(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 289 363 A1

# (12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
**02.03.2011 Bulletin 2011/09**

(21) Application number: **10157384.8**

(22) Date of filing: **23.03.2010**

(51) Int Cl.:
***A45B 25/00*** *(2006.01)* ***A45B 25/12*** *(2006.01)*
***A45B 25/14*** *(2006.01)*

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK SM TR**
Designated Extension States:
**AL BA ME RS**

(30) Priority: **26.08.2009 CN 200920174028 U**

(71) Applicant: **Kobold (Xiamen) International Co., Ltd.**
**Xiamen 361012 (CN)**

(72) Inventor: **Wang, Max**
**Taichung City (CN)**

(74) Representative: **Jenkins, Peter David**
**Page White & Farrer**
**Bedford House**
**John Street**
**London WC1N 2BF (GB)**

## (54) Safety device for an automatically openable umbrella

(57) A safety device for an automatically openable umbrella includes a pulling cord (800) connected to an upper hub (500) and a reel member (10) through a runner (600). Reel-out movement of the reel member (10) is restrained by a unidirectional retaining mechanism (30). The safety device further includes an entrapment mechanism (40) disposed in a telescopic central shaft (300) of the umbrella and having a gate member (41) and a retained body (45). The retained body (45) is retained by the gate member (41) when the umbrella is collapsed so as to guard against upward movement of the runner (600), thereby avoiding undesirable opening or extension of the umbrella.

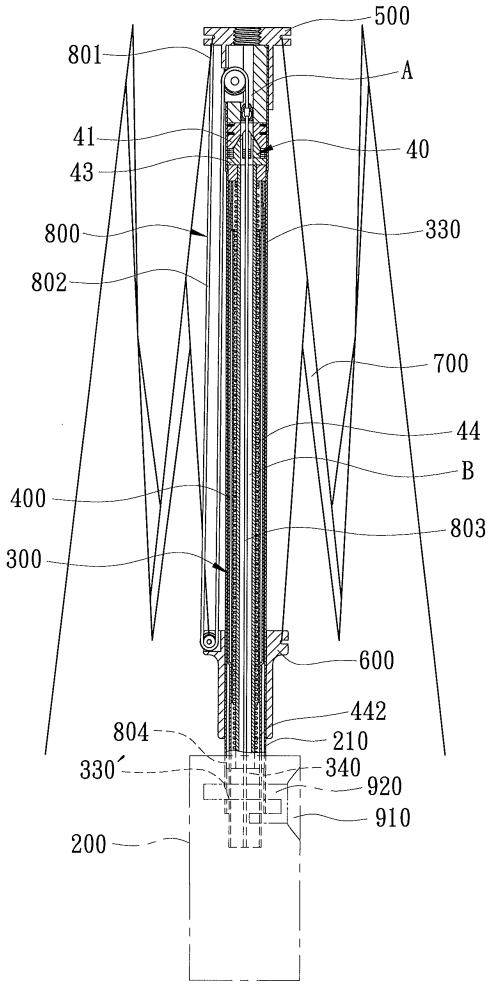


FIG. 2

EP 2 289 363 A1

## Description

**[0001]** This invention relates to an automatically openable umbrella, more particularly to a safety device for an automatically openable umbrella.

**[0002]** Referring to Fig. 1, a conventional auto-umbrella disclosed in Chinese PatentApplication No.200710009892.1 is shown to include a telescopic central shaft 1, an opening spring 2 disposed in the central shaft 1, a handle 3 secured on a lower end of the central shaft 1, a control unit 4 mounted in the handle 3, and a driving unit 5 connected between the handle 3 and the central shaft 1. The control unit 4 includes a reel 401, a cord 402 wound on the reel 401, a coil spring 403, and a unidirectional clutch 404 disposed between the reel 401 and the handle 3. During retraction of the central shaft 1 to close the umbrella, by means of the coil spring 403, the cord 402 can be reeled in such that, if the user inadvertently lets the umbrella slip from his/her grasp when pushing the central shaft 1, the clutch 404 can guard against reel-out rotation of the reel 401 to thereby prevent undesired extension of the central shaft 1. However, the control unit 4 has a complicated structure, so that the handle 3 is relatively bulky.

**[0003]** The object of the present invention is to provide a safety device for an automatically openable umbrella which can prevent undesirable opening of the umbrella during retraction of a telescopic central shaft thereof, and which has a simplified construction.

**[0004]** According to this invention, the safety device for an automatically openable umbrella includes a force transmitting cord, a reel member, a reel biasing spring, a push button, a unidirectional retaining mechanism, and an entrapment mechanism. The umbrella includes a telescopic central shaft, an upper hub and a handle shell respectively secured on top-side and bottom ends of the central shaft, a runner slidable along the central shaft between upper and lower positions to spread and collapse a rib-and-stretcher assembly, and a retaining unit disposed to releasably restrain movement of an upper tube of the central shaft toward an extended position by counteracting the biasing action of an opening spring.

**[0005]** The pulling cord has an anchoring end tensely moved with the upper hub, and a first cord segment which extends from the anchoring end to the runner and which is wound on the runner. The first cord segment further extends upward through the upper hub and then downward to form a second cord segment which is further led into the central shaft and along a guiding route and which terminates at a connected end that is located in the handle shell.

**[0006]** The reel member is rotatablymounted to the handle shell, and is configured to permit the connected end of the pulling cord to be secured thereon such that the second cord segment is reeled out when the upper tube is forced to move towards the extended position, and is reeled in when the upper tube is manually pressed toward a retracted position.

**[0007]** The reel biasing spring is disposed to bias the reel member to reel in the second cord segment when the upper tube is manually pressed toward the retracted position.

**[0008]** The push button is manually operable to perform a stroke movement relative to the handle shell to release the retaining unit so as to permit the upper tube to be moved toward the extended position.

**[0009]** The unidirectional retaining mechanism is disposed between the push button and the reel member, and is displaceable, in response to the stroke movement of the pushbutton, fromablockingposition, where the reel member is guarded against performing a reeling-out movement, to a free-rotating position, where the reel member is permitted to reel out the second cord segment.

**[0010]** The entrapment mechanism is disposed in the central shaft, and includes a gate member and a retained body. The gate member is disposed in the upper tube, and extends across the guiding route to divide the guiding route into trapping and running regions. The gate member has an entry port which is configured to permit the second cord segment to run therethrough when in a normal state, and which is configured to be enlargeable so as to be placed in an enlarged state. The retained body is disposed in the running region when the runner is in the upper position, and is movable with the second cord segment such that, once the runner is moved from the upper position to the lower position, the retained body is forced to push through the entry port to place the entry port in the enlarged state and is thereby disposed in the trapping region. The retained body is retained in the trapping region once the entry port returns to the normal state. Thus, undesirable extension and opening of the umbrella, which may cause injury to the user or people nearby can be avoided.

**[0011]** Other features and advantages of the present invention will become apparent in the following detailed description of the preferred embodiment of the invention, with reference to the accompanying drawings, in which:

Fig. 1 is a schematic sectional view of a handle of a conventional auto-umbrella;

Fig. 2 is a schematic sectional view showing an automatically openable umbrella incorporating the preferred embodiment of a safety device according to this invention in a closed state;

Fig. 3 is an enlarged schematic view of the preferred embodiment;

Fig. 4 is an exploded perspective view of the preferred embodiment ;

Fig. 5 is a cut-out view showing an entrapment mechanism of the preferred embodiment;

Fig. 6 is a schematic sectional view showing the automatically openable umbrella incorporating the preferred embodiment in an opened state;

Fig. 7 is an enlarged schematic view of the preferred embodiment when a push button is pushed;

Fig. 8 is a schematic sectional view showing the au-

tomatically openable umbrella incorporating the preferred embodiment in a collapsed state; and

Fig. 9 is a fragmentary sectional view showing the entrapment mechanism of the preferred embodiment.

