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(54) **GATE BOARD TIGHTENING DEVICE**

(57) A gate board tightening device (2) is mountable in a main rail (81) of floodgate device (8) and includes a drive bar (3), a retention plate (4), and a first coupling seat (5) and a second coupling seat (6). The drive bar (3) has two ends respectively provided with a first connection terminal (31) and a second connection terminal (32). The first connection terminal (31) is coupled with the first coupling seat (5) and the second connection terminal (32) is coupled with the second coupling seat (6). The retention plate (4) is inserted into a tubular member (814) formed in the main rail (81) of the floodgate device (8) with the first coupling seat (5) mounted at one end of the main rail (81) of the floodgate device (8) and the second coupling seat (6) mounted at an opposite end of the main rail (81) of the floodgate device (8). When gate boards (82) of the floodgate device (8) are sequentially disposed in the coupling channel (811) of the main rail (81), an operation member (A) is inserted into a hole (312) formed in the first connection terminal (31) of the drive bar (3) and the operation member (A) is wrenched to cause the drive bar (3) to rotate in site for driving the retention plate (4) to horizontally push the gate boards (82) so that a powerful tight engagement is established between the gate boards (82) and a water-resistant strip (817) arranged in the main rail (81) of the floodgate device (8).

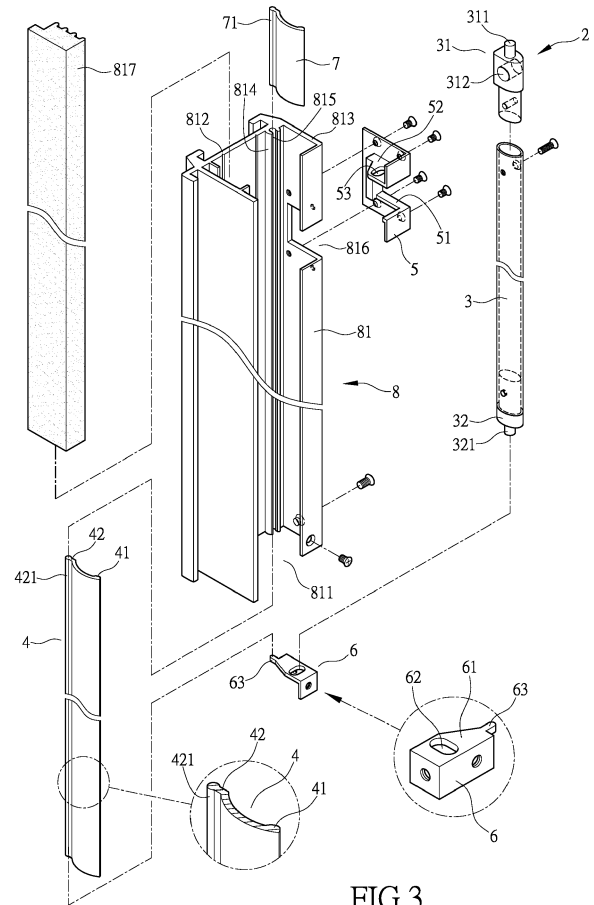


FIG.3

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Description

(a) Technical Field of the Invention

[0001] The present invention relates generally to a gate board tightening device, and more particularly to a gate board tightening device that allows gate boards of a flood-gate device to be secured simultaneously to achieve tightened engagement between each gate board tightened and main rails for the purpose of stopping (blocking) water flows.

(b) Description of the Prior Art

[0002] Global climate abnormality causes extreme weather conditions that impose severe influences on the living of human beings. Particularly, sudden and strong rainfalls occur in high frequency recently and the intense and huge precipitation of rainwater eventually causes flooding, leading to casualty and property damage.

[0003] A floodgate device is available for protection against flood and as shown in FIGS. 1 and 2, the conventional floodgate device 1 generally comprises two main rails 11 mounted to walls and a plurality of gate boards 12 received between the two main rails 11. The main rails 11 each have a side forming a coupling channel 111 in the form of a hollow channel. The coupling channel 111 is provided, on one side thereof, with a water-resistant strip 112 and is also provided, on an opposite side thereof, with a pressing member 113. The pressing member 113 is coupled with a plurality of threaded rods 114. The main rails 11 are each provided, on a top thereof, with a vertical pressing mechanism 13.

[0004] To use, the main rails 11 are first attached to support pillars 14 that are fixed in the walls and the plurality of gate boards 12 are disposed, in sequence, into the coupling channels 111 of the main rails 11. The vertical pressing mechanisms 13 are then operated to apply a pressing force to force the gate boards 12 downward such that a water-resistant strip 121 provided under each of the gate boards 12 is forcibly pressed and thus tightened so as to achieve a tightening and sealing effect between the gate boards 12. The threaded rods 114 are then operated to drive the pressing member 113 to provide horizontal compression to the gate boards 12 so that an excellent sealing effect may be achieved between each of the gate boards 12 and the water-resistant strips 112 of the main rails 11.

[0005] The above-described floodgate device 1 provides an effect of stopping (blocking) flood. However, the threaded rods 114 must be operated to drive the pressing members 113 against the gate boards 12 for achieving horizontal compression and the horizontal compression against the gate boards 12 must be conducted by operations of the multiplicity of threaded rods 114. This extends the necessary time period for the operations. In an emergent condition, this would cause a big hurry in conducting such operations. Further, although the threaded

rods 114 may drive the pressing member 113 to push against the gate boards 12, the contact between each of the threaded rods 114 and the pressing member 113 is in fact point contact. Such an arrangement of point contact between the threaded rod 114 and the pressing member 113, when attacked by flood, would make the pressure induced on the gate boards 12 by the flood transmitted from the pressing member 113 to each individual one of the threaded rods 114. This would make each individual one of the threaded rods 114 necessarily bear an extremely large force. Also, it is possible that different ones of the threaded rods 114 may take different levels of force or pressure applied thereto, and this would make it susceptible for the parts to get easily damaged.

SUMMARY OF THE INVENTION

[0006] The present invention is made to overcome the drawback of the prior art floodgate device that the horizontal compression against each of multiple gate boards may cause insufficiency of compression or make it susceptible for parts to get easily damaged.

[0007] To achieve the above objective, the present invention provides a gate board tightening device. The gate board tightening device according to the present invention comprises, at least, a drive bar, a retention plate, a first coupling seat, and a second coupling seat, wherein the drive bar is a straight bar having a cross-section that is generally in the form of an ellipse and has two ends respectively provided with a first connection terminal and a second connection terminal, such that the first connection terminal and the first coupling seat are coupled together, while the second connection terminal and the second coupling seat are coupled together; the retention plate is an elongate plate having a cross-section that is generally in the form of a curved configuration and is receivable in a tubular member of a main rail of a flood-gate device with the first coupling seat mounted at one end of the main rail of the floodgate device and the second coupling seat mounted at an opposite end of the main rail of the floodgate device.

[0008] The efficacy that the present invention may achieve through application of the above-described technical solution is that in the present invention, the drive bar, the retention plate, the first coupling seat, and the second coupling seat are arranged in a main rail of a floodgate device so that when gate boards of the flood-gate device are placed in the coupling channel of the main rail, an operation member is inserted into a hole formed in a first connection terminal of the drive bar of the present invention and then, the operation member is wrenched to cause in-situ rotation of the drive bar. The rotation of the drive bar causes the retention plate to rotate or swing so that the retention plate pushes and presses all the gate boards toward and against the water-resistant strip arranged in the main rail of the floodgate device thereby achieving tight engagement for sealing between the gate boards and the main rail. Oppositely,

to remove, the operation member is inserted again into the hole of the first connection terminal of the drive bar and wrenches in an opposite direction to cause the drive bar to rotate in an opposite direction, so that when the drive bar is rotated in the opposite direction to reach a condition of separating from pushing engagement with the retention plate, the retention plate no longer applies a pushing force to the gate boards. Once the retention plate is released to a predetermined extent, the gate boards can be removed, one by one, from the coupling channel of the main rail to complete an operation of dismounting.

