

(19)



(11)

EP 4 218 704 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
02.08.2023 Bulletin 2023/31

(51) International Patent Classification (IPC):
A61G 5/10 ^(2006.01) **A61G 5/06** ^(2006.01)

(21) Application number: **22212506.4**

(52) Cooperative Patent Classification (CPC):
A61G 5/1089; A61G 5/06

(22) Date of filing: **09.12.2022**

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

(71) Applicant: **Karma Medical Products Co., Ltd.**
Minsyong Township
Chiayi County 62145 (TW)

(72) Inventor: **YANG, Yao-Lung**
62145 Minsyong Township (TW)

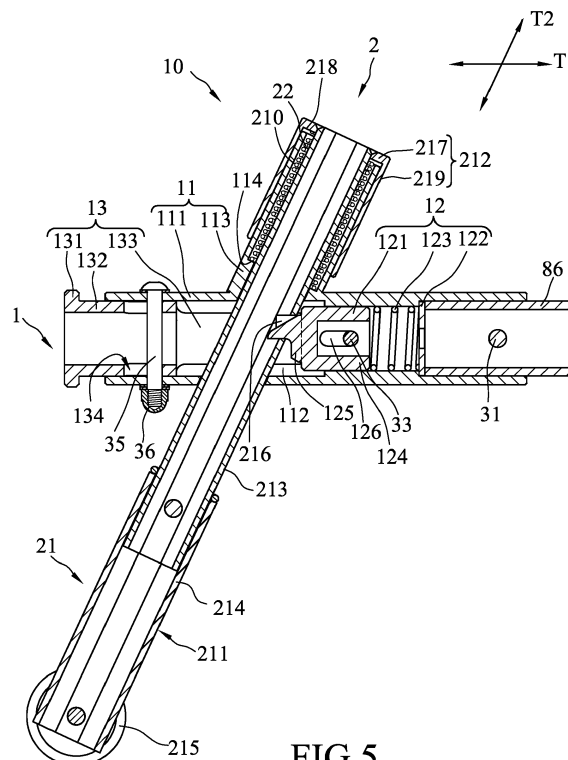
(74) Representative: **Studio Torta S.p.A.**
Via Viotti, 9
10121 Torino (IT)

(30) Priority: **28.01.2022 TW 111103832**

(54) OPERABLE ANTI-TIP ASSEMBLY

(57) An operable anti-tip assembly includes a mounting unit defining a mounting space, and a positioning unit that is disposed in the mounting space and that includes a first engaging portion. An anti-tip strut unit is inserted through the mounting unit and includes a second engaging portion. A resilient member is connected to the mounting unit and the anti-tip strut unit, and urges the anti-tip strut unit to move from the ground. The positioning unit

is changeable within the mounting space between a locking state, where the first engaging portion engages the second engaging portion to prevent the anti-tip strut unit from moving relative to the mounting unit, and an unlocking state, where the first engaging portion disengages from the second engaging portion to allow the anti-tip strut unit to be urged by the resilient member to move relative to the mounting unit or the ground.

**FIG.5**

Description

[0001] The disclosure relates to an anti-tip assembly, and more particularly to an operable anti-tip assembly for a wheelchair.

[0002] As shown in Figure 1, an existing wheelchair 9 includes a main seat body 91 and an anti-tip apparatus 92. The main seat body 91 has a seat frame 911, two front wheels 912, and two rear wheels 913. The front and rear wheels 912, 913 are connected to the seat frame 911 in a front-rear manner. The anti-tip apparatus 92 is integrally fixed to and is inclined rearwardly and downwardly relative to a lower part of the seat frame 911 to prevent the wheelchair 9 from tipping backwards for enhancing safety of a user (not shown).

[0003] However, because the anti-tip apparatus 92 is integrally fixed on the main seat body 91, when the wheelchair 9 needs to be moved from a lower ground (e.g., a street) to a higher ground (e.g., a raised sidewalk), lifting the front wheels 912 while using the rear wheels 913 as a fulcrums is impeded by abutment of the anti-tip apparatus 92 against the lower ground. As a result, the wheelchair 9 is unable to be tilted further backwards. Hence, there is still room for improvement in the wheelchair 9.

[0004] Therefore, an object of the disclosure is to provide an operable anti-tip assembly that can alleviate the aforesaid drawback of the prior art.

[0005] According to the disclosure, an operable anti-tip assembly is adapted for a wheelchair, and includes a control mechanism and an anti-tip mechanism.

[0006] The control mechanism includes a mounting unit and a positioning unit. The mounting unit is adapted to be mounted at a rear end portion of the wheelchair in a removable manner, extends in a first direction, and defines a mounting space. The positioning unit is disposed in the mounting space in a resiliently restorable manner and includes a first engaging portion.

[0007] The anti-tip mechanism includes an anti-tip strut unit and a resilient member. The anti-tip strut unit is movably inserted through the mounting unit in a second direction inclined with respect to the first direction, and includes a second engaging portion. The resilient member is connected to the mounting unit and the anti-tip strut unit, and urges the anti-tip strut unit to move away from a ground surface.

[0008] The positioning unit is changeable within the mounting space between a locking state, where the first engaging portion engages the second engaging portion to prevent the anti-tip strut unit from moving relative to the mounting unit in the second direction, and an unlocking state, where the first engaging portion disengages from the second engaging portion to allow the anti-tip strut unit to be urged by the resilient member to move relative to the mounting unit in the second direction and away from the ground surface.

[0009] Other features and advantages of the disclosure will become apparent in the following detailed description of the embodiment(s) with reference to the ac-

companying drawings. It is noted that various features may not be drawn to scale.

Figure 1 is a side view of an existing wheelchair with an anti-tip apparatus.

Figure 2 is a perspective view illustrating an anti-tip assembly according to a first embodiment of the disclosure for a wheelchair.

Figure 3 is an enlarged perspective view illustrating the anti-tip assembly of the first embodiment.

Figure 4 is an exploded perspective view illustrating the anti-tip assembly of the first embodiment.

Figure 5 is a sectional view of the first embodiment illustrating a positioning unit in a locking state to immobilize an anti-tip strut unit of the anti-tip assembly.

Figure 6 is a sectional view similar to Figure 5, but illustrating the anti-tip strut unit being movable when the positioning unit is in an unlocking state.

Figure 7 is an enlarged perspective view illustrating an operable anti-tip assembly according to a second embodiment of the disclosure.

Figure 8 is an exploded perspective view of the second embodiment but not illustrating an anti-tip portion of the anti-tip assembly.

Figure 9 is a sectional view of the second embodiment illustrating the anti-tip strut unit being movable when the positioning unit is in the unlocking state.

Figure 10 is a sectional view similar to Figure 9, but illustrating the anti-tip strut unit being immobilized when the positioning unit is in the locking state.

Figure 11 is an enlarged perspective view illustrating an operable anti-tip assembly according to a third embodiment of the disclosure.

Figure 12 is an exploded perspective view of the third embodiment but not illustrating the anti-tip portion of the anti-tip assembly.

Figure 13 is a sectional view of the third embodiment illustrating the anti-tip strut unit being movable when the positioning unit is in the unlocking state.

Figure 14 is a sectional view similar to Figure 13, but illustrating the anti-tip strut unit being immobilized when the positioning unit is in the locking state.

Figure 15 is a sectional view similar to Figure 13, but illustrating a control member of the anti-tip assembly being pressed to change the positioning unit from the locking state to the unlocking state.

DETAILED DESCRIPTION

[0010] Before the disclosure is described in greater detail, it should be noted that where considered appropriate, reference numerals or terminal portions of reference numerals have been repeated among the figures to indicate corresponding or analogous elements, which may optionally have similar characteristics.

[0011] Referring to Figures 2 and 3, two operable anti-tip assemblies 10 according to a first embodiment of the disclosure are adapted for a wheelchair 81. The wheel-

chair 81 includes a seat body 82, two front wheels 83 connected to a front end of the seat body 82, and two rear wheels 84 connected to a rear end of the seat body 82. The seat body 82 includes two frame members 86 that are disposed at a bottom side of the seat body 82 and that extend in a front-rear direction. In this embodiment, the two operable anti-tip assemblies 10 are respectively assembled to rear end portions of the frame members 86. Since the two operable anti-tip assemblies 10 are identical, only one of the two operable anti-tip assemblies 10 is to be described hereinafter.

[0012] In this embodiment, the wheelchair 81 is a manual wheelchair. In variant embodiments, the wheelchair 81 may be a power wheelchair. The number of the anti-tip assemblies 10 may be one as long as a rear end portion of the wheelchair 81 allows installation thereof.

[0013] Referring to Figures 3 to 5, the operable anti-tip assembly 10 includes a control mechanism 1 and an anti-tip mechanism 2. The control mechanism 1 includes a mounting unit 11, a positioning unit 12, and a control member 13.

[0014] The mounting unit 11 is fixed to the rear end portion of the frame member 86 in a removable manner by a bolt 31 and a nut 32, and includes a first mounting tube 111 and a second mounting tube 113. The first mounting tube 111 is in the form of a round tube that extends in a first direction (T1) parallel with the front-rear direction, and defines a mounting space 112 extending in the first direction (T1). The second mounting tube 113 is fixedly connected to an outer peripheral surface of the first mounting tube 111, extends in a second direction (T2) inclined with respect to the first direction (T1), and is internally in communication with the first mounting tube 111. The second mounting tube 113 has an abutment surface portion 114 that extends radially inwardly from an inner circumferential surface of the second mounting tube 113 in a position below a top end of the second mounting tube 113, and that faces upwardly toward the top end of the second mounting tube 113.

[0015] The positioning unit 12 is disposed in the mounting space 112 in a resiliently restorable manner, and includes a positioning member 121, a fixed plate 122, and a springy member 123. The positioning member 121 is disposed in the mounting space 112 and is movable in the first direction (T1) relative to the mounting unit 11. The fixed plate 122 is fixed in the mounting space 112 adjacent to the frame member 86, and is spaced apart from the positioning member 121. The springy member 123 is disposed between and abuts against the positioning member 121 and the fixed plate 122.

[0016] The positioning member 121 is disposed between the control member 13 and the springy member 123, and has an abutting portion 124 and a first engaging portion 125. The abutting portion 124 in a cylinder form extends in the first direction (T1) and abuts against the springy member 123. The first engaging portion 125 protrudes and is narrowed from the abutting portion 124 in a manner away from the frame member 86. The springy

member 123 is a compression spring that urges the positioning member 121 to move away from the fixed plate 122. Specifically, the frame member 86 is inserted into the first mounting tube 111 in the first direction (T1) and communicates with the mounting space 112. In some embodiments, the fixed plate 122 and the springy member 123 may be disposed in the frame member 86 as long as the springy member 123 is disposed between the positioning member 121 and the fixed plate 122 to urge the positioning member 121 to move away from the fixed plate 122.

[0017] In this embodiment, the positioning member 121 further has a first limiting hole 126 that extends through the abutting portion 124 and that is elongated in the first direction (T1). A bolt 33 extends through the first mounting tube 111 and the first limiting hole 126 and is fixed onto the first mounting tube 111 by a nut 34 so that movement of the positioning member 121 is limited to a length of the first limiting hole 126 that is movable in the first direction (T1) relative to the bolt 33. In other embodiments, the positioning member 121 may further have a limiting component (not shown), such as a slot or a protrusion. The first mounting tube 111 may have a corresponding limiting component (not shown), such as a corresponding protrusion or a corresponding slot, to engage with the limiting component of the positioning member 121 so that the positioning member 121 may move in the first direction (T1) within the first mounting tube 111.

