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(54) A SLIDE GATE FOR A MOLTEN-STEEL VESSEL

(57) The present invention provides a ladle flow control system, which includes the base plate fixed on the ladle; A housing is fixed on this base plate, with the top of housing being connected with the driving mechanism of sliding nozzle; A carrier frame is set on this housing, and an elastic used for generating pressure is provided on the carrier frame; A slider is set on the carrier frame; notches are set on the corresponding surfaces of the housing and slider, and bottom plate and slide plate are respectively embedded in one notch, a rolling mechanism is set on said carrier frame, a guide mechanism is correspondingly set on the slider; the guide mechanism correspondingly set on the slider makes reciprocating motion relative to the rolling mechanism set on the carrier frame, so as to control the open or close of the ladle sliding nozzle. In the present invention, the rolling mechanism is symmetrically set on the carrier frame, and the guide mechanism is correspondingly set on the slider. In the relative motion between the slider and the carrier frame, the fluctuation of its pressure is obviously decreased, so that the overall stability of the system is improved. The elastic element is isolated with the high-temperature zone, which not only leads to relatively low working temperature but also to lasting pressure and long life or permanence.

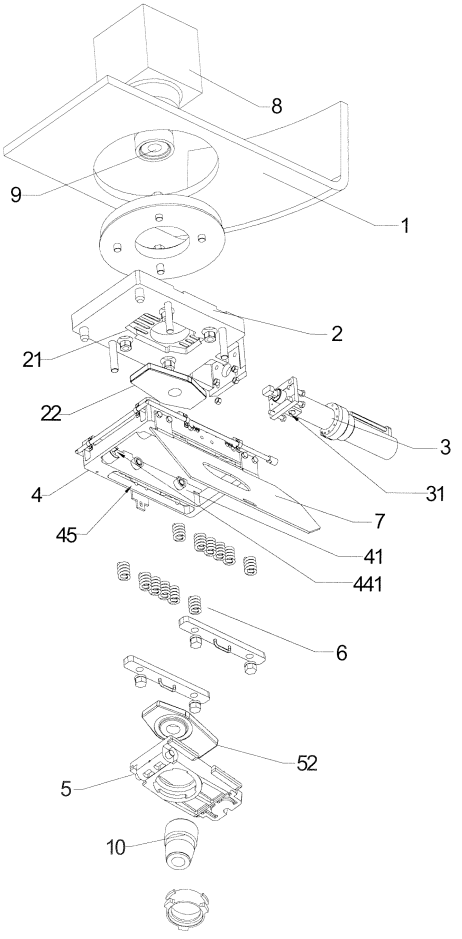

FIG 1

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Description

Field of the Invention

[0001] The present invention relates to a ladle flow control system installed on the outer side of a base plate at the liquid steel outlet of a ladle, which belongs to the technical field of machine manufacturing.

Description of the Prior art

[0002] In the ladle flow control systems of the prior art, the rail wheel is generally set on the slider, and the rail is fixed on the carrier frame. The relative motion between the slider and the carrier frame in this type of flow control system is achieved through rolling of the rail wheel on the rail. Since the pressure transmission in this structure is achieved by means of the rail wheel, its force transmission point is constantly changing, which results in rather obvious fluctuation in pressure. In this way, potential safety hazards may exist, so that the safety factor of the machine is greatly reduced and untimely maintenance may cause accident.

Summary of the Invention

[0003] The technical object of the present invention is to provide a ladle flow control system aiming at overcoming the deficiency of the prior art. In the relative motion between the slider and the carrier frame, the fluctuation of system pressure is obviously reduced, so that the overall stability of the system is improved.

[0004] Said technical object of the present invention is achieved by means of the technical solution described as follows:

[0005] A ladle flow control system includes a base plate fixed on the ladle, wherein a housing is fixed on this base plate. The top of the housing is connected with the driving mechanism of the ladle sliding nozzle. A carrier frame is provided on this housing, an elastic used for generating pressure is set on the carrier frame, and a slider is provided on the carrier frame. Notches are set on the corresponding surfaces of housing and slider. The bottom plate and the slide plate are respectively embedded in the notch. A rolling mechanism is provided on said carrier frame, and a guide mechanism is set on the slider correspondingly. The guide mechanism correspondingly set on the slider makes reciprocating motion relative to the rolling mechanism set on the carrier frame, so as to control the opening or closing of the ladle sliding nozzle.