[0009] The foregoing objectives and summary provide only a brief introduction to the present invention. To fully appreciate these and other objects of the present invention as well as the invention itself, all of which will become apparent to those skilled in the art, the following detailed description of the invention and the claims should be read in conjunction with the accompanying drawings. Throughout the specification and drawings identical reference numerals refer to identical or similar parts.

[0010] Many other advantages and features of the present invention will become manifest to those versed in the art upon making reference to the detailed description and the accompanying sheets of drawings in which a preferred structural embodiment incorporating the principles of the present invention is shown by way of illustrative example.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011]

FIGS. 1 and 2 are schematic views illustrating a conventional floodgate device.

FIG. 3 is an exploded view of the present invention.

FIG. 4 is a perspective view of the present invention in an assembled condition.

FIGS. 5-8 show an illustrative example according to the present invention.

FIGS. 9-10 show another illustrative example according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0012] The following descriptions are exemplary embodiments only, and are not intended to limit the scope, applicability or configuration of the invention in any way. Rather, the following description provides a convenient illustration for implementing exemplary embodiments of the invention. Various changes to the described embodiments may be made in the function and arrangement of the elements described without departing from the scope

of the invention as set forth in the appended claims.

[0013] Referring first to FIGS. 3 and 4, the present invention provides a gate board tightening device 2, which comprises, at least, a drive bar 3, a retention plate 4, a first coupling seat 5, and a second coupling seat 6.

[0014] The drive bar 3 comprises a straight rod-like body having a cross-sectional shape that is generally in the form of an ellipse. The drive bar 3 has two ends respectively provided with a first connection terminal 31 and a second connection terminal 32. The first connection terminal 31 has at least one side having an outer contour similar or identical to that of the drive bar 3. The first connection terminal 31 is provided, on a top side thereof, with an axle 311 mounted thereto and is also provided with a hole 312 formed in a middle thereof, such that the hole 312 extends in a direction substantially perpendicular to an axial direction of the drive bar 3. The second connection terminal 32 is provided, on a bottom side thereof, with an axle 321. The second connection terminal 32 has a cross-sectional shape corresponding to a cross-sectional shape of the drive bar 3. Further, at least one of the first connection terminal 31 and the second connection terminal 32 is integrally formed with the drive bar 3 as a unitary structure, or alternatively, at least one of the first connection terminal 31 and the second connection terminal 32 is formed separate from the drive bar 3 as individual structures, which are then combined together as a single unitary structure.

[0015] The retention plate 4 comprises an elongate plate body having a cross-section that is generally in the form of a curved or arc configuration. The retention plate 4 has a side edge along which a rib 41 is formed and another side edge that is opposite to the rib 41 and is extended to form a straight section 42, wherein the straight section 42 has a distal end that is further extended to form a cylindrical body 421 extending along the side edge.

[0016] The first coupling seat 5 comprises an open section 51 that is a hollowed section forming an open space and a carrying plate 52 arranged above the open section 51, wherein the carrying plate 52 comprises a hole 53 that is an elongate circular hole formed therein.

[0017] The second coupling seat 6 comprises a carrying plate 61, and the carrying plate 61 comprises a hole 62 that is an elongate circular hole formed therein, and the carrying plate 61 has an end that is extended to form a rounded projecting distal end 63.

[0018] The positioning member 7 is fixed on a top side of the retention plate 4 and has at least one side edge that is provided with a cylindrical body 71. For purposes of aesthetics and product entirety consistency of the positioning member 7, the positioning member 7 is preferably made similar in shape to the retention plate 4.

[0019] Further referring to FIG. 4, the gate board tightening device 2 according to the present invention is provided for use and installation in a floodgate device 8. The floodgate device 8 comprises, at least, two main rails 81 for mounting to walls. The main rails 81 each have a

surface that is formed with a hollowed coupling channel 811. The coupling channel 811 is provided, in an interior space thereof, with a cylindrical, hollow, tubular member 814 mounted on the bottom board 812 at a location adjacent to one side board 813. The tubular member 814 is opened with an opening slot 815 formed in and extending along a tubular body thereof. The main rail 81 is further formed with an opening 816 that is formed in the side board 813 adjacent to the tubular member 814. The coupling channel 811 is provided, on an opposite side thereof, with a water-resistant strip 817.

[0020] Based on the above, the first coupling seat 5 is first installed in the main rail 81 such that the open section 51 of the first coupling seat 5 corresponds to the opening 816 of the side board 813 of the main rail 81 and the first coupling seat 5 is mounted to the side board 813 of the main rail 81 to be fixed thereto by a plurality of threaded fastening elements to have the first coupling seat 5 fixedly installed and mounted in the main rail 81.

[0021] The axle 311 of the first connection terminal 31 of the drive bar 3 is then inserted into and rotatably mounted in the hole 53 of the first coupling seat 5, where supporting is provided for temporary fixing.

[0022] The cylindrical body 421 of the retention plate 4 is then set to align with the tubular member 814 of the main rail 81 to make the straight section 42 of the retention plate 4 align with the opening slot 815 of the tubular member 814 thereby allowing the cylindrical body 421 of the retention plate 4 to penetrate into the tubular member 814 of the main rail 81.

[0023] Finally, the second coupling seat 6 is mounted to an opposite end of the coupling channel 811 of the main rail 81 such that the hole 62 of the second coupling seat 6 corresponds to the axle 321 of the second connection terminal 32 of the drive bar 3 to allow the axle 321 to extend into and be thus rotatably mounted in the hole 621 of the second coupling seat 6 and also, the projecting distal end 63 of the second coupling seat 6 is received through the opening slot 815 of the tubular member 814 so that the projecting distal end 63 of the second coupling seat 6 extends into the tubular member 814. Under this condition, the cylindrical body 421 of the retention plate 4 is seated on and supported by the projecting distal end 63 of the second coupling seat 6 so as to provide an effect of positioning the lower side of the retention plate 4. A plurality of threaded fastening elements may then be applied to fix the second coupling seat 6 in the main rail 81 so that the second coupling seat 6 is securely mounted and coupled in the main rail 81. Also, the first connection terminal 31 at one end of the drive bar 3 is rotatably coupled to the first coupling seat 5, while the second connection terminal 32 at an opposite end is rotatably coupled to the second coupling seat 6 so that the drive bar 3 is allowed to take in-situ rotational motion, at a fixed location, between the first coupling seat 5 and the second coupling seat 6.

[0024] Finally, the positioning member 7 is mounted at the location above the retention plate 4 in such a way

that the cylindrical body 71 of the positioning member 7 extends into the tubular member 814 of the main rail 81 and then, other measures, such as tight fitting through proper selection of sizes/dimensions or welding, are taken to securely fix the positioning member 7 so that the installation of the positioning member 7 provides an effect of positioning and/or constraining the top side of the retention plate 4. In practice, the positioning member 7 may be set in slight contact with the retention plate 4 or preferably not in contact therewith, so that the top of the retention plate 4 is constrained, in position, by the cylindrical body 71 of the positioning member 7 and the bottom of the retention plate 4 is positioned on and supported by the projecting distal end 63 of the second coupling seat 6 to prevent the retention plate 4 from detached from the tubular member 814 of the main rail 81 and to provide an effect of allowing the retention plate 4 to rotate or swing about a center of the cylindrical body 421 within and relative to the tubular member 814.