**[0012]** Referring to Figs. 2, 3 and 6, the preferred embodiment of a safety device according to the present invention is incorporated in an automatically openable umbrella. The umbrella generally includes a central shaft 300, an upper hub 500, a handle shell 200, a runner 600, an opening spring 400, a rib-and-stretcher assembly 700, and a retaining unit.

**[0013]** The central shaft 300 includes upper, middle and lower tubes 330, 320, 310 which are telescopically coupled to one another along a longitudinal axis. The upper and lower tubes 330, 310 respectively have a top-side end and a bottom end of the central shaft 300. The lower tube 310 has a convergent retaining portion 340. The upper hub 500 and the handle shell 200 are secured on the top-side end and the bottom end of the central shaft 300, respectively. The handle shell 200 defines a guide rail 210 extending along a linear path that is parallel to the longitudinal axis. The runner 600 is sleeved on the central shaft 300 and is slidable between upper and lower positions that are respectively distal from and proximate to the bottom end. The opening spring 400 is mounted in the central shaft 300 to bias the upper tube 330 to move from a retracted position, where the upper hub 500 is closer to the handle shell 200, to an extended position, where the upper hub 500 is remote from the handle shell 200. The rib-and-stretcher assembly 700 interconnects the upper hub 500 and the runner 600, and is configured to be spread out when the runner 600 is displaced to the upper position, and to be collapsed when the runner 600 is displaced to the lower position. The retaining unit includes an engaging hole 330' which is formed in a lower portion of the upper tube 330, and an engaging ring 920 which is movably disposed in the handle shell 200 to be releasably engaged with the engaging hole 330' so as to releasably restrain movement of the upper tube 330 toward the extended position by counteracting the biasing action of the opening spring 400.

**[0014]** With reference to Fig. 4, the safety device of this embodiment is shown to comprise a pulling cord 800, a reel member 10, a reel biasing spring 20, a push button 910, a unidirectional retaining mechanism 30, and an entrapment mechanism 40.

**[0015]** The pulling cord 800 has an anchoring end 801 tensely moved with the upper hub 500, and a first cord segment 802 which extends from the anchoring end 801 to the runner 600 and which is wound on the runner 600. The first cord segment 802 further extends upward through the upper hub 500 and then downward to form a second cord segment 803 which is led into the central shaft 300 and along a guiding route and which terminates at a connected end 804 that is located in the handle shell 200.

**[0016]** The reel member 10 is rotatably mounted to the handle shell 200 about a reel axis, and is configured to permit the connected end 804 of the pulling cord 800 to be secured thereon such that the second cord segment 803 is reeled out when the upper tube 330 is forced to move towards the extended position, and is reeled in when the upper tube 330 is manually pressed toward the retracted position. The reel biasing spring 20 is disposed to bias the reel member 10 to reel in the second cord segment 803 when the upper tube 330 is manually pressed toward the retracted position.

**[0017]** The push button 910 is configured to be manually operable to perform a stroke movement relative to the handle shell 200 so as to release the retaining unit, thereby permitting the upper tube 330 to be moved toward the extended position. In this embodiment, the engaging ring 920 of the retaining unit is integrally formed with the push button 910.

**[0018]** The unidirectional retaining mechanism 30 includes a ratchet wheel 31, a pawl 32, a pawl biasing member 34, a lever 33, and an actuating finger 930. The ratchet wheel 31 is sleeved on and rotated with the reel member 10, and has a plurality of ratchet teeth 311 angularly displaced from one another about the reel axis. The pawl 32 has a projecting driven portion 323, two sliders 322 mounted on the guide rail 210 and slidable along the linear path that is transverse to a direction of the stroke movement of the push button 910, and a retaining end 321 movable relative to the ratchet wheel 31 between a blocking position, as shown in Fig. 3, where the retaining end 321 is engaged with one of the ratchet teeth 311 so as to guard against reeling-out movement of the reel member 10, and a free-rotating position, as shown in Fig. 7, where the retaining end 321 is disengaged from the ratchet wheel 31 to permit the reel member 10 to reel out the second cord segment 803 of the pulling cord 800. The pawl biasing member 34 is disposed to bias the pawl 32 toward the blocking position. The lever 33 is pivotably mounted on the handle shell 200 about a pivot axis that is parallel to the reel axis of the reel member 10, and has an actuating end 333 which is engaged with the driven portion 323 so as to move the retaining end 321 of the pawl 32 from the blocking position to the free-rotating position, and a force-transmitting end 332 which is actuated by the stroke movement of the push button 910. The actuating finger 930 is integrally formed with the push button 910 to be moved therewith so as to transmit the stroke movement to the force-transmitting end 332 of the lever 33. In this embodiment, the push button 910, the engaging ring 920 and the actuating finger 930 are formed as a single-piece switch body 900.

**[0019]** With reference to Fig. 5, the entrapment mechanism 40 is disposed in the central shaft 300, and includes a gate member 41, a retained body 45, a pressing head 43, and a tubular actuator 44. The gate member 41 is secured in the upper tube 330, and extends across the guiding route of the second cord segment 803 of the pulling cord 800 to divide the guiding route into trapping and

running regions (A,B) that are respectivelyproximate to and distal from the upper hub 500. The gate member 41 has left and right gate halves 411 which cooperatively define an entry port 47 that is configured to permit the second cord segment 803 to run therethrough when in a normal state, and which are movable radially away from each other so as to place the entry port 47 in an enlarged state. Two gate springs 42 are disposed to respectively bias the left and right gate halves 411 to move toward each other. The left and right gate halves 411 further cooperate to define a mouth 48 which is in spatial communication with the entry port 47 and which is configured to diverge downwardly. The retained body 45 is secured to and movable with the second cord segment 803 of the pulling cord 800. As shown in Fig. 6, when the runner 600 is in the upper position, the retained body 45 is disposed in the running region (B). The pressing head 43 is configured to be tubular for extension of the pulling cord 800 therethrough, and has an engaging end 432 which converges toward the gate member 41 and which is matingly engaged with the mouth 48 of the gate member 41, and a pressed end 433 which is opposite to the engaging end 432. The tubular actuator 44 has an upper end 441 which is engaged with the pressed end 433 of the pressing head 43, and a lower end 442 which is disposed to abut against the retaining portion 340 of the lower tube 310 when the upper tube 330 is displaced to the retracted position, as shown in Fig. 2, so as to generate an upward pressing force that is transmitted to the pressing head 43 such that the engaging end 432 is forced against the gate member 41 so as to move the left and right gate halves 411 radially away from each other, thereby placing the entry port 47 in the enlarged state. A head spring 46 is disposed to bias the engaging end 432 away from the mouth 48.

**[0020]** When the umbrella is in the closed state, referring to Figs. 2 to 4, the upper tube 330 is in the retracted position such that the engaging ring 920 is engaged in the engaging hole 330' and the rib-and-stretcher assembly 700 is collapsed. In addition, the opening spring 400 is compressed, the pawl 32 is engaged with one of the teeth 311 of the ratchet wheel 31, and the pulling cord 800 is reeled in.