[0006] The rolling mechanism may be composed of the rollers symmetrically set on the carrier frame, and the guide mechanism may be the guide rail set on the edge of the slider. The orientation pin-jointed part is correspondingly set on the inner side at one end of the carrier frame and on the outer side at one end of the slider, so that the slider may rotate around the carrier frame in a definite mode with the orientation pin-jointed part as its rotating shaft, without the risk of detachment by itself. The orientation pin-jointed part is composed of an arc notch set on the inner side at one end of the carrier frame and a convex pin correspondingly set on the outer side at one end of the slider, or it is composed of a convex pin set on the inner side at one end of the carrier frame and an arc notch correspondingly set on the outer side at one end of the slider, with this convex pin being embedded in the arc notch. This arc notch is in the shape of a sleeve with an opening being set on its side wall. The width of this opening is corresponding to the diameter of the convex pin set on the outer side at the bottom of the slider. At the time of assembly, the convex pin is embedded along the opening of the arc notch. The elastic is a spring box with built-in spring nest. The upper and lower ends of this spring box constitute a carrier frame through two mutually connected beams, and this carrier frame is hinged on the housing.

[0007] To sum up, in the present invention, the rolling mechanism is symmetrically set on the carrier frame, and the guide mechanism is correspondingly set on the slider. In the relative motion between the slider and the carrier frame, the fluctuation of its pressure is obviously reduced, so that the overall stability of the system is improved.

[0008] Several embodiments of the present invention are described below in combination with the attached figures.

Brief Description of the Drawings

[0009]

Figure 1 is the No.1 overall structure schemes of the first embodiment of the present invention;
Figure 2 is the structure scheme of the half-axle roller, namely the rolling mechanism of the present invention;
Figure 3 is the No.1 structure scheme of the sliders of the present invention;
Figure 4 is the No.2 overall structure scheme of the first embodiment of the present invention;
Figure 5 is the No.2 structure scheme of the slider of the present invention;
Figure 6 is the overall structure scheme of the second embodiment of the present invention.

Detailed Description of the Preferred Embodiments

First Embodiment

[0010] Figure 1 is the No. 1 overall structure scheme of the first embodiment of the present invention. As may be known from Figure 1, the present invention provides a ladle flow control system, which includes the base plate 1 fixed on the ladle. A housing 2 is fixed on this base plate 1, and one end of the housing 2 is connected with the driving mechanism 3 of the sliding nozzle. A carrier frame 4 is provided on this housing 2, and an elastic used

for generating pressure is provided on the carrier frame 4. A slider 5 is also set through a pivot on the carrier frame 4. The notch 21 and notch 51(Not shown in the Figure) are set on the corresponding surfaces of the housing 2 and the slider 5. The bottom plate 22 and the slide plate 52 are respectively embedded in the notch 21 and the notch 51. A rolling mechanism is set on the carrier frame 4, and a guide mechanism is correspondingly set on the slider 5. The guide mechanism correspondingly set on the slider makes reciprocating motion relative to the rolling mechanism set on the carrier frame, so as to control the opening or closing of the ladle sliding nozzle. The rolling mechanism is the roller 41 set on the carrier frame. Figure 2 is the partial structure scheme of the half-axle roller, which constitutes the rolling mechanism of the present invention. As may be known from Figure 2, said roller 41 may be set as half-axle rollers according to need, and the structure of the half-axle 42 is as shown in Figure 2. The roller 41 is set on the half-axle 42 and may rotate with the half-axle 42 as its shaft. The half-axle 42 is fixed on the carrier frame 4. Figure 3 is the No.1 structure scheme of the slider of the present invention. As may be known from Figure 3, the guide mechanism is the rail 51 set at the edge of slider 5. This rail 51 is fixed on the slider 5. Since this rail 51 is an easily worn part, it is required to separately set the rail 51 and the slider 5, so as to facilitate the replacement of rail 51.

