



**EUROPEAN PATENT APPLICATION**

Application number : **92810377.9**

Int. Cl.<sup>5</sup> : **A45B 25/16**

Date of filing : **20.05.92**

Priority : **12.06.91 JP 167784/91**

Date of publication of application :  
**16.12.92 Bulletin 92/51**

Designated Contracting States :  
**AT BE CH DE ES FR GB IT LI LU NL SE**

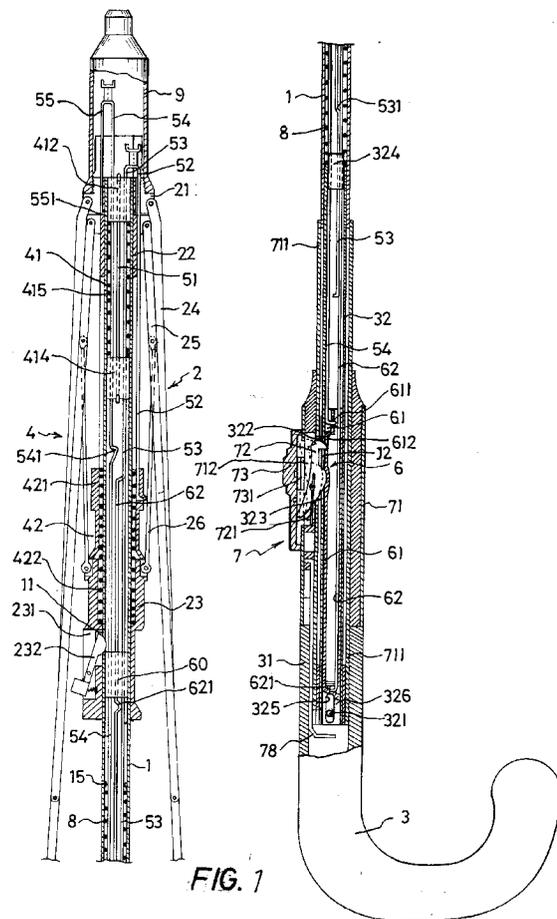
Applicant : **Day, Sheng-Tong**  
**1 Chung Yang North Road**  
**Ching Shui Taichung Hsien (TW)**

Inventor : **Chou, Lung-Chiao**  
**1, Alley 9, Lane 250, Cheng Kung Road, Sec. 2**  
**Nei Hu District, Taipei (TW)**  
Inventor : **Cheng, Cheng-Pu**  
**5th Floor, 10, Lane 169 Ta An Road, Sec. 1**  
**Taipei (TW)**

Representative : **Kiliaridis, Constantin et al**  
**Bugnion S.A., 10, Route de Florissant, Case**  
**Postale 375**  
**CH-1211 Genève 12 (CH)**

**Automatically opening and closing umbrella.**

An umbrella having a tubular shaft 1, a set of rib assembly 2 expandable and collapsible by a runner mechanism, a handle 3 arranged to be slidable in relation to the shaft 1, an umbrella-opening energy accumulating mechanism 4 including an upper energy accumulating device 41 and a lower energy accumulating device 42, a linkage mechanism 6 capable of linking and controlling the umbrella-opening energy accumulating mechanism 4, an actuating mechanism 7 worked by an operating mechanism 7 and an umbrella-closing coil spring 8 disposed between the inside lower end of said shaft 1 and the front end of said intermediate shaft 32. The invention has for its purpose to provide a self opening and closing umbrella capable of being opened or closed without having to consume any extra energy and with a little strength, while at the same time the umbrella will in no way collapse accidentally.



## BACKGROUND OF THE INVENTION

The present invention relates to an automatically openable and closable umbrella which, upon a push-press of the umbrella while its front end is propping against the ground or wall to compress a coil spring disposed inside the shaft, is capable of accumulating the elastic force and which at the same time upon operating of the button to release the elastic force accumulated in the coil spring, is whereby able to close the umbrella.

In a conventional self-opening umbrella, such as the one disclosed in the applicant's US Patent 4,534,374, the umbrella is provided with a strong first coil spring and a second coil spring. The strong first coil spring of this umbrella is located inside an intermediate tubular shaft to permit the upper and lower inner shafts to be constantly biased towards the outer side of the intermediate tubular shaft, that is, the upper and lower inner shafts becoming ready to depart in a direction away from each other from the intermediate tubular shaft. The second coil spring, on the other hand, is mounted on the upper end outer circumference of the intermediate tubular shaft, which, upon opening of the umbrella, is capable of enabling the intermediate ring or runner and the lower ring or runner to be ready in the direction away from each other. Next, the handle of such an automatic umbrella is provided with a button device, this button device is used to activate the locking spring leaf which is engageable in the intermediate tubular shaft and the outer tubular shaft.

Based on this self-opening umbrella, if a push-press could be applied to the handle while the tip of the umbrella were still pressing against the ground or a wall to compress the first coil spring thereby accumulating elastic energy for use in opening of the umbrella when the umbrella was in the closed state, and further of the push button could be depressed to possible release the locking spring leaf from engagement with the outer tubular shaft, the outer tubular shaft would move and rise on the upper end of the intermediate tubular shaft by virtue of a partial energy released by the first coil spring and the lower runner mounted on the outer tubular shaft would compress the second coil spring and accumulate elastic energy for use in closing of the umbrella the same time while the umbrella was being opened by the ribs. Under the condition when the umbrella was open and if the push button was depressed, then the locking state between the locking spring bar and the intermediate tubular shaft would be set free, thus enabling the intermediate tubular shaft to rise by the elastic force of second coil spring. At the same time, the upper and lower inner shafts would slide up and down in the intermediate tubular shaft by virtue of elastic energy of the first coil spring and close the umbrella by the ribs.

According to the foregoing known example when

the umbrella is open, the first coil spring and the second coil spring would work against each other in the opposite direction, that is, in an antielastic direction. Since part of the elastic force from a coil spring on one side would have to be spent on the coil spring from the other side, it would be necessary to use a coil spring of sufficient elasticity. Therefore, during use to push against the umbrella so as to compress the first coil spring and accumulate elastic energy for use as an impetus in opening and closing the umbrella while holding the handle and pressing the tip of the umbrella against the ground, there must apply a very strong push pressure of 16 kg to 20 kg. Generally speaking, for operating an umbrella of the type it not only requires the strength of one's wrist the user has also to use part of his body weight, that is, the body has to lean in the direction of the wrist in order to provide an additional force to the wrist. Hence, for a person sitting in the bus or an electric car to push against the umbrella entirely with a single hand till the first coil spring is fully compressed, there would be difficulty even with an adult. As for a child or an aged person it may certainly be said that there is even no possibility for them to push move the umbrella. With an umbrella of the type, there is therefore inconvenience in use and also is the restriction in the age of the users, which has thus contributed to its inability as a self-opening umbrella to be conveniently used by persons irrespective of their ages.

