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(54) **Door closing sequence controller**

(57) A door closing sequence controller (10) utilized to control closing sequence between a leading panel (F) having a first door closer (C1) and a trailing panel (M) having a second door closer (C2), comprises a first actuator mechanism (11), a second actuator mechanism (12), a fixing base (13) disposed between the first actuator mechanism (11) and the second actuator mechanism (12), a movable base (14) disposed at the fixing base (13), a locking mechanism (15) disposed in the movable base (14), and a blocking pin (16), the movable base (14) comprises an accommodating space (145), the blocking pin (16) is disposed in the accommodating space (145), the locking mechanism (15) remains clamping the second actuator mechanism (12) till the first actuator mechanism (11) interacts with the locking mechanism (15), such that the locking mechanism (15) can release the second actuator mechanism (12) from clamping.

able base (14), and a blocking pin (16), the movable base (14) comprises an accommodating space (145), the blocking pin (16) is disposed in the accommodating space (145), the locking mechanism (15) remains clamping the second actuator mechanism (12) till the first actuator mechanism (11) interacts with the locking mechanism (15), such that the locking mechanism (15) can release the second actuator mechanism (12) from clamping.

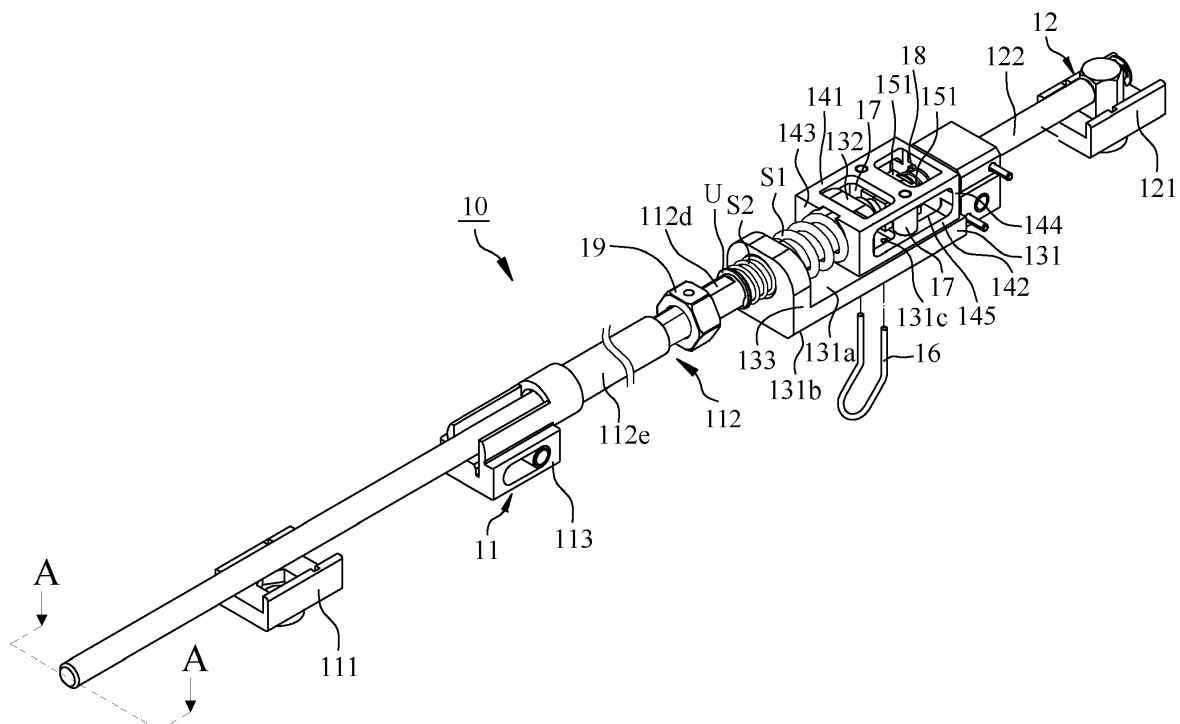


FIG. 4

Description

FIELD OF THE INVENTION

[0001] The present invention generally relates to a door closing sequence controller, and more particularly to a door closing sequence controller that utilizes a locking mechanism to achieve door sequence control.

BACKGROUND OF THE INVENTION

[0002] In doors with at least two door panels there is a leading panel and a trailing panel. Because of different structures and functions the leading panel and trailing panel must close in sequence, i.e. the leading panel is closed before the trailing panel. It has to be made sure that the leading panel and the trailing panel can be closed in sequence by a user. Fig. 1 shows a conventional door selector for a double door which is known from DE 10111732 A1 to assist a user to correctly close the leading door and the trailing door, wherein a sliding rod R connected with the trailing door is penetrated through a circular plate O. The mobility and door closing sequence of the sliding rod R can be controlled by adjusting swing angles of the circular plate O. When the leading panel and the trailing panel are both open, swing angles of the circular plate O are greater than zero degree (cf. dashed line in Fig. 1). The sliding rod R may be blocked by the circular plate O to enable the sliding rod R to be unable to move, so that the trailing panel can be prevented from closing in advance. Comparatively, when the leading panel closes in advance, swing angle of the circular plate O can be adjusted to zero degree solid line to release the sliding rod R. Due to the sliding rod R is capable of moving without limitation, the trailing panel can be closed smoothly. However, conventional circular plate O possesses thinner structure and small contact area contacted with the sliding rod R which may cause stress concentration to deform the circular plate O after long-term usage, and the function of door closing sequence may be failed.

SUMMARY

[0003] The object of the present invention is to increase the lifetime of a door closing sequence controller.

[0004] This technical problem is solved by a door closing sequence controller according to claim 1. Advantageous embodiments are indicated in further claims.

[0005] The door closing sequence controller according to the present invention can be used to control the closing sequence between a leading panel having a first door closer and a trailing panel having a second door closer. It comprises a first actuator mechanism connected with the first door closer, a second actuator mechanism connected with the second door closer, a fixing base disposed between the first actuator mechanism and the second actuator mechanism, a movable base movably dis-

posed at the fixing base, a locking mechanism movably disposed in the movable base, and a blocking pin selectively disposed into an accommodating space of the movable base. The locking mechanism remains clamping the second actuator mechanism until the first actuator mechanism interacts with the locking mechanism, such that the locking mechanism can release the second actuator mechanism from clamping. The blocking pin may contact against the locking mechanism to prevent the locking mechanism from moving relative to the movable base.

[0006] This invention may utilize the locking mechanism to tightly clamp the second actuator mechanism thereby preventing the second actuator mechanism from moving. When a user intends to close the trailing panel in advance, for the reason that the second actuator mechanism is incapable of moving, the trailing panel can be kept from closing in advance. Instead, when a user closes the leading panel in advance, the locking mechanism can be pushed by the first actuator mechanism to enable the second actuator mechanism to disengage with the locking mechanism. Meanwhile, the second actuator mechanism can be restored into a movable state and the trailing panel can be closed fluently. Besides, the contact area between the locking mechanism and the second actuator mechanism is substantially increased, therefore, the suppression force applied to the second actuator mechanism can be raised and the lifetime of the door closing sequence controller can be effectively extended.

DESCRIPTION OF THE DRAWINGS

[0007]

FIG 1 is a structure diagram of conventional door closing sequence controller.

FIG 2 is a deployment diagram illustrating a door closing sequence controller in accordance with a preferred embodiment of the present invention.

FIG 3 is a perspective exploded view illustrating the door closing sequence controller in accordance with a preferred embodiment of the present invention.

FIG 4 is a perspective assembly view illustrating the door closing sequence controller in accordance with a preferred embodiment of the present invention.

FIG 5 is a section view along line A-A of FIG 4 illustrating the door closing sequence controller in accordance with a preferred embodiment of the present invention.

FIG. 5A is a partial enlargement view of FIG 5 illustrating the door closing sequence controller in accordance with a preferred embodiment of the present invention.

FIG 6 is an action diagram illustrating the door closing sequence controller in accordance with a preferred embodiment of the present invention.

FIG 6A is a partial enlargement view of FIG 6 illustrating the door closing sequence controller in accordance with a preferred embodiment of the present invention.

FIG 7 is another action diagram illustrating the door closing sequence controller in accordance with a preferred embodiment of the present invention.