**[0021]** Referring to Figs. 6 and 7, when the push button 910 is pressed, the engaging ring 920 is removed from the engaging hole 330', and the lever 33 is turned pivotally by virtue of engagement between the actuating finger 930 and the force-transmitting end 332 to force the pawl 32 to move to the free-rotating position. At this stage, the central shaft 300 can be extended to the extended position by the biasing action of the opening spring 400, and the runner 600 is moved upwardly by pulling of the pulling cord 800 and rotation of the reel member 10, thereby spreading out the rib-and-stretcher assembly 700 of the umbrella. It is noted that, when the runner 600 is moved to the upper position, the retained body 45 is moved to pass through the entry port 47 into the running region (B), and the entry port 47 is placed in the normal state since the lower end 442 of the tubular actuator 44 is not in abutment with the retaining portion 340 of the lower tube 310.

**[0022]** Referring to Figs. 8 and 9, when it is desired to close the umbrella, the push button 910 is pressed and the runner 600 is pulled downwards to the lower position, so that the retained body 45 is forced to push through the entry port 47 to place the entry port 47 in the enlarged state and is thereby disposed in the trapping region (A). The retained body 45 is retained in the trapping region (A) once the entry port 47 returns to the normal state. Hence, the rib-and-stretcher assembly 700 cannot be spread out at this stage.

**[0023]** Referring again to Figs. 8 and 4, when it is desired to telescopically fold the umbrella, a pressing force is applied to bring the handle shell 200 and the upper hub 500 to move toward each other. By virtue of the biasing action of the reel biasing spring 20, the ratchet wheel 31 is rotated to reel in the pulling cord 800 on the reel member 10, and is brought to slap against the pawl 32 intermittently so as to provide audible and tactile feedback to the user until the engaging hole 330' in the runner 600 is engaged with the engaging ring 920 and the umbrella is in the closed state, as shown in Fig. 2. It is noted that the entry port 47 is forced to be disposed in the enlarged state for passage of the retained body 45 during opening of the umbrella.

**[0024]** During folding of the umbrella, if the user inadvertently loses grip of the central shaft 300, as shown in Fig. 8, due to the engagement between the pawl 32 and the ratchet wheel 31, the movement of the pulling cord 800 is restrained so as to hold the runner 600, the central shaft 300, and the rib-and-stretcher assembly 700 in position. Thus, undesirable extension and opening of the umbrella, which may cause injury to the user or people nearby can be avoided. In addition, since the retained body 45 is retained in the trapping region (A) when the runner 600 is in the lower position, movement of the runner 600 to the upper position can be prevented so as to keep the rib-and-stretcher assembly 700 in a collapsed state. Moreover, the unidirectional retaining mechanism 30 has a simple construction so as to render the handle shell 200 compact and lightweight.

## Claims

**1.** A safety device for an automatically openable umbrella, the umbrella including

a central shaft (300) including upper and lower tubes (330,310) which are telescopically coupled to each other along a longitudinal axis, said central shaft (300) having a top-side end and a bottom end;

an upper hub (500) and a handle shell (200) secured on said top-side end and said bottom end of said central shaft (300), respectively;

a runner (600) sleeved on said central shaft (300) and slidable between upper and lower positions that

are respectively distal from and proximate to said bottom end;

an opening spring (400) mounted in said central shaft (300) to bias said upper tube (330) to move from a retracted position where said upper hub (500) isclos-er to said handle shell (200) to an extended position where said upper hub (500) is remote from said handle shell (200);

a rib-and-stretcher assembly (700) interconnecting said upper hub (500) and said runner (600) , and configured to be spread out when said runner (600) is displaced to the upper position, and to be collapsed when said runner (600) is displaced to the lower position;

a retaining unit (330',920) which is operable to releasably restrain movement of said upper tube (330) toward the extended position by counteracting the biasing action of said opening spring (400), **characterized in that** said safety device comprises:

a pulling cord (800) having an anchoring end (801) tensely moved with the upper hub (500), and a first cord segment (802) which extends from said anchoring end (801) to said runner (600) and which is wound on saidrunner (600) , said first cord segment (802) further extending upward through said upper hub (500) and then downward to form a second cord segment (803) which is further led into the central shaft (300) and along a guiding route and which terminates at a connected end (804) that is located in said handle shell (200);

a reel member (10) rotatably mounted to said handle shell (200) about a reel axis, and configured to permit said connected end (804) of said pulling cord (800) to be secured thereon such that said second cord segment (803) is reeled out when said upper tube (330) is forced to move towards the extended position, and is reeled in when said upper tube (330) is manually pressed toward the retracted position;

a reel biasing spring (20) disposed to bias said reel member (10) to reel in said second cord segment (803) when said upper tube (330) is manually pressed toward the retracted position;

a push button (910) configured to be manually operable to perform a stroke movement relative to said handle shell (200) so as to release the retaining unit (330',920) to thereby permit said upper tube (330) to be moved toward the extended position;

a unidirectional retaining mechanism (30) disposed between said push button (910) and said reel member (10), and displaceable, in response to the stroke movement of said push button (910), from a blocking position, where said reel member (10) is guarded against performing a reeling-out movement, to a free-rotating position, where said reel member (10) is permitted to reel out said second cord segment (803); and

an entrapment mechanism (40) disposed in said central shaft (300), and including

a gate member (41) which is disposed in said upper tube (330), and which extends across the guiding route to divide the guiding route into trapping and running regions (A,B) that are respectively proximate to and distal from said upper hub (500), said gate member (41) having an entry port (47) which is configured to permit said second cord segment (803) to run therethrough when in a normal state, and which is configured to be enlargeable so as to be placed in an enlarged state, and

a retained body (45) which is disposed in said running region (B) when said runner (600) is in the upper position, which is movable with said second cord segment (803), and which is configured such that, once said runner (600) is moved from the upper position to the lower position, said retained body (45) is forced to push through said entry port (47) to place said entry port (47) in the enlarged state and is thereby disposed in said trapping region (A) , said retained body (45) being retained in said trapping region (A) once said entry port (47) returns to the normal state.

2. The safety device according to Claim 1, **characterized in that** said entrapment mechanism (40) further includes apressinghead (43) having an engaging end (432) engaged with said gate member (41), and a pressed end (433) which is disposed opposite to said engaging end (432), and which is configured such that, once said upper tube (330) is displaced to the retracted position, said engaging end (432) is forced against said gate member (41) by virtue of an upward pressing force transmitted to said pressed end (433) to thereby place said entry port (47) in the enlarged state.

3. The safety device according to Claim 2, **characterized in that** said entrapment mechanism (40) further includes a tubular actuator (44) having an upper end (441) which is engaged with said pressed end (433) of said pressing head (43), and a lower end (442) which is disposed to abut against said bottom end of said central shaft (300) when said upper tube (330) is displaced to the retracted position, so as to generate the upward pressing force.

4. The safety device according to Claim 3, **characterized in that** said engaging end (432) converges toward said gate member (41), and said gate member (41) has left and right gate halves (411) which cooperatively define said entry port (47), and which are movable radially away from each other so as to place

said entry port (47) in the enlarged state, said left and right gate halves (411) further cooperating to define a mouth (48) which is in spatial communication with said entry port (47), and which is configured to diverge and to mate with said engaging end (432) such that, when the upward pressing force is transmitted to said pressed end (433) of said pressing head (43), said left and right gate halves (411) are moved radially away from each other to place said entry port (47) in the enlarged state.