## SUMMARY OF THE INVENTION

In order to solve the above problem, according to the present invention there is provided an automatically openable and closable umbrella which, as shown in FIG. 1, comprises a tubular shaft 1, a rib assembly 2 mounted on the upper portion of the shaft 1 and capable of expanding and collapsing by means of a stretching and collapsing mechanism including an upper, an intermediate and a lower runners 21, 22, 23, a handle 3 arranged at the lower end of the shaft 1 and being slidable in relation to the shaft 1, an umbrella opening energy accumulating mechanism 4 located at the upper end of the shaft 1 and equipped with an upper energy accumulating device 41 and a lower energy accumulating device 42, a linkage mechanism 5 located on the inner and outer sides of the shaft 1 and formed of wire materials linking and controlling the umbrella-opening energy accumulating mechanism 4, an actuating mechanism 6 located in the lower end interior of the shaft 1 and capable of working by an operating mechanism 7 to be described hereinafter, an operating mechanism 7 mounted by inserting in the lower end of the shaft 1 to push on the upper end of the handle 3 and located outside of an intermediate shaft 32 which is inserted in the interior of the handle 3 and with which it forms into a single body and equipped with a control button 73, a heart cam 75, a spring

stop 76 and a push lever 78, a coil spring 8 located between the lower end inside of the shaft 1 and the front end of the intermediate shaft 32, and a cap like ferrule 9 mounted on the upper end of the upper runner 21.

When an umbrella is in the closed condition, normally the upper accumulating device 41 of the energy accumulating mechanism 4 for use in opening the umbrella is maintained at a state of pre-accumulated energy while the lower accumulating device 42 is kept at a release state of no accumulated energy. On the other aspect, the coil spring for accumulating energy for closing the umbrella likewise is maintained at the release condition. During use, the umbrella is first pushed with the ferrule 9 is pressing against the ground or a wall surface while gripping the handle of the umbrella with a hand. In this way, because of the relative sliding action between the intermediate shaft 32 and the main shaft 1 it serves to compress the umbrella-closing coil spring 8 and thereby accumulate energy for closing the umbrella, while, at the same time, the spring of the lower energy accumulating device 42 by way of the movable tube will be drawn thereby accumulating energy for use in opening the umbrella. On opening the umbrella, it is possible to relieve the upper and lower accumulating devices 41, 42 of the umbrella-opening energy accumulating mechanism 4 from the energy maintaining condition thereby permitting the umbrella-opening energy to be released by way of the actuating mechanism 6 and the linkage device 5 by merely pressing the control button 73 of the operating mechanism 7 just a little toward the upper direction. The umbrella will thus be extended and opened. To close the umbrella, it only requires to depress the control button 73 slightly so that the umbrella-closing coil spring 8 is relieved from the compressed condition, thereby releasing energy. By means of this energy the shaft 1 is able to move upwardly from the intermediate shaft 32 whereas the lower runner 23 will move downwardly relative to the rise of the shaft 1. Finally, the upper spring leaf 232 is engaged in an engaging hole of the shaft 1, whereas the upper umbrella-opening energy accumulating device 41 now is compressed by the linkage device 5 to accumulate energy. The intermediate runner 22 also ascends and the umbrella is thus closed to be in the original closed position.

The heart cam 75 located in the operating mechanism 7 facilitates smooth operation of the control button 73 and at the same time serves to avoid occurrence of any erroneous operation. Next, the provision of a spring stop 76 assists in preventing the umbrella from closing during a strong wind.

#### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a partial sectional view of an automatically openable and closable umbrella of the in-

vention in the closed position;

FIG. 2 is an exploded perspective view of the main portion of the umbrella;

FIG. 3 is a partial sectional view of the umbrella which because of umbrella-closing coil spring being compressed is in the umbrella-closed condition of accumulation of energy;

FIG. 4 is a partial sectional view of the umbrella of FIG. 1 in the open condition;

FIG. 5 is a side view illustrating one side construction part of the operating portion of the umbrella in section;

FIG. 6 is a partial sectional side view of one side construction of the heart-shape device of the operating portion as shown in FIG. 5;

FIG. 7 illustrates the construction relation in the umbrella operating state of the operating portion as shown in FIG. 5; and

FIG. 8 illustrates the construction relation in the umbrella operating state of the operating portion as shown in FIG. 6.

#### DESCRIPTION OF THE PREFERRED EMBODIMENT

As shown in FIGS. 1 and 2, the automatically openable and closable umbrella of the present invention comprises, basically, a tubular shaft 1 acting as the basic shaft, a set of rib assembly 2 located on the upper part of the tubular shaft 1 and capable of extending and closing by means of a push and retract mechanism, a handle 3 fixed to the lower end of the shaft 1, an energy accumulating mechanism 4 for opening the umbrella concealed inside the upper end portion of the shaft 1, a linkage mechanism located in the inside and outside of the shaft 1 and formed of the wire material linking to and controlling the umbrella-opening energy accumulating mechanism 4, a control mechanism 7 for opening the umbrella mounted by inserting in the lower end of the shaft 1 to push against the upper end of the handle 3, and a coil spring 8 for closing the umbrella concealed inside the lower end of the shaft 1.

The tubular shaft 1 serves as the elongated tubular shaft of a basic shaft provided in the middle and the lower parts on one side thereof respectively with a slotted first engaging hole 11 and an elongated second engaging hole 12.

The rib assembly 2 is closely mounted with a linking action on the shaft 1 by means of an upper, an intermediate and a lower runners 21, 22 and 23 located at the upper end of the shaft 1 for cooperating action. This rib assembly 2 comprises the upper runner 21 fixed at the upper end of the shaft 1, the lower runner 23 slidably attached below the upper runner 21 to the shaft 1, the intermediate runner 22 slidably attached between the upper and lower runners 21 and 23 to the shaft 1 and a plurality of dome ribs 24, stretchers

25 and actuating ribs 26 pivotally attached respectively to the runners 21, 22 and 23 and capable of spreading out and collapsing in a mutually linking manner. One end of each dome rib 24 is rotatably pivotally attached to the upper runner 21 while the other end thereof remains free. Each of the stretchers 25, on the other hand, has one end rotatably pivotally attached to the intermediate runner 22 while its other end is pivotally attached to a generally middle place on the dome rib 24. Also, one end of each of the actuating ribs 26 is rotatably pivotally attached to the lower runner 23 and the other end thereof is rotatable generally towards the above and pivotally attached to a middle place on the stretcher 25. As shown in FIG. 2, the lower end of the lower runner 23 is integrally formed with a downwardly extended extension tube 230. This extension tube 230 is provided on one side with an axial channel 231. Inside the axial channel 231 is disposed an upper spring leaf 232 which, by the spring being under compression, constantly presses on the shaft.