FIG 7A is a partial enlargement view of FIG 7 illustrating the door closing sequence controller in accordance with a preferred embodiment of the present invention.

FIG 8 is another three dimensional view showing a first action for disengaging the closing sequence function of the door closing sequence controller in accordance with a preferred embodiment of the present invention.

FIG 9 is another three dimensional view showing a second action for disengaging the closing sequence function of the door closing sequence controller in accordance with a preferred embodiment of the present invention.

FIG 10 is another three dimensional view showing a third action for disengaging the closing sequence function of the door closing sequence controller in accordance with a preferred embodiment of the present invention.

FIG 11 is another section view illustrating the door closing sequence controller in accordance with a preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0008] With reference to Figs. 2, 3 and 4, a door closing sequence controller 10, in accordance with a preferred embodiment of the present invention used to control closing sequence between a leading panel F having a first door closer C1 and a trailing panel M having a second door closer C2, comprises a first actuator mechanism 11 connected with the first door closer C1, a second actuator mechanism 12 connected with the second door closer C2, a fixing base 13 disposed between the first actuator mechanism 11 and the second actuator mechanism 12, a movable base 14, a locking mechanism 15 and a blocking pin 16.

[0009] The first actuator mechanism 11 comprises a first sliding block 111 connected with the first door closer C1 of the leading panel F and a pushing block 113 capable of being contacted against the first sliding block

111, and the second actuator mechanism 12 comprises a second sliding block 121 connected with the second door closer C2 of the trailing panel M and a rod 122 linked to the second sliding block 121.

[0010] The fixing base 13 comprises a bottom plate 131 having a top surface 131a, a bottom surface 131b and at least one combination hole 131c in contact with the top surface 131a and the bottom surface 131b, the movable plate 14 is movably disposed at the bottom plate 131 of the fixing base 13 and comprises an accommodating space 145, and the locking mechanism 15 is movably disposed in the accommodating space 145 of the movable base 14.

[0011] The blocking pin 16 is selectively disposed into the accommodating space 145 of the movable base 14, especially into the combination hole 131c of the fixing base 13 and protruded to the top surface 131a of the fixing base 13 to contact against the locking mechanism 15 to prevent the locking mechanism 15 from moving relative to the movable plate 14. In this embodiment, the movable base 14 is disposed between the first actuator mechanism 11 and the second actuator mechanism 12.

[0012] The locking mechanism 15 remains clamping the second actuator mechanism 12 until the first actuator mechanism 11 interacts with the locking mechanism 15, such that the locking mechanism 15 can release the second actuator mechanism 12 from clamping.

[0013] The fixing base 13 further comprises a blocking plate 132 formed on the bottom plate 131, a supporting plate 133 formed on the bottom plate 131, the movable plate 14 further comprises an upper plate 141, a lower plate 142, a first lateral plate 143 and a second lateral plate 144, wherein the blocking plate 132 is passed into the lower plate 142 and located at the accommodating space 145 of the movable base 14, the first lateral plate 143 is in contact with the upper plate 141 and the lower plate 142, the second lateral plate 144 is disposed relative to the first lateral plate 143, the first lateral plate 143 of the movable base 14 is movable between the supporting plate 133 and the blocking plate 132, and the accommodating space 145 is formed between the upper plate 141 and the lower plate 142.

[0014] Referring to Figs. 3, 4 and 5, in this embodiment, the door closing sequence controller 10 further comprises a pair of rollers 17 pivotally disposed at the accommodating space 145 of the movable base 14, each of the rollers 17 is located between the upper plate 141 and the lower plate 142.

[0015] The locking mechanism 15 comprises a pair of locking elements 151 located between each of the rollers 17, each of the locking elements 151 comprises a first lateral surface 15a in contact against each of the rollers 17, a second lateral surface 15b corresponded to the first lateral surface 15a and an arc slot 152 recessed into the second lateral surface 15b, wherein the rod 122 penetrates through the arc slots 152, and each of the first lateral surfaces 15a is a ramp surface 15c. Each of the first lateral surfaces 15a further has two flat surfaces 15d

formed at two lateral sides of the ramp surface 15c, each of the rollers 17 is restrained to move along the ramp surface 15c between the two flat surfaces 15d, each of the arc slots 152 has an arc wall 152a, and each of the arc walls 152a is in contact against the rod 122.

[0016] The door closing sequence controller 10 further comprises a first spring 18 disposed at the accommodating space 145 of the movable base 14, one end of the first spring 18 is in contact against each of the locking elements 151, preferably, the first spring 18 is disposed between each of the locking elements 151 and the second lateral plate 144 of the movable base 14. Besides, the first actuation mechanism 11 further comprises a tube 112 driven by the first sliding block 111 which contacting against the pushing block 113 such that the first sliding block 111 and the pushing block 113 can move together, wherein the rod 122 penetrates the accommodating space 145 of the movable base 14 via the first lateral plate 143 and movably inserts into a second end 112b of the tube 112. The tube 112 is two-parts assembled and penetrated through the supporting plate 133 and the blocking plate 132 of the fixing base 13, a first end 112a of the tube 112 is faced toward the pushing block 113 of the first actuator mechanism 11, and the second end 112b of the tube 112 is faced toward each of the locking elements 151 and located in the accommodating space 145 of the movable base 14. In this embodiment, the second end 112b may contact against each of the locking elements 151. The tube 112 comprises a hollow chamber 112c, the rod 122 is penetrated through the hollow chamber 112c of the tube 112, and the length of the tube 112 can be adjusted by inserting a first part 112d into a second part 112e. An adjusting nut 19 is mounted on the first part 112d by screwing a screw 19a. Except mentioned design applying with the adjusting nut 19 and the screw 19a, we may also apply the first part 112d with external screw thread disposed thereon and the adjusting nut 19 with internal screw thread disposed therein to enable the adjusting nut 19 to fix at the first part 112d.

[0017] In addition, the door closing sequence controller 10 further comprises a sleeve 20 disposed at the supporting plate 133 for supporting the tube 112, the supporting plate 133 of the fixing base 13 has an open 13a to fit the sleeve 20, thus the tube 112 is penetrated through the open 13a and supported by the sleeve 20. Additionally, the door closing sequence controller 10 further comprises a clamping member 21 having two retention supports 211 in contact against each of the locking elements 151 toward the rod 122. Via mentioned retention supports 211, each of the locking elements 151 can be limited from continuously moving toward the movable base 14 and departing from the clamping member 21.

[0018] Referring to Figs. 3, 4 and 5, in this embodiment, the door closing sequence controller 10 further comprises a second spring S1, a retaining ring U and a third spring S2. The second spring S1 is disposed between the supporting plate 133 of the fixing base 13 and the first lateral plate 143 of the movable base 14, and two

ends of the second spring S1 are in contact against the supporting plate 133 and the first lateral plate 143 separately. Preferably, the first lateral plate 143 of the movable plate 14 has a recess 143a, and one end of the second spring S1 is disposed into the recess 143a of the first lateral plate 143. Besides, in this embodiment, the first lateral plate 143 may be blocked by the blocking plate 132 to enable the second spring S1 to have the best acting force applied to the movable base 14. The retaining ring U is assembled onto the tube 112, the third spring S2 is disposed around the tube 112, one end of the third spring S2 is in contact against the supporting plate 133 of the fixing base 13, and another end of the third spring S2 is in contact against the retaining ring U.

[0019] With regard to the action of the door closing sequence controller 10, please refer to Figs. 2, 5, 5A, 6 and 6A. First, Figs. 2, 5 and 5A indicate components diagram of the door closing sequence controller 10 when the leading panel F and the trailing panel M are both open, wherein each of the locking elements 151 can be pushed by the first spring 18 and thereafter located between each of the rollers 17, each of the locking elements 151 can be pressed to the other by limitation of each of the rollers 17 as a clamping state, then the rod 122 is capable of being clamped by the arc walls 152a of the arc slots 152 to enable the rod 122 to be unable to move thereby preventing the trailing panel M from being closed in advance.