**5.** The safety device according to Claim 4, **characterized in that** said entrapment mechanism (40) further includes two gate springs (42) disposed to respectively bias said left and right gate halves (411) to move toward each other, and a head spring (46) disposed to bias said engaging end (432) away from said gate member (41).

**6.** The safety device according to Claim 1, **characterized in that** said unidirectional retaining mechanism (30) includes
a ratchet wheel (31) rotatable with said reel member (10), and having a plurality of ratchet teeth (311) angularly displaced from one another about the reel axis,
a pawl (32) having a retaining end (321) and movable relative to said ratchet wheel (31) between the blocking position, where said retaining end (321) is engaged with one of said ratchet teeth (311) to guard against reeling-out movement of said reel member (10), and the free-rotating position, where said retaining end (321) is disengaged from said ratchet wheel (31), and
a lever (33) pivotably mounted to said handle shell (200), and having an actuating end (333) which is disposed to move said pawl (32) from the blocking position to the free-rotating position, and a force-transmitting end (332) which is actuated by the stroke movement of said push button (910) to permit said actuating end (333) to move said pawl (32) toward the free-rotating position.

**7.** The safety device according to Claim 6, **characterized in that** said unidirectional retaining mechanism (30) further includes an actuating finger (930) which is disposed to be moved with said push button (910) so as to transmit the stroke movement to said force-transmitting end (332) of said lever (33), and a pawl biasing member (34) which is disposed to bias said pawl (32) toward the blocking position.

**8.** The safety device according to Claim 7, **characterized in that** said lever (33) is pivotally mounted on said handle shell (200) about a pivot axis that is parallel to the reel axis of said reel member (10), said pawl (32) being movable relative to said ratchet wheel (31) along a linear path that is transverse to a direction of the stroke movement of said push button (910).

**9.** The safety device according to Claim 8, **characterized in that** said actuating finger (930) is integrally formed with said push button (910), and said handle shell (200) defines a guide rail (210) for guiding movement of said pawl (32) along the linear path.