[0018] The control member 13 is assembled to the mounting unit 11, is disposed distally from the positioning member 121 opposite to the frame member 86, and is operable to move in the first direction (T1). The control member 13 includes a pressing portion 131, a restricting portion 132, and two pushing portions 133. The pressing portion 131 is in the form of a button and is disposed outside the first mounting tube 111. The restricting portion 132 extends from the pressing portion 131 into the mounting space 112 in the first direction (T1). The two pushing portions 133 extend from the restricting portion 132 in the first direction (T1), and are spaced apart from each other and disposed in the mounting space 112. The restricting portion 132 has a second limiting hole 134 extending therethrough. The second limiting hole 134 is elongated in the first direction (T1). A bolt 35 extends through the first mounting tube 111 and the second limiting hole 134 and is fixed to the first mounting tube 111 by a nut 36 so that movement of the control member 13 is limited to a length of the second limiting hole 134 that is movable in the first direction (T1) relative to the bolt 35. Each pushing portion 133 is in the form of a long sheet. The pushing portions 133 abut against the abutting portion 124 of the positioning member 121, and the first engaging portion 125 of the positioning member 121 is disposed between the pushing portions 133. When the control member 13 is operated to move toward the frame member 86, the positioning member 121 is pushed by the control member 13 to move toward the frame member 86. In practice, the control member 13 may be a steel

cable directly connected between the positioning member 121 and the seat body 82 of the wheelchair 81 to drive the movement of the positioning member 121 toward the frame member 86.

[0019] The anti-tip mechanism 2 includes an anti-tip strut unit 21 and a resilient member 22.

[0020] The anti-tip strut unit 21 is movably inserted through the mounting unit 11 in the second direction (T2), and includes an anti-tip strut 211 and a cap member 212. The anti-tip strut 211 is movably inserted through the first and second mounting tubes 111, 113 in the second direction (T2) and extends movably between the pushing portions 133. The anti-tip strut 211 has an insertion portion 213, a connection portion 214, an anti-tip portion 215, and a second engaging portion 216. The insertion portion 213 is hollow and is movably inserted through the first and second mounting tubes 111, 113 in the second direction (T2). The connection portion 214 is disposed below the first mounting tube 111 and is fixedly connected to a bottom end of the insertion portion 213. The anti-tip portion 215 is connected to a bottom end of the connection portion 214 and is movable to touch the ground surface for preventing the wheelchair from tipping backwards. The second engaging portion 216 is disposed on a front outer peripheral surface of the insertion portion 213. A top end of the insertion portion 213 of the anti-tip strut 211 and the second mounting tube 113 are radially spaced apart from each other to define an accommodating space 210 therebetween. The cap member 212 fixedly covers a top end of the anti-tip strut 211. The cap member 212 has an annular end wall 217 that is sleeved fixedly on the top end of the insertion portion 213 of the anti-tip strut 211, and a tubular portion 219 that extends downwardly from an outer periphery of the annular end wall 217 in the second direction (T2). The annular end wall 217 has an inner surface 218 facing downwardly. The tubular portion 219 is sleeved movably on the second mounting tube 113. In this embodiment, the first engaging portion 125 of the positioning member 121 is a protruding tongue that extends from the abutting portion 124 of the positioning member 121 toward the anti-tip strut unit 21 and that is engageable with the second engaging portion 216 of the anti-tip strut 211. The second engaging portion 216 of the anti-tip strut 211 is an engaging hole for engagement of the first engaging portion 125 therewithin.

[0021] The resilient member 22 is sleeved around the top end of the insertion portion 213 of the anti-tip strut 211 and is accommodated within the accommodating space 210. Two opposite ends of the resilient member 22 respectively abut against the abutment surface portion 114 of the second mounting tube 113 and the inner surface 218 of the cap member 212. The resilient member 22 urges the anti-tip strut unit 21 to move away from the ground surface.

[0022] Referring to Figure 6 in combination with Figures 2 and 5, the positioning unit 12 is changeable within the mounting space 112 between a locking state (see Figure 5), where the first engaging portion 125 of the

positioning member 121 engages with the second engaging portion 216 of the anti-tip strut 211 to prevent the anti-tip strut unit 21 from moving relative to the mounting unit 11 in the second direction (T2) so that the anti-tip strut 211 is disposed adjacent to the ground surface, and an unlocking state (see Figure 6), where the first engaging portion 125 disengages from the second engaging portion 216 to allow the anti-tip strut unit 21 to be urged by the resilient member 22 to move relative to the mounting unit 11 in the second direction (T2) and away from the ground surface. When the positioning unit 12 is in the unlocking state, the connection portion 214 of the anti-tip strut 21 abuts against the first mounting tube 111, thereby preventing the anti-tip strut 211 from upward movement relative to the mounting unit 11. Specifically, the control member 13 is operable to move in the first direction (T1) so that the positioning unit 12 may be switched between the locking and unlocking states.

[0023] In this embodiment, the anti-tip portion 215 of the anti-tip strut 211 is, but not limited to, a caster. In other variant embodiments, the anti-tip portion 215 may be a block to prevent the wheelchair 81 from tipping backward when the positioning unit 12 is in the locking state.

[0024] As shown in Figures 2 and 5, during regular use, the positioning unit 12 is in the locking state to prevent backward tipping of the wheelchair 81. In such a case, the first engaging portion 125 engages the second engaging portion 216, and the anti-tip portion 215 is adjacent to the ground surface. When the wheelchair 81 tilts backward, the anti-tip portion 215 touches the ground surface to prevent the wheelchair from tipping backward.

[0025] As shown in Figures 2 and 6, when the wheelchair 81 needs to move from a lower ground (e.g., a street) to a higher ground (e.g., a raised sidewalk), a user (not shown) may press the control member 13 in the first direction (T1) to move the positioning member 121 toward the frame member 86 so that the first engaging portion 125 of the positioning member 121 may disengage from the second engaging portion 216 of the anti-tip strut 211 and so that the positioning unit 12 is changed to the unlocking state. The anti-tip strut 211 is urged by the resilient member 22 to move automatically upwardly away from the ground surface in a manner that the anti-tip portion 215 is situated on a radially inward side of one of the rear wheels 84. When the wheelchair 81 is rotated backward about the rear wheels 84, which together serve as a fulcrum, the anti-tip strut unit 21 would not touch the ground surface. In other words, when the positioning unit 12 is in the unlocking state, the wheelchair 81 is not limited by the anti-tip strut 211 to rotating backward only by a small degree. As a result, the wheelchair 81 may easily rotate backward about the rear wheels 84, which serve as the fulcrum, until the front wheels 83 are raised and touch the higher ground, thereby transferring the whole wheelchair 81 onto the higher ground.

[0026] After the whole wheelchair 81 is transferred onto the higher ground, the user may step on a top end of the cap member 212 to move the anti-tip strut 211 down-

wardly until the second engaging portion 216 of the anti-tip strut 211 engages with the first engaging portion 125 of the positioning member 121, thereby changing the positioning unit 12 to the locking state to immobilize the anti-tip unit 21.

[0027] By virtue of the positioning unit 12 being changeable between the locking and unlocking states, the anti-tip strut unit 21 is either immobilized or movable relative to the mounting unit 11. When the wheelchair 81 needs to be stabilized, the anti-tip strut unit 21 is immobilized by changing the positioning unit 12 to the locking state. When the wheelchair 81 needs to rotate backward, the anti-tip strut unit 21 is movable by changing the positioning unit 12 to the unlocking state. The operable anti-tip assembly 10 is relatively practical and convenient to provide the wheelchair 81 both safety and mobility. Specifically, the user may directly step on either the control member 13 or the top end of the cap member 212 so that the anti-tip portion 215 of the anti-tip strut 211 may move away from or become adjacent to the ground surface; the user does not need to stoop down to operate the operable anti-tip assembly 10 using hands, and therefore the operation is relatively convenient.

[0028] Figures 7 to 10 illustrate an operable anti-tip assembly 10 according to a second embodiment of the disclosure. The second embodiment is similar in structure and operation to the first embodiment. Only the differences between the second and first embodiments are to be described.

[0029] In the second embodiment, the second mounting tube 113 of the mounting unit 11 is omitted. The first mounting tube 111 has a through slot 115 disposed above and spatially communicated with the mounting space 112. The through slot 115 extends through the outer peripheral surface of the first mounting tube 111 and is elongated in the first direction (T1).

[0030] Regarding the positioning unit 12, the positioning member 121 is rotatably and fixedly disposed in the mounting space 112 by a pivot member 37. The positioning unit 12 further includes a resilient restoring member 127 connected between the first mounting tube 111 and the positioning member 121. The first engaging portion 125 of the positioning member 121 has a barb configuration and extends towards the anti-tip mechanism 2. The positioning member 121 further has an arm portion 128 connected to and disposed behind the first engaging portion 125. The resilient restoring member 127 is sleeved around the arm portion 128. A top end of the resilient member restoring 127 is fixedly connected to the positioning member 121. A bottom end of the resilient member 127 is fixedly connected to a bottom side of an inner circumferential surface of the first mounting tube 111. The resilient restoring member 127 provides a resilient force urging the arm portion 128 to move upwardly away from the bottom side of the inner circumferential surface of the first mounting tube 111 and toward the through slot 115.

[0031] The control member 13 extends upwardly from

a top end of the positioning member 121. The pressing portion 131 of the control member 13 extends outside the through slot 115, is thicker than the positioning member 121, and is pressable. The restricting portion 132 and the pushing portions 133 are omitted from the control member 13 in this embodiment.

[0032] The control mechanism 1 further includes an abutting member 14 that is mounted in the mounting space 112 in a spaced-apart manner from the positioning member 121 of the positioning unit 12.

[0033] Regarding the anti-tip mechanism 2, the anti-tip strut unit 21 is movably inserted through the mounting unit 11 in the second direction (T2), and the resilient member 22 is disposed in the anti-tip strut unit 21.

[0034] The anti-tip strut 211 of the anti-tip strut unit 21 is hollow and has a strut portion 213' that extends in the second direction (T2) while the insertion and connection portions 213, 214 are omitted from the anti-tip strut 211. The anti-tip portion 215 of the anti-tip strut 211 is mounted to a bottom end of the strut portion 213'. The cap member 212 of the anti-tip strut unit 21 covers a top end of the strut portion 213'. A front side of the strut portion 213' is formed with a first elongated opening 42 that extends in the second direction (T2). In this embodiment, the anti-tip strut unit 21 further includes a mounting member 41 that is fixedly disposed within the anti-tip strut 211 by a bolt 38 and that extends in the second direction (T2). The mounting member 41 has a second elongated opening 411 that extends in the second direction (T2). The abutting member 14 protrudes into the second elongated opening 411 through the first elongated opening 42. In order to meet the requirements of different types of wheelchairs, the anti-tip strut 211 has a plurality of second engaging portion 216' formed at a rear side of the strut portion 213' so that a distance between the anti-tip strut 211 and the ground surface is adjustable. The number of the second engaging portions may be one in some other embodiments.

[0035] The resilient member 22 is sleeved around the mounting member 41, and abuts against and is disposed between the mounting member 41 and the abutting member 14, thereby urging the anti-tip strut unit 21 to move away from the ground surface.

[0036] Figures 9 and 10 illustrate the positioning unit 12 in the unlocking state and the locking state. When the positioning unit 12 is in the locking state (see Figure 10), the first engaging portion 125 of the positioning unit 12 engages with one of the second engaging portions 216' of the anti-tip strut 211 so that the anti-tip strut 211 is immobilized in the second direction (T2) in a manner that anti-tip portion 215 of the anti-tip strut 211 is disposed adjacent to the ground surface. When the positioning unit 12 is in the unlocking state (see Figure 9), the first engaging portion 125 of the positioning unit 12 disengages from the second engaging portions 216' of the anti-tip strut 211 so that the anti-tip strut 211 is urged by resilient member 22 to move away from the ground surface.

[0037] When in use, the cap member 212 is stepped

on by the user until the first engaging portion 125 engages with one of the second engaging portions 216' so as to change the positioning unit 12 from the unlocking state to the locking state. To change the positioning unit 12 from the locking state to the unlocking state, the control member 13 is depressed to rotate the positioning member 121 of the positioning unit 12 in a direction (arrow A, as shown in Figure 10) so that the first engaging portion 125 disengages from the second engaging portions 216' and so that the anti-tip strut 211 is urged by the resilient member 22 to move away from the ground surface. Therefore, the operable anti-tip assembly 10 of the second embodiment is capable of achieving the same effect as the first embodiment.