[0020] Next, referring to Figs. 2, 6 and 6A, when the leading panel F is closed, the first sliding block 111 of the first actuator mechanism 11 is driven by the first door closer C1, the first sliding block 111 of the first actuator mechanism 11 contacts against the pushing block 113 to move toward the fixing base 13. Sequentially, the pushing block 113 may actuate the second part 112e of the tube 112 to push the adjusting nut 19 to move. Owing to the adjusting nut 19 being tightly screwed onto the first part 112d of the tube 112, so that the first part 112d moves as well, and the second end 112b may push the locking elements 151. Therefore, the locking elements 151 may slightly depart from the rollers 17 and compress the first spring 18. When the locking elements 151 are slightly departed from each of the rollers 17, the clamping state of the locking elements 151 is disengaged. Meanwhile, the arc wall 152a of each of the arc slots 152 may loosen the rod 122, i.e. the rod 122 will not be clamped by each of the locking elements 151 and will be free to move to enable the trailing panel M to close smoothly. In this embodiment, when each of the locking elements 151 is pushed by the tube 112, the third spring S2 may be compressed by the retaining ring U. In addition, when the leading panel F and the trailing panel M are reopened, the retaining ring U may be pushed by the third spring S2 so that the tube 112 can be restored.

[0021] With reference to Figs. 2, 7 and 7A, in order to prevent a destruction from forcibly closing the trailing panel M in advance, when the closing force of the trailing panel M is greater than the tension force of the second

spring S1, the movable base 14 and the rollers 17 may move toward the supporting plate 133 of the fixing base 13, the second spring S1 can be pushed by the movable base 14, and each of the locking elements 151 is movable toward the tube 112. The locking elements 151 are blocked to stop moving when each of the locking elements 151 is in contact against the tube 112, the movable base 14 and the rollers 17 may continue to move toward the supporting plate 133, and each of the locking elements 151 is loose gradually from each of the rollers 17 and disengaged from the clamping state. Meanwhile, the rod 122 is loose from the arc wall 152a of each of the arc slots 152 so that the trailing panel M can be forcibly closed thereby preventing the door closing sequence controller 10 from destruction.

[0022] To disengage the closing sequence can be referred to Fig. 8. First, maintaining the trailing panel M and the leading panel F into an open state. Then, disengaging a screwed state of the adjusting nut 19 originally screwed by the screw 19a and enabling the adjusting nut 19 to move toward the direction of the fixing base 13 till the second part 112e of the tube 112 pushed by the pushing block 113 incapable of contacting the adjusting nut 19. Referring to Fig. 9, after that, actuating the first part 112d of the tube 112 to move toward the fixing base 13 thereby pushing the locking elements 151. Therefore, the locking elements 151 may slightly depart from the rollers 17 and the clamping state of the locking elements 151 is disengaged, at the same time, the blocking pin 16 is disposed into the combination holes 131c and protruded to the top surface 131a to limit the locking elements 151 from moving. Then, with reference to Fig. 10, loosening the first part 112d of the tube 112 and inserting the blocking pin 16 more deeply, on the other hand, the third spring S2 provides elasticity to actuate the first part 112d to move toward the first sliding block 111. Owing to the locking elements 151 being limited by the blocking pin 16, the locking elements 151 can not move and remain in the disengaged state even if the elasticity of the first spring 18 is provided. By utilizing mentioned operation, when the leading panel F and the trailing panel M are both open, one end of each of the locking elements 151 is capable of being pushed by the first spring 18, however, another end of each of the locking elements 151 is blocked by the blocking pin 16 to stop moving toward the direction of the supporting plate 133 of the fixing base 13. Therefore, the rod 122 is not able to be clamped by the locking elements 151. Besides, the rod 122 can be moved back and forth without limitation so that the function of door closing sequence can be effectively disengaged. As a result, the trailing panel M may close itself and is independent of the movement of the leading panel F. With reference to Fig. 11, for the reason that the screwing position of the adjusting nut 19 has changed, the second part 112e can not contact and push the adjusting nut 19 even if the leading panel F closes in advance to enable the first sliding block 111 to contact against the pushing block 113. Therefore, the first part 112d of the tube 112

will not be actuated and may not contact the locking elements 151 while the leading panel F closes in advance. Eventually, the clamping state of the locking elements 151 can remain disengage.

[0023] This invention utilizes the rollers 17 to limit the locking elements 151 and enable the rod 122 to be clamped by the locking elements 151 thereby preventing the rod 122 from moving. When a user tends to close the trailing panel M in advance, for the reason that the rod 122 is incapable of moving, the trailing panel M is not able to close in advance. Comparatively, when a user closes the leading panel F in advance, each of the locking elements 151 may be pushed by the tube 112 to enable each of the locking elements 151 to depart from each of the rollers 17 so that the clamping state can be disengaged. Meanwhile, the rod 122 is restored into a movable state, and the trailing panel M can be closed smoothly. In this invention, the contact area between each of the locking elements 151 and the rod 122 increases substantially, therefore, the suppression force to the rod 122 can be raised and the lifetime of the door closing sequence controller 10 can be effectively extended.

[0024] While this invention has been particularly illustrated and described in detail with respect to the preferred embodiments thereof, it is to be understood that the invention is not limited to the specific embodiments shown and described and that various modifications and changes may be made without departing from the scope of the claims.

Claims

1. A door closing sequence controller (10) used to control closing sequence between a leading panel (F) having a first door closer (C1) and a trailing panel (M) having a second door closer (C2), the door closing sequence controller (10) comprising:
 - a first actuator mechanism (11) connected with the first door closer (C1) of the leading panel (F);
 - a second actuator mechanism (12) connected with the second door closer (C2) of the trailing panel (M);
 - a fixing base (13) disposed between the first actuator mechanism (11) and the second actuator mechanism (12);
 - a movable base (14) movably disposed at the fixing base (13), the movable base (14) comprises an accommodating space (145);
 - a locking mechanism (15) movably disposed in the accommodating space (145) of the movable base (14), wherein the locking mechanism (15) remains clamping the second actuator mechanism (12) until the first actuator mechanism (11) interacts with the locking mechanism (15), such that the locking mechanism (15) can release the second actuator mechanism (12) from clamp-

- ing; and
 a blocking pin (16) selectively disposed into the accommodating space (145) of the movable base (14) to contact against the locking mechanism (15) to prevent the locking mechanism (15) from moving relative to the movable base (14).
2. The door closing sequence controller in accordance with claim 1, **characterized in that** the first actuator mechanism (11) comprises a first sliding block (111) connected with the first door closer (C1) of the leading panel (F) and a tube (112) driven by the first sliding block (111), the second actuator mechanism (12) comprises a second sliding block (121) connected with the second door closer (C2) of the trailing panel (M) and a rod (122) linked to the second sliding block (121).
 3. The door closing sequence controller in accordance with claim 2, **characterized in that** the rod (122) penetrates the accommodating space (145) of the movable base (14) and movably inserts into a second end (112b) of the tube (112).
 4. The door closing sequence controller in accordance with claim 3, **characterized in that** a pair of rollers (17) is pivotally disposed at the accommodating space (145) of the movable base (14), the locking mechanism (15) comprises a pair of locking elements (151) located between each of the rollers (17), the rod (122) penetrates between each of the locking elements (151), and the second end (112b) of the tube (112) is located in the accommodating space (145) of the movable base (14) and may contact against each of the locking elements (151).
 5. The door closing sequence controller in accordance with claim 4, **characterized by** a clamping member (21) having two retention supports (211) in contact against each of the locking elements (151) toward the rod (122).
 6. The door closing sequence controller in accordance with claim 4 or 5, **characterized in that** each of the locking elements (151) comprises a first lateral surface (15a) in contact against each of the rollers (17) and a second lateral surface (15b) corresponding to the first lateral surface (15a), wherein each of the first lateral surfaces (15a) is a ramp surface (15c).
 7. The door closing sequence controller in accordance with claim 6, **characterized in that** each of the first lateral surfaces (15a) has two flat surfaces (15d) formed at two lateral sides of the ramp surface (15c).
 8. The door closing sequence controller in accordance with at least one of claims 2 to 7, **characterized in that** the movable base (14) comprises an upper plate (141), a lower plate (142) and a first lateral plate (143), the first lateral plate (143) is in contact with the upper plate (141) and the lower plate (142), each of the rollers (17) is located between the upper plate (141) and the lower plate (142), and the tube (112) penetrates the accommodating space (145) of the movable base (14) via the first lateral plate (143).
 9. The door closing sequence controller in accordance with claim 8, **characterized in that** the movable base (14) further comprises a second lateral plate (144) disposed relative to the first lateral plate (143), and a first spring (18) is disposed between each of the locking elements (151) and the second lateral plate (144).
 10. The door closing sequence controller in accordance with at least one of claims 1 to 9, **characterized in that** the fixing base (13) comprises a bottom plate (131) which the movable base (14) is movably disposed at, a blocking plate (132) formed on the bottom plate (131), and the blocking plate (132) is passed into the lower plate (142) and located at the accommodating space (145) of the movable base (14).
 11. The door closing sequence controller in accordance with claim 10, **characterized in that** the fixing base (13) comprises a supporting plate (133) formed on the bottom plate (131), the first lateral plate (143) of the movable base (14) is movable between the supporting plate (133) and the blocking plate (132), and two ends of a second spring (S1) are in contact against the supporting plate (133) and the first lateral plate (143) separately.
 12. The door closing sequence controller in accordance with claim 11, **characterized in that** the supporting plate (133) of the fixing base (13) has an open (13a) to fit the sleeve (20), thus the tube (112) is penetrated through the open (13a) and supported by a sleeve (20).
 13. The door closing sequence controller in accordance with claim 11 or 12, **characterized in that** a third spring (S2) is disposed around the tube (112), and one end of the third spring (S2) is in contact against the supporting plate (133) of the fixing base (13).
 14. The door closing sequence controller in accordance with claim 13 **characterized in that** a retaining ring (U) is assembled onto the tube (112), and another end of the third spring (S2) is in contact against the retaining ring (U).
 15. The door closing sequence controller in accordance with one of claims 2 to 14, **characterized in that** the tube (112) is two-parts assembled, and the length of