[0011] Figure 4 is the No.2 overall structure scheme of the first embodiment of the present invention. As may be known from Figure 4, the orientation pin-jointed part is correspondingly set on the inner side at the bottom of one end of carrier frame 4 and set on the outer side at the bottom of one end of slider 5, so that the slider 5 rotates around the carrier frame 4 with the orientation pin-jointed part as its rotating shaft, which may facilitate the orientation of slider 5 in the process when it is installed on the carrier frame 4. Figure 5 is the No.2 structure scheme of the slider of the present invention. As may be known from Figure 4 in combination with Figure 5, the orientation pin-jointed part is composed of the arc notch 44 set on the inner side at the bottom of one end of the carrier frame and the convex pin 52 set on the outer side at the bottom of one end of slider 5, with this convex pin 52 being embedded in the arc notch 44. The arc notch 44 is in the shape of a sleeve with an opening being set on its sidewall. The width of this opening 441 (As shown in Figure 1) corresponds to the diameter of the convex pin 52 set on the outer side at the bottom of slider 5. At the time of assembly, the convex pin 52 will be embedded along the opening 441 of the arc notch 44. As can be known from Figure 1, said elastic is the spring nest 6. A room 45 is provided on the carrier frame 4 to accommodate this spring nest 6. As can be known in combination with Figure 3, the orientation pin-jointed part correspondingly set on the inner side at the bottom of carrier frame 4 and on the outer side at the bottom of slider 5 may also be composed of a convex pin (not shown in the figure) set on the inner side at the bottom of carrier frame 4 and the notch 53 set on the outer side at the bottom of slider 5. This convex pin 52 is embedded in the notch 53.

[0012] As shown in Figure 1, a cylinder bracket 31 for the driving mechanism of the sliding nozzle is set on the top of the housing 2, and three sets of driving mechanisms for sliding nozzle are set in this cylinder bracket 31, which are designed to drive the motion of slider 5. A heat shield panel 7 used for heat insulation is also provided on the external of carrier frame 4.

[0013] The assembly process of the ladle flow control system provided in this embodiment is described as follows: Firstly, fixing the housing 2 on the base plate 1 of the ladle, fixing the cylinder bracket 31 of the driving mechanism for sliding nozzle on the top of housing 2, fixing the carrier frame 4 with heat shield panel 7 on the housing 2 , placing the spring nest 6 into the room 45 inside the carrier frame 4 and sealing this room; Then, embedding the convex pin 52 on slider 5 into the arc notch 44 on carrier frame 4, turning the slider 5 downward, loading the driving mechanism 3 into the cylinder bracket 31 and fixing it; Installing the well block 8 and the nozzle 9, respectively placing them into the bottom plate 22 and the slide plate 52, connecting the driving mechanism 3 with the groove (not shown in the Figure) at the head of slider 5, connecting the extrusion device with the internal of bottom plate 22 and slide plate 52 and turning the slider 5 upward, so that the slider 5 is buckled with the housing 2 in the carrier frame 4; Installing the exchangeable collector nozzle 10 in place before the contraction of driving mechanism 3; Upon the contraction of driving mechanism 3, pulling up the slider 5 from the carrier frame 4, the elastic building up pressure at this time; Closing the heat shield panel 7 and locking it. In this way, the installation of the entire system is completed.

Second Embodiment

[0014] Figure 6 is the overall structure scheme of the second embodiment of the present invention. As may be known from Figure 6, the difference between this embodiment and the first embodiment consists in the structure of the elastic. The elastic in this embodiment is the spring box 100 with built-in spring nest, the upper and lower ends of this spring box 100 constituting a carrier frame 103 through two mutually connected beams 101 and 102, and this carrier frame 103 being hinged on the housing 2.

[0015] In this embodiment, the installation procedures for the spring box 100 itself are as follows: The spring rod 104 passes through the spring box 100 through the hole at the bottom of spring box 100; After the long groove (not shown in the Figure) has been put in the spring nest 105, the spring holddown 106 is assembled with the spring rod 104 through the hold on itself and holds down the spring holddown 106 through the action between the nut and spring rod.

[0016] Since the other technical characteristics of this embodiment are identical to those of the first embodi-

ment, no more unnecessary details will be given herein. For the detail, please refer to the foregoing.