[0038] Figures 11 to 15 illustrate an operable anti-tip assembly 10 according to a third embodiment of the disclosure. The third embodiment is similar in structure and operation to the second embodiment. Only the differences between the third and second embodiments are to be described.

[0039] Regarding the mounting unit 11, the first mounting tube 111 further has an opening 116 that opens at a rear end thereof and that communicates with the through slot 115.

[0040] Regarding the positioning unit 12, the positioning member 121 further has a first pushing portion 129 that is disposed on the top end of the positioning member 121 and that protrudes backward away from the anti-tip strut unit 21.

[0041] The control member 13 is rotatably disposed in the mounting space 112 of the first mounting tube 111 by a pivot member 39 and partially extends outside the mounting space 112. In this embodiment, the pressing portion 131 of the control member 13 extends outside and protrudes backward from the through slot 115 and the opening end 116. The control member 13 further has a second pushing portion 135 that is disposed in the mounting space 112 and that is located forwardly relative to the pressing portion 131. The second pushing portion 135 is rotatable by pressing the control member 13 to push the first pushing portion 129 for rotating the positioning member 121 about the pivot member 37 along a direction reverse to a direction (arrow B), thereby disengaging the first engaging portion 125 from the second engaging portion 216.

[0042] The resilient restoring member 127 of the positioning unit 12 is resiliently connected between the positioning member 121 and the control member 13 to urge rotation of the positioning member 121 about the pivot member 37 along the direction (arrow B) so that the first engaging portion 125 rotates toward the anti-tip strut unit 21 to engage the second engaging portion 216 and so that the first pushing portion 129 is rotated toward the second pushing portion 135.

[0043] The cap member 212 is omitted.

[0044] As shown in Figure 14, when the positioning unit 12 is in the locking state, because the first engaging portion 125 engages with the second engaging portion

216, the anti-tip strut unit 21 is immobilized in the second direction (T2) and situated adjacent to the ground surface. As shown in Figure 13, when the positioning unit 12 is in the unlocking state, because the first engaging portion 125 disengages from the second engaging portion 216, the anti-tip strut unit 21 is urged by the resilient member 22 to move in the second direction (T2) away from the ground surface.

[0045] Referring back to Figures 13 to 15, in practice, when the positioning unit 12 is in the unlocking state, the top end of the anti-tip strut unit 21 is stepped on to move toward the ground surface until the first engaging portion 125 is urged by the resilient restoring member 127 in rotation along the direction (arrow B) to engage with the second engaging portion 216, thereby changing the positioning unit 12 from the unlocking state (Figure 13) to the locking state (Figure 14). As shown in Figure 15, to move the anti-tip strut unit 21 away from the ground surface, the control member 13 is pressed downwardly to rotate about the pivot member 39 along a direction (arrow C) so that the second pushing portion 135 is rotated upwardly to push the first pushing portion 129 in a manner that the positioning member 121 is driven to rotate about the pivot member 37 along the direction reverse to the direction (arrow B), thereby disengaging the first engaging portion 125 from the second engaging portion 216. As a result, the anti-tip strut unit 21 is urged by the resilient member 22 to move away from the ground surface, and the positioning unit 12 is in the unlocking state.

[0046] In summary, because the anti-tip strut unit 21 is immobilized or movable relative to the ground surface by the control member 13 driving the positioning unit 12 to switch between the locking and unlocking states for the first engaging portion 125 of the positioning unit 12 to engage with or disengage from the second engaging portion 216 of the anti-tip strut unit 21, and because the user need not stoop down to operate the operative anti-tip assembly 10, the operative anti-tip assembly 10 is convenient to use, not only for effectively preventing the wheelchair 81 from tipping backwards but also for allowing the wheelchair 81 to cross a tall obstacle. As a result, the wheelchair 81 with the operative anti-tip assembly 10 may be easily transferred onto grounds with various heights.

[0047] In the description above, for the purposes of explanation, numerous specific details have been set forth in order to provide a thorough understanding of the embodiment(s). It will be apparent, however, to one skilled in the art, that one or more other embodiments may be practiced without some of these specific details. It should also be appreciated that reference throughout this specification to "one embodiment," "an embodiment," an embodiment with an indication of an ordinal number and so forth means that a particular feature, structure, or characteristic may be included in the practice of the disclosure. It should be further appreciated that in the description, various features are sometimes grouped together in a single embodiment, figure, or de-

scription thereof for the purpose of streamlining the disclosure and aiding in the understanding of various inventive aspects; such does not mean that every one of these features needs to be practiced with the presence of all the other features. In other words, in any described embodiment, when implementation of one or more features or specific details does not affect implementation of another one or more features or specific details, said one or more features may be singled out and practiced alone without said another one or more features or specific details. It should be further noted that one or more features or specific details from one embodiment may be practiced together with one or more features or specific details from another embodiment, where appropriate, in the practice of the disclosure.

Claims

1. An operable anti-tip assembly (10) adapted for a wheelchair (81), and **characterized by**:
 - a control mechanism (1) including
 - a mounting unit (11) that is adapted to be mounted to a rear end portion of the wheelchair (81) in a removable manner, and that defines a mounting space (112) extending in a first direction (T1), and
 - a positioning unit (12) that is disposed in said mounting space (112) in a resiliently restorable manner and that includes a first engaging portion (125); and
 - an anti-tip mechanism (2) including
 - an anti-tip strut unit (21) that is movably inserted through said mounting unit (11) in a second direction (T2) inclined with respect to the first direction (T1) and that includes a second engaging portion (216), and
 - a resilient member (22) that is connected to said mounting unit (11) and said anti-tip strut unit (21) and that urges said anti-tip strut unit (21) to move away from a ground surface;
 - wherein said positioning unit (12) is changeable within said mounting space (112) between a locking state, where said first engaging portion (125) engages said second engaging portion (216) to prevent said anti-tip strut unit (21) from moving relative to said mounting unit (11) in the second direction (T2), and an unlocking state, where said first engaging portion (125) disengages from said second engaging portion (216) to allow said anti-tip strut unit (21) to be urged by said resilient member (22) to move relative

to said mounting unit (11) in the second direction (T2) and away from the ground surface.

2. The operable anti-tip assembly (10) as claimed in Claim 1, **characterized in that** said control mechanism (1) further includes a control member (13) assembled to said mounting unit (11), said control member (13) being operable to move in the first direction (T1) so that said positioning unit (12) is switched between the locking and unlocking states.
3. The operable anti-tip assembly (10) as claimed in Claim 2, **characterized in that** said control member (13) has a pressing portion (131) disposed outside said mounting unit (11), and at least one pushing portion (133) that is connected to said pressing portion (131), that is disposed in said mounting space (112) of said mounting unit (11), and that abuts against said positioning unit (12).
4. The operable anti-tip assembly (10) as claimed in Claim 3, **characterized in that**:
 - said positioning unit (12) includes a positioning member (121), a fixed plate (122), and a springy member (123);
 - said positioning member (121) is disposed in said mounting space (112) and is movable in the first direction (T1) related to said mounting unit (11), said positioning member (121) having said first engaging portion (125);
 - said fixed plate (122) is fixed in said mounting space (112) and spaced apart from said positioning member (121); and
 - said springy member (123) is disposed between and abuts against said positioning member (121) and said fixed plate (122) to urge said positioning member (121) to move away from said fixed plate (122) toward said anti-tip strut unit (21).
5. The operable anti-tip assembly (10) as claimed in Claim 4, **characterized in that**:
 - said control member (13) has two of said pushing portions (133) spaced apart from each other;
 - said positioning member (121) is disposed between said control member (13) and said springy member (123), and further has an abutting portion (124) abutting against said springy member (123); and
 - said first engaging portion (125) of said positioning member (121) extends from said abutting portion (124) toward said anti-tip strut unit (21), and is engageable with said second engaging portion (216) of said anti-tip strut unit (21).
6. The operable anti-tip assembly (10) as claimed in

any one of Claims 1 to 5, **characterized in that** said second engaging portion (216) is an engaging hole for engagement of said first engaging portion (125) therewithin.

7. The operable anti-tip assembly (10) as claimed in any one of Claims 1 to 6, **characterized in that:**

said anti-tip strut unit (21) includes an anti-tip strut (211) movably inserted through said mounting unit (11) in the second direction (T2), and a cap member (212) fixedly covering a top end of said anti-tip strut (211); and said resilient member (22) is sleeved around said anti-tip strut (211), and abuts against and is disposed between said cap member (212) and said mounting unit (11).

8. The operable anti-tip assembly (10) as claimed in Claim 7, **characterized in that:**

said mounting unit (11) includes a first mounting tube (111) that extends in the first direction (T1) and that defines said mounting space (112), and a second mounting tube (113) that is fixedly connected to an outer peripheral surface of said first mounting tube (111) and that extends in the second direction (T2); said anti-tip strut (211) is movably inserted through said first and second mounting tubes (111, 113), said top end of said anti-tip strut (211) and said second mounting tube (113) being radially spaced apart from each other to define an accommodating space (210) therebetween, said resilient member (22) being accommodated within said accommodating space (210); and said cap member (212) has an annular end wall (217) that is sleeved fixedly on said top end of said anti-tip strut (211), and a tubular portion (219) that extends from an outer periphery of said annular end wall (217), said tubular portion (219) being sleeved movably on said second mounting tube (113).

9. The operable anti-tip assembly (10) as claimed in Claim 7, **characterized in that:**

said anti-tip strut (211) has an insertion portion (213) movably inserted through said mounting unit (11) in the second direction (T2), a connection portion (214) that is disposed below said mounting unit (11) and that is fixedly connected to a bottom end of said insertion portion (213), and an anti-tip portion (215) that is connected to a bottom end of said connection portion (214) and that is movable to touch the ground surface for preventing the wheelchair from tipping backward; and

when said positioning unit (12) is in the unlocking state, said connection portion (214) abuts against said first mounting tube (111), thereby preventing said anti-tip strut (211) from upward movement relative to said mounting unit (11).

10. The operable anti-tip assembly (10) as claimed in Claim 3, **characterized in that:**

said control member (13) has two of said pushing portions (133) connected to said pressing portion (131); and said anti-tip strut unit (21) extends movably between said pushing portions (133).

11. The operable anti-tip assembly (10) as claimed in Claim 1, **characterized in that:**

said mounting unit (11) includes a through slot (115) disposed above and spatially communicated with said mounting space (112); said positioning unit (12) further includes a positioning member (121) rotatably disposed in said mounting space (112), and a resilient restoring member (127) connected between said mounting unit (11) and said positioning member (121); said control mechanism (1) further includes a control member (13) that is connected to said positioning member (121) and that extends partially outside said through slot (115), and an abutting member (14) that is mounted in said mounting space (112) in a spaced-apart manner from said positioning member (121); said positioning member (121) has said first engaging portion (125) extending towards said anti-tip mechanism (2), and an arm portion (128) connected to and disposed behind said first engaging portion (125); said resilient restoring member (127) is sleeved around said arm portion (128) and resiliently urges said arm portion (128) to move upwardly relative to said mounting unit (11); said anti-tip strut unit (21) includes an anti-tip strut (211) that is hollow, that extends in the second direction (T2), and that has said second engaging portion (216), and a mounting member (41) that is disposed within said anti-tip strut (211) and that extends in the second direction (T2); said resilient member (22) is sleeved around said mounting member (41) and abuts against and is disposed between said mounting member (41) and said abutting member (14); said anti-tip strut (211) further has a first elongated opening (42) that extends in the second direction (T2); said mounting member (41) has a second elongated opening (42) that extends in the second direction (T2);

gated opening (411) that extends in the second direction (T2); and
 said abutting member (14) protrudes into said second elongated opening (411) through said first elongated opening (42).

