

GATE VALVE WITH SECURE SEALING MECHANISM

BACKGROUND OF THE INVENTION

1. Field of the Invention:

5 The present invention relates to gate valves, and more particularly, to a gate valve with secure sealing mechanism.

2. Description of the Related Art:

US 7,341,237 discloses a valve mechanism for optionally sealing or opening a valve opening in a casing, while the valve opening is provided with a seat surface. Therein, the valve mechanism comprises at least a valve member capable of moving in parallel or vertical to the seat surface of the valve opening in the casing. A driving board is disposed in the casing and connected to at least a valve member, wherein the driving board is able to move horizontally, such that the valve member is driven to move horizontally.

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The valve mechanism aforementioned is able to drive the valve member to move horizontally or vertically by use of the driving board, thereby sealing the valve opening. However, the valve mechanism is not provided with any locking devices or

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secure mechanisms for stably securing the valve member at the sealing position, such that the driving board is easily shifted or displaced. As a result, the valve member is hindered from effectively sealing the valve opening. In a more serious
5 environment, fluid tends to be leak out from the valve opening, causing unnecessary loss.

SUMMARY OF THE INVENTION

For improving aforementioned issues, the present
10 invention discloses a gate valve with secure sealing mechanism, which applies non-linear driving track for a rolling member of a swing arm to circularly move, so as to drive a sliding seat to slide, whereby a valve member seals the valve opening of the main body. Also, when the swing arm is at a first or second
15 position, the swing arm is biased against the route direction of the sliding seat. As a result, the sliding seat is prevented from swaying due to external force, thereby assuring the valve opening is securely sealed when the swing arm is at the second position.

20 For achieving the objective above, the present invention

provides a gate valve with secure sealing mechanism,
comprising:

a main body, provided with a valve opening;

a driver, disposed on the main body;

5 a sliding seat, slidably disposed in the main body;

a swing arm, with one end thereof connected to the driver
and the other end thereof connected to the sliding seat, such
that the driver drives the swing arm to circularly move between
a first position and a second position, so as to trigger the
10 sliding seat to slide, wherein when the swing arm is at the first
or second position, the swing arm is biased against a route
direction of the sliding seat;

a valve member, disposed on the sliding seat for moving in
parallel or vertical to the valve opening,

15 such that the sliding seat is prevented from swaying when
the swing arm is at the first or second position, and the valve
opening is stably sealed when the swing arm is at the second
position.

Preferably, the sliding seat is provided with a driving
20 groove having a non-linear driving track, while one end of the

swing arm is provided with a rolling member placed in the driving groove and capable of circularly moving along the driving track, such that the sliding seat reciprocates between two ends of the main body.

5 Preferably, the driver of the present invention is disposed on the main body and manually operated.

 Preferably, the driving track of the present invention includes a first driving section, a second driving section, and a third driving section. The second driving section is inclinedly
10 connected between the first driving section and the third driving section, such that when the rolling member moves from the first driving section to the second driving section, the valve member perpendicularly moves against the valve opening for sealing the valve opening.

15 Preferably, the sliding seat of the present invention includes two first guiding portions disposed in parallel with each other, and the valve member has two second guiding portions. Furthermore, the first guiding portion has at least one connecting groove, while the second guiding portion has at
20 least one matching groove oppositely disposed in relation to

the connecting groove. Plural circular rods pass through the connecting groove and the connecting groove, such that the connecting groove overlaps and cooperates with the matching groove. Therefore, the valve member is stably controlled to
5 move against the sliding seat, thereby sealing the valve opening.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view of the gate valve in accordance
10 with the present invention.

Fig. 2 is an internal schematic view illustrating the sliding seat at the first end in accordance with the present invention

Fig. 3 is an internal schematic view illustrating the sliding seat at the second end in accordance with the present invention.

15 **Fig. 4** is a schematic view illustrating the status of the driver connected with the swing arm in accordance with the present invention.

Fig. 5 is a sectional schematic view illustrating the valve opening sealed by the valve member in accordance with the
20 present invention.

Fig. 6 is a horizontal sectional schematic view illustrating the status of the sliding seat contacted with the main body.