The handle 3 has a tubular intermediate shaft 32, which is capable of forming an annular space inside the front end tubular portion 31 of the handle 3 and is thereby fixed by one end thereof in that tubular portion 31 by a pin 321 while its other end is slidably inserted in the lower end interior of the shaft 1. On the side of a control mechanism 7 of the intermediate shaft 32 there is formed a series of elongated slots 322 and furthermore, at the upper end of the intermediate shaft 32 is located an intermediate shaft stopper 324 while at its lower end is inserted a movable stopper 326 with limiting stroke by being engaged in an elongate hole 325 of the pin 321.

The umbrella-opening energy accumulating mechanism 4 comprises an upper energy accumulating device 41 disposed inside the upper end of the shaft 1 and a lower energy accumulating device 42 located in the shaft 1 between the lower runner 23 and the intermediate runner 22. The upper energy accumulating device 41, in turn, comprises an upper stopper 412 located inside the upper end of the shaft 1 and provided on the outer circumference thereof with a plurality of axially guiding channels 411, a movable stopper 414 slidably inserted in the interior of the shaft 1 below the upper stopper 412 and having axially guiding channels 413 corresponding to the guiding channels 411, and an upper coil spring 415 disposed between the two stoppers 412 and 414. The lower energy accumulating device 42, on the other hand, comprises a movable tube 421 mounted above the lower runner 23 and being slidable in relation to the shaft 1 and an outer coil spring 422 disposed between the lower runner 23 and the movable tube 421.

The linkage mechanism 5, which is used for linking up the upper and the lower energy accumulating devices 41 and 42, comprises a wire material 51 for regulating and limiting position of the lower stopper

414 slidably inserted by the upper and lower ends thereof in the guiding channels 411 and 413 respectively of the upper and lower stoppers 412 and 414 and located between the two stoppers by two bent ends being engaged simultaneously respectively in the upper and lower stoppers 412 and 414, a first outer dog wire material 52 located on one side between the upper runner 21 and the movable tube 421 and having the upper end passing through the guiding channels 221 and 211 respectively of the intermediate runner 22 and the upper runner 21 to extend upwardly and the lower end being engaged in an engaging channel 423 of the movable tube 421, a first inner dog wire material 53 having the upper end connected to the upper end of the wire material 52 by a metallic member and the lower end passing through a central hole 212 of the upper runner 21 and the guiding channels 411 and 413 respectively of the upper and lower stoppers 412 and 414 and slidably inserted in the guiding channel 601 of a sliding piece 60 inside the shaft 1 and in a guiding channel 327 of the intermediate shaft stopper 324 to extend inside the upper end of the intermediate shaft 32, a second inner dog wire material 54 having the upper end projecting upwardly from the central hole of the upper runner 21 and the lower end slidably passing the guiding channels 411 and 413 respectively of the upper and lower stoppers 412 and 414, the guiding channel 601 of the sliding piece 60 and the guiding channel 327 of the intermediate shaft stopper 324 and being releasably engaged in the upper end of an actuating plate 61 of the actuating mechanism 6 to be described later, and a second outer dog wire material 55 having the upper end connected to the upper end of the wire material 54 by a metallic member and the ring-shaped lower end 551 passing through the guiding channel 211 of the upper runner 21 and inserted in a cavity on the lower side of the upper runner 21. The second inner dog wire material 54 is formed in the middle part thereof with a bent portion 541 located in a position below the lower stopper 414. The first inner dog wire material 53 is also formed on the lower part thereof with a bent portion 531 located in a position above the intermediate shaft stopper 324.

The actuating mechanism 6, described above, comprises an elastic actuating plate 61 having the lower end connected to the movable stopper 326 of the intermediate shaft 32 and the upper end being engaged by an engaging hole 611 at the lower end of the second inner dog wire material 54, a slidable sliding piece 60 disposed inside the shaft 1 in a position corresponding to the spring leaf 232 of the lower runner 23, and an actuating wire material 62 having the lower end being fixed to the movable stopper 326 and the upper end passing through the guiding channel 601 of the sliding piece 60 to extend into the interior of the shaft 1 in a position corresponding to the movable tube 421. Furthermore, the actuating wire material 62

at the lower end of the sliding piece 60 is formed with a bent portion 621 being engaged in the lower end of the sliding piece 60. The elastic actuating plate 61 is also provided on the upper end thereof with an engaging hole 612 for engagement by the spring leaf 72 during opening of the umbrella.

The control mechanism 7 includes a base tube 71 located on the upper end of the handle 3 to which it is integrally connected and set in on the outside of the intermediate shaft 32 by an extension tubular portion 711 being inserted in the center of the tube, a lower spring leaf 72 located in a cavity 712 on one side of the base tube 71 and urged by a spring 721 to be constantly engaged in a slot opening 322 of the intermediate shaft 32 by the engaging end thereof through the cavity and a groove 712 on the extension tubular portion 711, a control button 73 slidably operationally mounted in the groove 712 by means of a sliding element 731 slidably inserted in a guiding channel 713 formed by the two sides of the groove 712, a button recovery spring 74 disposed on one side of the control button 73, a heart cam device 75 located on one side of the base tube 71 and formed by a heart cam 751 and a driven arm 725, a spring stop 76 inserted by the upper and lower ends thereof in the guiding channels 714 and 715 respectively of the base tube 71 and the lower end extension tubular portion 711 below the recovery spring 74, a coil spring 77 disposed inside the guiding channel 715 and constantly urging the stop 76 to be upwardly biased, and an upward acting bar 78 having the upper end fixed to a projection 732 connected integrally to the control button 73 and the L-shaped lower end along the outer side of the extension tubular portion 711 pushing disengageably against the movable stopper 326 at the lower end of the tubular portion 711 and the intermediate shaft 32. The recovery spring 74 of the control button 73 is integrally formed with the sliding element and is disposed in an accommodating hole 734 defined in a wing panel 733 being slidable in the channel 716 and in another accommodating hole 717 which in the channel 716 corresponds to the accommodating hole 734. When the wing panel 733 and the sliding element 731 move together towards the above, the spring 74 will be compressed in between the lower end of the accommodating hole 734 and the upper end of the accommodating hole 717. The heart cam device 75 is formed on a wing panel 735 disposed on the side opposite the recovery spring 74 of the control button 73 and includes a heart cam 751 and a driven arm 752 having one end pivotally connected to the tubular portion 71 and the other end being slidable in a cam slot 753 formed on the heart cam 751 and pushing against the cam 751. This heart cam device 75 is capable of regulating and limiting the switching sequence in the umbrella opening and closing operation of the control button 73 to prevent any operation by mistake. The spring stop 76 is an elongated leaf spring having the