the tube can be adjusted by inserting a first part (112d) into the a second part (112e).

16. The door closing sequence controller in accordance with one of claims 1 to 15, **characterized in that** the bottom plate (131) of the fixing base (13) has a top surface (131a), a bottom surface (131b) and at least one combination hole (131c) in contact with the top surface (131a) and the bottom surface (131b), wherein the blocking pin (16) is selectively disposed into the combination hole (131c) of the fixing base (13) and protruded to the top surface (131a) of the fixing base (13).

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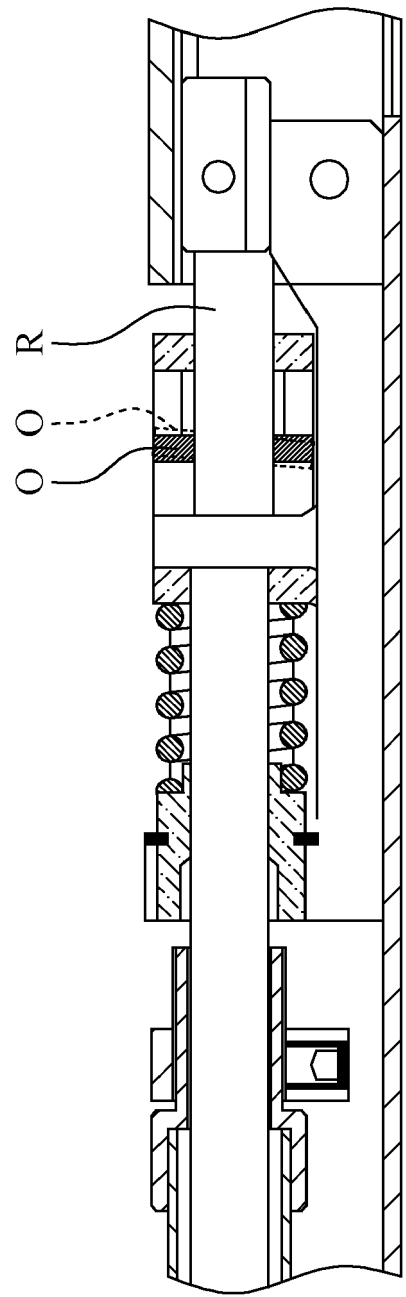