Fig. 7 is an exploded view of the sliding seat and the valve member in accordance with the present invention.

5 **Fig. 8A** to **Fig. 8C** are schematic views illustrating the relative displacements between the connecting groove and the matching groove.

10 **Fig. 9A** to **Fig. 9D** are schematic views illustrating different positions of the swing arm in relation to the driving groove in accordance with the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The aforementioned and further advantages and features of the present invention will be understood by reference to
15 the description of the preferred embodiment in conjunction with the accompanying drawings where the components are illustrated based on a proportion for explanation but not subject to the actual component proportion.

Referring to **Fig. 1** to **Fig. 9**, the present invention
20 provides a gate valve with secure sealing mechanism **100**,

comprising a main body 10, a driver 20, a sliding seat 30, a swing arm 40, and a valve member 50. Therein, the main body 10 is hollow and provided with a first end 11 and a second end 12. The second end 12 has a valve opening 13
5 disposed on a lateral side thereof. The driver 20 drives the swing arm 40 to rotate, so as to trigger the sliding seat 30 to reciprocate along the direction in accordance with the arrowhead A in Fig. 2, whereby the valve member 50 seals the valve opening 13.

10 The main body 10 is provided with two guiding planks 14 disposed on two sides of the inner edge thereof, respectively, and a positioning groove 15 is disposed on the guiding plank 14 adjacent to the valve opening 13. Also, the positioning groove 15 is provided with a curved portion 151
15 and a distal portion 152.

The driver 20 is disposed on the main body 10, as shown in Fig. 4. In the preferred embodiment, the driver 20 is rotatable disposed on the main body 10 and operated manually. Also, the driver 20 is allowed to be driven
20 pneumatically. Further, the driver 20 comprises a fixing

portion 21, an acting portion 22, a rotary shaft 23, and an operation rod 24. The fixing portion 21 is fixed on the top of the main body 10, and the acting portion 22 is rotatable disposed on the fixing portion 21. The rotary shaft 23 is
5 mounted with a bearing and thereby longitudinally disposed between the acting portion 22 and the fixing portion 21, with one end of the rotary shaft 23 inserted into the main body 10. The operation rod 24 passes through the acting portion 22 and the rotary shaft 23; in the preferred embodiment, the
10 operation rod 24 is screwed to the rotary shaft 23 for driving the rotary shaft 23 to rotate. In addition, one block 231 is disposed on the end of the rotary shaft 23 for engaging the swing arm 40, such that the driver 20 drives the swing arm 40 to work.

15 The sliding seat 30 is slidably disposed in the main body 10, with one end thereof transversely provided with a driving groove 31. The driving groove 31 defines a non-linear driving track 32, while the driving track 32 comprises a first driving section 321, a second driving
20 section 322, and a third driving section 323. Therein, the

second driving section **322** is inclinedly connected between
the first driving section **321** and the third driving section **323**.
End parts of the first driving section **321** and the third
driving section **323** are both in an arc shape. Four corners of
5 the sliding seat **30** is provided with a first roller **33**,
respectively, for rollingly contacting the inner lateral sides
of the two guiding planks **14**.

One hollow portion **34** is disposed on the sliding seat **30**
adjacent the driving groove **31**, with two first guiding
10 portions **35** fixed in parallel on the hollow portion **34**.
Therein, the first guiding portion **35** is formed of two first
planks **36** which are disposed in parallel with a certain
spacing therebetween, while each of the two first planks **36**
is provided with two connecting grooves **37**, such that the
15 connecting groove **37** on each of the two first planks **36** are
symmetrically disposed. Therein, each of the connecting
grooves **37** has a first end **371** and a second end **372**, with a
bias section **373** disposed therebetween, as shown in **Fig. 8A**
to **Fig. 8C**.

20 Furthermore, two ends of the first guiding portion **35** of

the sliding seat 30 are provided with a second roller 38,
respectively, for rollingly contacting the inner face of the
main body 10 on one side in opposite to the valve opening 13.
Therein, one of the second rollers 38 on the first guiding
5 portion 35 is disposed between the two first planks 36, while
the other second roller 38 on the other end thereof is
disposed on the outer first plank 36 of the two first planks
36.