[0025] Further referring to FIGS. 5, 6, and 7, to use the present invention, a floodgate device 8 is installed such that gate boards 82 are set in the coupling channel 811 of the main rail 81 and then, an operation member A, such a wrench, may be inserted into the hole 312 of the first connection terminal 31 of the drive bar 3 and the operation member A is wrenched to make the drive bar 3 rotate in-situ. The rotation of the drive bar 3 causes a movement of the retention plate 4, so that the retention plate 4 swings or sways about a center of the cylindrical body 421 and the retention plate 4 pushes simultaneously all the gate boards 82 toward and compressing against the water-resistant strip 817 of the main rail 81 to such a condition that the drive bar 3 is rotated by around 90 degrees, where a maximum extent that the drive bar 3 may push the retention plate 4 is reached and under such a condition, an opposite side of the drive bar 3 is forced against and in tight engagement with the side board 813 of the main rail 81. After the operation, the two opposite sides of the drive bar 3 are respectively set tight against the retention plate 4 and the side board 813 of the main rail 81 to thereby achieve and provide a tight, sealing engagement between the gate boards 82 and the water-resistant strip 817 that completely prevents water from leaking therethrough. In addition, the tight engagement between the drive bar 3 and the side board 813 of the main rail 81 provides a great supporting and pushing force.

[0026] Oppositely, to dismount, the operation member A is inserted into the hole 312 of the first connection terminal 31 of the drive bar 3 again and wrenched in an opposite direction to drive the drive bar 3 to rotate in an opposite direction so that when the drive bar 3 is rotated to a condition of releasing the pushing engagement thereof with the retention plate 4, the retention plate 4 is then released from application of a pushing force to the gate boards 82 so that after the retention plate 4 is released to quite an extent, the gate boards 82 may be removed, one by one, from the coupling channel 811 of

the main rail 81.

[0027] It is noted here that the retention plate 4 is provided with a body having a curved or arc configuration and a rib 41 to achieve close and tight mating engagement with the elliptic configuration of the drive bar 3 so that when the drive bar 3 is rotated by an angle of around 90 degrees, the drive bar 3 is just retained in position by the retention plate 4 and the rib 41 thereof to thereby ensure that the drive bar 3 is easily further moved or rotated and thus effectively maintaining a pushing effect on the retention plate 4. Further, the curved or arc configuration of the retention plate 4, when pushed by the drive bar 3, would get into increasing tight engagement with and thus increasingly forcibly pushing and pressing the gate boards 82, this helping greatly reduce surface damage that may occur on the gate boards 82. Further, when the drive bar 3 drives the retention plate 4 to push and press against all the gate boards 82, the drive bar 3 and the retention plate 4 provide linear contact engagement, through the entire length thereof, with all the gate boards 82 to push and press them all so that the force applied to each of the gate boards 82 are generally the same. As such, non-uniform application of force to the gate boards would not happen and thus, damage caused by non-uniform application of force can be eliminated. In addition, in case of flood where a great water pressure is acting on the gate boards 82, the pressure that the gate boards 82 takes would be transmitted through the retention plate 4 to the drive bar 3 and due to the tight pushing engagement between the drive bar 3 and the side board 813 of the main rail 81, the drive bar 3 is kept in a securely supported condition to thereby maintain integrity and stiffness of the present invention against being damaged by the water pressure applied thereto.

[0028] Further referring to FIGS. 9 and 10, in another illustrative example of the present invention, in case that the floodgate device 8 is made to span over a large distance between two walls, in addition to the two main rails 81 mounted to the two walls, at least one intermediate pillar 83 is necessarily provided between the two main rails 81, where the gate board tightening device 2 is also applicable. In practice, the intermediate pillar 83 has two opposite side surfaces each forming a hollowed coupling channel 831. The coupling channel 831 is provided, in an interior space thereof, with a cylindrical, hollow, tubular member 834 mounted on a bottom board 832 thereof at a location adjacent to one side board 833. The tubular member 834 is opened with an opening slot 835 formed in and extending along a tubular body thereof. The intermediate pillar 83 is further formed with an opening 836 that is formed in the side board 833 adjacent to the tubular member 834. The coupling channel 831 is provided, on an opposite side thereof, with a water-resistant strip 837. The drive bar 3, the retention plate 4, the first coupling seat 5, the second coupling seat 6, and the positioning member 7, according to the present invention, may also be provided in the intermediate pillar 83 of the floodgate device 8 and are mounted in the intermediate pillar 83 in

exactly the same way as that for mounting in the pillar 82 so that no repeated description will be provided herein. Similarly, an operation member **A** may be inserted into the hole 312 of the first connection terminal 31 of the drive bar 3 to carry out a wrenching operation so as to have the drive bar 3 provided in the intermediate pillar 83 of the present invention driving the retention plate 4 for pushing and pressing against or releasing the gate boards 82 thereby achieving the use thereof with the floodgate device 8.

[0029] The effectiveness of the present invention is that when the gate boards 82 of the floodgate device 8 are placed in the coupling channel 811 of the main rails 81, an operation member **A** is inserted into the hole 312 of the first connection terminal 31 of the drive bar 3 to wrench the operation member **A** for causing the drive bar 3 to rotate in site. The rotation of the drive bar 3 causes the retention plate 4 to rotate or swing about a center of the cylindrical body 421 so that the retention plate 4 pushes and presses the gate boards 82 toward and against the water-resistant strip 817 of the floodgate device 8. As such, a powerful and tight engagement for sealing between the gate boards 82 and the water-resistant strip 817 can be achieved. To release, the operation member **A** is inserted again into the hole 412 of the first connection terminal 31 of the drive bar 3 and wrenches in an opposite direction to cause the drive bar 3 to rotate in an opposite direction. When the drive bar 3 is rotated in the opposite direction to reach a condition of separating from pushing engagement with the retention plate 4, the retention plate 4 no longer applies a pushing force to the gate boards 82. Once the retention plate 4 is released to a predetermined extent, the gate boards 82 can be removed, one by one, from the coupling channel 811 of the main rail 81 to complete an operation of dismounting.

[0030] It will be understood that each of the elements described above, or two or more together may also find a useful application in other types of methods differing from the type described above.

[0031] While certain novel features of this invention have been shown and described and are pointed out in the annexed claim, it is not intended to be limited to the details above, since it will be understood that various omissions, modifications, substitutions and changes in the forms and details of the device illustrated and in its operation can be made by those skilled in the art without departing in any way from the claims of the present invention.

Claims

1. A gate board tightening device, comprising, at least:
 - a drive bar (3), which a straight rod-like body having two ends respectively provided with a first connection terminal (31) and a second connection terminal (32), the first connection termi-