middle portion formed in an expanded portion 761 expanding on the two sides thereof and the upper and lower ends 762 and 763 slidably inserted in the guiding channels 714 and 715 respectively. Furthermore, the expanded portion 761 is slidably inserted in an expanded slot 718 below the channel 714. The lower end 763 of the stop 76 is bent to form an inwardly directed L-shape and when the upper end of the shaft 1 is compressed and operates to accumulate energy, the lower end of the shaft 1 will be blocked by the lower end 763 of the stop piece 76. The upper end 762 of the stop piece 76 is also bent to form an outwardly directed L-shape. When opening an umbrella if the shaft 1 moves a fixed distance upward, with the elasticity of the coil spring 77 the stop piece 76 will follow the shaft 1 and move upward to block the shaft at its lower end. In this way, the umbrella can be prevented from closing accidentally by a strong breeze.

The umbrella-closing coil spring 8 is accommodated inside the lower end of the shaft 1, the upper end of the coil spring pushing against a catch member 15 formed of a plurality of inwardly directed projections provided on the circumferential wall of the shaft 1 below the sliding piece 60 and the lower end thereof being blocked on the top of the stopper 324 of the intermediate shaft 32.

Symbol 9 is a ferrule placed on the upper end of the upper runner 21 to protect the upper end of the wire materials 52 to 55, this ferrule 9 also serves a function of pushing against the ground.

In accordance with the automatically openable and closable umbrella constituted as the above, when closing the umbrella the movable stopper 414 accompanying the umbrella closing action is lifted up by the wire materials 54 and 55 being pressed towards the above due to the ascent of the intermediate runner 22, thereby forcing the lower end of the upper coil spring 415 to be compressed toward the above. In this way, the spring 415 is maintained in a position when energy to be used for opening the umbrella is accumulated in advance. The umbrella-closing coil spring 8 is, on the other hand, in the release condition and the coil spring 422 disposed between the movable tube 421 and the lower runner 23 is also maintained in the release condition. At the same time, the upper spring leaf 232 is now engaged in the engaging hole 11 of the shaft 1 and the lower spring leaf 72 is engaged in engaging holes 322 and 612 of the overlapping intermediate shaft 32 and elastic actuating plate 61 to be maintained in the umbrella-closing condition.

In use of the umbrella, the handle 3 is first pressed under the condition where the ferrule 9 is being pushed against the ground or a wall, or the handle 3 and the ferrule 9 are compressed against each other with two hands. In this way, because of the relative movement of the handle 3 and the shaft 1 the front end of the intermediate shaft 32 on the one side compresses the umbrella-closing coil spring 8 and on the

other side slides in the shaft 1. On the other hand, owing to the relative movement the lower end of the shaft 1 also slides in the extension tubular portion 711 of the base tube 71 and descends. The lower spring leaf 72 of the control mechanism 7 is thus moved to be engaged in the engaging hole 12 below the shaft 1 whereby to store the umbrella-closing energy in the coil spring 8. At the same time, the movable tube 421 by way of the linking relation whereby the lower end of the movable tube 421 is being pushed to the wire material 53 on the above by the wire material 52 is lifted up to the above. The coil spring 222 is thereby extended for storage of energy.

In opening the umbrella, all that is required is to push move the control button 73 up toward the above with a thumb. At this time, the upward acting bar 78 following the movement of the control button 73 ascends and by the lower end of the bar 78 it drives the movable stopper 326 to move up towards the above, the distance of movement of which is however regulated and limited by the relation of the pin 321 to the elongated hole 325. Hence, the actuating wire material 62 fixed by the lower end thereof to the movable stopper 326 presses the sliding piece 62 upward by the bent portion 621 forcing the spring leaf 232 under pressure to move backward. Hence, the spring leaf 232 and the engaging hole 11 of the shaft 1 are liberated from their engaging state permitting the energy accumulated by the upper and lower accumulating devices 41 and 42 of the umbrella-opening energy accumulating mechanism 4, that is, the elastic force of the spring, to be released. Following this, the lower runner 23 moves up toward the above by the contracting force of the spring 422, at the same time, the intermediate runner 22 moves toward the lower side by the extension force of the spring 415 through the wire materials 54 and 55. Through the linkage relation of the various runners 21, 22 and 23 in the rib assembly 2 it is possible to open the umbrella. Now, the upper and lower ends of the spring stop piece 76 are located respectively on the upper ends of the guiding channels 714 and 715 and the stop piece 76 is blocked at the lower end of the shaft 1 by the upper end thereof. Hence, even encountered by a strong breeze the umbrella will not close by itself. On the other hand, the heart cam 751 of the heart cam mechanism 75 is integrally formed with the control button 73 and is moved toward the front end side whereas the front end of the driven arm 752 is led in the cam slot 753 to arrive at the lower side of the cam 751 for operating the control button 73 during the closing of the umbrella.

When an open umbrella is next to be closed, all that is required to do is to press the control button 73 down toward the lower side. Now, the sliding element 731 of the control button 73 presses the rear end of the lower spring leaf 72 down whereby the engaging state between the front engaging end of the lower

spring leaf 72 and the engaging hole 11 on the shaft 1 is released. Hence, the umbrella-closing coil spring 8, which has till now been maintained in the contracted condition, expands and releases the umbrella-closing energy and moves the shaft 1 to extend upwardly. At this time, the lower runner 23 opposing the upwardly moving shaft 1 moves downwardly enabling the upper spring leaf 232 to be eventually engaged in the engaging hole of the shaft 1 and stop there. In the same time, the intermediate runner 22 at the intermediary of the linkage mechanism 5 moves to push against the lower side of the upper runner 21 and stop there. The upper umbrella-opening energy accumulating device 41 also at the intermediary of the linkage mechanism 5 and by the inertia where the rib assembly 2 has returned to the umbrella closing condition because of the runners 21, 22 and 23 is compressed to accumulate energy. The umbrella is closed simultaneously and returns to the original umbrella-closing state.