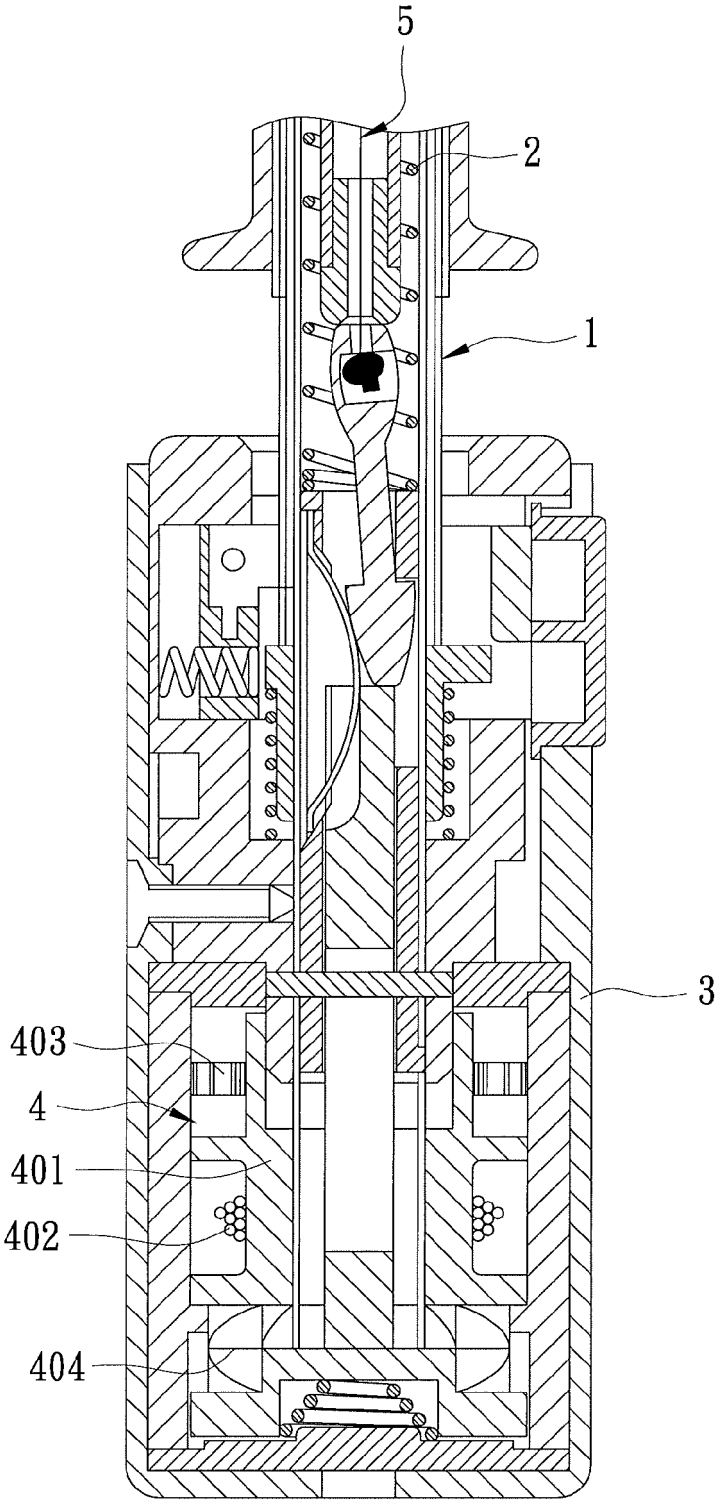


FIG. 1
PRIOR ART

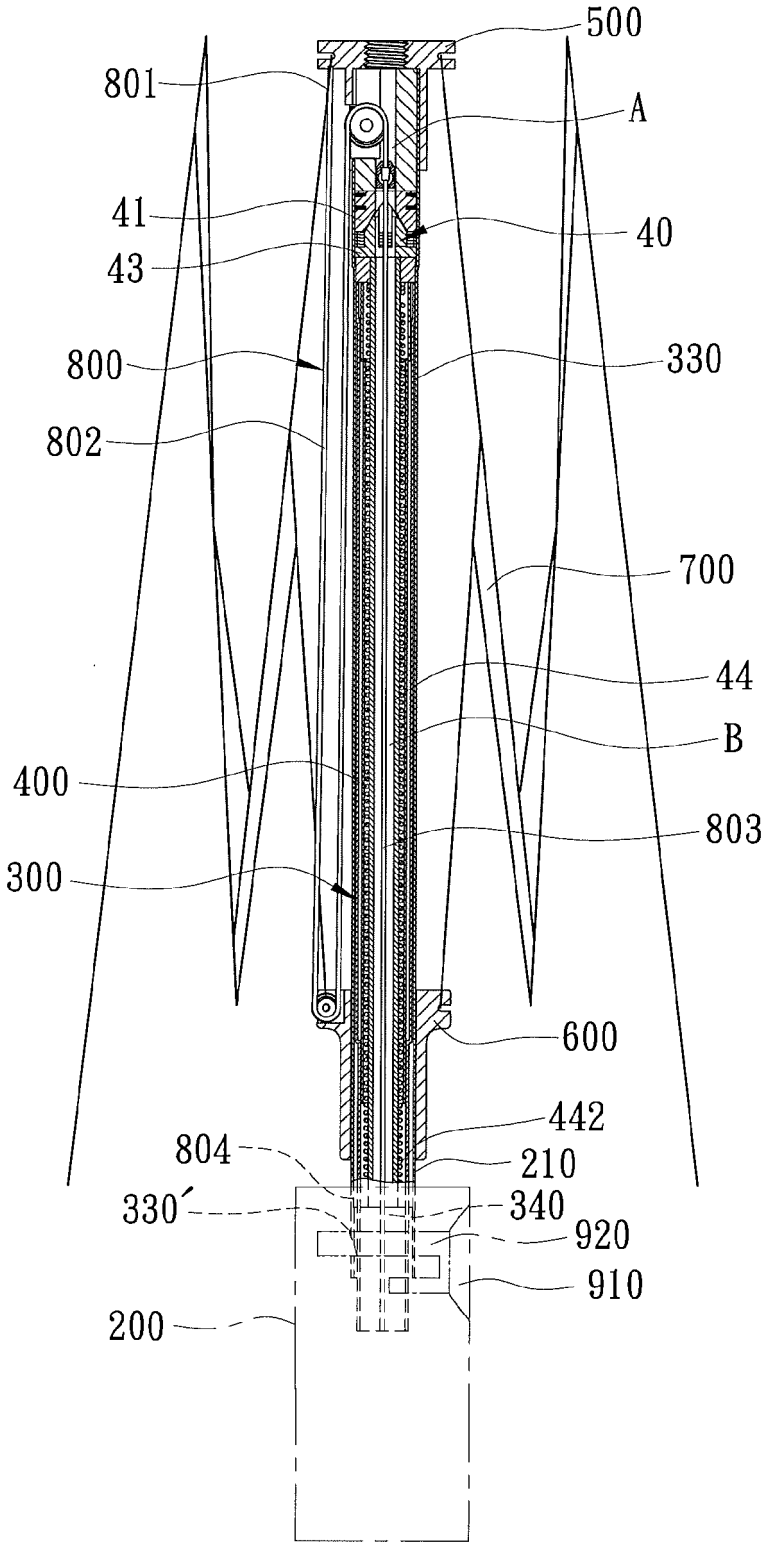
500
801
A
41
40
43
800
330
802
700
44
B
400
803
300
600
442
804
210
330´
340
920
910
200

FIG. 2

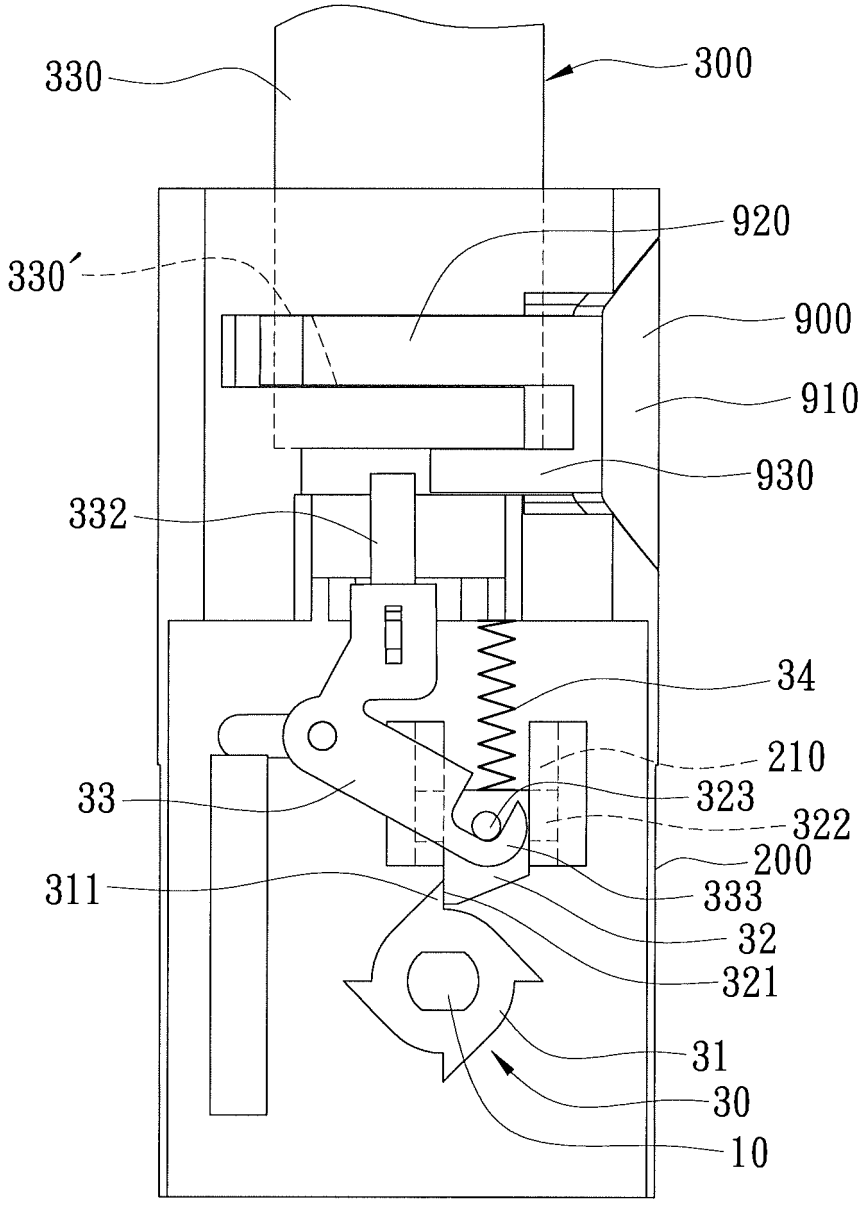
330
300
920
330´
900
910
930
332
34
210
33
323
322
200
311
333
32
321
31
30
10