[0017] Although said two embodiments have differences in their internal structures, they have the same casting process: Under the action of the driving mechanism 3, the rolling mechanism makes motion on the guide mechanism to control the stagger and alignment of the nozzle 9 and exchangeable collector nozzle 10 and achieve the opening or closing of ladle sliding nozzle, so as to control the flow and casting action in the casting process.

[0018] Finally it must be mentioned that said embodiments are merely used to describe rather than limit the present invention; Although detail description of the present invention is provided with reference to preferred embodiments, the common technologists in this field shall understand that all the modifications or equitable substitutions to the present invention without deviation from the spirit and range of present invention shall be covered by the Claims of present invention.

Claims

1. A ladle flow control system, comprising a base plate fixed on the ladle; A housing is fixed on this base plate, with the top of the housing being connected with the driving mechanism of a sliding nozzle; A carrier frame is set on this housing, and an elastic used for generating pressure is provided on the carrier frame; A slider is set on the carrier frame; notches are set on the corresponding surfaces of the housing and the slider, and a bottom plate and a slide plate are respectively embedded in the notch, **characterized in that** a rolling mechanism is set on said carrier frame, a guide mechanism is correspondingly set on the slider; the guide mechanism correspondingly set on the slider makes reciprocating motion relative to the rolling mechanism set on the carrier frame, so as to control the opening or closing of the ladle sliding nozzle.

2. The ladle flow control system of Claim 1, **characterized in that** said rolling mechanism is composed of rollers symmetrically set on the carrier frame.

3. The ladle flow control system of Claim 1 or 2, **characterized in that** said guide mechanism is the rail set at the edge of the slider.

4. The ladle flow control system of Claim 1 or 2 or 3, **characterized in that** an orientation pin-joint part is correspondingly set on the inner side at one end of said carrier frame and on the outer side at one end of said slider, so that the slider rotates around the carrier frame in a definite mode with the orientation pin-joint part as its rotating shaft, without the risk of detachment by itself.

5. The ladle flow control system of Claim 4, **characterized in that** the orientation pin-jointed part is composed of an arc notch set on the inner side at one end of the carrier frame and a convex pin correspondingly set on the outer side at one end of slider, or composed of a convex pin set on the inner side at one end of the carrier frame and an arc notch correspondingly set on the outer side at one end of the slider, with this convex pin being embedded in the arc notch.

6. The ladle flow control system of Claim 5, **characterized in that** said arc notch is in the shape of a sleeve with an opening being established on its side wall; The width of this opening corresponds to the diameter of the convex pin set on the outer side at the bottom of the slider; At the time of assembly, the convex pin is embedded along the opening of the arc notch.

7. The ladle flow control system of Claim 1 or 2 or 3, **characterized in that** said elastic is a spring box with built-in spring nest; The upper and lower ends of this spring box constitute a carrier frame through two mutually connected beams, and this carrier frame is hinged on the housing.