FIG. 1
PRIOR ART

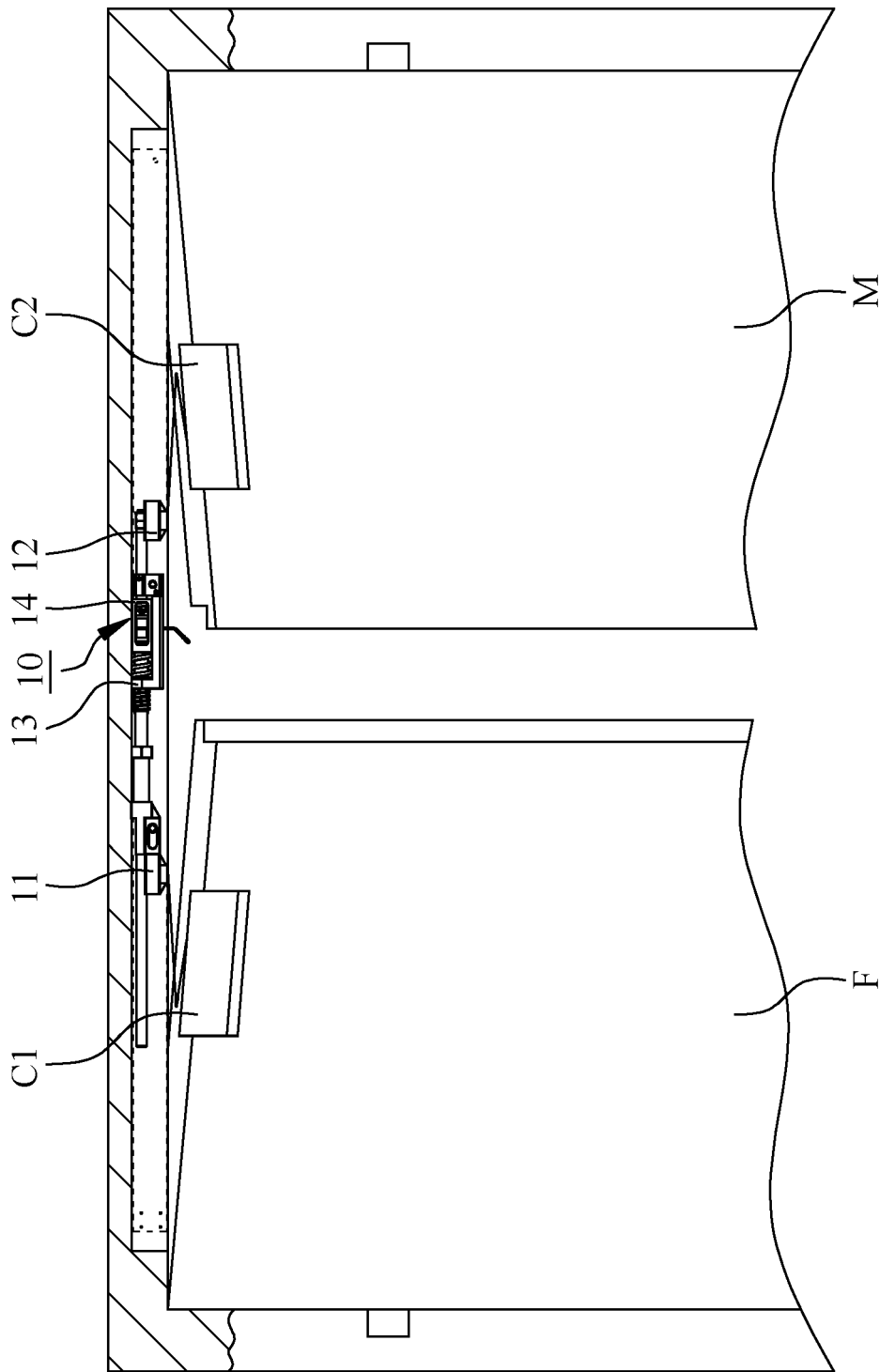


FIG. 2

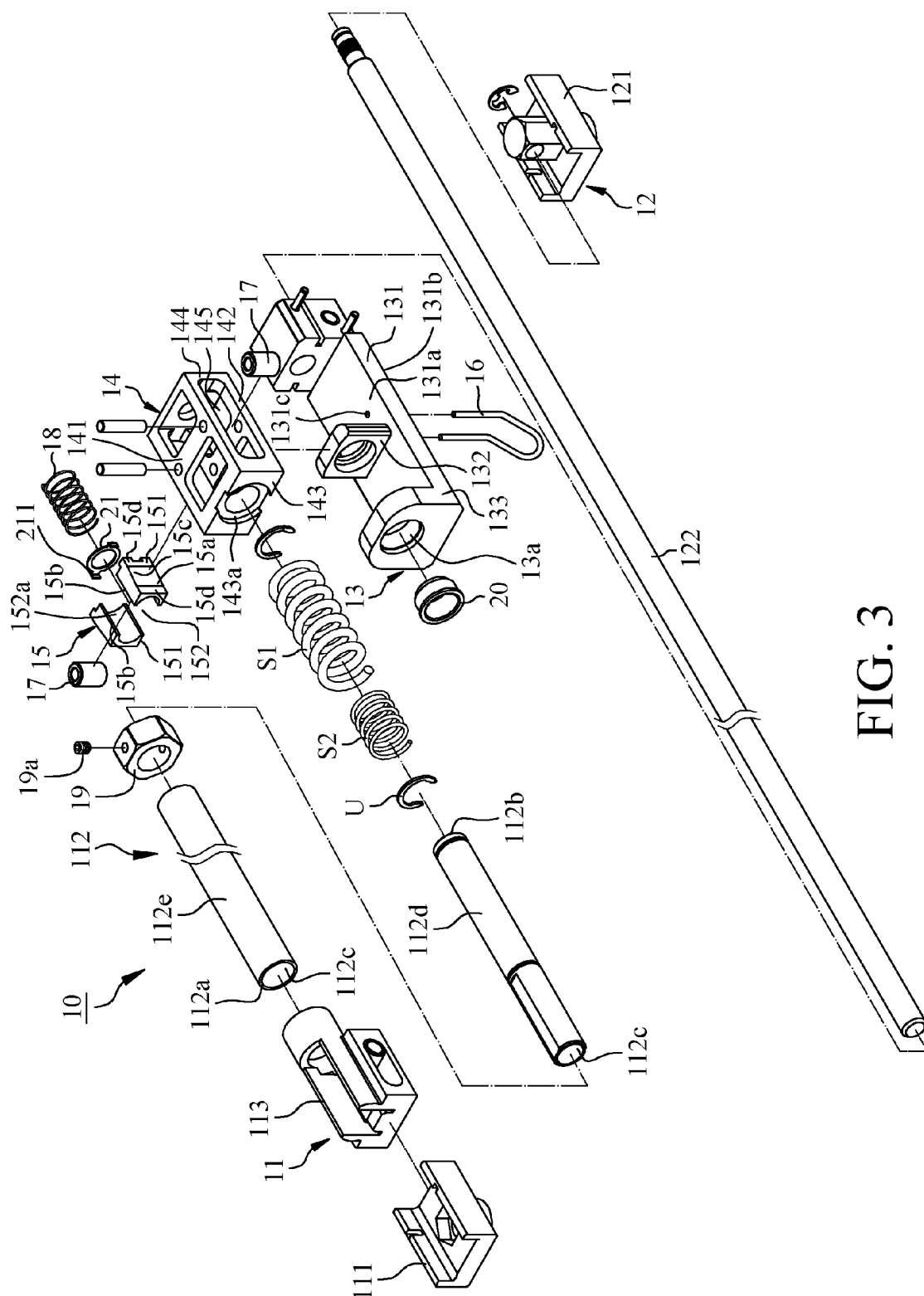


FIG. 3

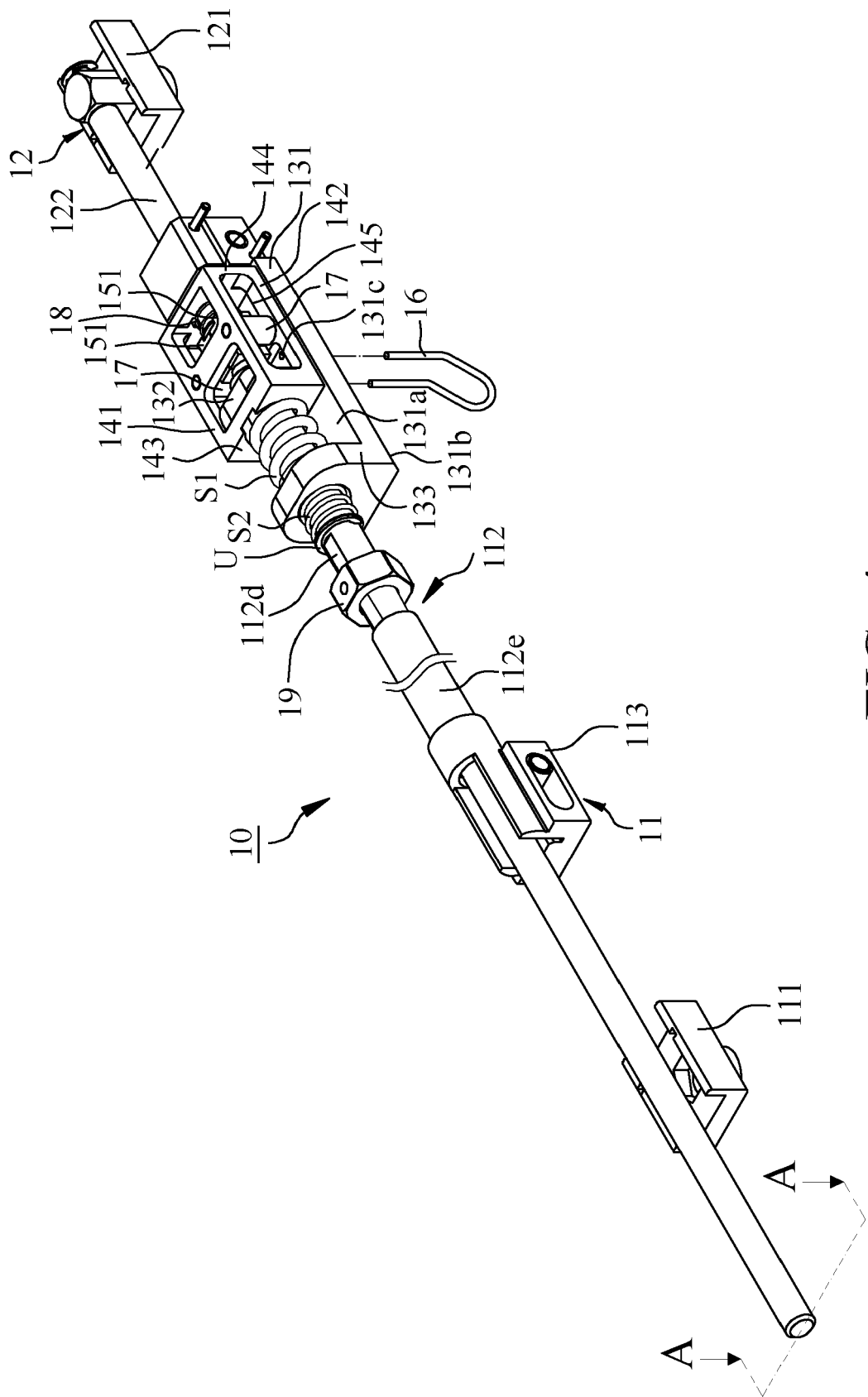