Further, one end of the sliding seat 30 adjacent to the
10 driving groove 31 is provided with a guiding wheel 39 for
contacting the inner face of the main body 10 on one side
provided with the valve opening 13, as shown in Fig. 6.
Through the configuration of the first roller 33 with the
second roller 38 and the guiding wheel 39, the sliding seat 30
15 is allowed to slide in the main body 10.

The swing arm 40 is provided with an engaging hole 41
on one end thereof and a rolling member 42 on the other end
thereof, so as to be placed in the driving groove 31. The
engaging hole 41 of the swing arm 40 is applied for engaging
20 and fixing the block 231 of the rotary shaft 23, and a

fastening member **43** is transversely fastened to the engaging hole **41** and the block **231**. Therein, the swing arm **40** is formed of two planks, and the fastening member **43** is allowed to be fastened to the two planks, thereby fixing the swing arm **40**. Thus, the driver **20** is able to drive the swing arm **40** to circularly move by use of the rolling member **42** along the driving track **32** between the first end **11** and the second end **12**. Especially, when the swing arm **40** is at the first position or the second position, the swing arm **40** is biased against the route direction of the sliding seat **30**; meanwhile, the rolling member **42** is constantly placed at the end part of the third driving section **323** when the swing arm **40** is at either the first position or the second position, as shown in **Fig. 9A** to **Fig. 9D**, wherein the arrowhead **B** defines the biased direction of the swing arm **40**.

The valve member **50** is disposed on the sliding seat **30** or moving in parallel or vertical to the valve opening **13**. The valve member **50** is provided with two second guiding portions **51** which are coupled with the first guiding portions **35**, so as to seal the valve opening **13** by a linkage structure.

Preferably, structures of the second guiding portions **51** and the first guiding portions **35** are similar. Each of the second guiding portions **51** is formed of two second planks **52** disposed with a certain spacing therebetween, and each of
5 the second plank **52** is provided with two matching grooves **53**, while the matching grooves **53** are in an identical shape with the connecting grooves **37** but reversely disposed in relation to the connecting grooves **37**. Also, each of the matching grooves **53** is provided with a first end **531**, a
10 second end **532**, and a bias section **533** between the first end **531** and the second end **532**, as shown in **Fig. 8A** to **Fig. 8C**. Each couple of the second planks **52** is disposed between a couple of the first planks **36**, and a linkage plank **70** is disposed between each couple of the second planks **52**. A
15 guiding roller **54** is disposed on two sides of the valve member **50**, respectively, for rollingly contacting the corresponding guiding plank **14**.

Plural circular rods **60** are disposed to pass through related connecting grooves **37**, matching grooves **53**, and the
20 linkage planks **70**, respectively, such that the connecting

groove 37 overlaps and cooperates with the matching groove 53, while each of the circular rods 60 is allowed to synchronously move by use of the linkage planks 70. Therein, when the rolling member 42 of the swing arm 40 moves to the second driving section 322 in the driving groove 31, the guiding roller 54 enters the curved portion 151 of the positioning groove 15. In addition, the valve member 50 is allowed to move in vertical to the valve opening 13 due to the linkage mechanism between the first guiding portion 35 and the second guiding portion 51. Also, when the rolling member 42 of the swing arm 40 moves to the third driving section 323 of the driving groove 31, the guiding roller 54 enters the distal portion 152 of the positioning groove 15, such that the valve member 50 stably and tightly seal the valve opening 13, as shown in Fig. 5.

Fig. 8A, Fig. 8B, and Fig. 8C illustrate the route of the circular rod 60 moving in the connecting groove 37 and the matching groove 53. Referring to Fig. 8A, with the corresponding connecting groove 37 and the matching groove 53, the circular rod 60 is placed in an overlapping area of the

first end **371** of the connecting groove **37** and the second end
532 of the matching groove **53**. The circular rod **60** is limited
by the arc-shaped ends of the connecting groove **37** and the
matching groove **53**, such that the sliding seat **30** remains in
5 a stop status and is thereby prevented from swaying.