In accordance with the principle of the invention, the umbrella-opening energy accumulating mechanism 4 is divided into the upper and lower two stage actions and the upper umbrella-opening accumulating device 41 has preaccumulated energy at the time of umbrella closing or assembly. Therefore, when the umbrella-closing coil spring 8 is compressed to accumulate energy for use in closing the umbrella it is not required, as the conventional technique does, for accumulation to be carried out against the elastic force of the umbrella-opening coil spring 415 and requires thus no extra consumption of body strength. In addition, since the umbrella-closing coil spring 8 can be compressed independently a coil spring of small elastic force may be used and the coil spring may be handled with a push-press force of about below one half the conventional apply force, in other words, with a push-press force of 7-10 kg. Again, in substitution of the conventional way of accumulating energy by compressing the coil spring directly, the upper and lower umbrella-opening energy accumulating devices 41 and 42 may accumulate energy by use of wire materials 51-55 having a fulcrum action to lift the springs 415 and 422, in other words, the present invention has applied an action method opposite that of the conventional technique, whereby it enables action of the springs with just a slight force. Also, because led by the heart cam device 75 the control button 73 of the operating mechanism 7 performs the sequence of the opening and closing operations precisely, any handling of the upward press or downward press by mistake can be avoided. Again, because the operating mechanism 7 is provided with a spring stopper 76, when subjecting to an external force or a strong breeze the closing of the umbrella by accident can be prevented.

## Claims

1. An automatically opening and closing umbrella, comprising:

a tubular shaft (1),

a rib assembly (2) mounted on the upper end of said tubular shaft (1) and arranged to be expandable and closable with the help of stretching and collapsing means constituted by an upper, intermediate and a lower runners (21, 22, 23),

a handle (3) mounted to the lower end of said shaft (1) and being slidable relative to said shaft (1) by way of an intermediate shaft (32),

an umbrella-opening energy accumulating mechanism (4) disposed in the upper end of said shaft (1) and equipped on the inner side thereof with an upper energy accumulating device (41) and on the outer side thereof with a lower energy accumulating device (42),

a linkage mechanism (5) disposed on the inner and outer sides of said shaft (1) for controlling by linkage said umbrella-opening energy accumulating mechanism (4) and formed by assembly of a plurality of wire materials,

an actuating mechanism (6) disposed on the lower end of said shaft (1) and in the inside of said handle (3) and being capable of working with an operating mechanism (7) to be described hereinafter,

an operating mechanism (7) slidably inserted in the lower end of said shaft (1) to be located on the outside of said intermediate shaft (32) together with the upper end of said handle (3) to which it is integrally connected and including a control button (73), a heart cam device (75), a spring stopper (76) and an acting bar (78) and

an umbrella-closing coil spring (8) disposed between the inside lower end of said shaft (1) and the front end of said intermediate shaft (32).

2. An automatically opening and closing umbrella according to claim 1, characterized in that said handle (3) is a grip capable of forming an annular space inside the front end tube (31) of said handle (3) and including a tubular intermediate shaft (32) having the lower end thereof fixed by a pin in said tube and the upper end thereof slidably inserted in the lower end interior of said shaft 1 and said intermediate shaft (32) is provided on the lateral surface of the side of said operating mechanism (7) with holes (322, 323) for engaging the spring leaf, said intermediate shaft (32) having on the upper end an intermediate shaft stopper (324) fixed thereto and on the lower end by insertion a movable stopper (326) capable of moving only in a distance corresponding to said operating mech-

anism (7).

3. An automatically opening and closing umbrella according to claim 1, characterized in that said umbrella-opening energy accumulating mechanism (4) comprises an upper energy accumulating device (41) disposed in the upper end interior of said shaft (1) and a lower energy accumulating device (42) disposed between said lower runner (23) and said intermediate runner (22), said upper energy accumulating device (41) comprises an upper stopper (412) fixed in the upper end interior of said shaft (1), a lower stopper (414) disposed below said upper stopper (412) and slidably inserted in said shaft (1) and an upper coil spring (415) disposed between the pair of said stoppers (412, 414), and said lower energy accumulating device (42) comprises a movable tube (421) mounted above said lower runner (23) and slidably inserted in said shaft 1 and a lower coil spring (422) arranged between said lower runner (23) and said movable tube (421).

4. An automatically opening and closing umbrella according to claim 1, characterized in that said linkage mechanism (5) is a mechanism for linking said upper and lower energy accumulating devices (41, 42) and comprises a position regulating and limiting wire material (51) slidably insertibly passing by the upper and lower ends thereof through guiding channels (411, 413) defined on said upper and lower stoppers (412, 414) respectively and disposed between said upper and lower stoppers (412, 414) by the upper and lower ends being engaged respectively in said pair of stoppers (412, 414), a first outer dog wire material (52) disposed on one side between said upper runner (21) and said movable tube (421) and having the upper end passing through said intermediate runner (22) and said upper runner (21) to extend upwardly and the lower end engaged in said movable tube (421), a first inner dog wire material (53) connected by the upper end thereof to the upper end of said wire material (52) and passing through and slidably inserted by the lower end thereof in guiding channels respectively of said upper runner (21), said upper and lower stopper (412, 414), a sliding piece (60) inside said shaft (1) and said intermediate shaft stopper (324) and extending into the upper end interior of said intermediate shaft (32), a second inner dog wire material (54) having the upper end projecting toward the above from said upper runner (21) and the lower end provided by inserting slidably thereon with an upper runner (21), an upper and a lower stopper (412, 414), a sliding piece (60) and an intermediate shaft stopper (324) and connected engageably to said actuating mechanism (6) and a

second outer dog wire material (55) having the upper end connected to said wire material (54) and the ring lower end passing through said upper runner (21) and pushing in an engageable manner on the lower side of said upper runner (21). 5

5. An automatically opening and closing umbrella according to claim 1, wherein said actuating mechanism (6) comprises an actuating plate (61) connected by the lower end thereof to said movable stopper (326) and by the upper end thereof to the lower end of said second inner dog wire material, a sliding piece (60) disposed in a slidable manner inside said shaft (1) at a position corresponding to an upper spring leaf (232) disposed in said lower runner (23), and an actuating wire material (62) connected by the lower end thereof to said movable stopper (326) and passing by the upper end thereof through said sliding piece (60) and extending into the interior of said shaft (1) corresponding to said movable tube (421). 10 15 20

6. An automatically opening and closing umbrella according to claim 1, characterized in that said operating mechanism (7) includes a base tube (71) at the upper end of said handle (3) fitted by the lower extension tube (711) on the outside in said intermediate shaft (32) and formed into a single body with said handle (3), a lower spring leaf (72) disposed in a cavity on one side of said base tube (71) and having the front end constantly engaged in an engaging hole on said intermediate shaft (32), a control button (73) fitted in a slidable manner in a guiding channel of said cavity and having on the inner side a sliding element, a heart cam device (75) mounted on the surface of said base tube (71) adjacent the side of said control button (73) for regulating and limiting the operating sequence of said control button (73), a spring stop (76) mounted on the side of said base tube (71) opposite the mounted side of said heart cam device (75) and an upward acting bar (78) integrally connected by the upper end thereof to said control button (73) and pushing by the lower end thereof in an engageable manner on the movable stopper (326) at the lower end of said intermediate shaft (32). 25 30 35 40 45