FIG. 4

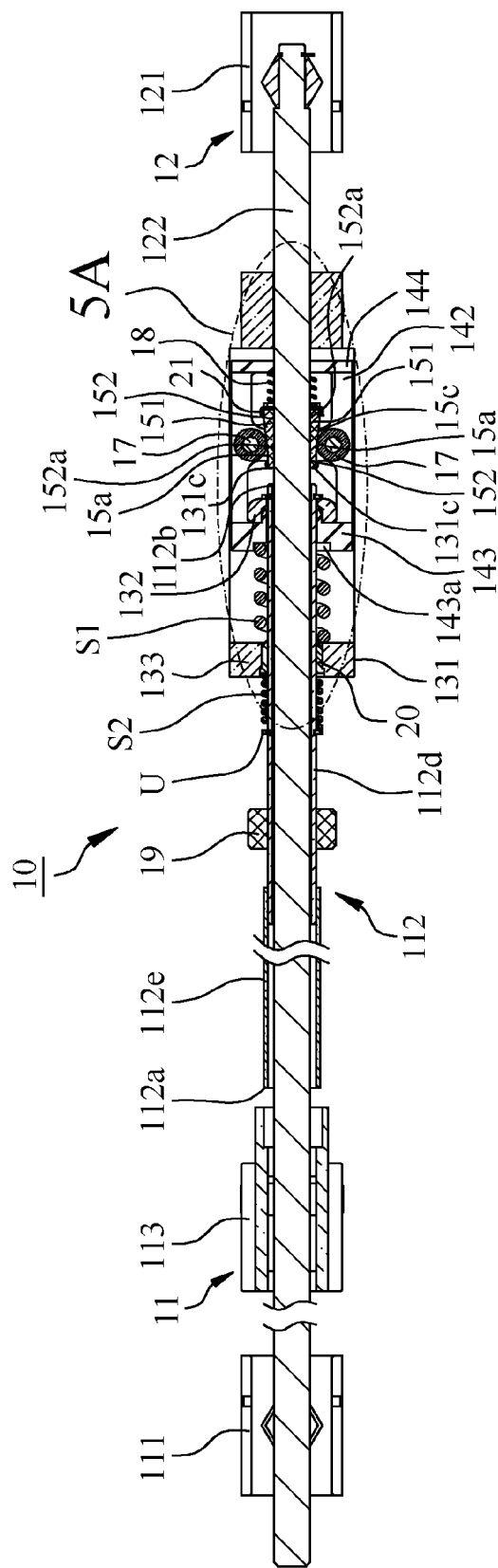


FIG. 5

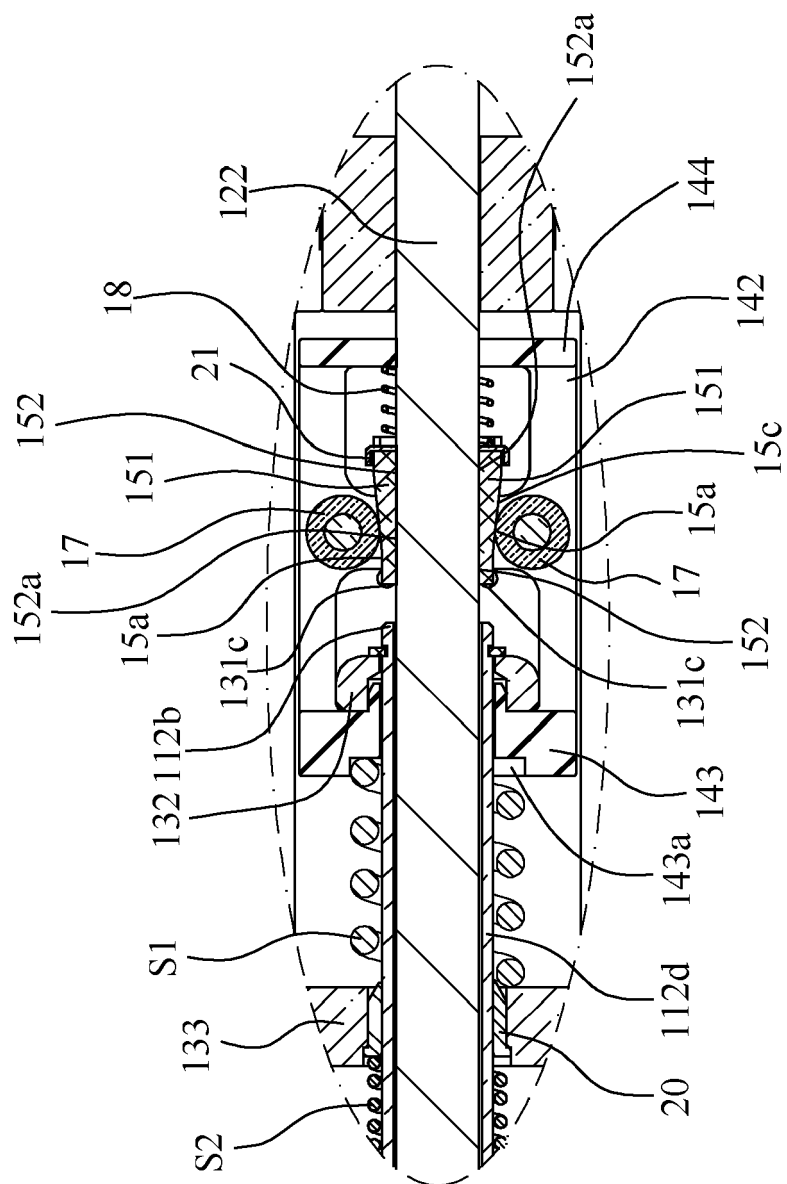
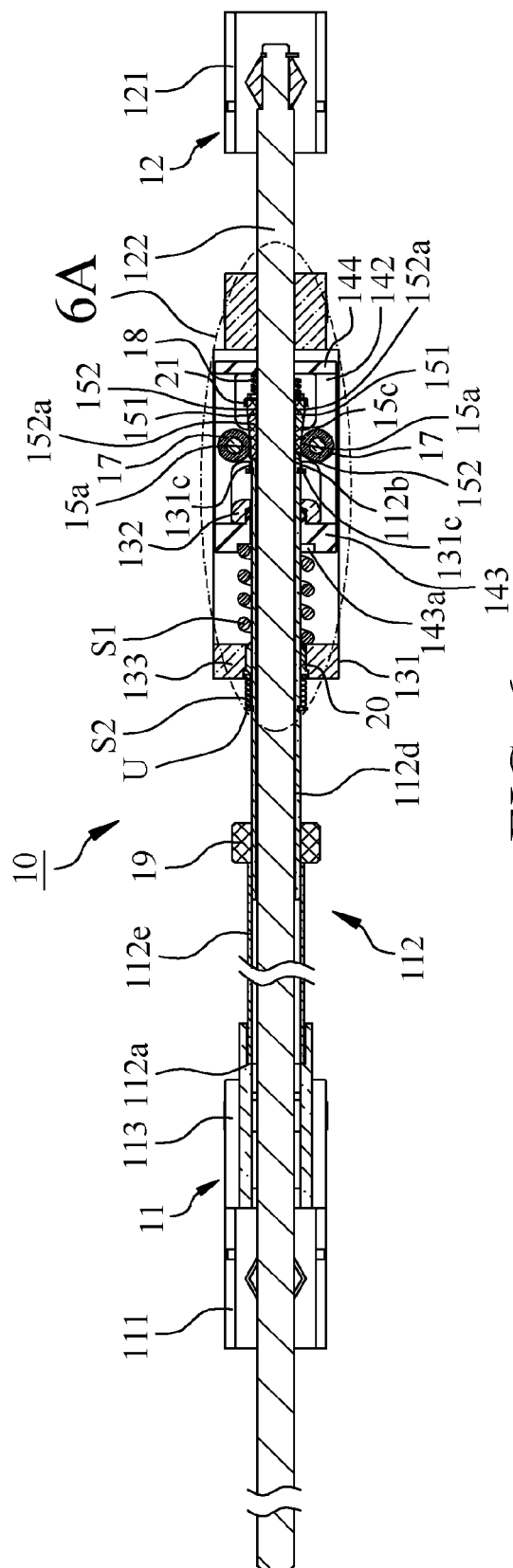