5

12. The operable anti-tip assembly (10) as claimed in Claim 1, **characterized in that:**

said positioning unit (12) further includes a positioning member (121) and a resilient restoring member (127), said positioning member (121) being rotatably disposed in said mounting space (112) and having said first engaging portion (125);
 said control mechanism (1) further includes a control member (13) that is rotatably disposed in said mounting space (112) and that partially extends outside said mounting space (112);
 said resilient restoring member (127) is resiliently connected between said positioning member (121) and said control member (13) to urge rotation of said positioning member (121) in a manner that said first engaging portion (125) rotates toward said anti-tip strut unit (21) to engage said second engaging portion (216).

10

15

20

25

13. The operable anti-tip assembly (10) as claimed in Claim 12, **characterized in that:**

said positioning member (121) has a first pushing portion (129) protruding away from said anti-tip strut unit (21); and
 said control member (13) has a second pushing portion (135) rotatable by pressing said control member (13) to push said first pushing portion (129) for rotating said positioning member (121), thereby disengaging said first engaging portion (125) from said second engaging portion (216).

30

35

40

45

50

55

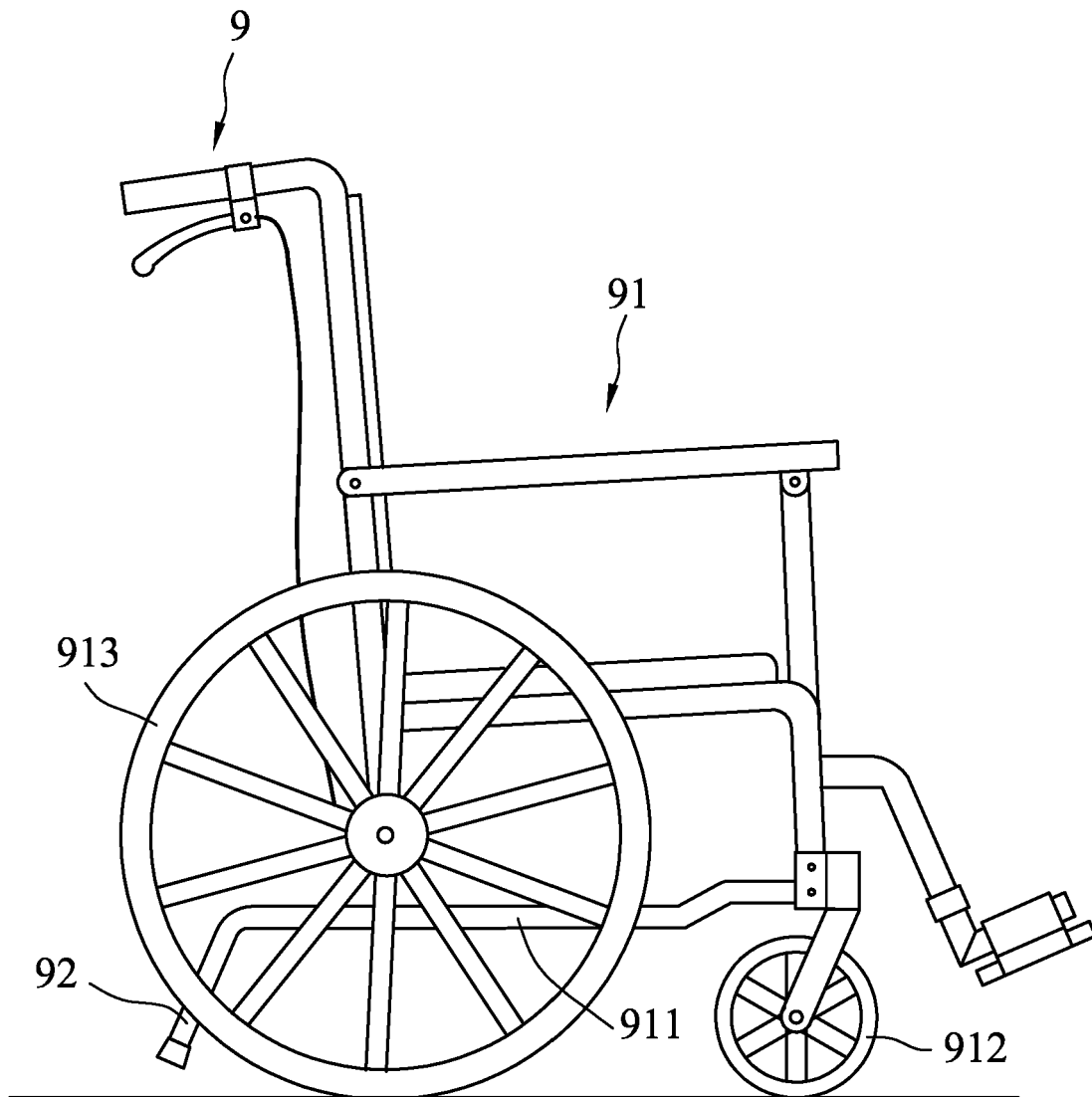


FIG.1
PRIOR ART

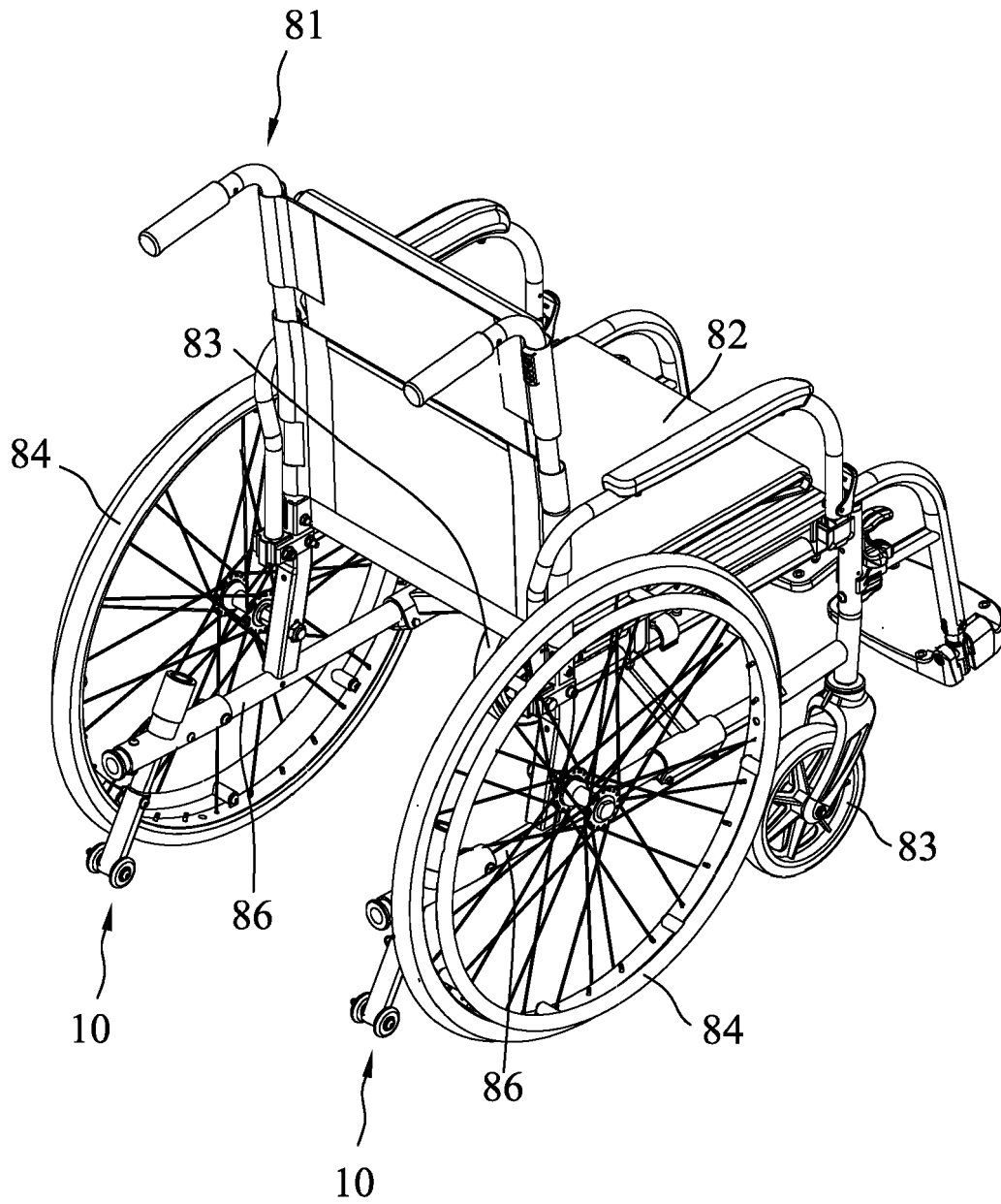


FIG.2

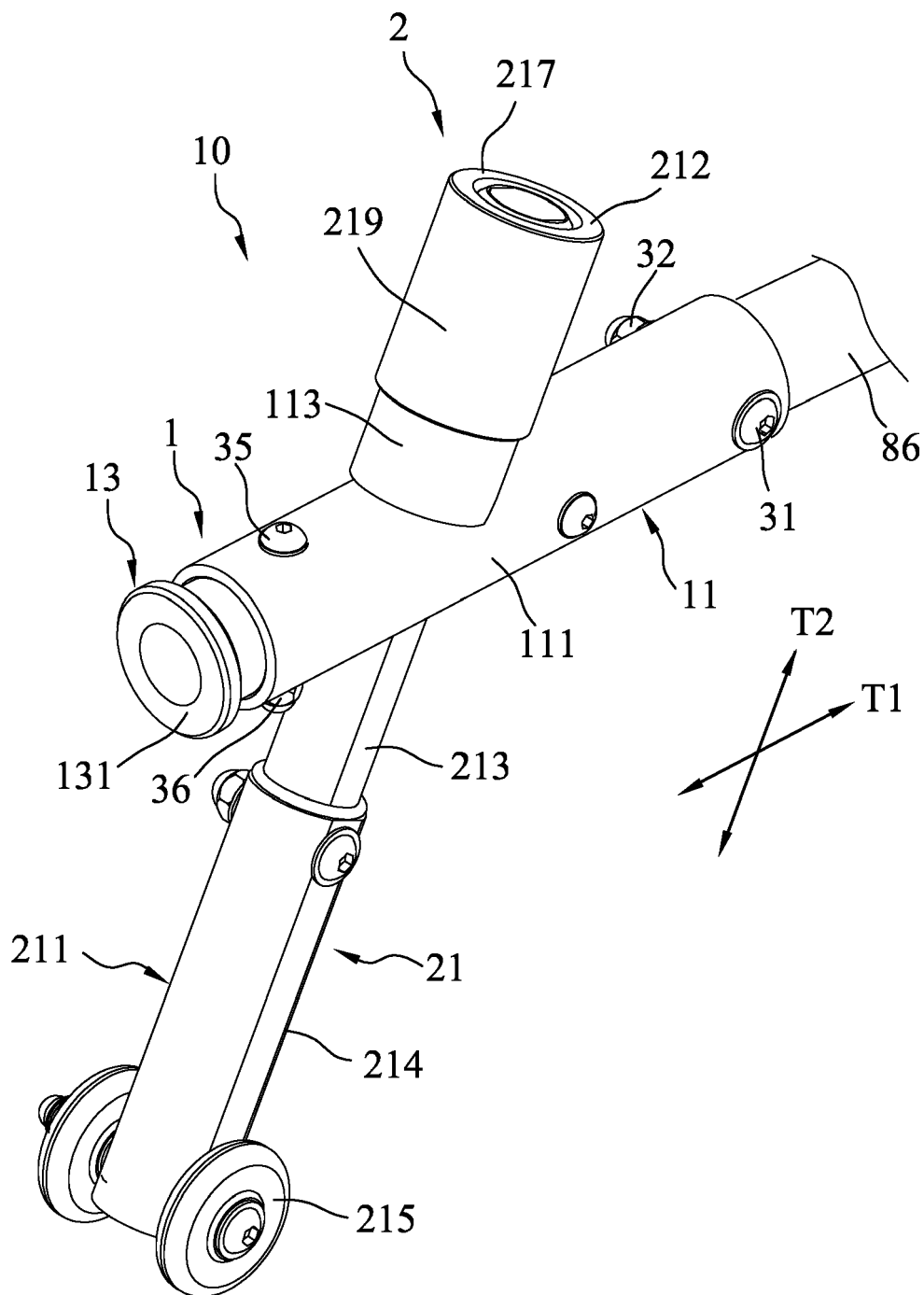


FIG.3

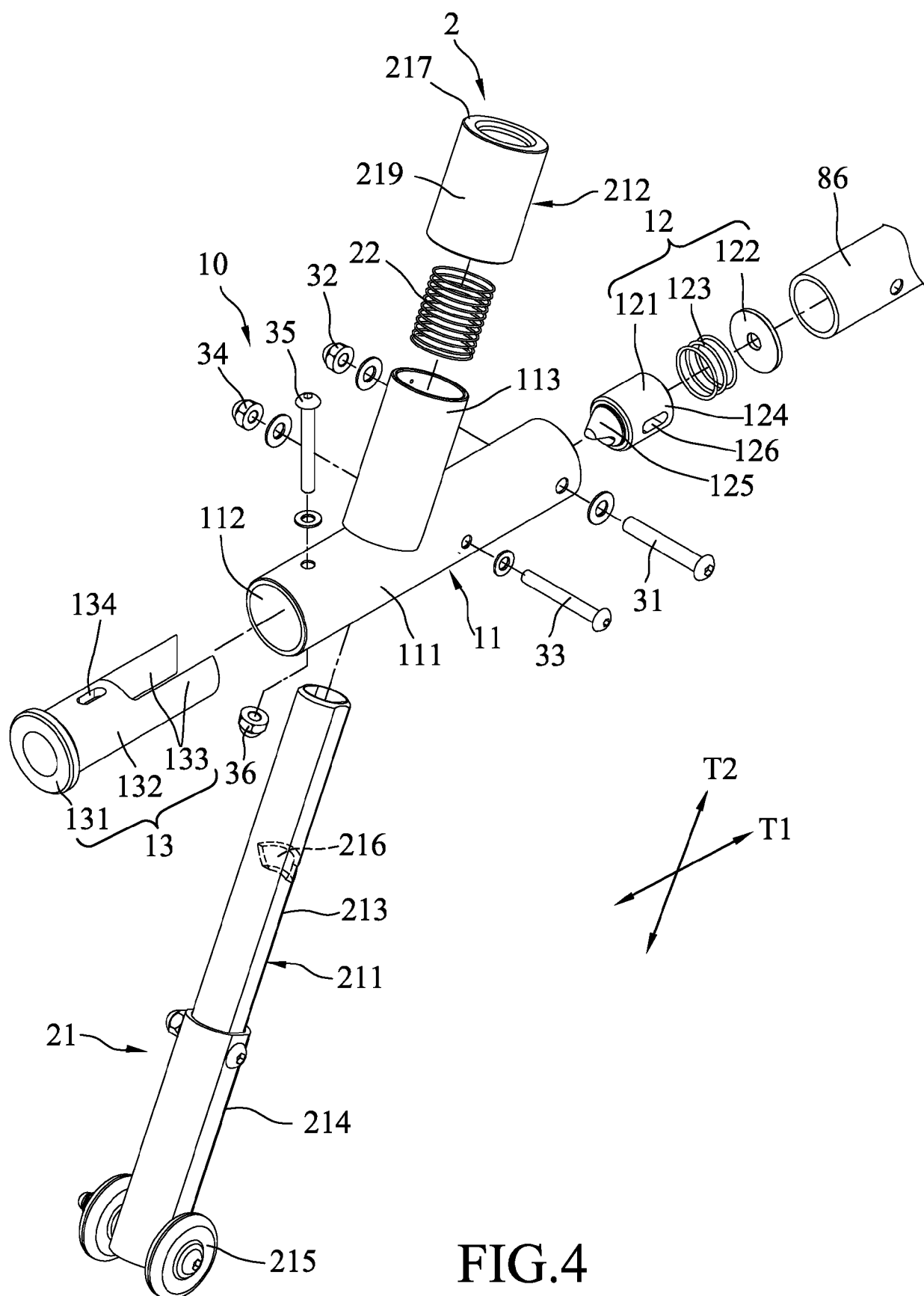
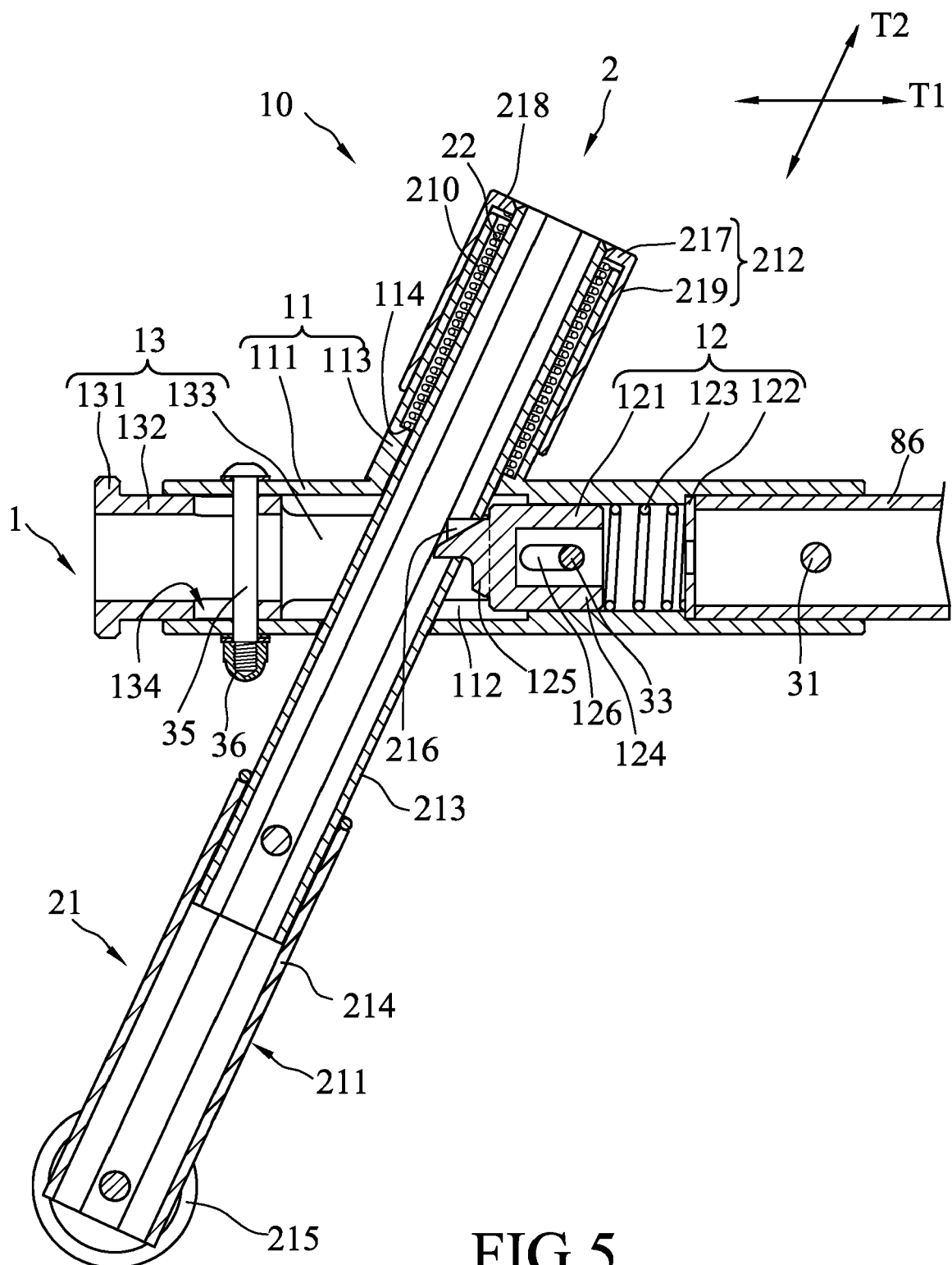