50

55

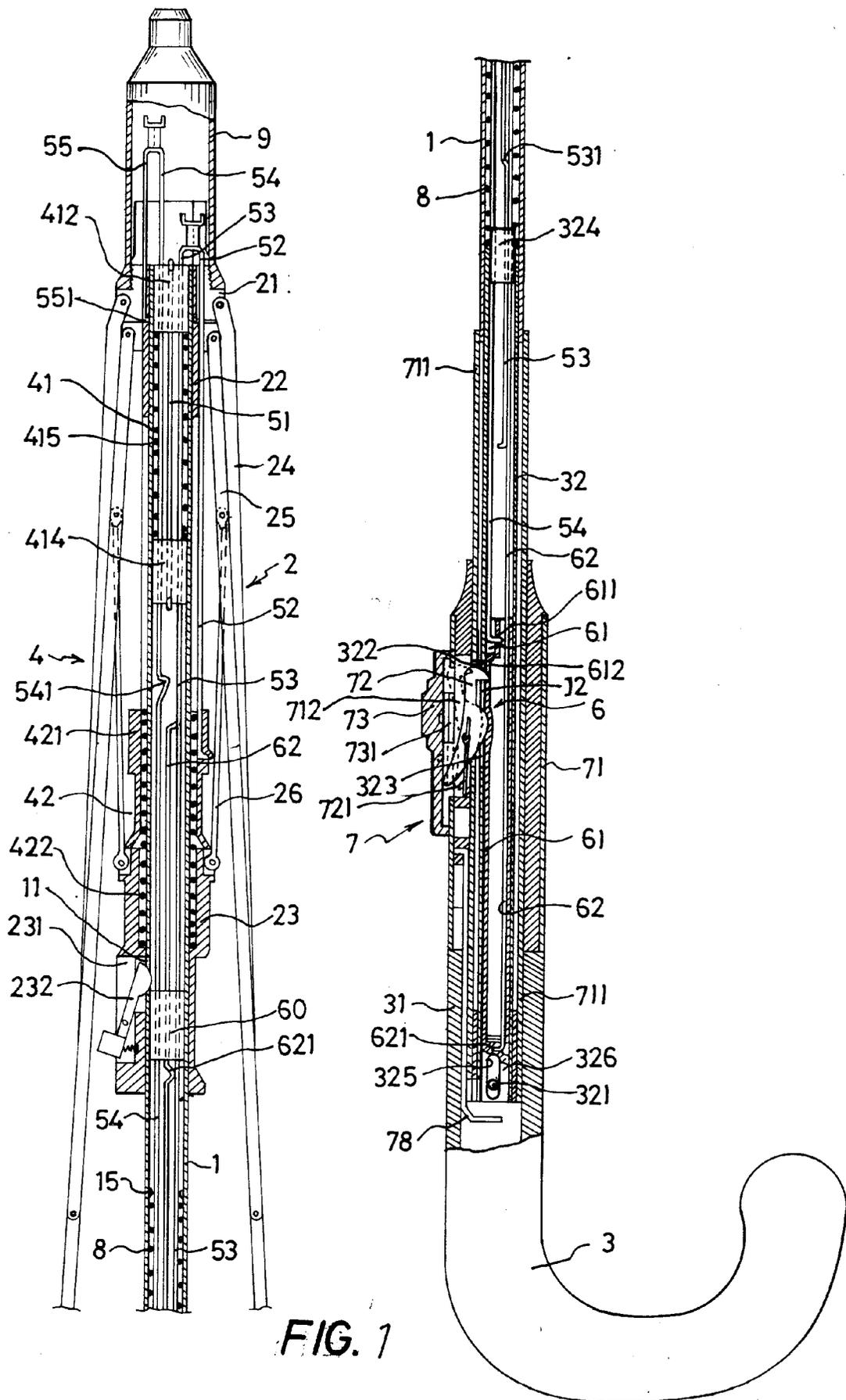


FIG. 1

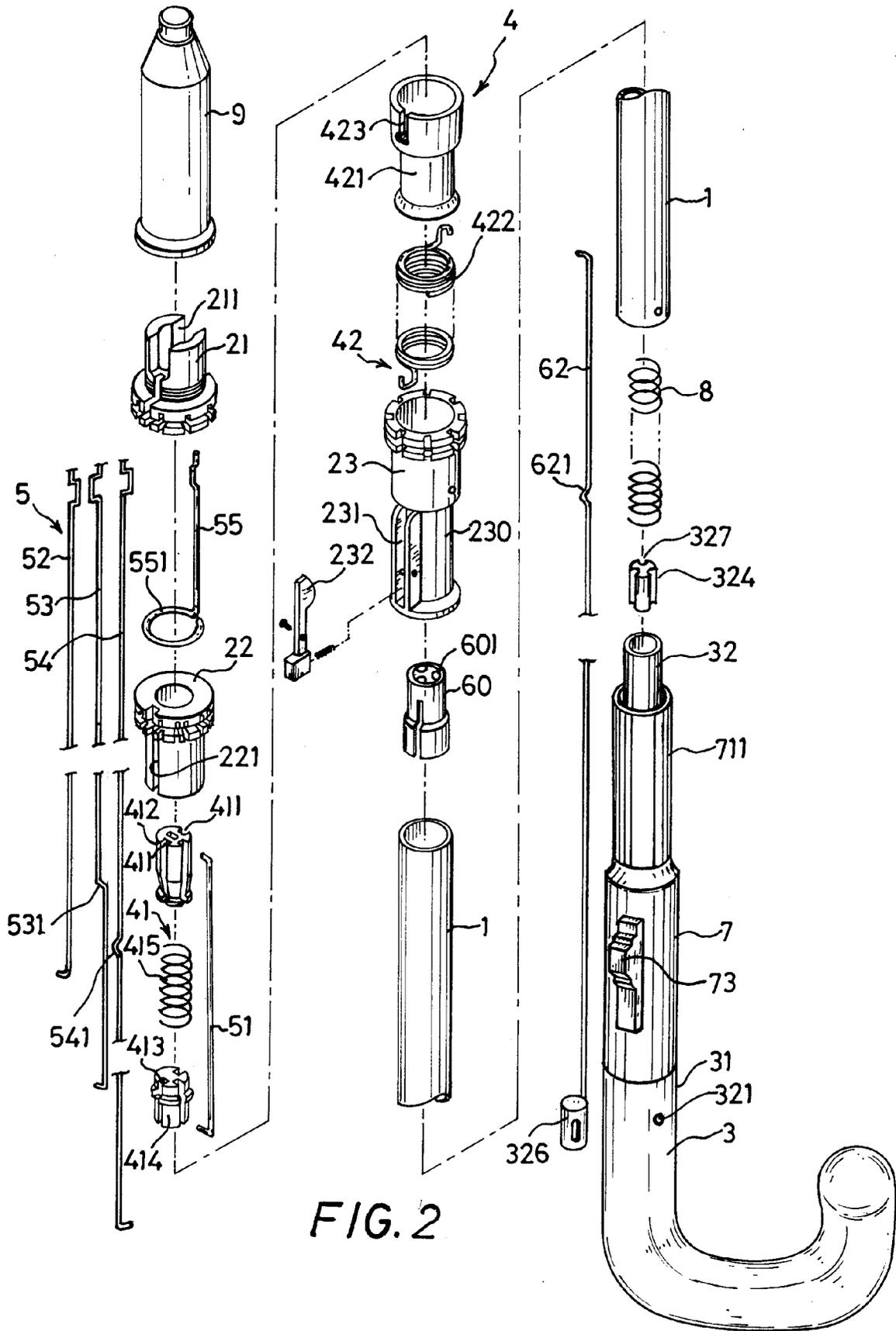