Referring to **Fig. 8B**, when the sliding seat **30**
horizontally moves along the direction defined by the
arrowhead **A** (as shown in **Fig. 2**), a linkage effect is
produced among the connecting groove **37**, the matching
10 groove **53**, and the circular rod **60** until the guiding roller **54**
enters the distal portion **152** of the positioning groove **15**,
such that the valve member **50** vertically moves toward the
valve opening **13**.

Referring to **Fig. 8C**, when the rolling member **42** of the
15 swing arm **40** moves to the third driving section **323** (as
shown in **Fig. 3**), the circular rod **60** is placed in the second
end **372** of the connecting groove **37** and the first end **531** of
the matching groove **53**, such that the sliding seat **30** remains
in a stop status again, whereby the valve member **50** stably
20 seal the valve opening **13**.

Fig. 9A, Fig. 9B, and Fig. 9C illustrate the swing arm **40** placed at different positions against the driving groove **31**. Referring to **Fig. 9A**, the swing arm **40** is at the first position, and the rolling member **42** is in the end part of the third driving section **323**. Meanwhile, the sliding seat **30** is placed at the first end **11** of the main body, as shown in **Fig. 1** and **Fig. 2**.

Referring to **9B**, the swing arm **40** is driven to move along the driving track **32** of the driving groove **31** to the end part of the first driving section **321**.

Referring to **Fig. 9C**, the rolling member **42** of the swing arm **40** moves from the first driving section **321** to the second driving section **322**. Meanwhile, the sliding seat **30** moves close to the second end **12** of the main body **10**, such that the guiding roller **54** enters the curved portion **151** of the positioning groove **15**, whereby the valve member **50** vertically moves toward the valve opening **13** to seal the valve opening **13**. When the guiding roller **54** enters the distal portion **152** of the positioning groove **15**, the valve member **50** stably and tightly seal the valve opening **13**, as

shown in **Fig. 5**.

Referring to **Fig. 9D**, the swing arm **40** is at the second position, and the rolling member **42** is in the end part of the third driving section **323** again. When the swing arm **40** is at
5 either the first position or the second position, position of the swing arm **40** is biased against the route direction of the sliding seat **30**. Thus, the sliding seat **30** is prevented from swaying, whereby the valve member **50** seals the valve opening **13** much effectively when the swing arm **40** is at the
10 second position, so as to prevent the sliding seat **30** from being imposed with lateral force. Therefore, the sealing effect between the valve member **50** and the valve opening **13** is assured.

Although particular embodiments of the invention have
15 been described in detail for purposes of illustration, various modifications and enhancements may be made without departing from the spirit and scope of the invention. Accordingly, the invention is not to be limited except as by the appended claims.

What is claimed is:

1. A gate valve (100) with secure sealing mechanism, comprising:
 - a main body (10), provided with a first end (11) and a second end, with the second end (12) having a valve opening (13);
 - a driver (20), disposed on the main body;
 - a sliding seat (30), slidably disposed in the main body (10) and transversely provided with a driving groove (31), the driving groove (31) defining a non-linear driving track (32), the sliding seat (30) provided with two parallel first guiding portions (35);
 - a swing arm (40), with one end thereof connected to the driver (20) and the other end thereof disposed in the driving groove (31), such that the driver (20) drives the swing arm (40) to circularly move along the driving track (32) between a first position and a second position, so as to trigger the sliding seat (30) to slide between the first end (11) and the second end (12), wherein when the swing arm (40) is at the first position and the second position, the swing arm (40) is biased against a route direction of the sliding seat (30); and
 - a valve member (50), disposed on the sliding seat (30) for moving in parallel or vertical to the valve opening (13) and provided with two second guiding portions (51), the valve member (50) thus allowed to move in vertical to the valve opening (13) for sealing the valve opening (13);

wherein the sliding seat (30) is at the first end (11) when the swing arm (40) is at the first position, and the sliding seat (30) is at the second end (12) when the swing arm (40) is at the second position, whereby the valve member (50) stably seals the valve opening (13),

characterized in that

each first guiding portion (35) is provided with two symmetric connecting grooves (37), and each second guiding portion (51) is provided with two symmetric matching grooves (53) reversely disposed in relation to the connecting grooves (37) for being coupled

with the connecting grooves (37) of the corresponding first guiding portion (35), with at least one circular rod (60) passing through each of the connecting grooves (37) and the matching grooves (53), respectively, such that each of the connecting grooves (37) overlaps and cooperates with each of the matching grooves (53), respectively.