FIG.4



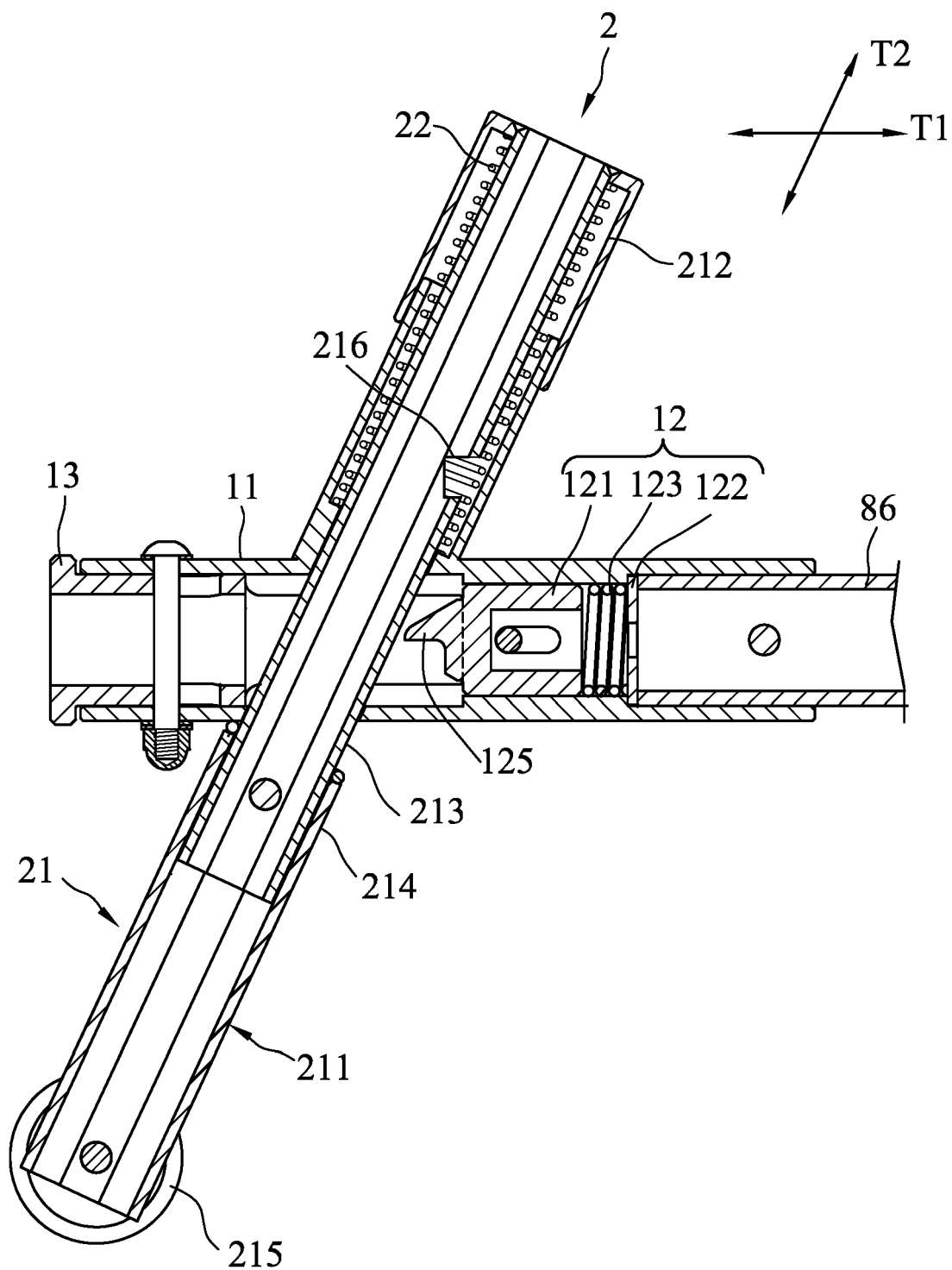


FIG.6

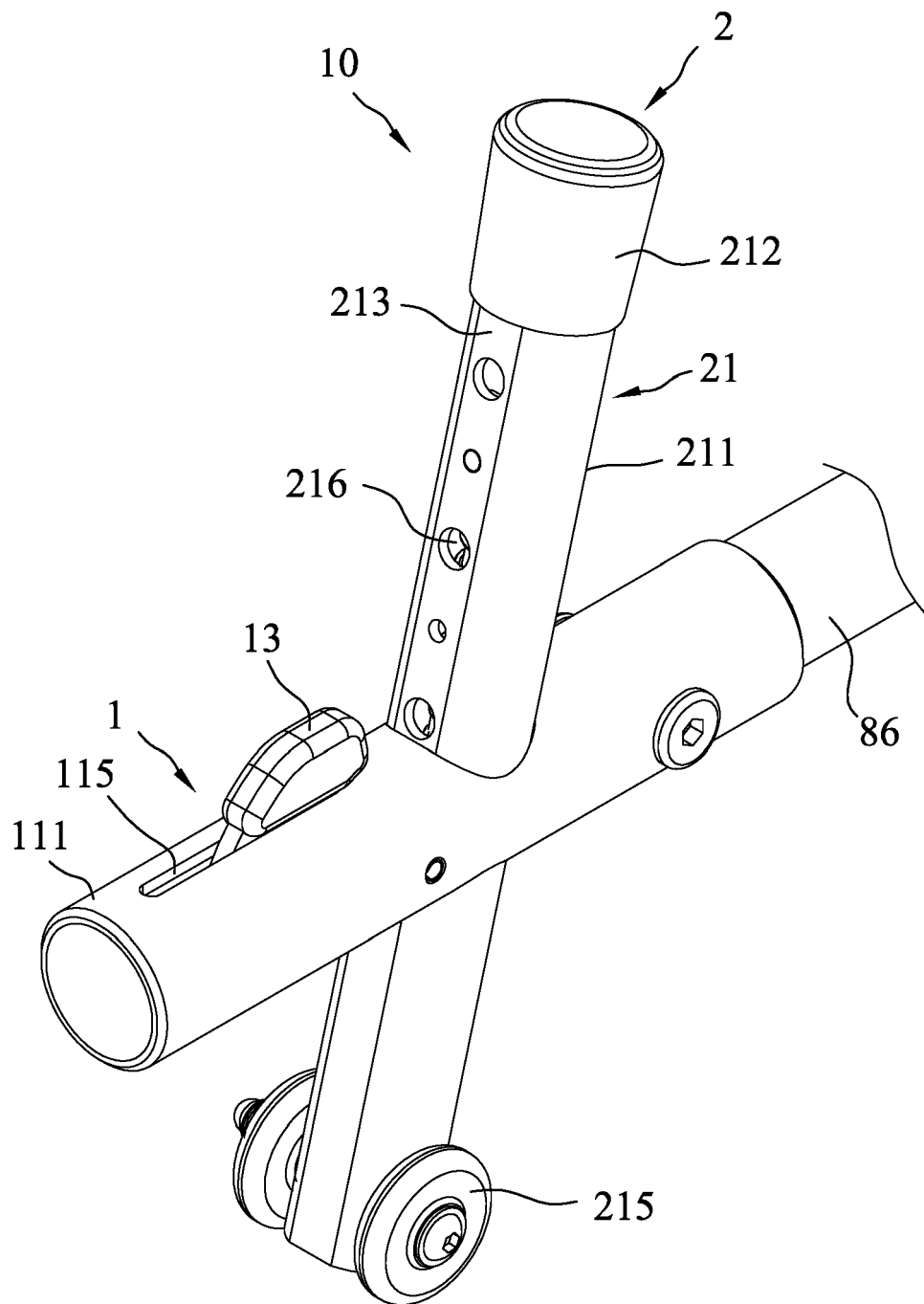
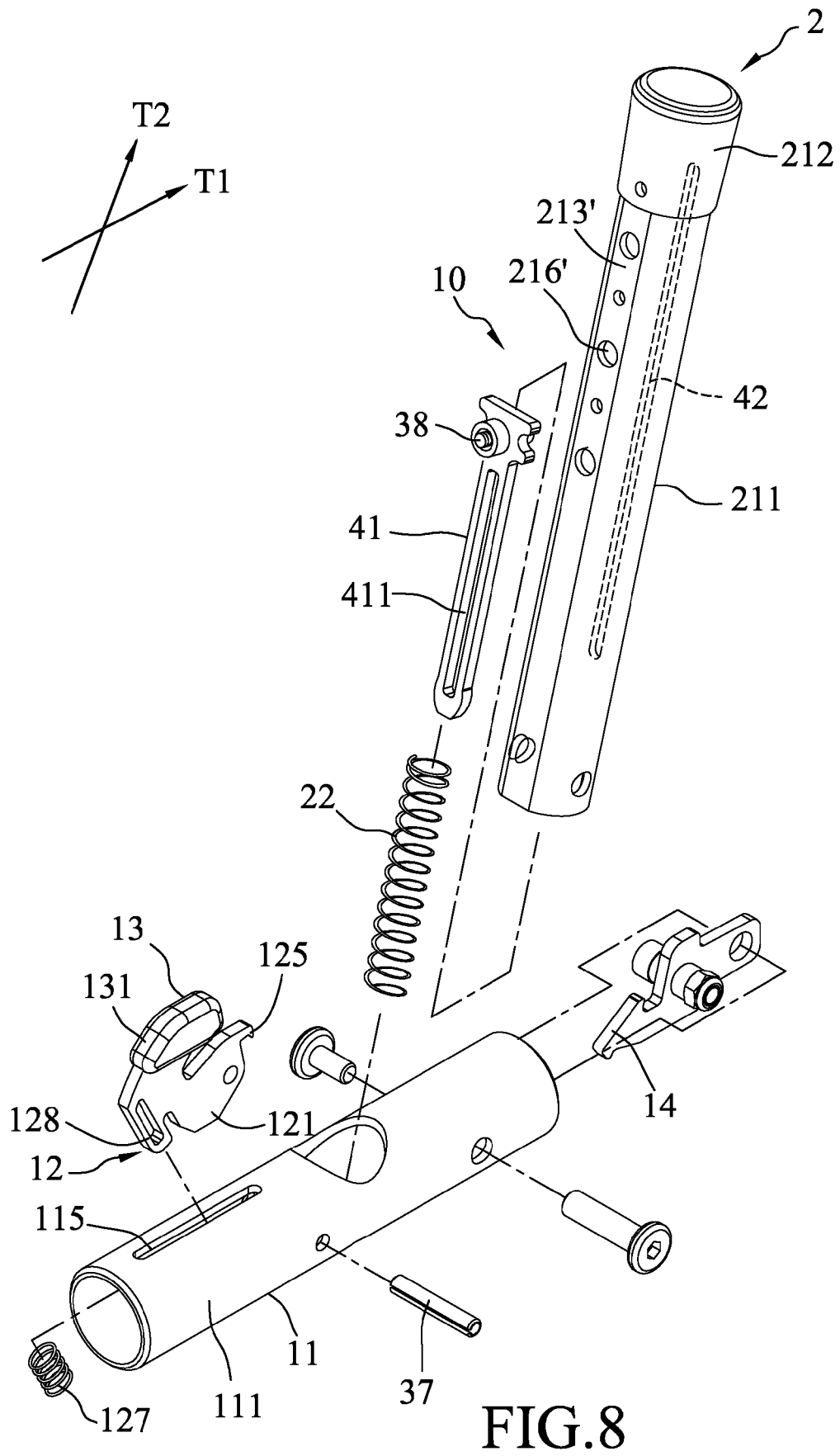