FIG. 3

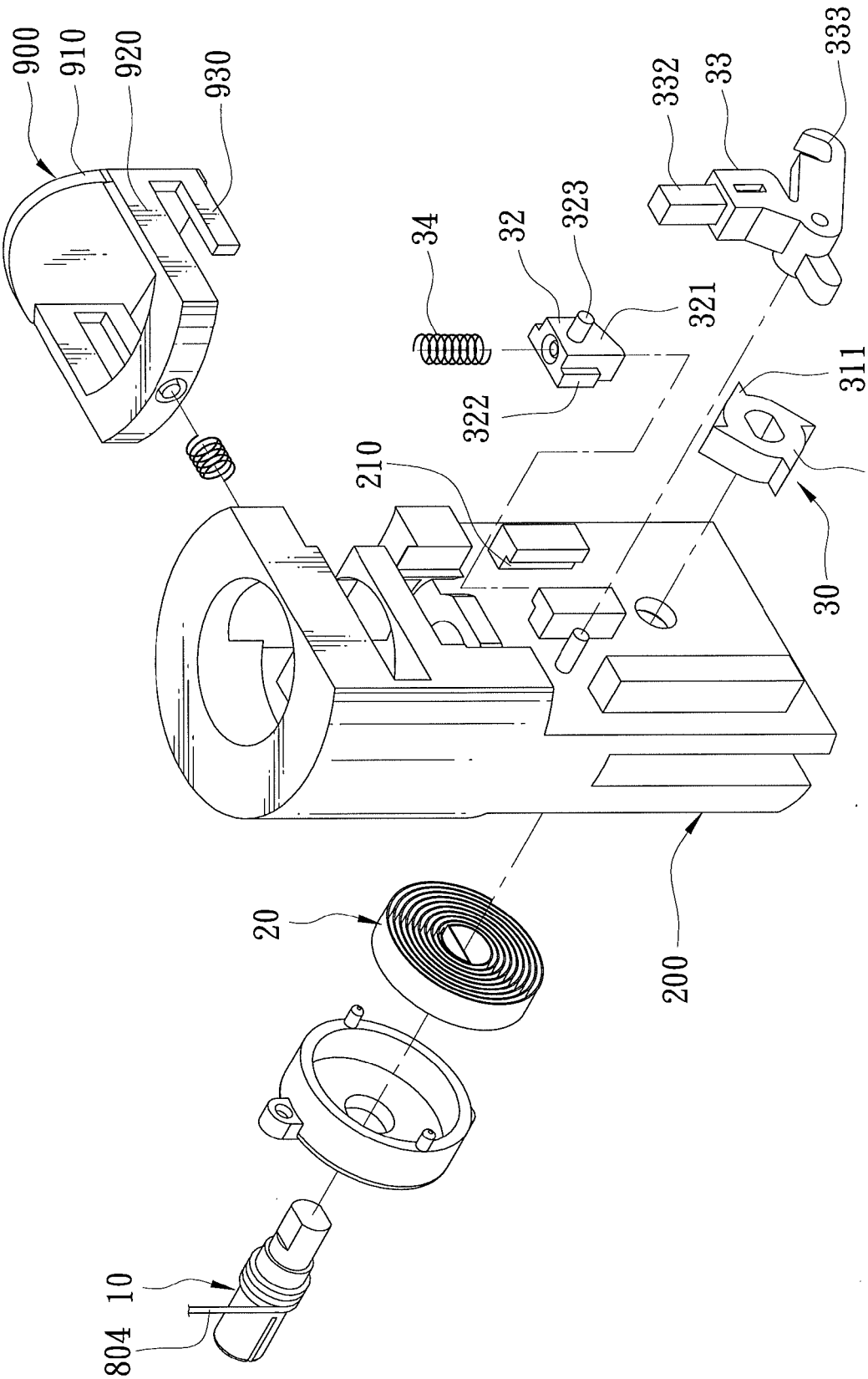
900
910
920
930
34
32
323
321
322
332
33
333
311
31
30
210
20
200
10
804