FIG. 5A



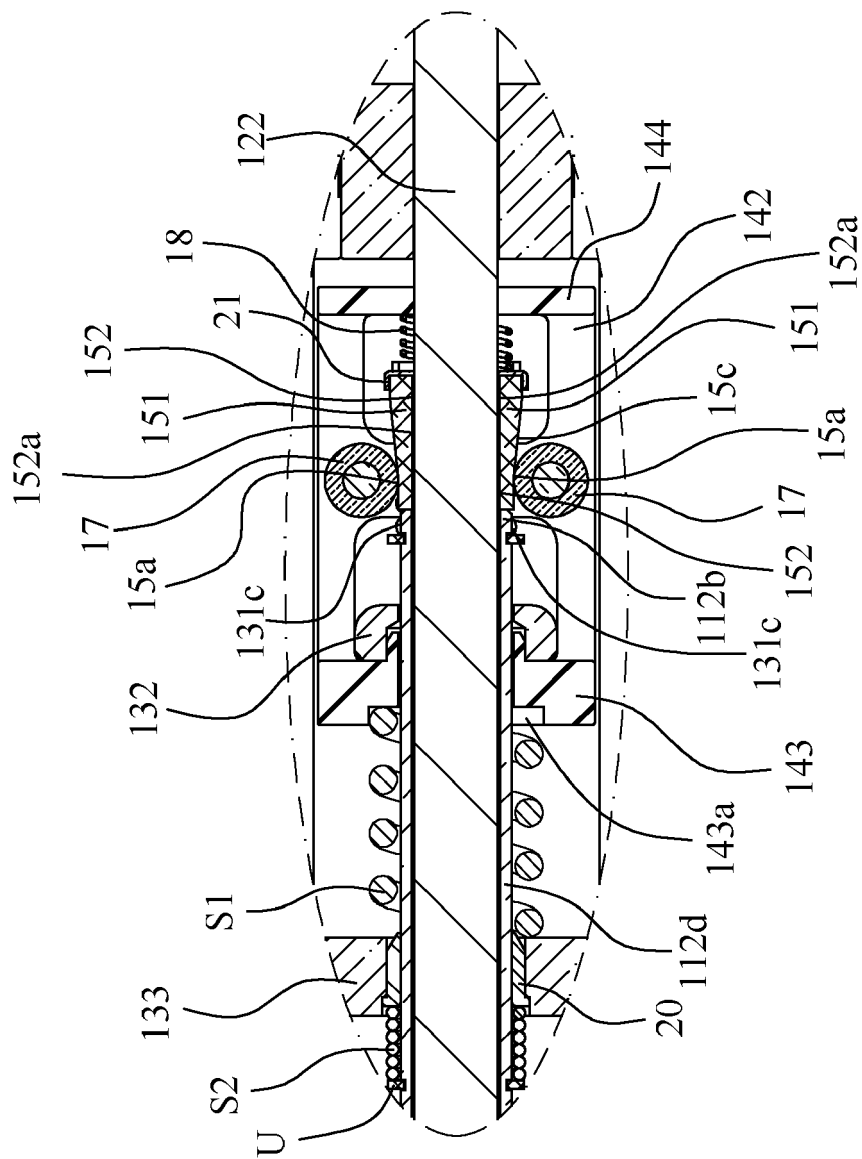


FIG. 6A

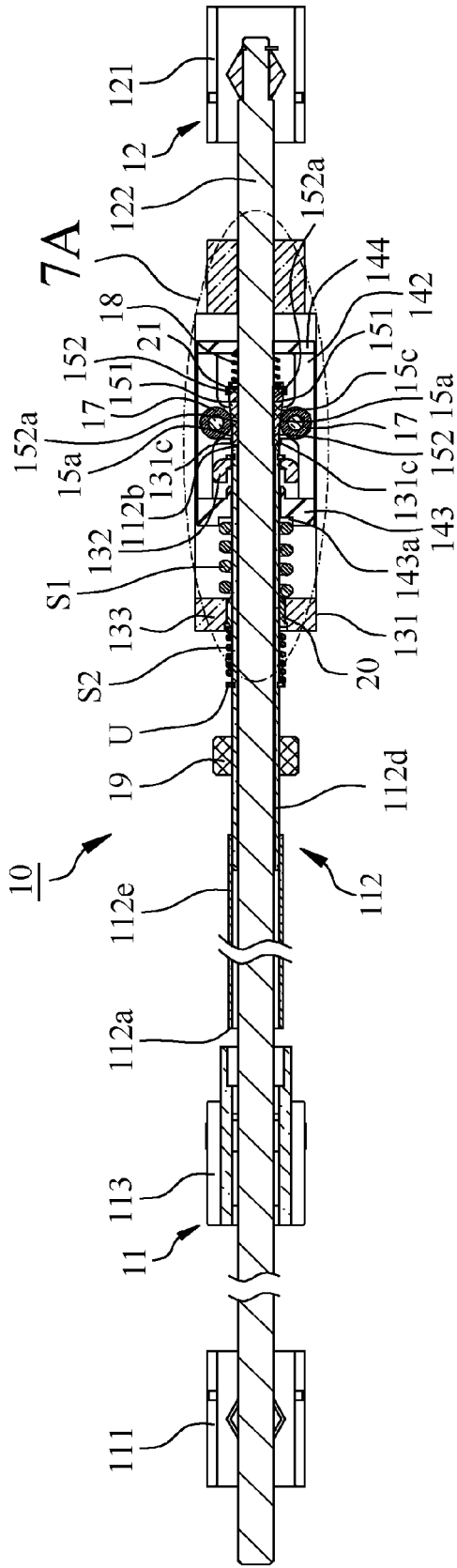


FIG. 7

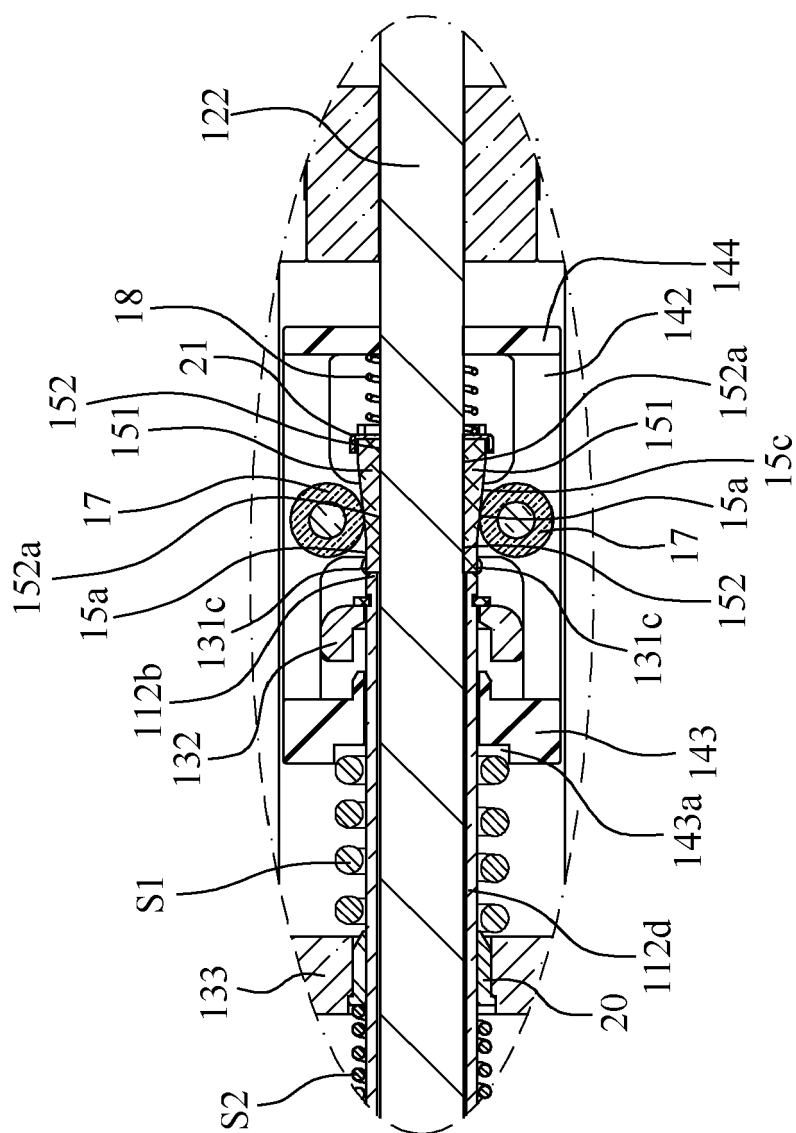


FIG. 7A

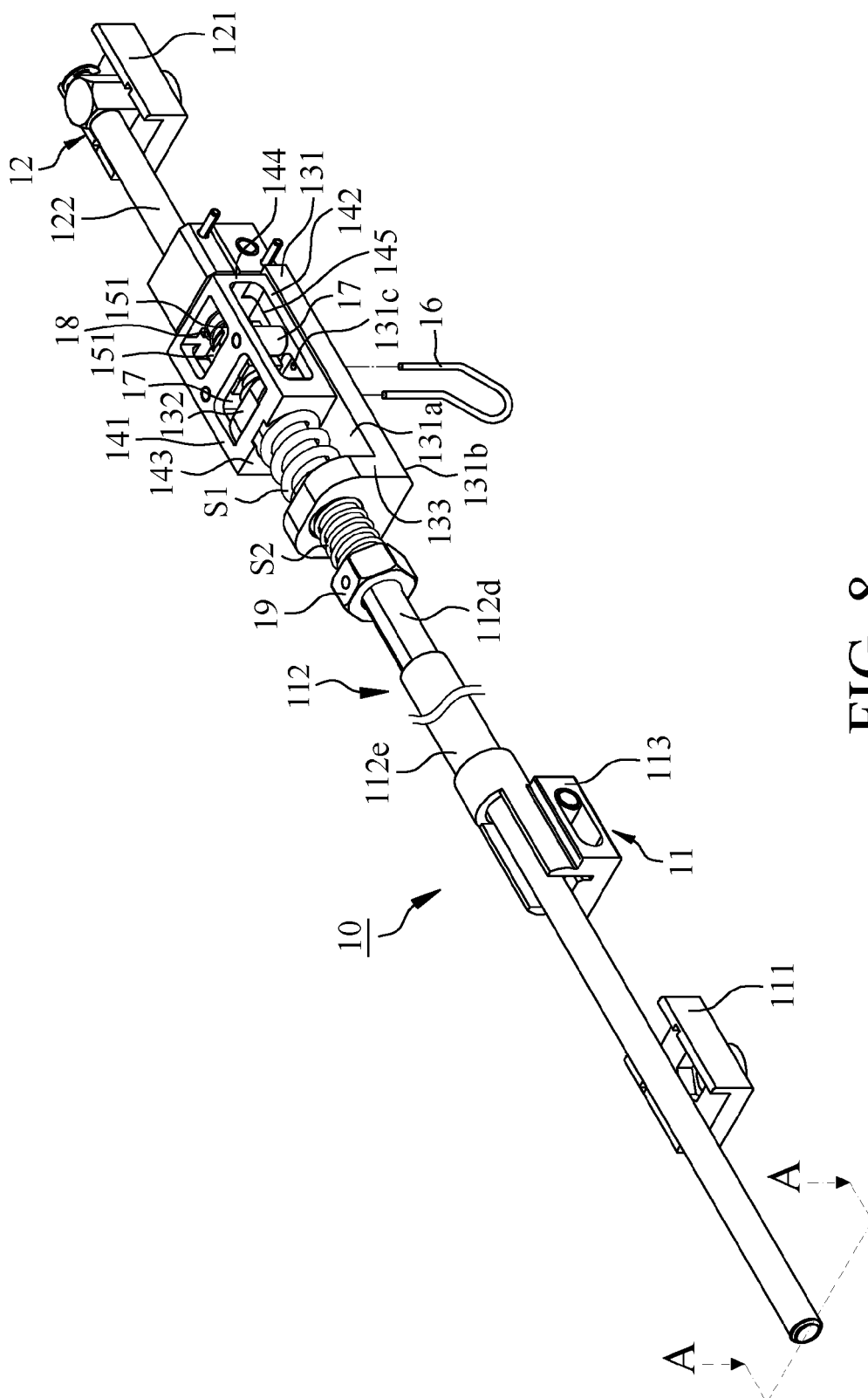


FIG. 8

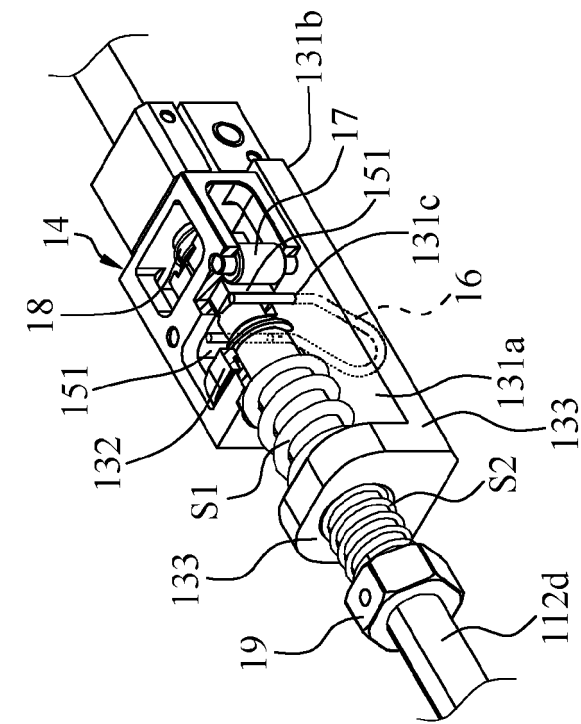


FIG. 10