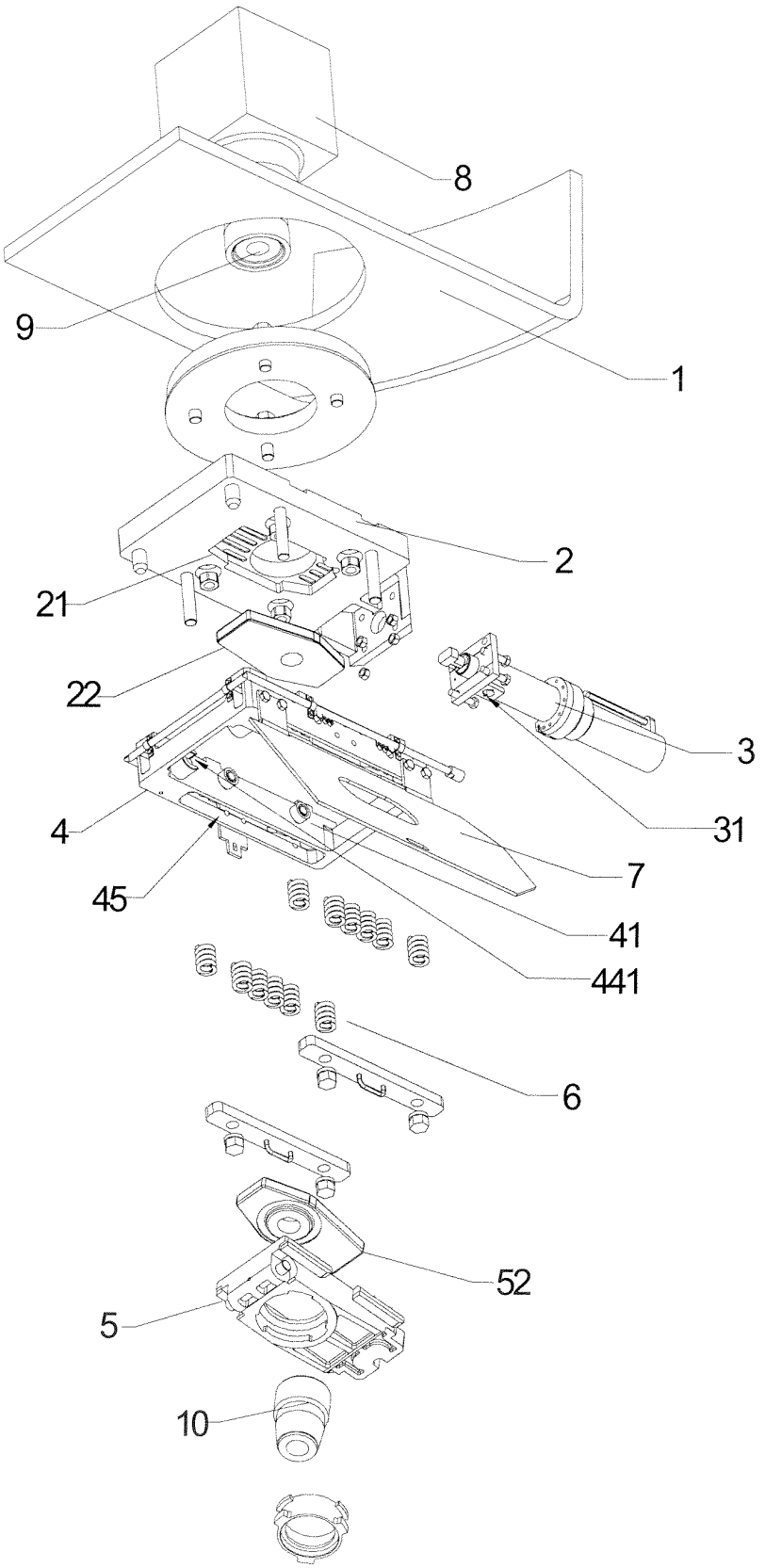

FIG 1

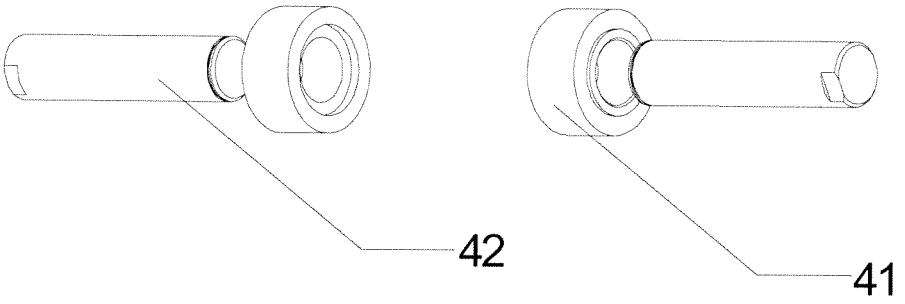

Fig 2

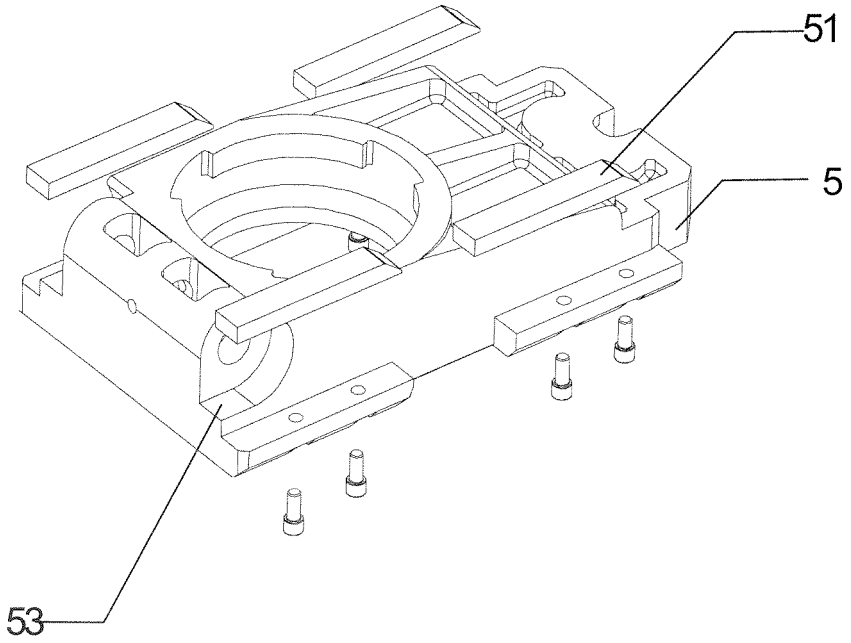

Fig 3

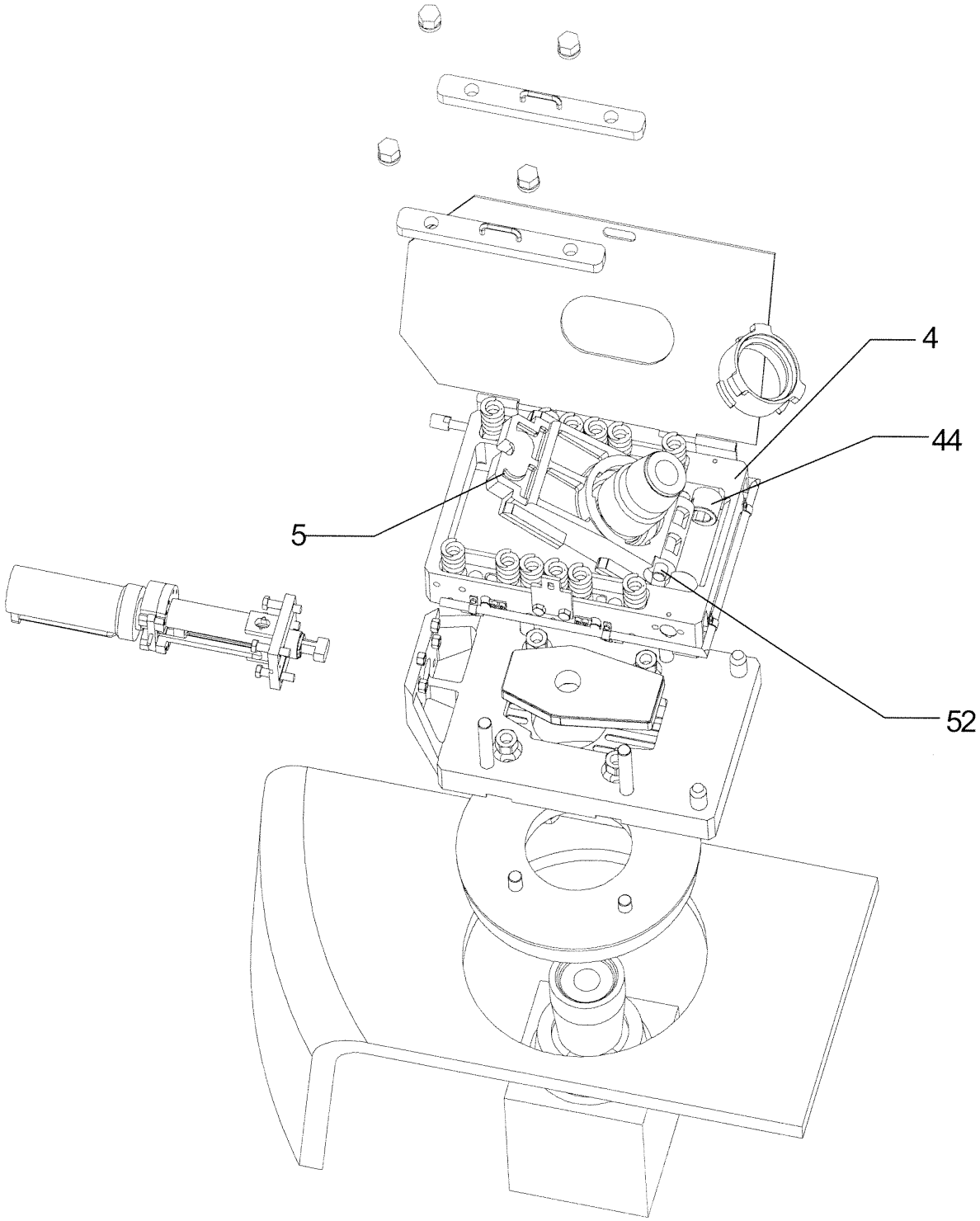

Fig 4

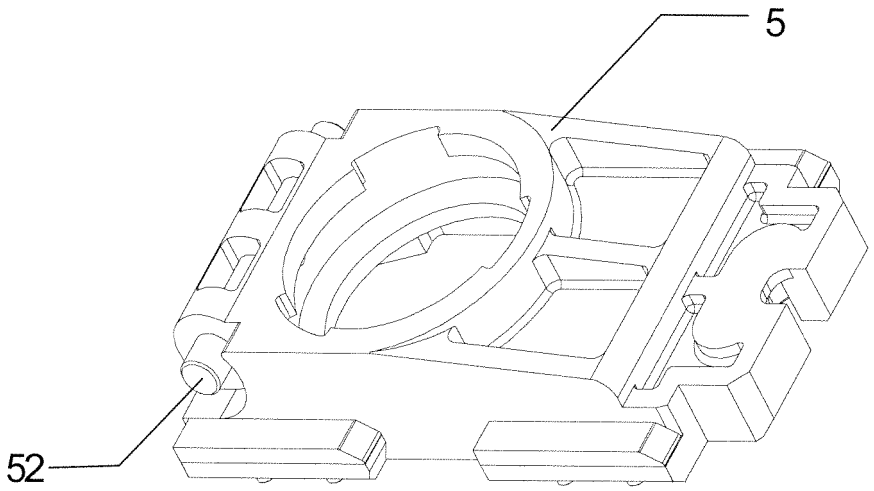

Fig 5

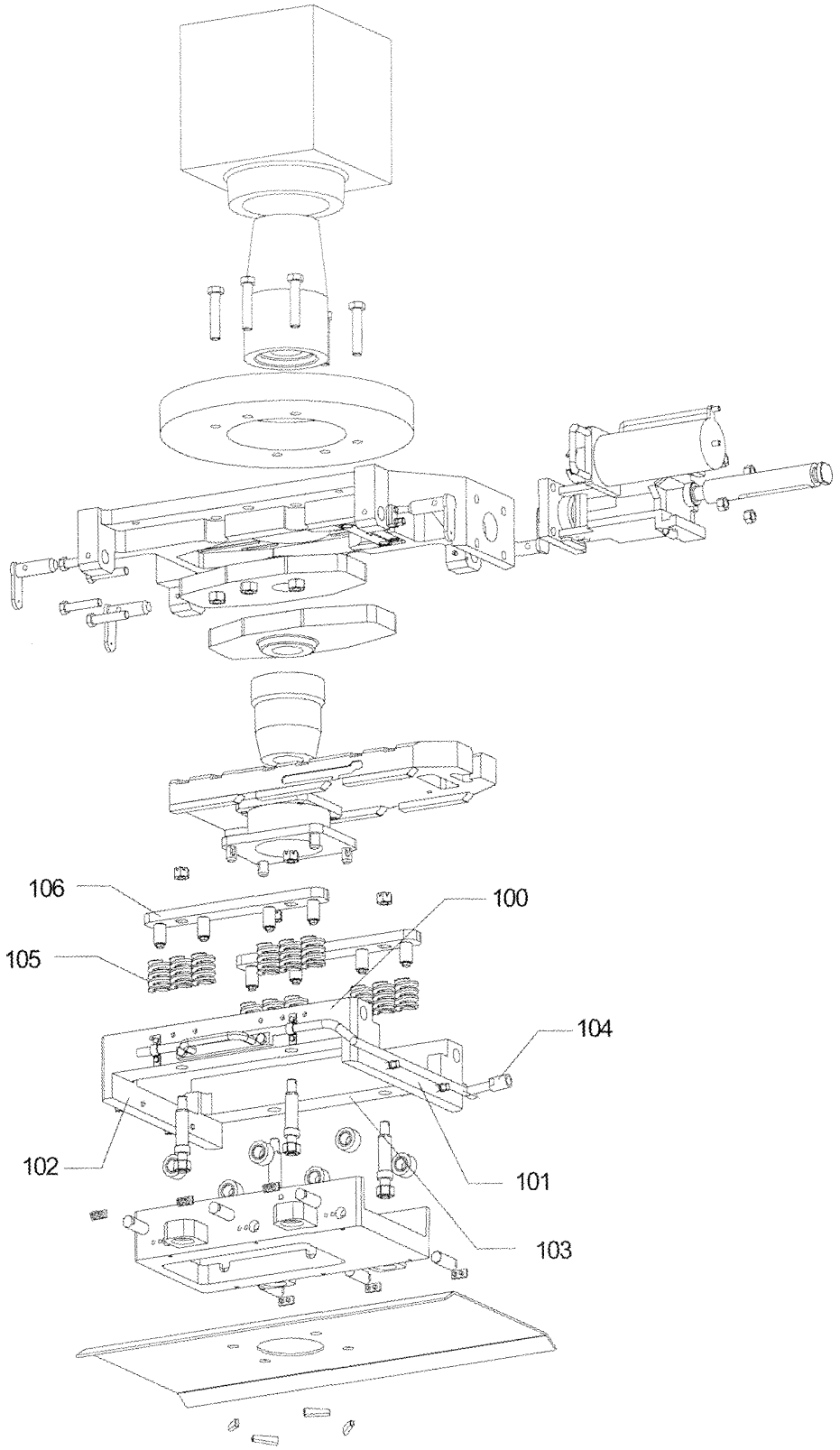

Fig 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2006/002864

A. CLASSIFICATION OF SUBJECT MATTER

See extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: B22D41/22, B22D41/24, B22D41/26, B22D41/34, B22D41/38, B22D41/40

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

