rendering an improved appearance as well as an improved structure in the view points of handling and avoiding such troubles due to a complicated outside surface as accumulation of dust, catching of alien materials, etc.

I claim:

1. An automatically openable and closable umbrella comprising: a shaft having a tubular outer shaft member, said tubular outer shaft member slidably housing therein an upper, an intermediate and a lower inner tubular shaft member; a first ring fixed to an upper portion of said upper inner shaft member and pivotally carrying ribs and tension spring means for closing the umbrella, said spring means each being connected at one end to an intermediate portion of each of the ribs and at the other end to the first ring at a position spaced from the pivotally mounting position of the ribs; a second ring fixed to the outer shaft member below said first ring and pivotally carrying first supporting spokes for supporting the ribs when they are opened; a third ring slidably mounted on said outer shaft member below said second ring and connected with said intermediate inner shaft member to be slidably therewith along said outer shaft member and pivotally carrying connecting rods; a fourth ring slidably mounted on said outer shaft member below said third ring and pivotally carrying second supporting spokes for restricting the ribs when the ribs are close; a compression spring for opening the umbrella, said compression spring being mounted within said outer shaft member and held between said intermediate and lower inner shaft members; a first latch adapted to selectively engage said fourth ring with said outer shaft member; and a second latch adapted to selectively engage said outer shaft member with said lower inner shaft member; said umbrella being characterized by a guide rod assembly mounted within said outer shaft member and including means connecting said intermediate and lower inner shaft members in such a manner as to provide stepwise extension of the distance between said intermediate and lower inner shaft members caused by said compression spring in order to avoid an abrupt one-stroke expansion of the compression spring which could otherwise cause an excessive shock to the structural elements of the umbrella.

2. An umbrella according to claim 1, wherein the guide rod assembly comprises: a guide rod and first and second stopper core members connected with end portions of the guide rod; said stopper core members each being provided with means defining an axial slit therealong; said first stopper core member being connected with said intermediate inner shaft member by a pin passed through said slit and carried by said intermediate inner shaft member; said second stopper core member being connected with said lower inner shaft member by a pin passed through said slit and carried by said lower inner shaft member.

3. An umbrella according to claim 2, wherein the total of the lengths of said slits of said first and second stopper core members corresponds to the displacement of said third ring due to opening or closing of the umbrella.

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