- nal (31) being provided, on a top side thereof, with an axle (311), the second connection terminal (32) being provided, on a bottom side thereof, with an axle (321);
 a retention plate (4), which an elongate plate body drivable by the drive bar (3) to move in unison therewith and having a side edge extended to form a straight section (42), the straight section (42) having a distal end that is further extended to form a cylindrical body (42);
 a first coupling seat (5), which is mountable to the first connection terminal (31) of the drive bar (3) and comprises an open section (51) forming an open space, a carrying plate (52) being arranged above the open section (51), the carrying plate (52) comprising a hole (53) formed therein; and
 a second coupling seat (6), which is mountable to the second connection terminal (32) of the drive bar (3) and comprises a carrying plate (61), the carrying plate (61) comprising a hole (62) formed therein.
2. The gate board tightening device according to claim 1, wherein the drive bar (3) has a cross-sectional shape that is generally in the form of an ellipse.
 3. The gate board tightening device according to claim 1, wherein at least one of the first connection terminal (31) and the second connection terminal (32) of the drive bar (3) is formed separately from the drive bar (3) and is combinable therewith to form a unitary structure.
 4. The gate board tightening device according to claim 1, wherein at least one of the first connection terminal (31) and the second connection terminal (32) of the drive bar (3) is integrally formed with the drive bar (3) as a unitary structure.
 5. The gate board tightening device according to claim 1, wherein the first connection terminal (31) of the drive bar (3) has at least one side having an outer contour similar or identical to the drive bar (3).
 6. The gate board tightening device according to claim 1, wherein the first connection terminal (31) of the drive bar (3) is provided, in a middle thereof, with a hole (312), such that the hole (312) extends in a direction substantially perpendicular to an axial direction of the drive bar (3).
 7. The gate board tightening device according to claim 1, wherein the second connection terminal (32) of the drive bar (3) has a cross-sectional shape corresponding to a cross-sectional shape of the drive bar (3).
 8. The gate board tightening device according to claim 1, wherein the retention plate (4) has a cross-section that is generally in the form of a curved configuration.
 9. The gate board tightening device according to claim 1, wherein the retention plate (4) has a side edge along which a rib (41) is formed.
 10. The gate board tightening device according to claim 1, wherein the hole (53) of the carrying plate (52) of the first coupling seat (5) is an elongate circular hole.
 11. The gate board tightening device according to claim 1, wherein the hole (62) of the carrying plate (61) of the second coupling seat (6) is an elongate circular hole.
 12. The gate board tightening device according to claim 1, wherein the carrying plate (61) of the second coupling seat (6) has an end that is extended to form a rounded projecting distal end (63).
 13. The gate board tightening device according to claim 1 further comprising a positioning member (7), the positioning member (7) being fixed on a top side of the retention plate (4) and having at least one side edge provided with a cylindrical body (71).
 14. The gate board tightening device according to claim 13, wherein the positioning member (7) is similar in shape to the retention plate (4).
 15. A floodgate device that comprises the gate board tightening device according to claim 1 mounted therein, wherein the floodgate device (8) comprises at least two main rails (81) adapted to be mounted to walls, each of the main rails (81) has a surface in which a hollowed coupling channel (811) is formed, wherein the coupling channel (811) is provided, in an interior space thereof, with a cylindrical, hollow, tubular member (814) mounted on the bottom board (812) at a location adjacent to one side board (813), the tubular member (814) being formed with an opening slot (815) formed in and extending along a tubular body thereof, the main rail (81) being further formed with an opening (816) that is formed in the side board (813) adjacent to the tubular member (814).
 16. The floodgate device according to claim 15, wherein the coupling channel (811) of the main rail (81) is provided, on an opposite side thereof, with a water-resistant strip (817).
 17. The floodgate device according to claim 15, wherein at least one intermediate pillar (83) arranged between the two main rails (81) and the intermediate pillar (83) has two opposite side surfaces each form-

ing a hollowed coupling channel (831), the coupling channel (831) being provided, in an interior space thereof, with a cylindrical, hollow, tubular member (834) mounted on a bottom board (832) thereof at a location adjacent to one side board (833), the tubular member (834) being formed with an opening slot (835) formed in and extending along a tubular body thereof, the intermediate pillar (83) being further formed with an opening (836) that is formed in the side board (833) adjacent to the tubular member (834).

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18. The floodgate device according to claim 17, wherein the coupling channel (831) of the intermediate pillar (83) is provided, on an opposite side thereof, with a water-resistant strip (837).

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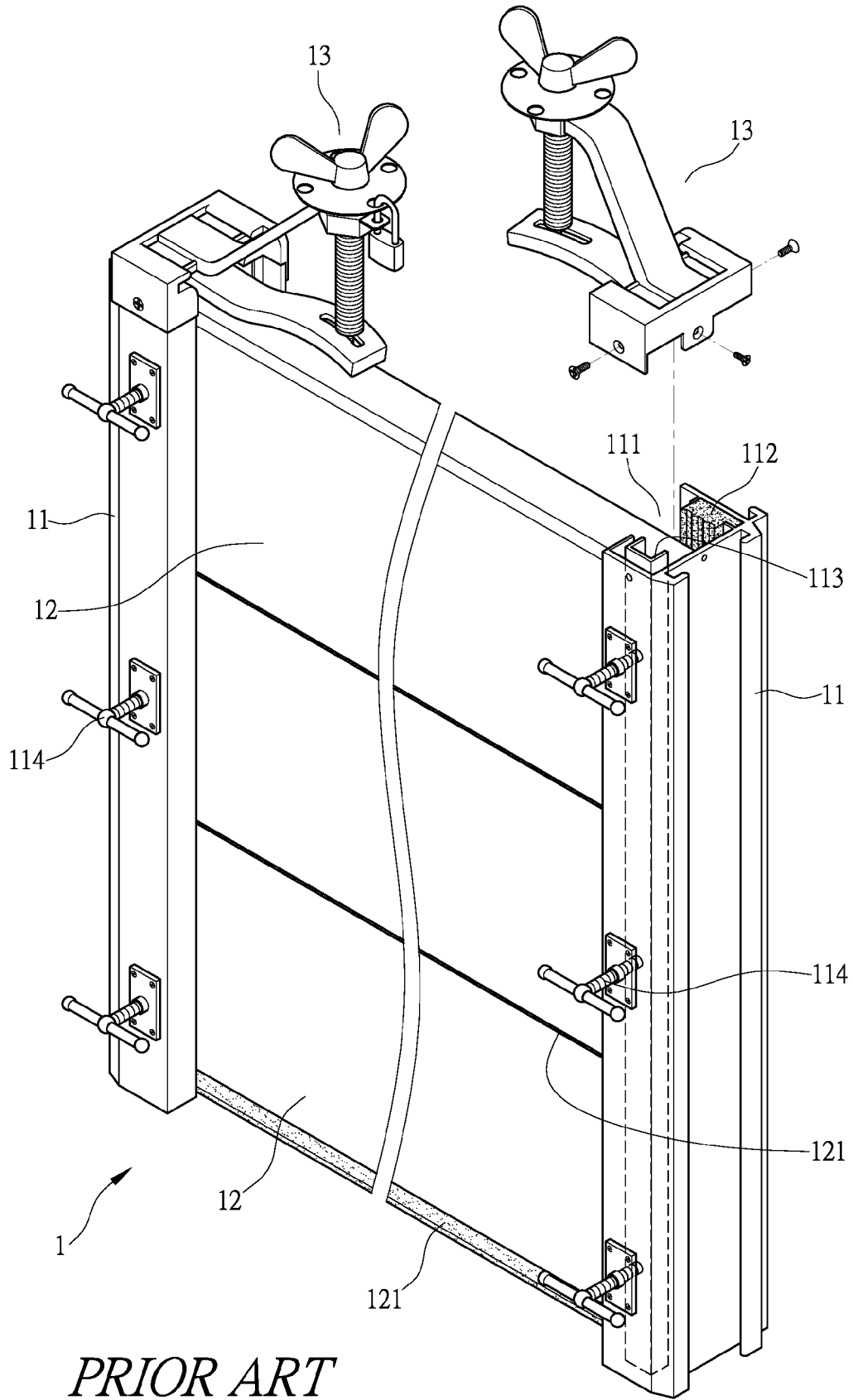
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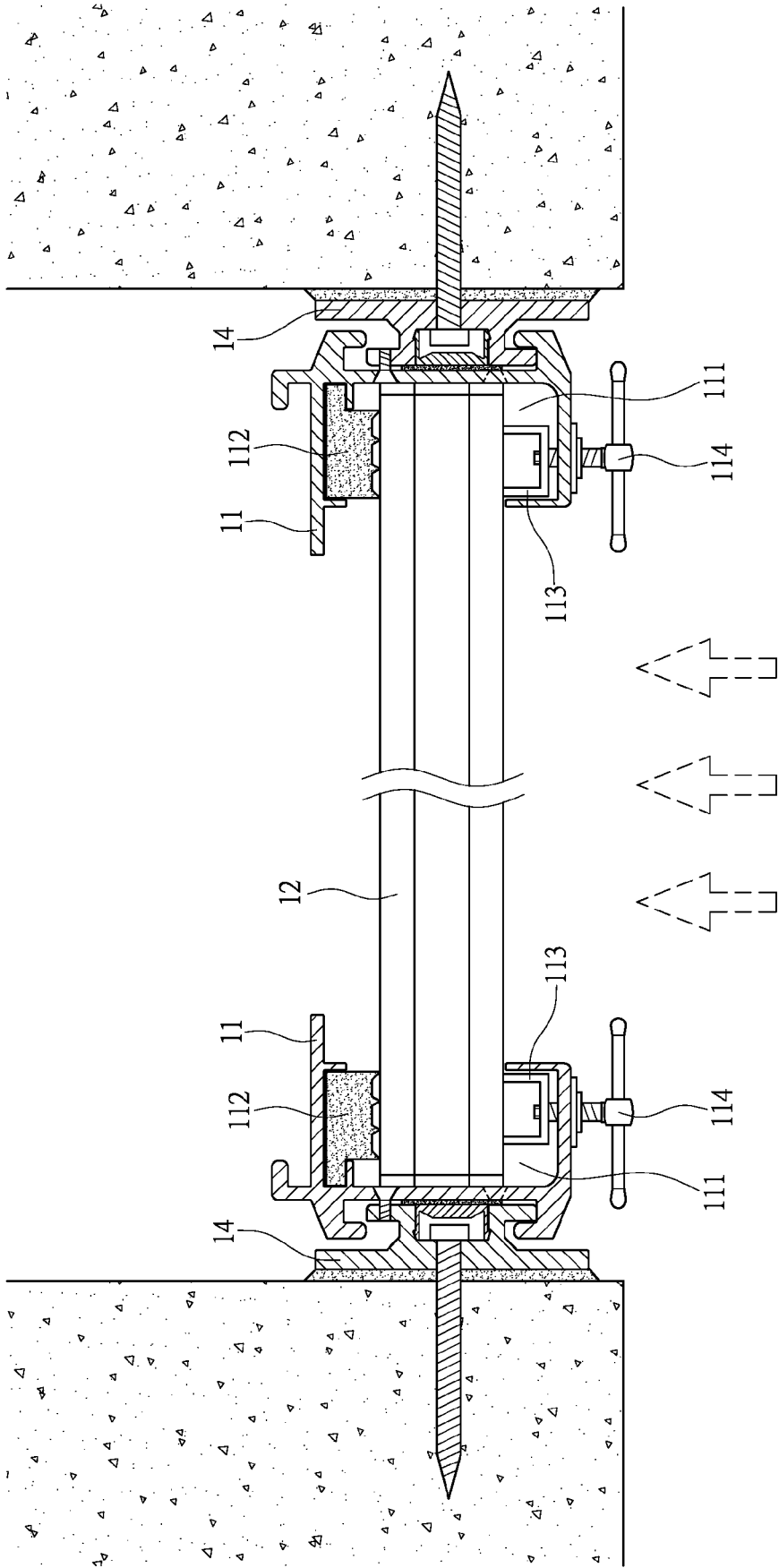
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PRIOR ART
FIG.1