FIG. 2



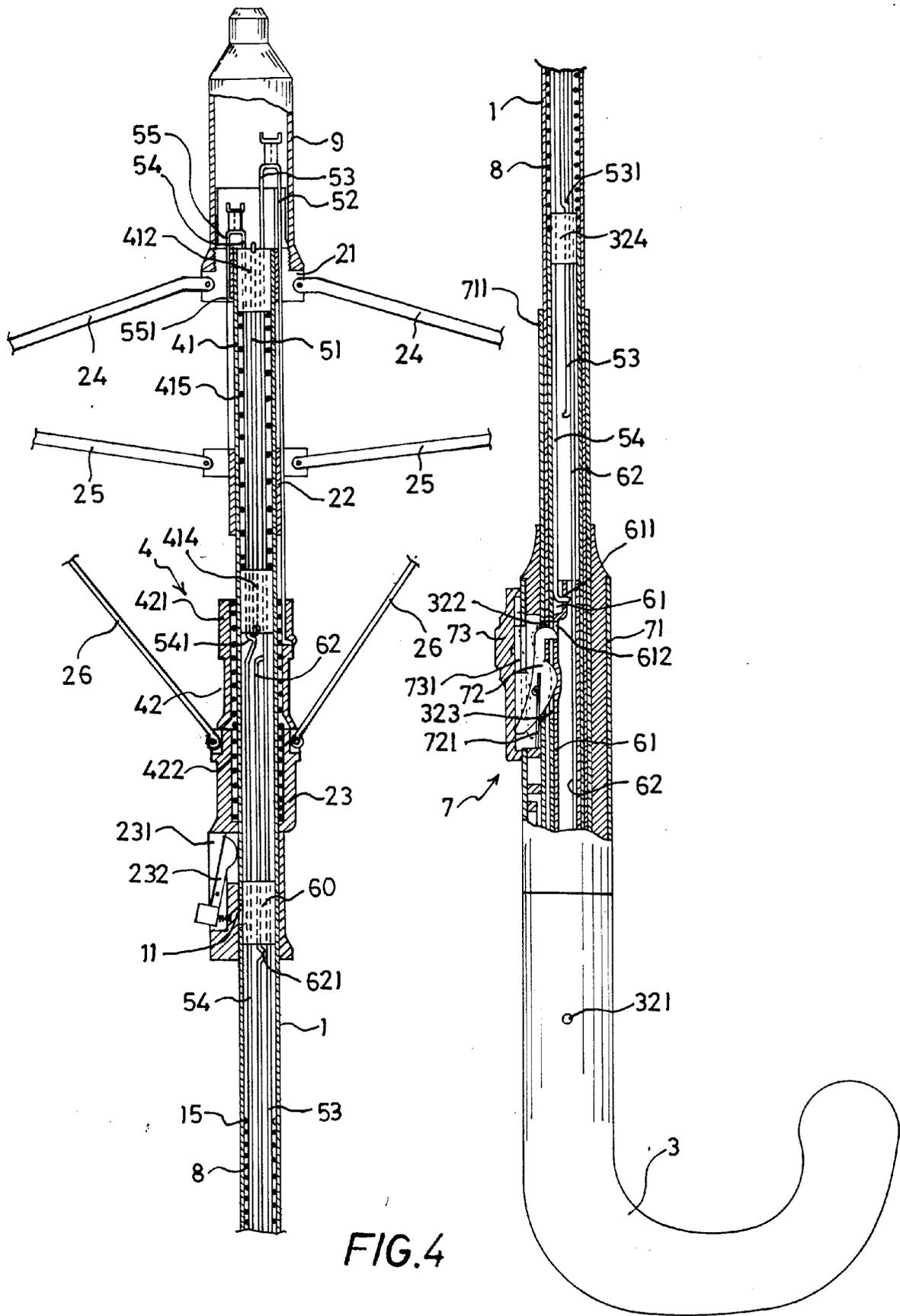


FIG. 4

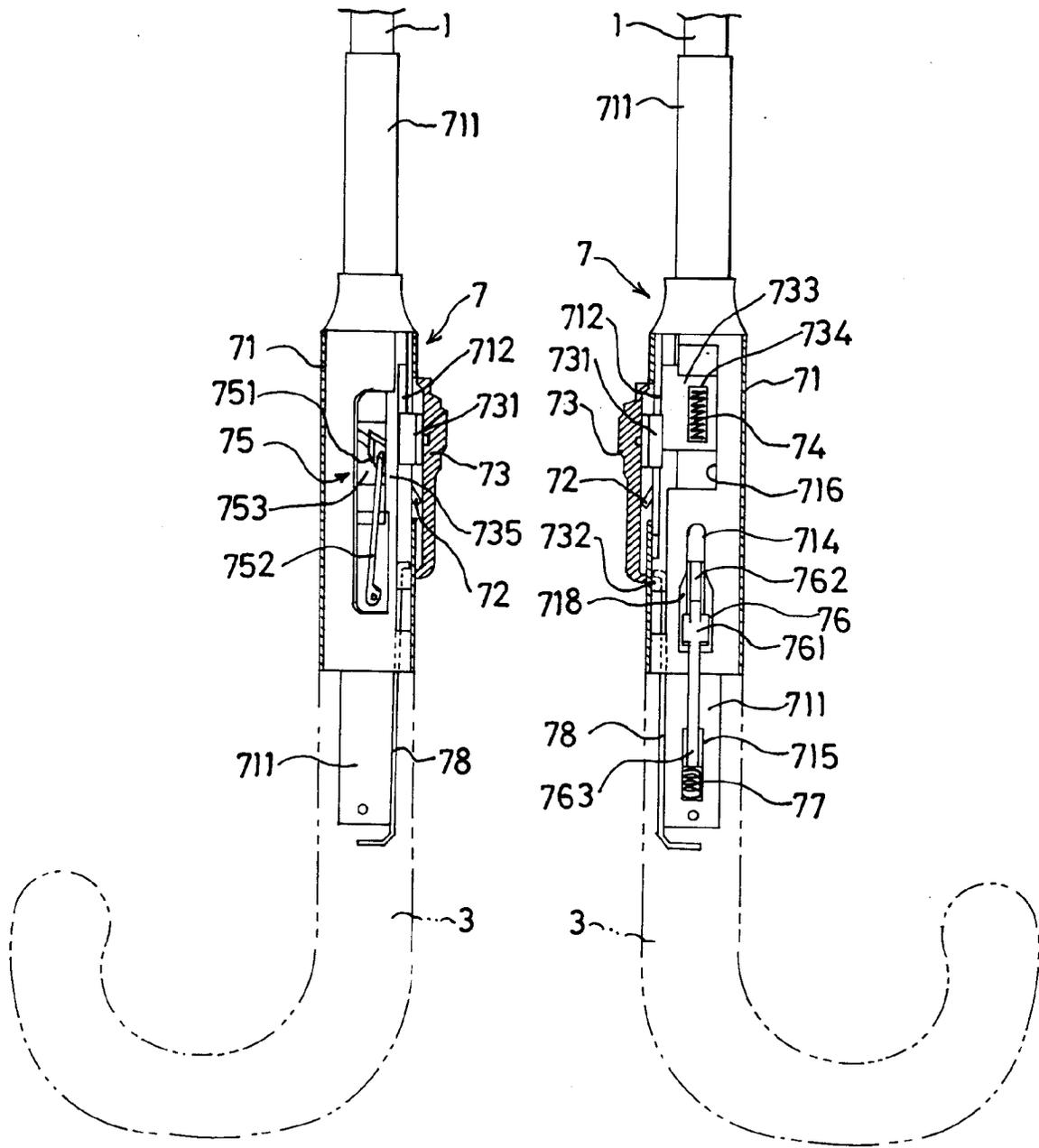