FIG. 4

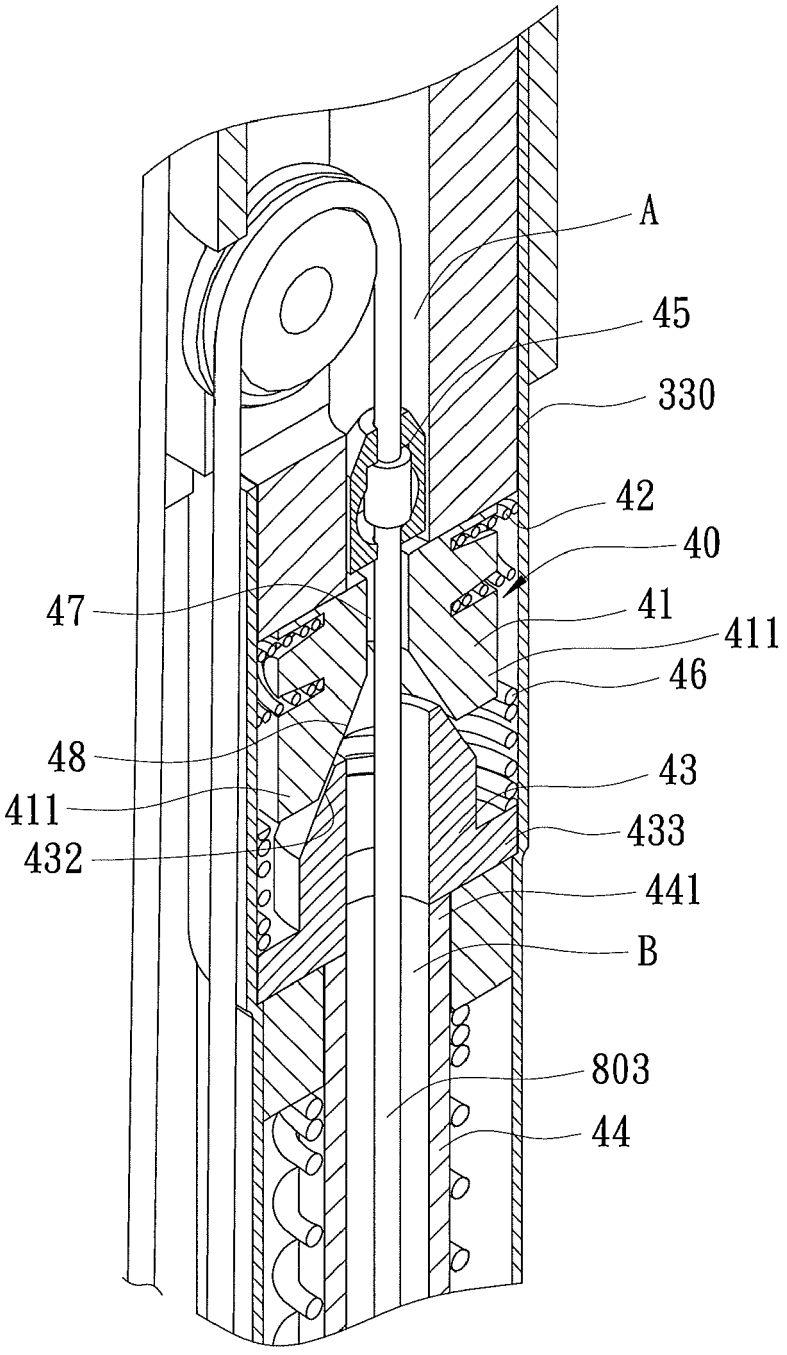


FIG. 5

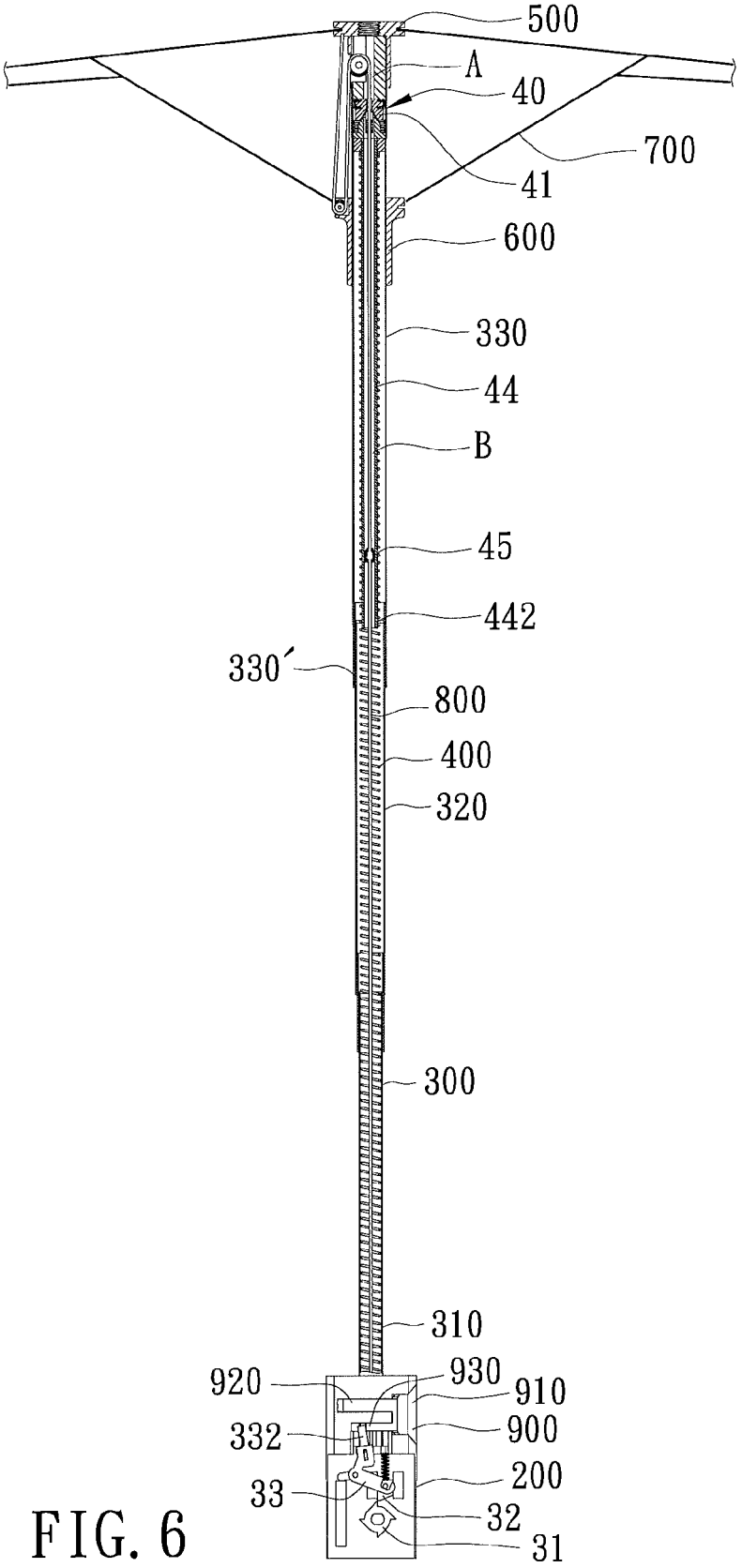
500
A
40
700
41
600
330
44
B
45
442
330'
800
400
320
300
310
920
930
910
332
900
200
33
32
31