PRIOR ART
FIG.2

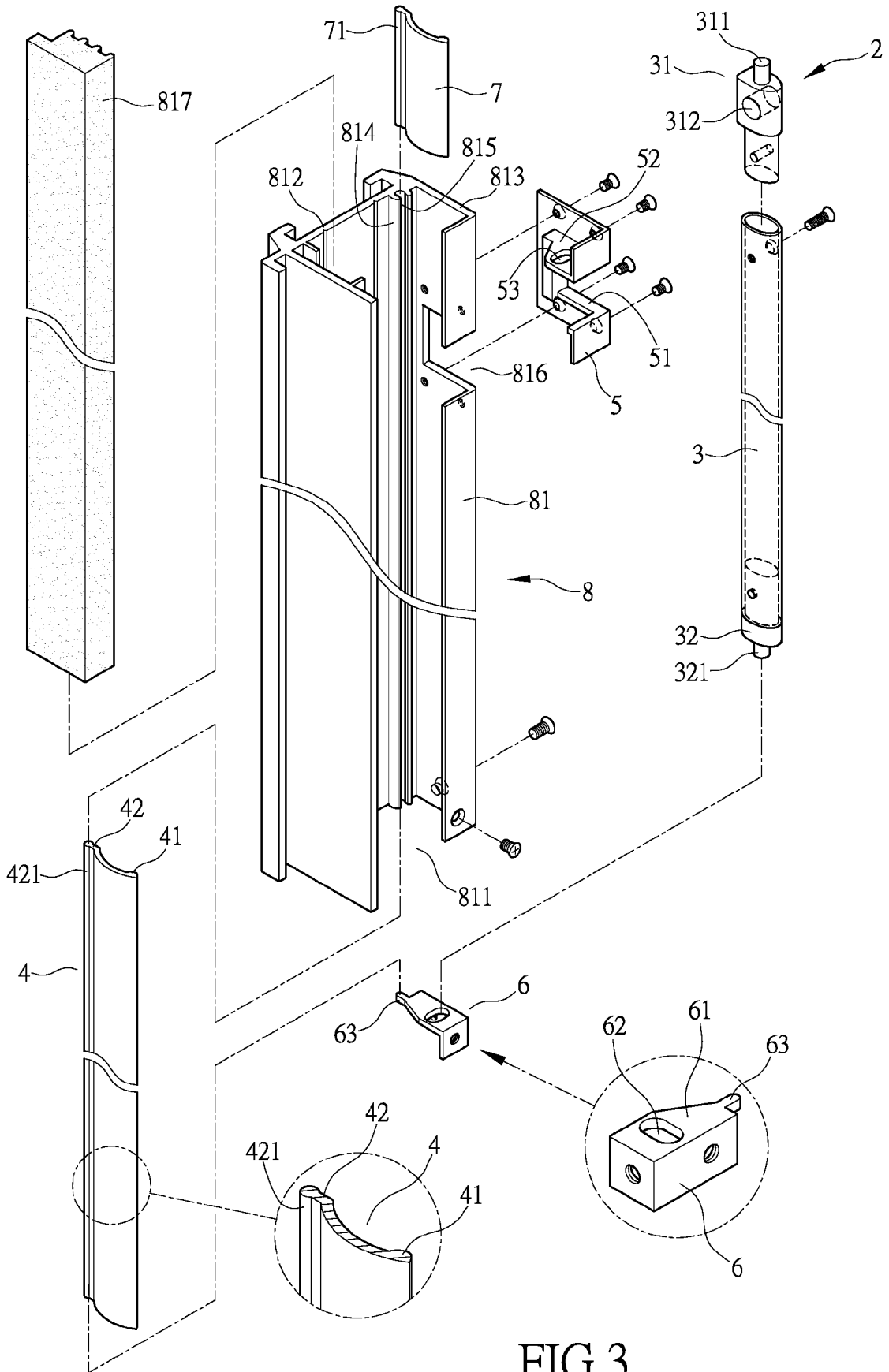


FIG.3

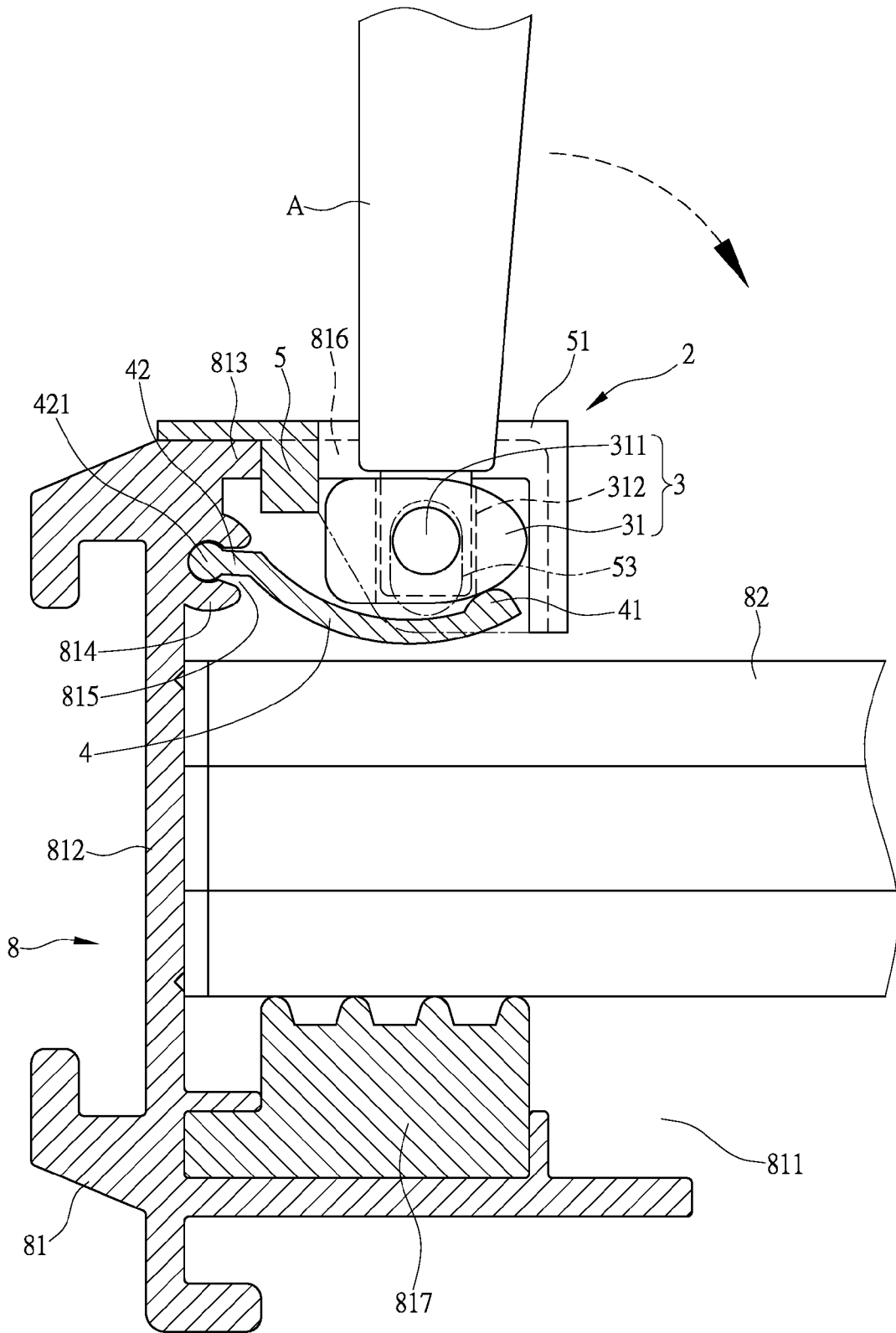


FIG.5

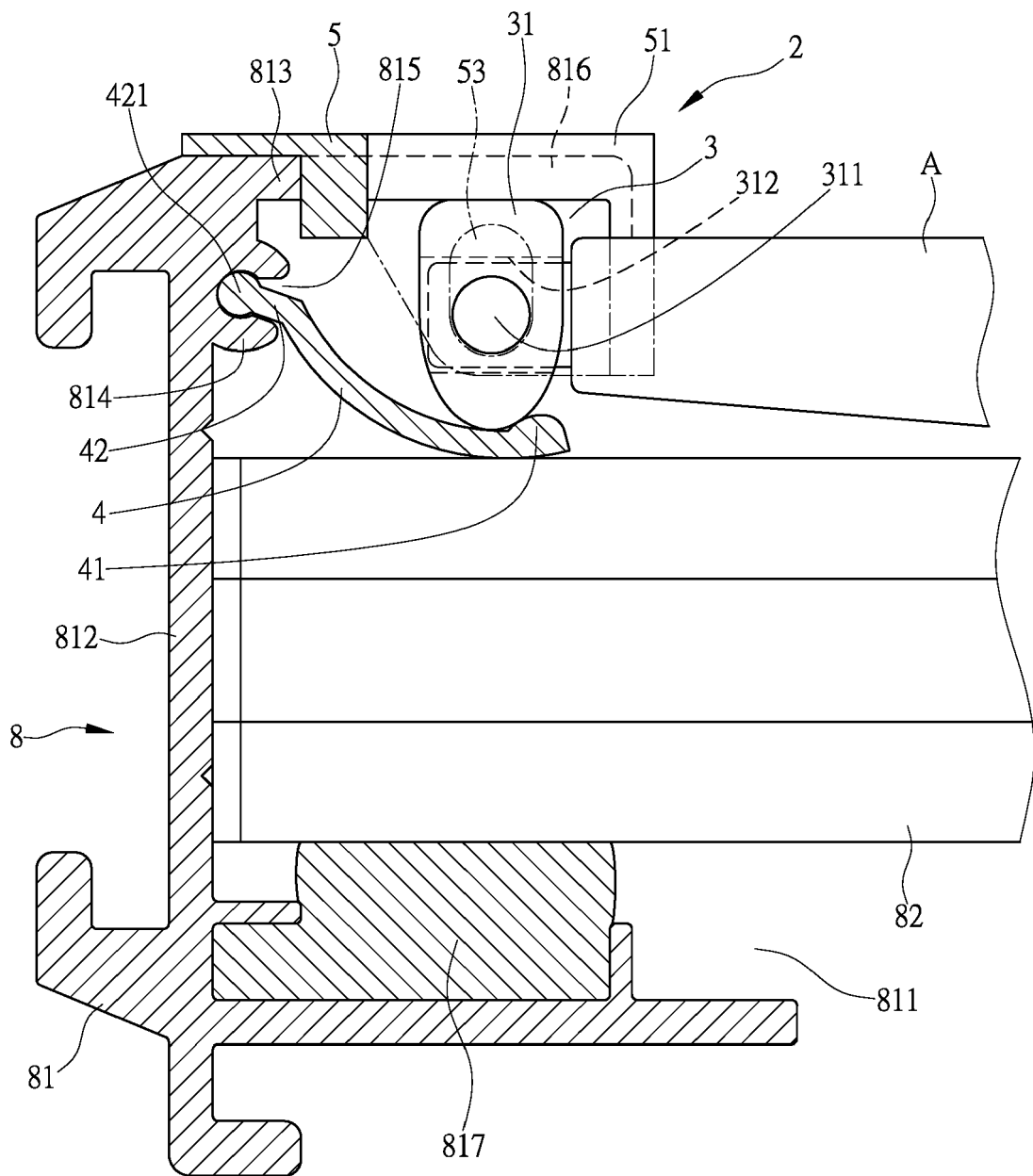


FIG.6

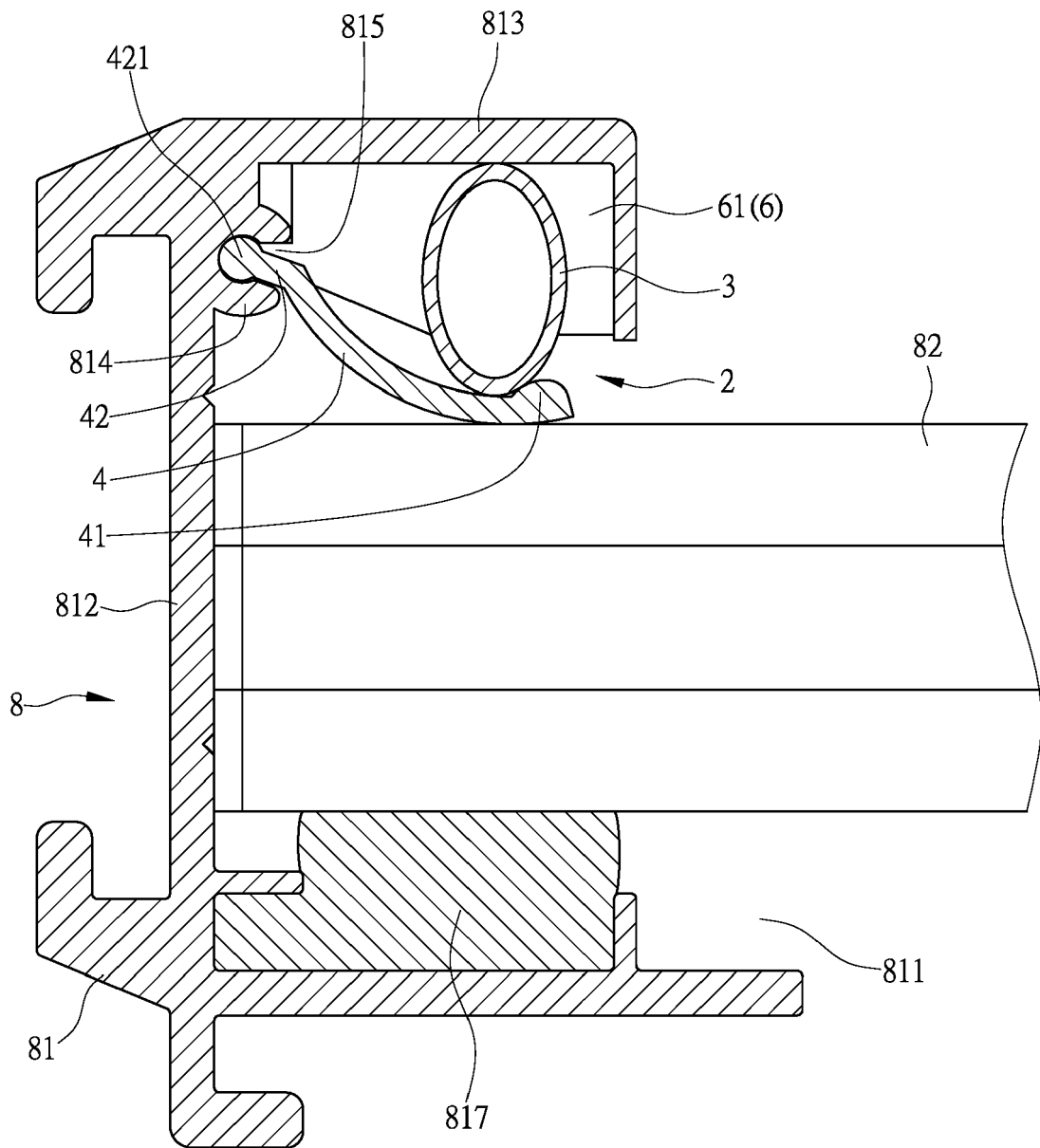


FIG. 7

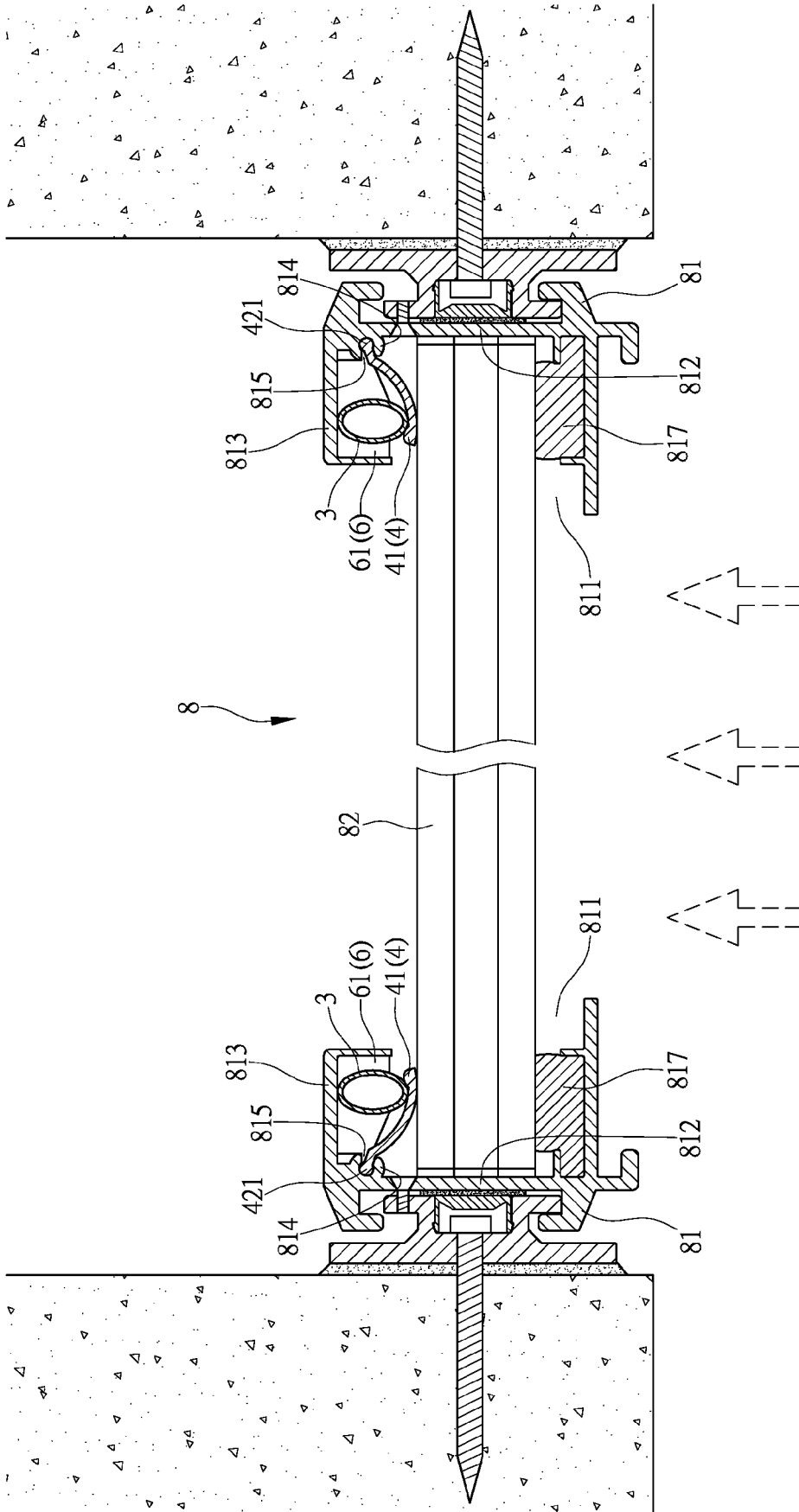


FIG. 8