PAJ WPI EPODOC CNPAT CNKI: downspout, slid+, groove or recess, guide, rail, stopper, ramp, wheel, roller, eccentric

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE10324801A1(KNOELLINGER FLO-TEC GMBH) 05.Jan 2005(05.01.2005) See the whole document	1-7
A	US6276573B1 (SUMITOMO HEAVY IND HIMATEX CO.) 21 AUG 2001(21.08.2001) See the description page 2-3, figure 1	1-7
A	CN2560456Y (LIU, Yueqin)16 JUL. 2003(16.07.2003) See the whole document	1-7
A	JP2006-43718A (SHINAGAWA FIRE BRICK) 16 FEB. 2006(16.02.2006) See the whole document	1-7
A	RU2104123C1 (VULKAN-T STOCK CO) 10 FEB. 1998(10.02.1998) See the whole document	1-7
A	CN2323893Y (LIU, Yueqin) 16 JUN. 1999(16.06.1999) See the whole document	1-7
A	RU2147971C1 (ALPATOV A A) 27 APR. 2000(27.04.2000) See the whole document	1-7

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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"&"document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
10 JUL. 2007 (10.07.2007)	26 · JUL 2007 (26 · 07 · 2007)
Name and mailing address of the ISA/CN The State Intellectual Property Office, the P.R.China 6 Xitucheng Rd., Jimen Bridge, Haidian District, Beijing, China 100088 Facsimile No. 86-10-62019451	Authorized officer Yu Hanzheng Telephone No. 62085400

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2006/002864

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
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CN2323893Y	16.06.1999	None	
RU2147971C1	27.04.2000	None	

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INTERNATIONAL SEARCH REPORT

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CLASSIFICATION OF SUBJECT MATTER

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