2. The gate valve (100) of claim 1, wherein the driver (20) is rotatable disposed on the main body (10) and operated manually.

3. The gate valve (100) of claim 1, wherein the driver (20) comprises a fixing portion (21) externally fixed on the main body (10); an acting portion (22) rotatable disposed on the fixing portion (21); a rotary shaft (23) longitudinally disposed between the acting portion (22) and the fixing portion (21), with one end of the rotary shaft (23) connected to the swing arm (40); an operation rod (24) passing through the acting portion (22) and the rotary shaft (23) for driving the rotary shaft (23) to rotate.

4. The gate valve (100) of claim 3, wherein one end of the swing arm (40) is provided with an engaging hole (41), while one end of the rotary shaft (23) is provided with a block (231) for being engaged with the engaging hole (41).

5. The gate valve (100) of claim 4, further comprising a fastening member (43) transversely fastened to the engaging hole (41) and the block (231).

6. The gate valve (100) of claim 1, wherein one end of the swing arm (40) is provided with a rolling member (42) which is placed in the driving groove (31).

7. The gate valve (100) of claim 6, wherein the driving groove (31) comprises a first driving section (321), a second driving section (322), and a third driving section (323), while the second driving section (322) inclinedly connected between the first driving section (321) and the third driving section (323), such that when the rolling member (42) moves from the first driving section (321) to the second driving section (322), the valve member (50) vertically moves toward the valve opening (13) for sealing the valve opening (13).

8. The gate valve (100) of claim 7, wherein when the swing arm (40) is at the first position and the second position, the rolling member (42) is positioned at an end part of the third driving section (323).

9. The gate valve (100) of claim 1, wherein two sides of the inner edge of the main body (10) are provided with a guiding plank (14), respectively, and two sides of the valve member (50) are correspondingly provided with a guiding roller (54), respectively, for rollingly contacting the corresponding guiding plank (14).

10. The gate valve (100) of claim 9, wherein a positioning groove (15) is disposed on each of the guiding planks (14) adjacent to the valve opening (13), respectively, and the positioning groove (15) is provided with a curved portion (151) and a distal portion (152), such that when the guiding wheel (54) moves from the curved portion (151) to the distal portion (152), the valve member (50) seals the valve opening (13).

11. The gate valve (100) of claim 1, wherein the shape of the connecting groove (37) is substantially identical with the shape of the matching groove (53).

12. The gate valve (100) of claim 11, wherein the connecting groove (37) and the matching groove (53) are provided with a first end (531) and a second end (532), respectively, with a bias section (533) disposed between the first end (531) and the second end (532).

13. The gate valve (100) of claim 1, wherein the first guiding portion (35) is formed of two parallel first planks (36) with a certain spacing therebetween, and the second guiding portion (51) is formed of two parallel second planks (52) with a certain spacing therebetween, while the two second planks (52) are sandwiched by the two first planks (36), with a linkage plank (70) disposed between the two second planks (52), such that movement of each of the circular rods (60) are synchronized.

14. The gate valve (100) of claim 9, wherein four corners of the sliding seat (30) is provided with a first roller (53), respectively, for rollingly contacting the inner lateral sides of the two guiding planks (14).

15. The gate valve (100) of claim 1, wherein the sliding seat (30) is provided with plural second rollers (38) for rollingly contacting the inner face of the main body (10) on one side in opposite to the valve opening (13).

16. The gate valve (100) of claim 1, wherein one end of the sliding seat (30) adjacent to the driving groove (31) is provided with a guiding wheel (54) for contacting the inner face of the main body (10) on one side provided with the valve opening (13).