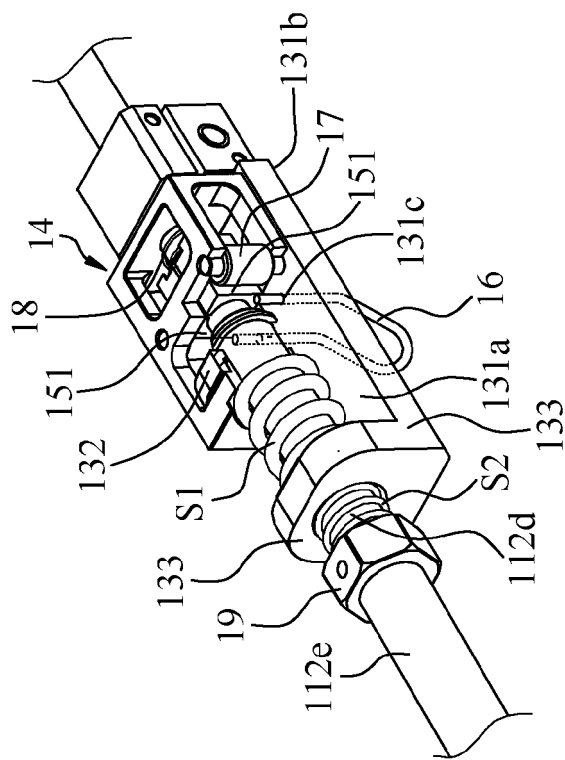


FIG. 9

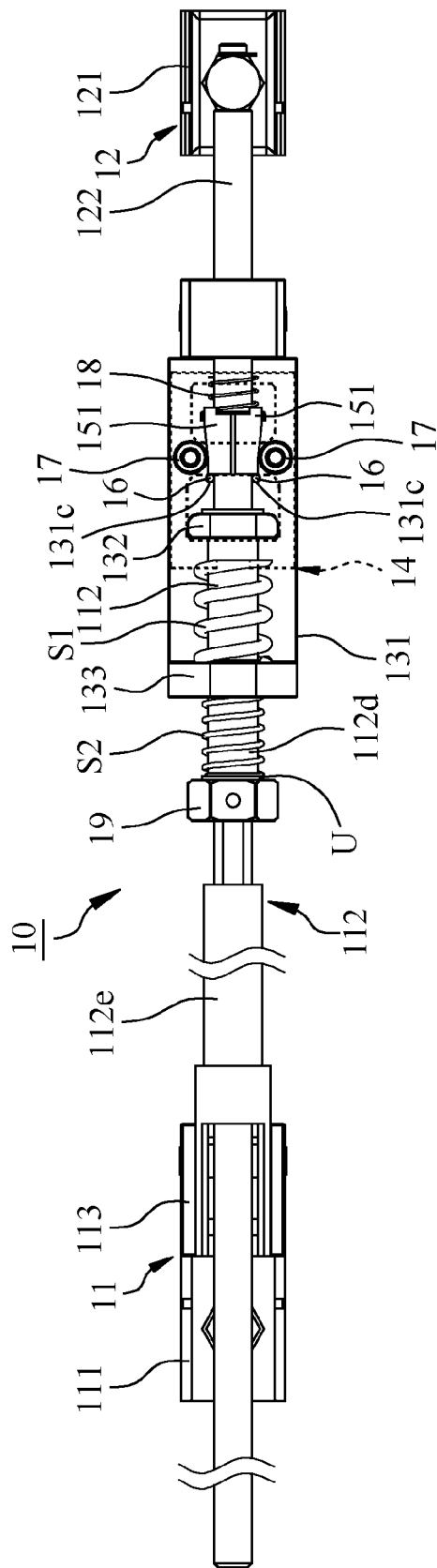


FIG. 11



EUROPEAN SEARCH REPORT

Application Number
EP 11 17 4200

DOCUMENTS CONSIDERED TO BE RELEVANT				
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)	
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