FIG.7



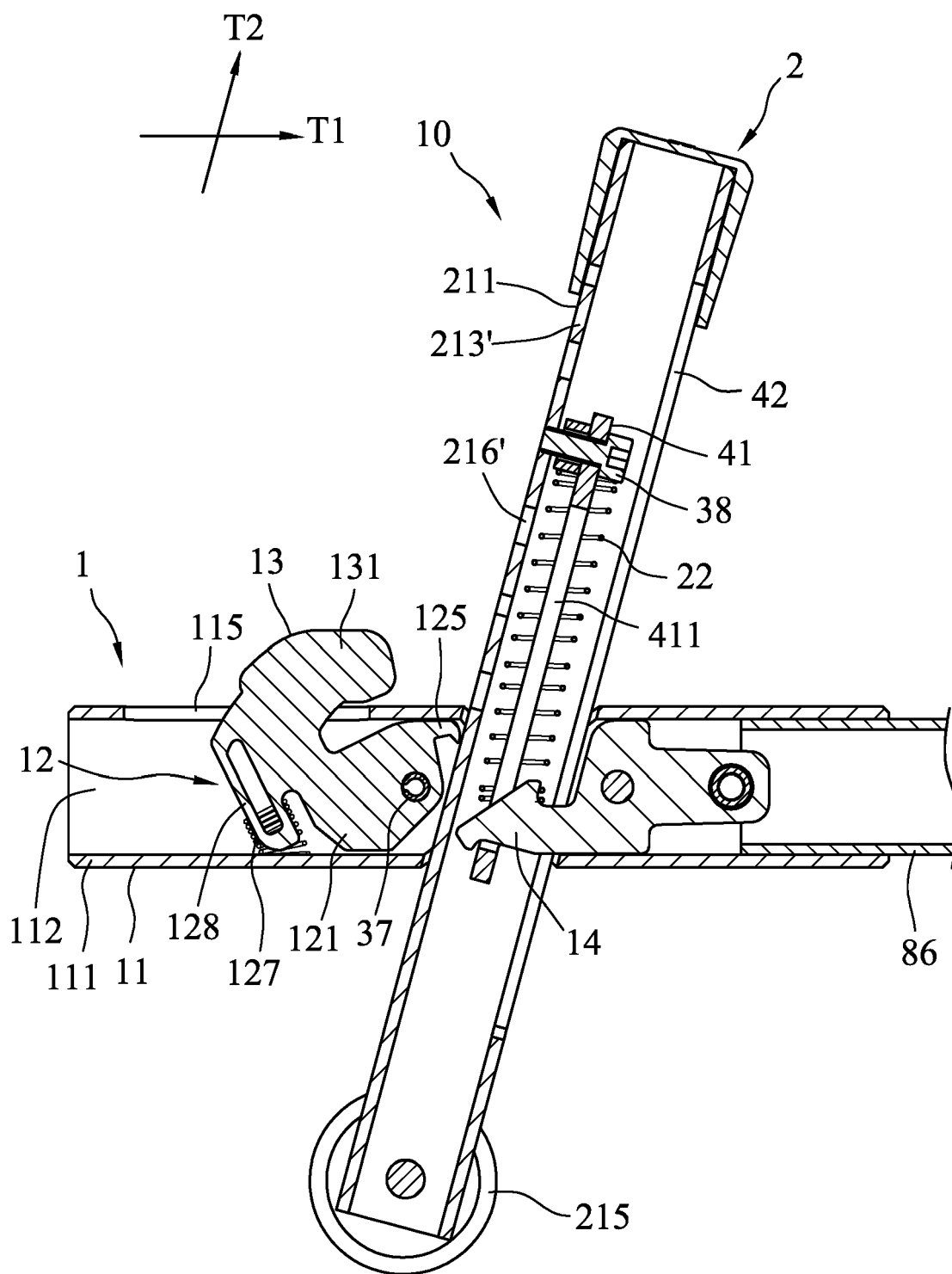


FIG.9

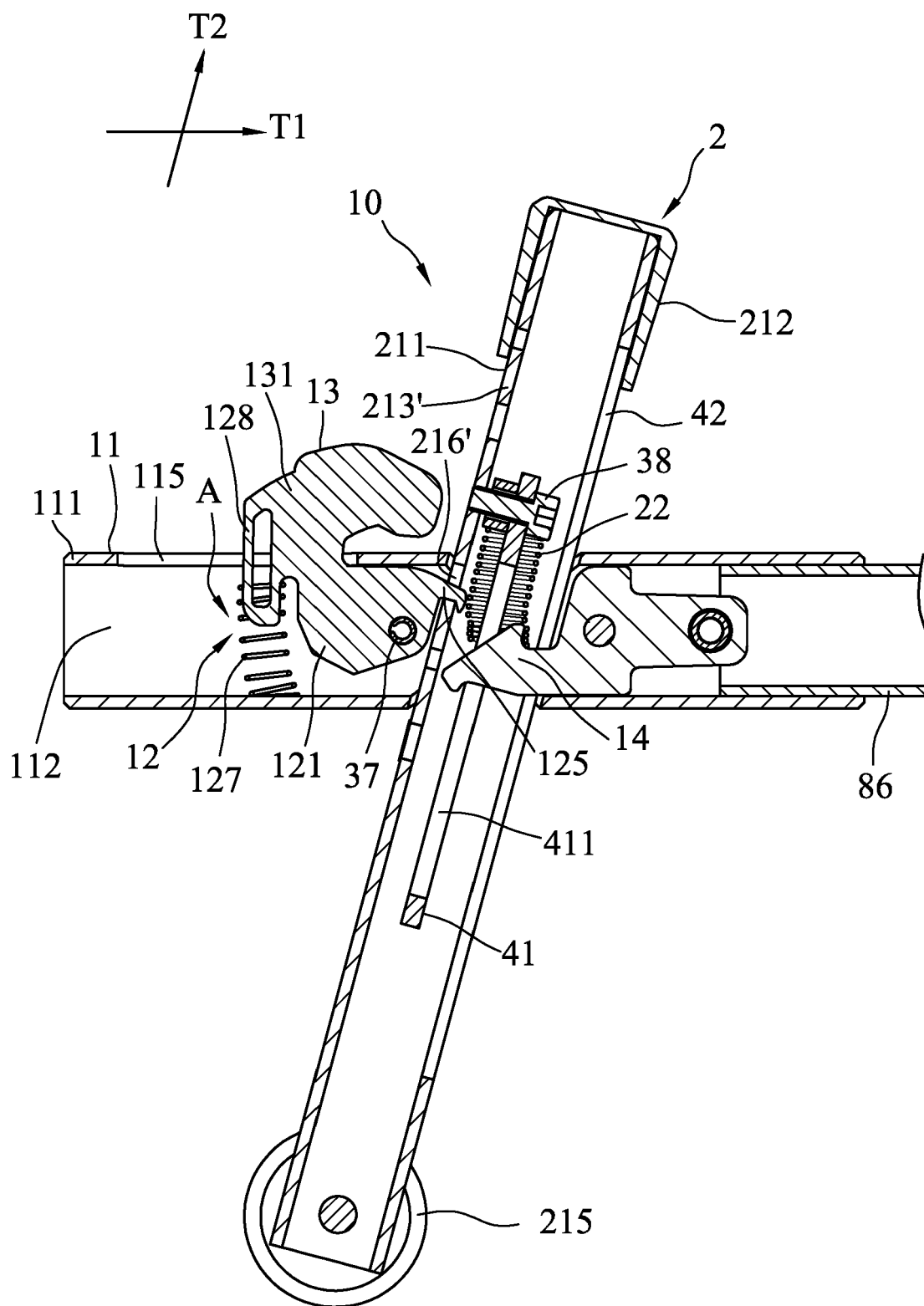


FIG.10

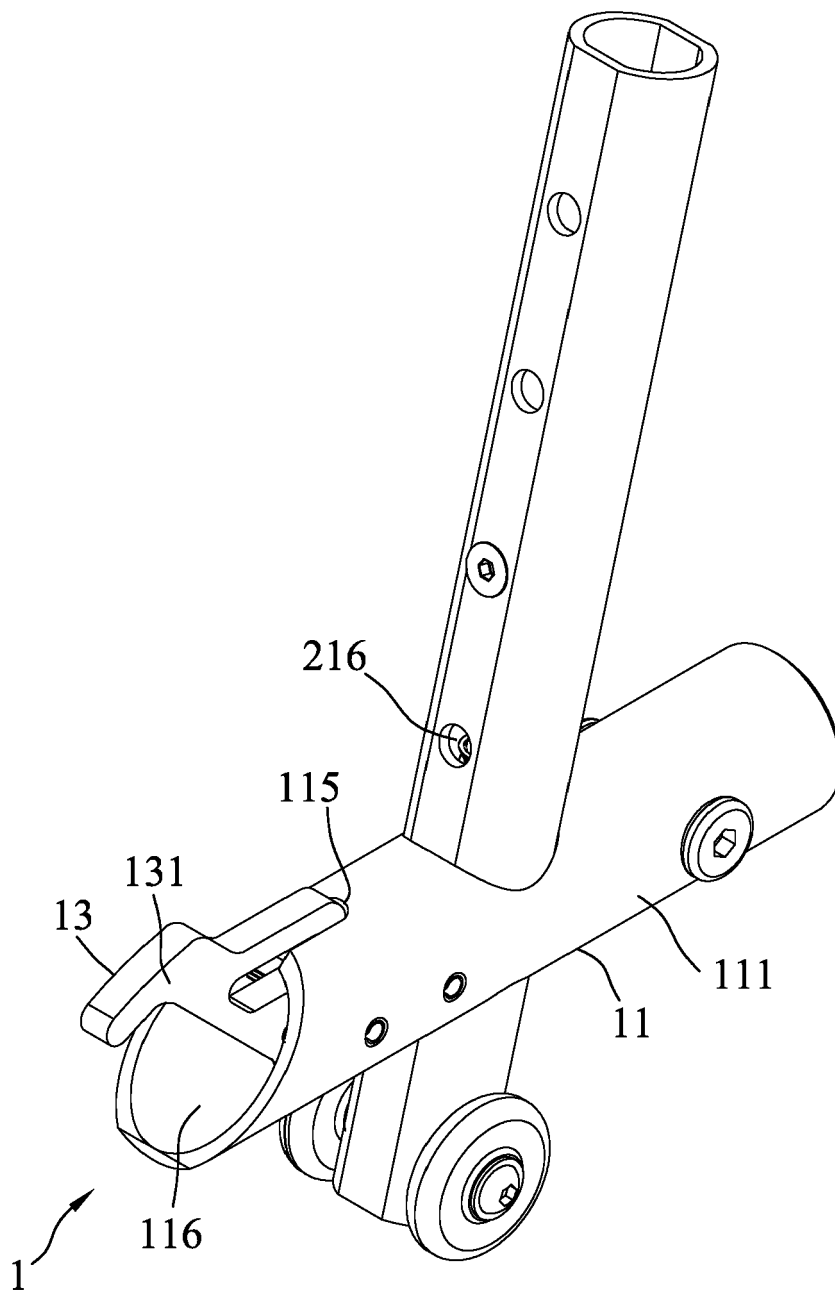


FIG.11

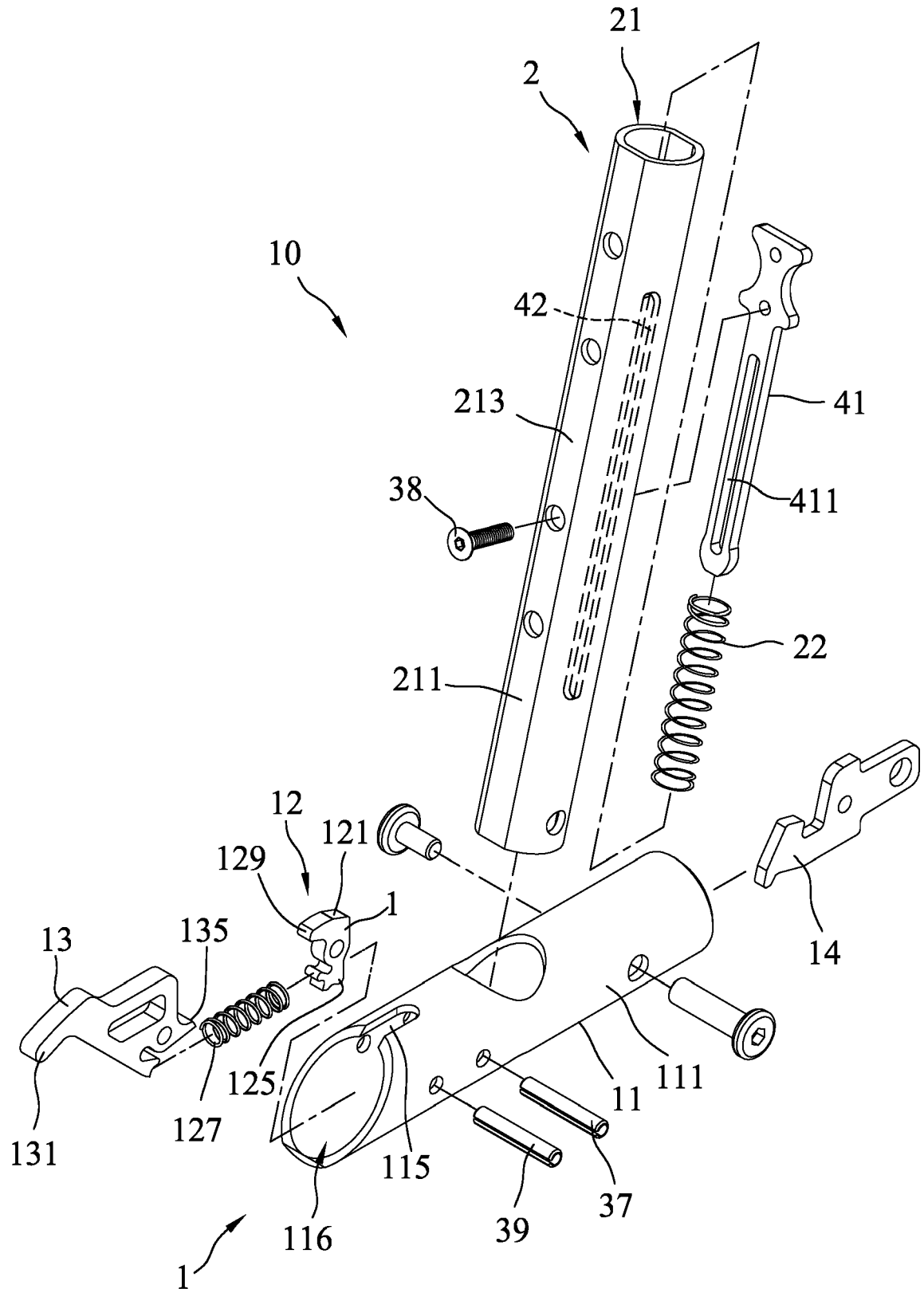


FIG.12

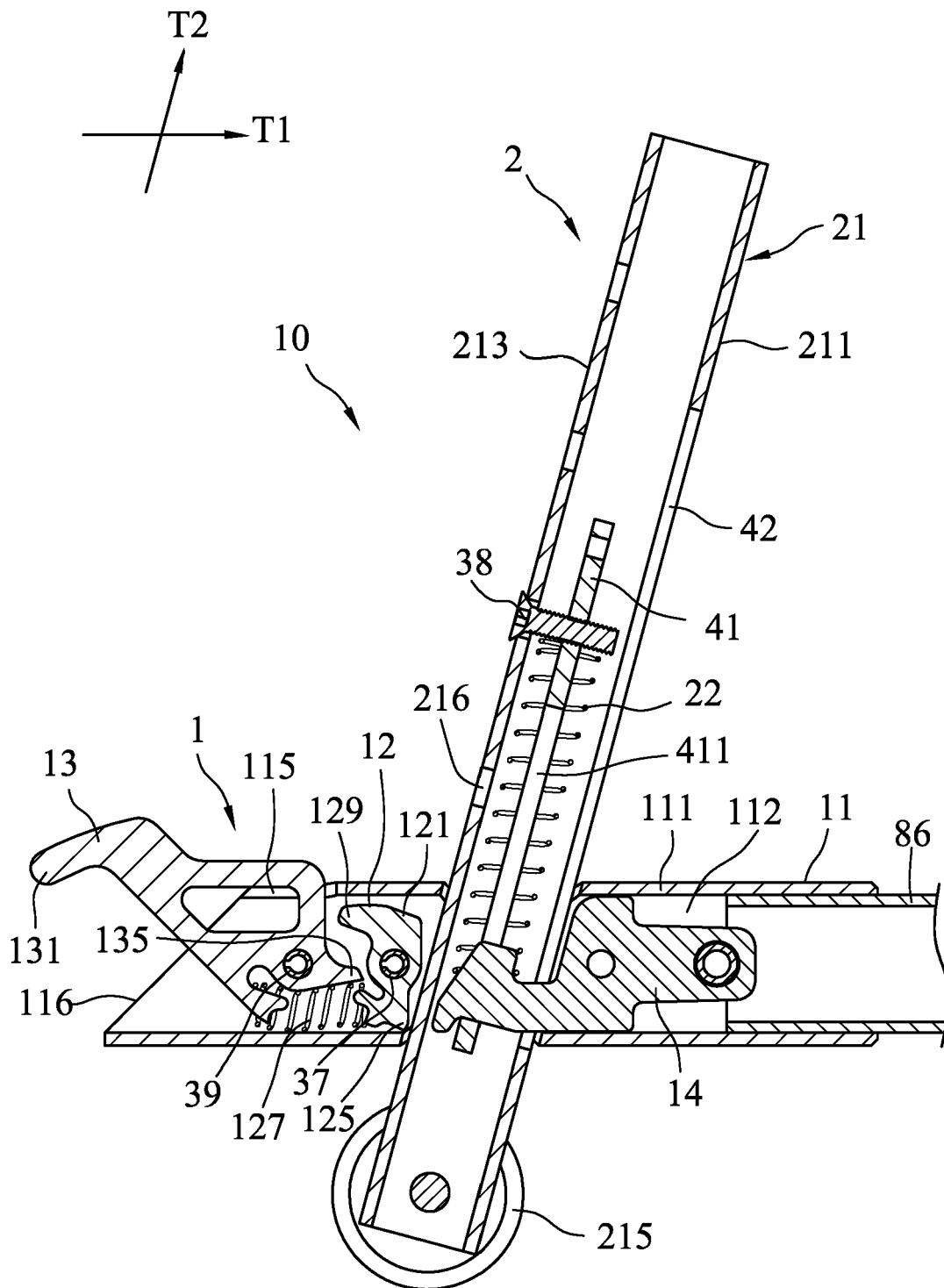


FIG. 13

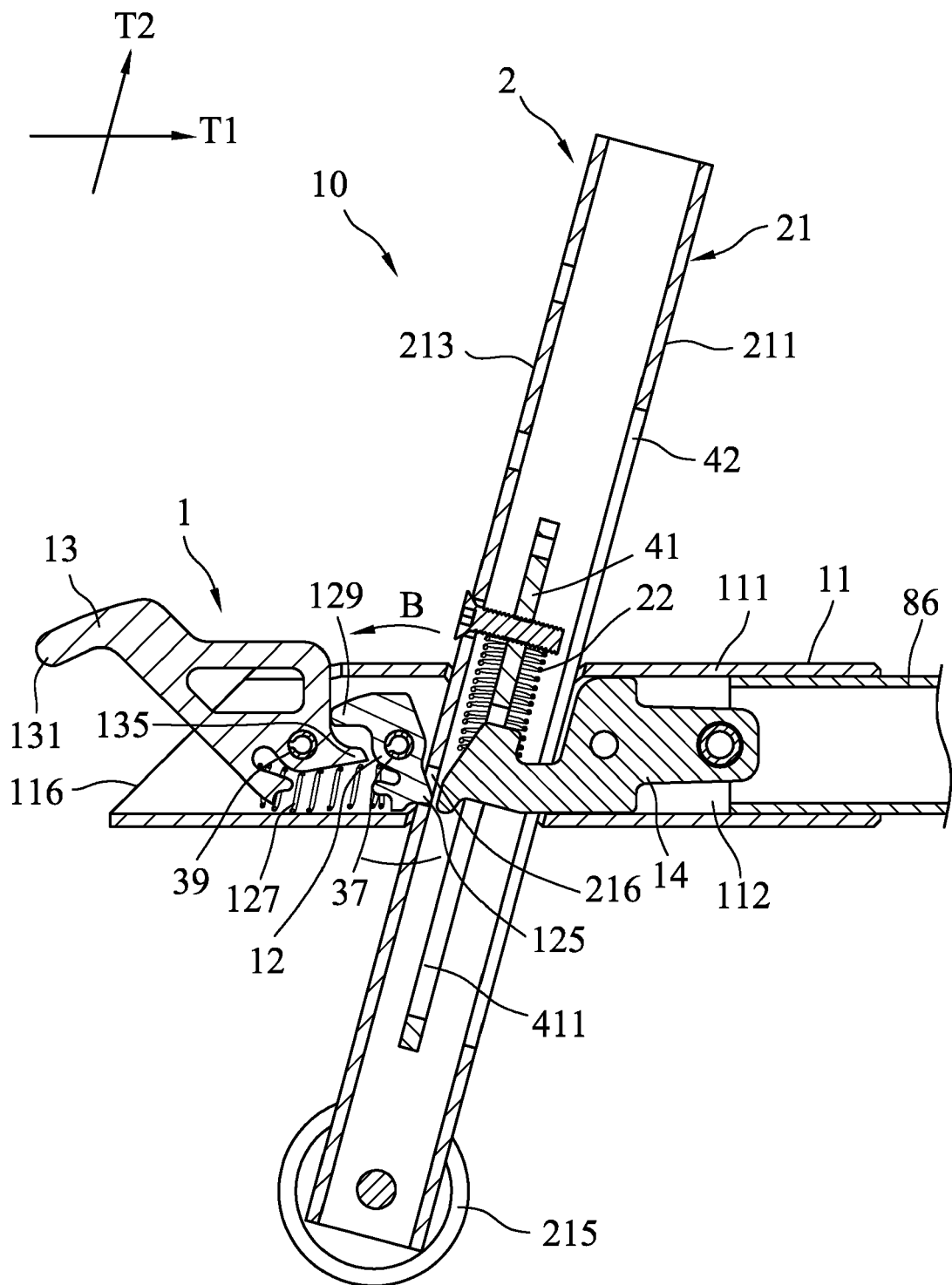


FIG.14

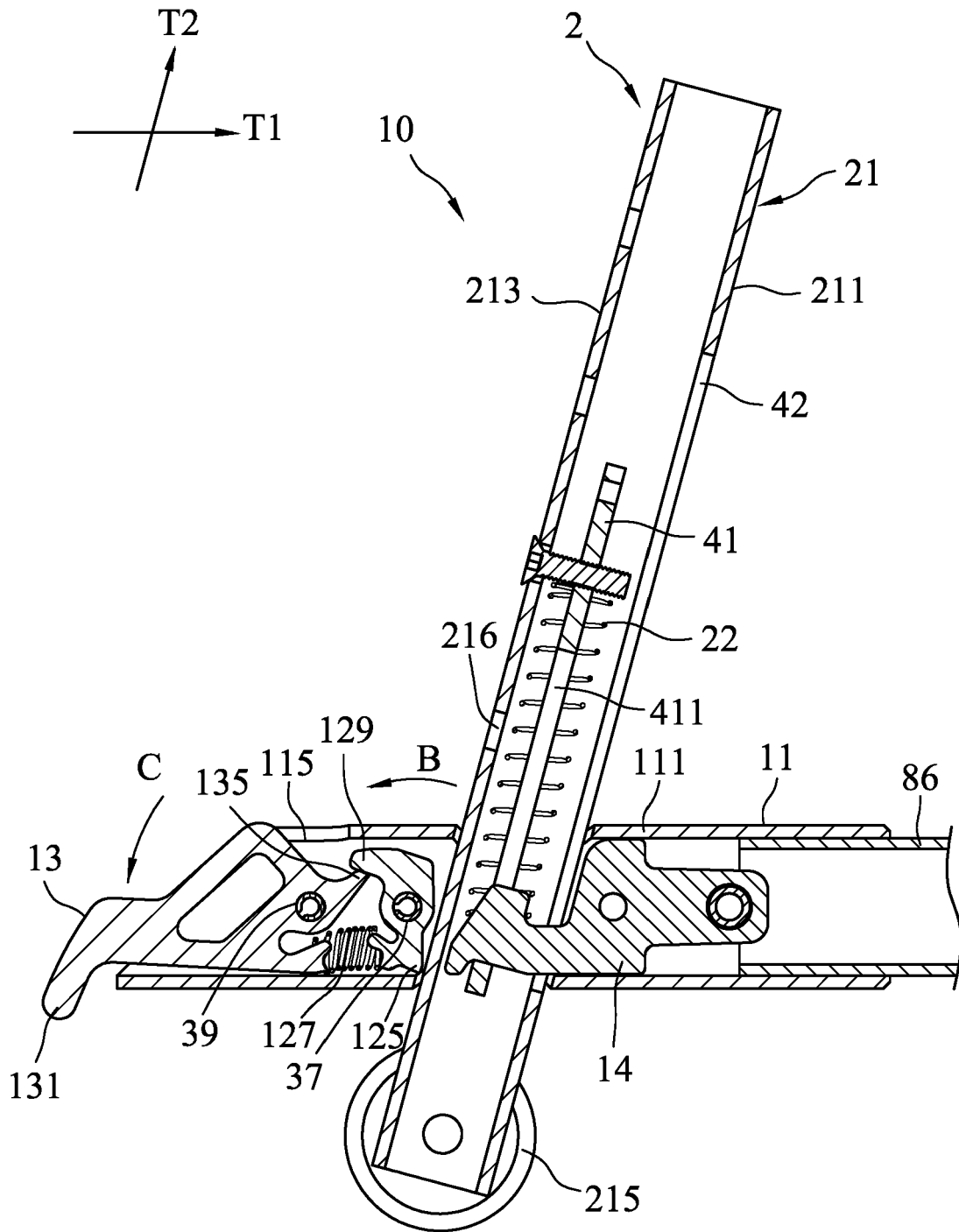


FIG.15



EUROPEAN SEARCH REPORT

Application Number

EP 22 21 2506

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	US 6 113 189 A (BENNETT JOHN [US] ET AL) 5 September 2000 (2000-09-05) * column 5, line 53 - column 6, line 20; figures 1, 6, 7 *	1-13	INV. A61G5/10 ADD. A61G5/06
A	WO 2019/068183 A1 (MOTION COMPOSITES INC [CA]) 11 April 2019 (2019-04-11) * figures 1-3 *	1-13	
			TECHNICAL FIELDS SEARCHED (IPC)
			A61G
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		31 May 2023	Mammeri, Damya
CATEGORY OF CITED DOCUMENTS		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	
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			

1
EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.

EP 22 21 2506

5 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.

31-05-2023

10	Patent document cited in search report	Publication date	Patent family member(s)	Publication date
	US 6113189 A	05-09-2000	NONE	
15	WO 2019068183 A1	11-04-2019	NONE	
20				
25				
30				
35				
40				
45				
50				
55				

EPO FORM P0459

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