FIG. 6

FIG. 5

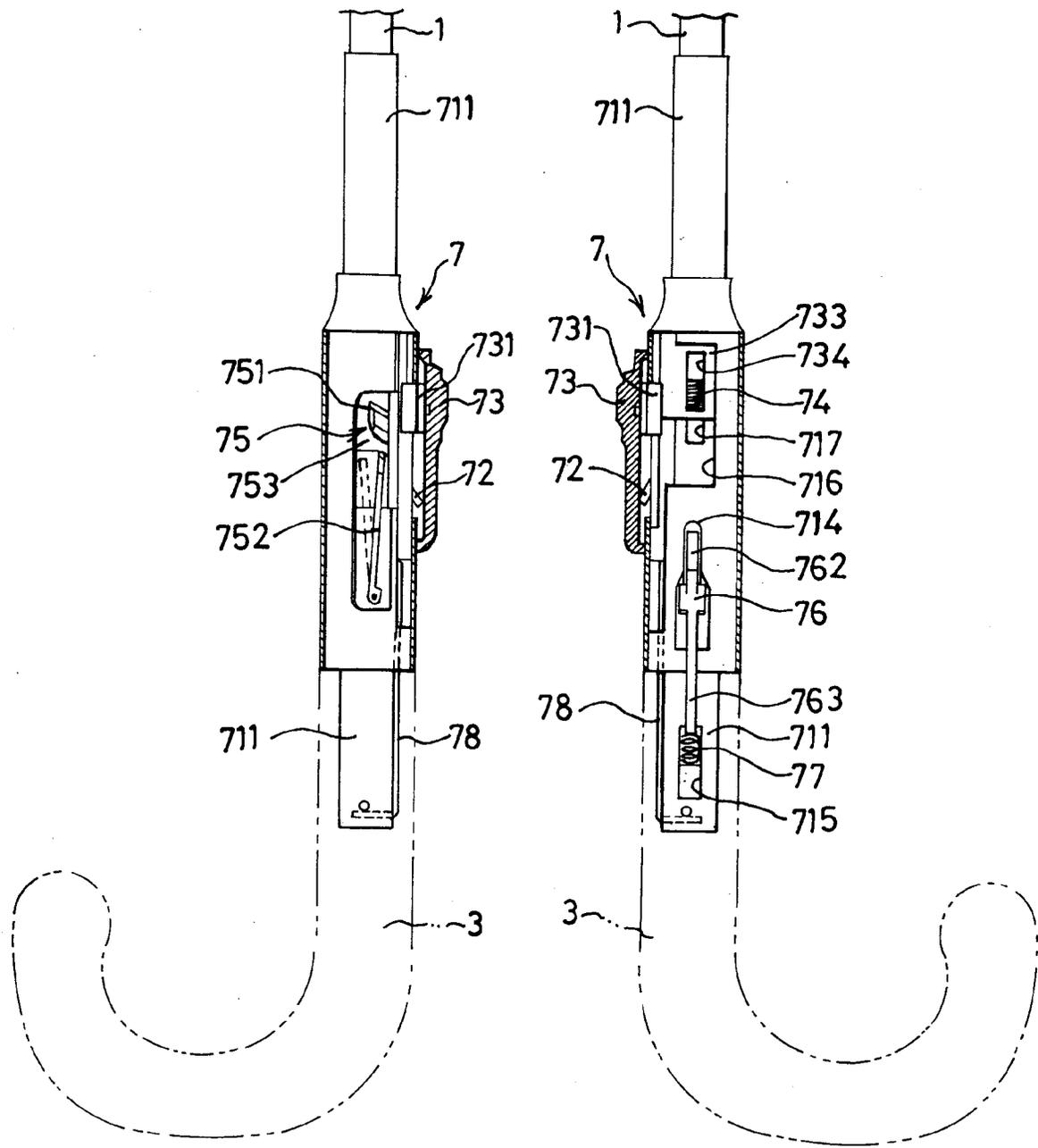


FIG. 8

FIG. 7