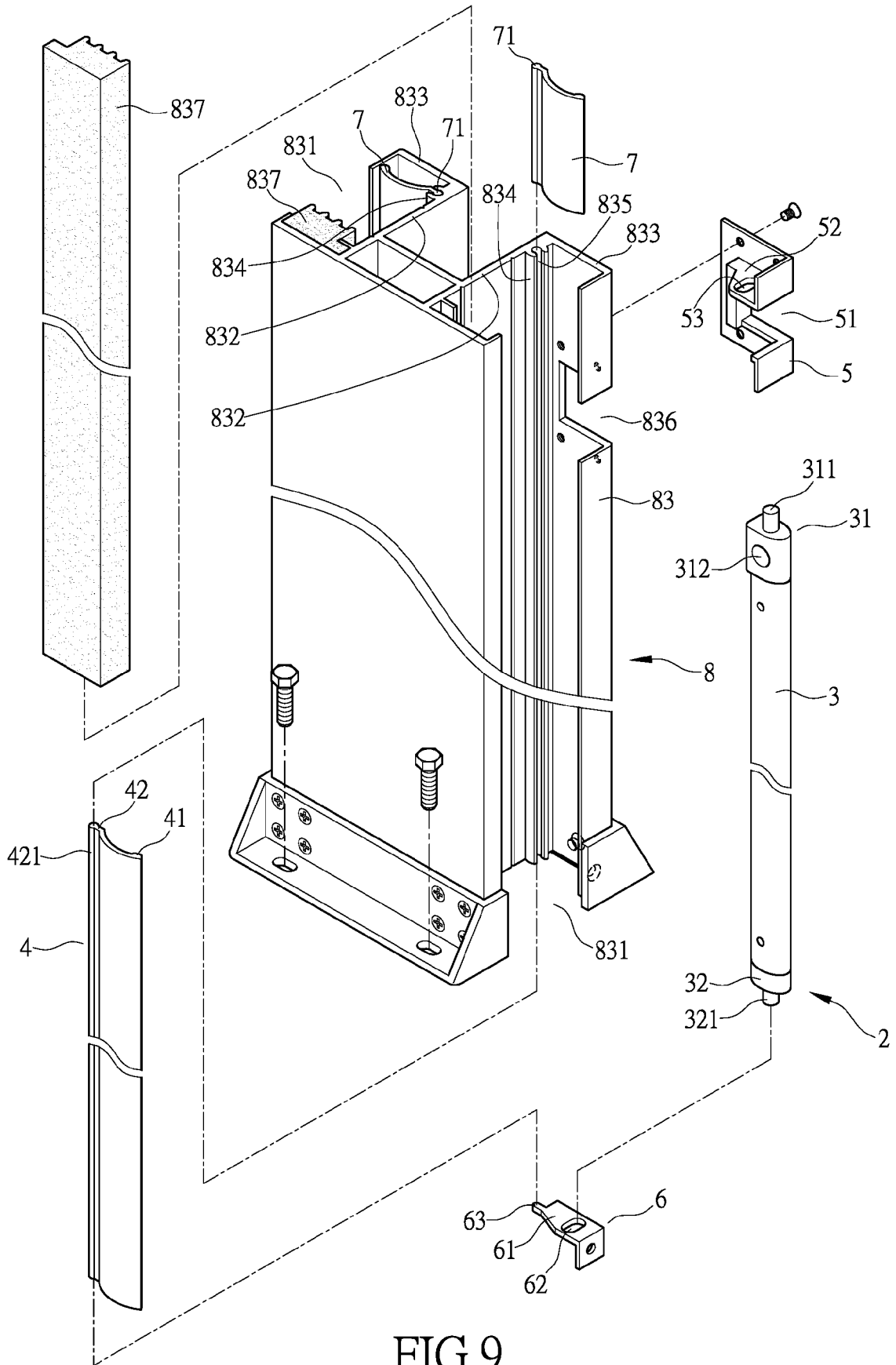


FIG.9

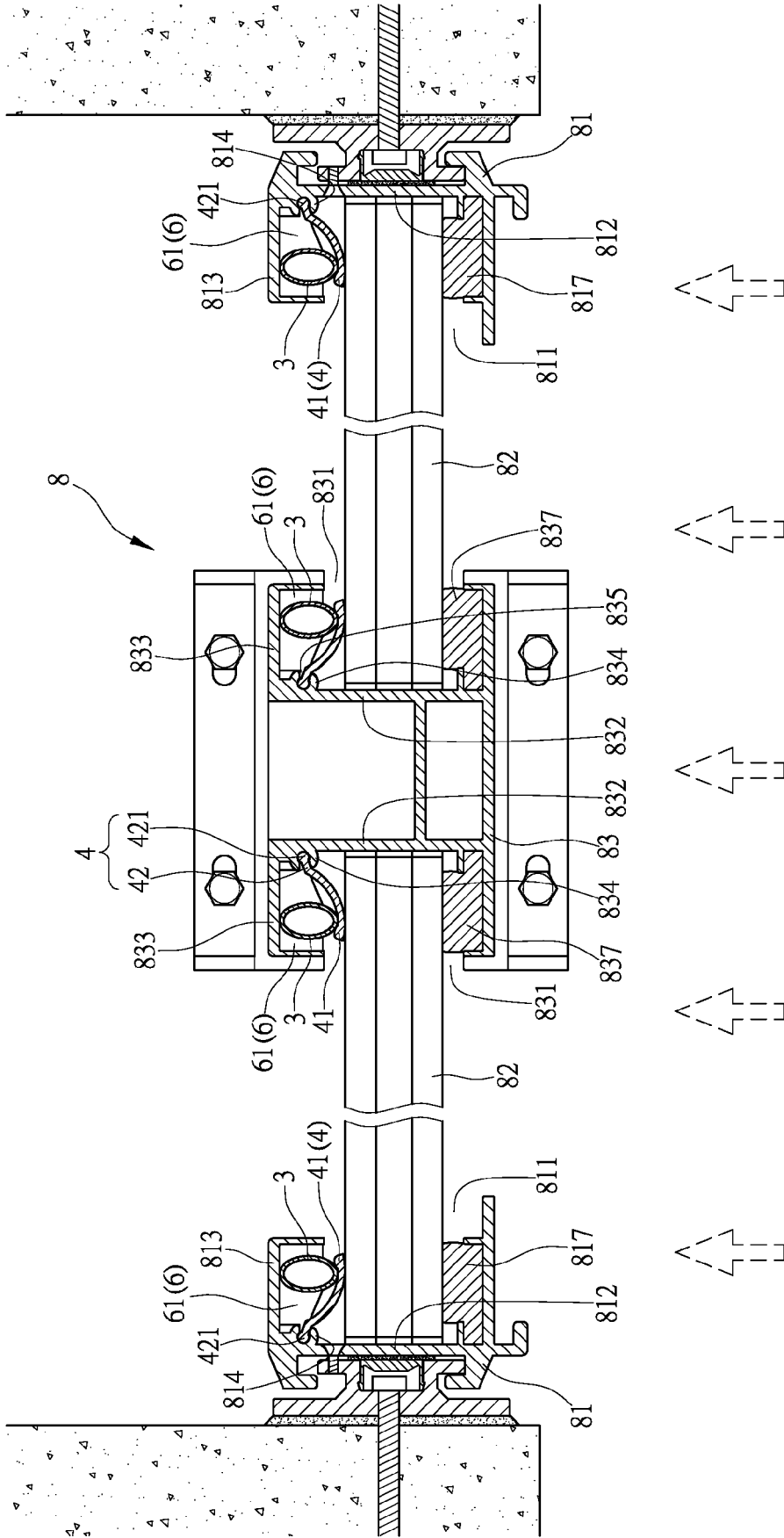


FIG.10



EUROPEAN SEARCH REPORT

Application Number
EP 17 16 7480

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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	DE 35 23 150 A1 (PASSAVANT WERKE [DE]) 8 January 1987 (1987-01-08) * column 3, line 11 - column 4, line 17; figures *	1	INV. E02B7/22 E02B7/54
A	SG 182 871 A1 (LIU HUI-HUNG [TW]) 30 August 2012 (2012-08-30) * the whole document *	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			E02B
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 25 October 2017	Examiner De Coene, Petrus
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EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 17 16 7480

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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