FIG. 6

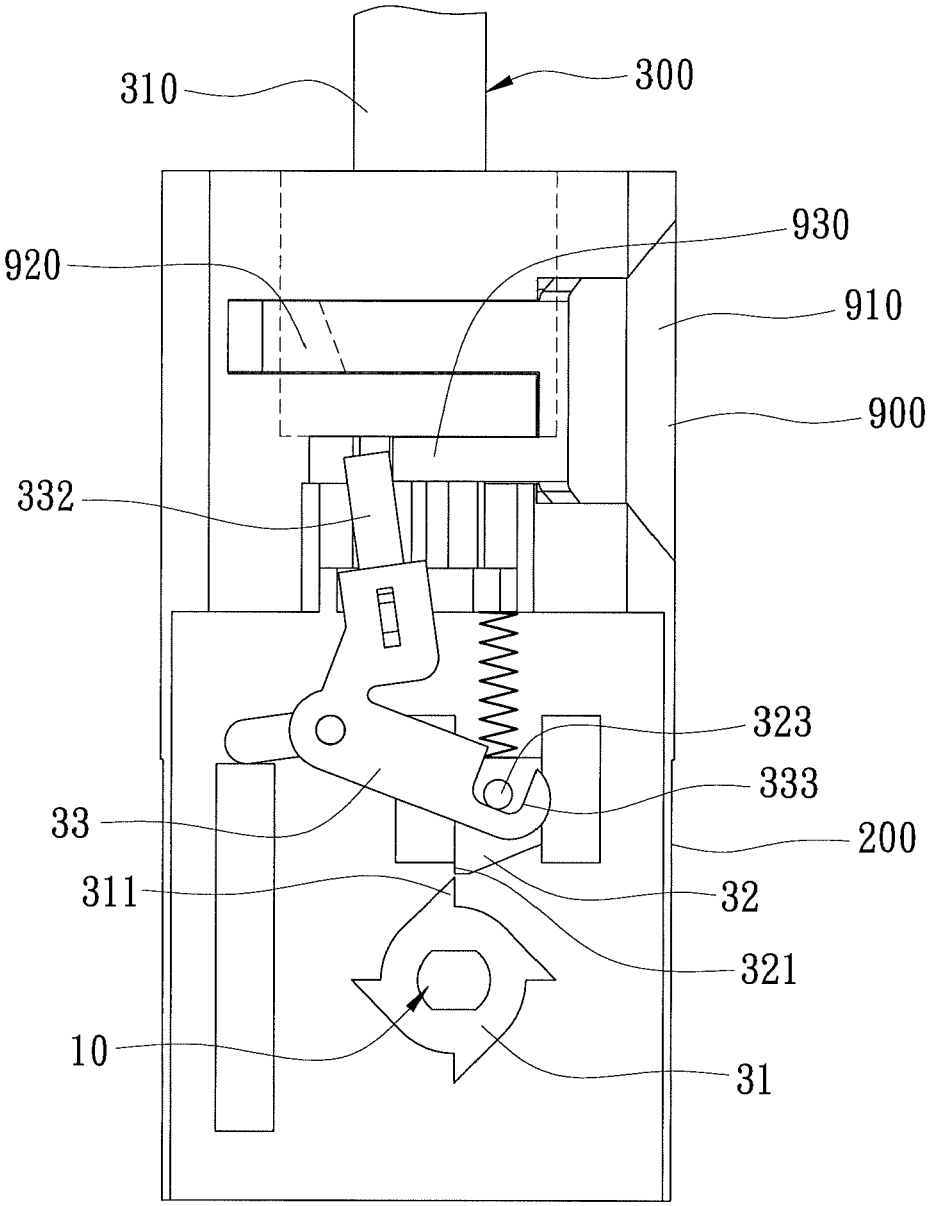


FIG. 7

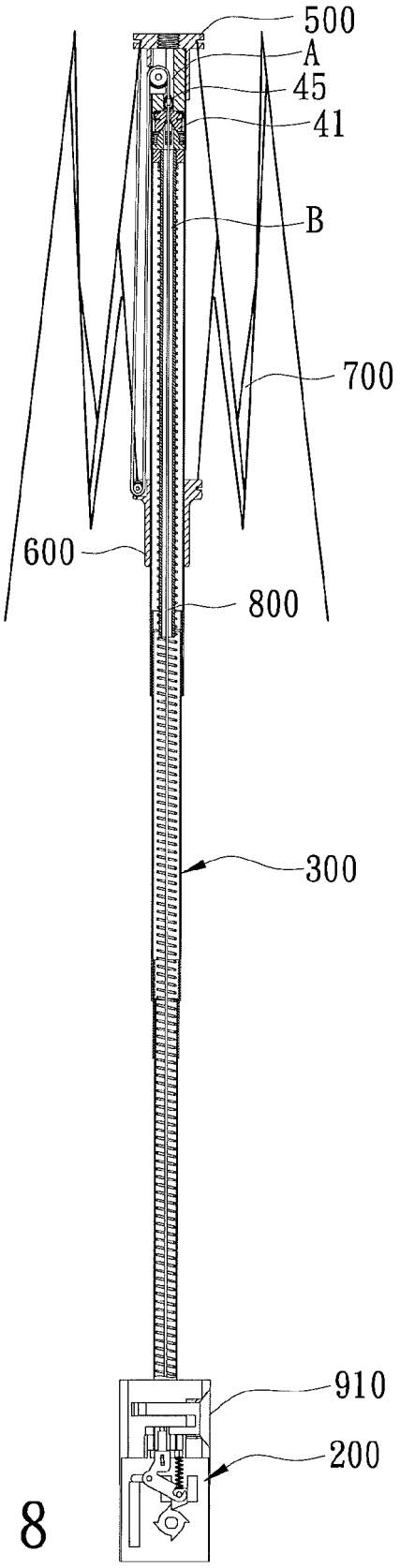


FIG. 8

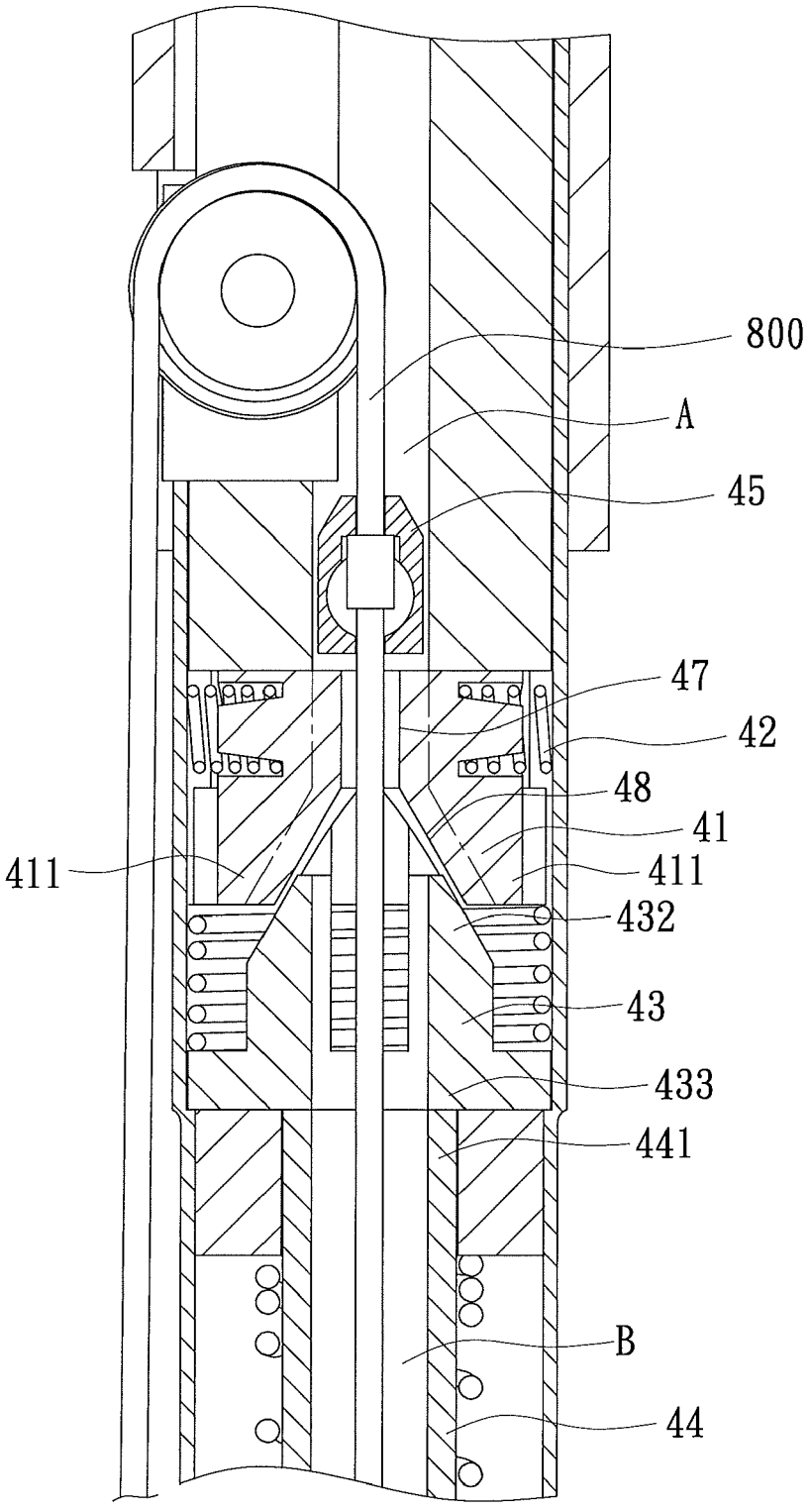


FIG. 9

Europäisches Patentamt
European Patent Office
Office européen des brevets

# EUROPEAN SEARCH REPORT

Application Number
EP 10 15 7384

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
|---|---|---|---|
| A,D | US 2009/133729 A1 (CHONG J J [CN]) 28 May 2009 (2009-05-28) * paragraphs [0005], [0006], [0013], [0028] - [0031], [0035], [0037], [0041] - [0043], [0047], [0048] * * figures 1-3, 8,11 * | 1-9 | INV. A45B25/00 A45B25/12 A45B25/14 |
| A,D | & CN 101 438 877 A (XIAMEN FUTA GINGHAM CO LTD [CN]) 27 May 2009 (2009-05-27) * abstract * | 1-9 | |
| A | US 5 626 161 A (LIN CHUNG-KUANG [TW] ET AL) 6 May 1997 (1997-05-06) * column 1, lines 30-45 * * column 2, lines 10-47 * * column 2, line 48 - column 3, line 17 * * figures 1,1A, 2 * | 1-9 | |
| A | US 5 441 065 A (LIN CHUNG-KUANG [TW] ET AL) 15 August 1995 (1995-08-15) * column 1, lines 32-49 * * column 2, lines 9-45 * * column 4, lines 47-68 * * figure 1 * | 1-9 | TECHNICAL FIELDS SEARCHED (IPC) A45B |
| A,P | CN 201 303 659 Y (XIUHUI CHEN [CN]) 9 September 2009 (2009-09-09) * abstract * * pages 9-14 * * figure 4 * | 1-9 | |

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| The Hague | 27 October 2010 | Faymann, Juan |

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

## ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 10 15 7384

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

27-10-2010

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| US 2009133729 A1 | 28-05-2009 | CN 101438877 A | 27-05-2009 |
| | | DE 102008057825 A1 | 25-06-2009 |
| | | JP 2009125581 A | 11-06-2009 |
| US 5626161 A | 06-05-1997 | NONE | |
| US 5441065 A | 15-08-1995 | CA 2132602 A1 | 09-05-1995 |
| | | US 5390686 A | 21-02-1995 |
| CN 201303659 Y | 09-09-2009 | EP 2183991 A1 | 12-05-2010 |
| | | JP 2010110614 A | 20-05-2010 |
| | | KR 20100052389 A | 19-05-2010 |
| | | US 2010116304 A1 | 13-05-2010 |

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

## REFERENCES CITED IN THE DESCRIPTION

*This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.*

### Patent documents cited in the description


- CN 200710009892 **[0002]**