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(72) Inventors:
• **TANG, Rulong**
Hunan 410100 (CN)
• **PENG, Guocheng**
Hunan 410100 (CN)

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(74) Representative: **Zinnecker, Armin et al**
Lorenz-Seidler-Gossel,
Widenmayerstrasse 23
80538 München (DE)

(71) Applicant: **Sany Heavy Industry Co., Ltd.**
Changsa
Hunan 410100 (CN)

(54) **A LUBRICATING ARRANGEMENT FOR CONCRETE PISTON**

(57) The invention relates to a lubricating apparatus for concrete piston, comprising a link (4), a grease injecting piston (6) and a grease adding valve (15). One end of the link (4) is connected with the concrete piston (3) arranged in the concrete transport cylinder (2), while the other end thereof is connected with the main oil cylinder (5) arranged in the water tank (1). A cavity is arranged

inside the link (4). The grease injecting piston (6) is arranged in the cavity and separates the cavity into a grease storing cavity (8) and a pressurizing cavity (9). The grease adding valve (15) is communicated with the grease storing cavity (8) provided with a grease outlet. The pressurizing cavity (9) is communicated with a pressurizing mechanism (7) through a first one-way valve (14).

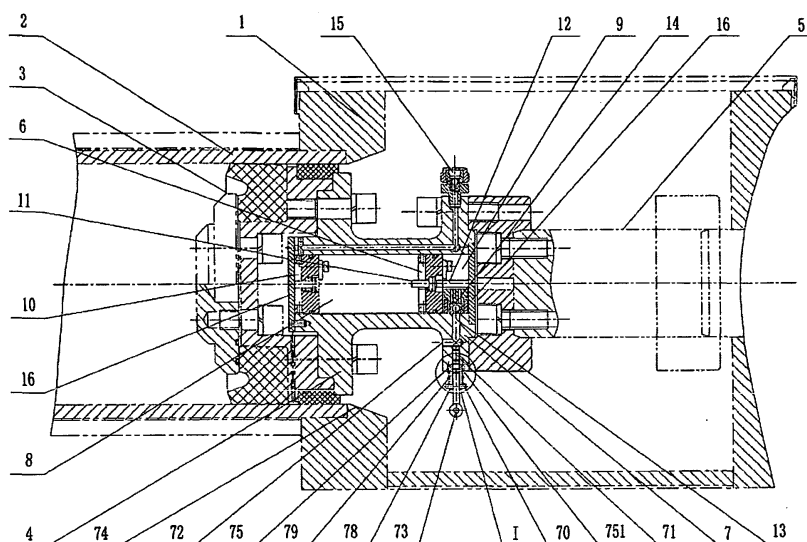


Fig. 2

Description

FIELD OF THE INVENTION

5 **[0001]** The invention relates to a concrete transport pump and pump vehicle, more specifically, to a lubricating apparatus for concrete piston.

BACKGROUND OF THE INVENTION

10 **[0002]** Currently, there are two ways of lubricating the concrete piston. One is arranging small radial holes on the concrete transport cylinder, through which a hydraulic system oilway or a specific lubricating oilway is introduced for lubricating directly. A disadvantage of this manner is that the concrete piston will be damaged due to the openings of the lubricating oil hole, thus the local abrasion of the concrete piston is accelerated, and the concrete piston will be abandoned earlier. The other is arranging a grease storing cavity on the link of the concrete piston, a spring and a piston
15 being arranged in the grease storing cavity, and the lubricating grease inside the piston is pushed into the concrete transport cylinder for lubricating with the resilient force of the spring. A disadvantage of this manner is that it is difficult to control the discharging amount and the discharging time of the lubricating grease. The lubricating grease is discharged from the grease storing cavity continuously with the resilient force of the spring, and the lubricating grease is also discharged to the location that is unnecessary to lubricate, thus the lubricating grease is wasted.

SUMMARY OF THE INVENTION

20 **[0003]** An object of the invention is to overcome the disadvantages of the prior art by providing a lubricating apparatus for concrete piston, which has longer life time, economizes the amount of the lubricating grease and reduces the wasting
25 of the lubricating grease.

30 **[0004]** A lubricating apparatus for concrete piston according to the invention comprises a link, a grease injecting piston and a grease adding valve. a cavity is arranged inside the link, the grease injecting piston being arranged in the cavity and separating the cavity into a grease storing cavity and a pressurizing cavity; the grease adding valve is communicated with the grease storing cavity provided with a grease outlet, characterized in that the pressurizing cavity is connected
35 with a pressurizing mechanism through a first one-way valve.

[0005] A second one-way valve is arranged on the grease injecting piston, a stop rod cooperating with the second one-way valve is arranged in the pressurizing cavity, and a cover plate cooperating with the second one-way valve is arranged in the grease storing cavity.

40 **[0006]** The pressurizing mechanism comprises a piston rod, a water pressing cylinder, a roller, and a return apparatus. The water pressing cylinder is communicated with the pressurizing cavity through the first one-way valve. A water intake is arranged on the water pressing cylinder. One end of the piston rod is arranged in the water pressing cylinder, while the other end thereof is connected with the roller. The return apparatus is fitted around the piston rod.

45 **[0007]** The pressurizing mechanism comprises a piston rod, a water pressing cylinder, a roller, a roller arm, and a return apparatus. The water pressing cylinder is communicated with the pressurizing cavity through the first one-way valve. A water intake is arranged on the water pressing cylinder. One end of the piston rod is arranged in the water pressing cylinder, while the other end thereof is slidely arranged in a waist-shaped hole in the roller arm. One end of the roller arm is connected with the link, while the other end thereof is connected with the roller. The return apparatus is fitted around the piston rod.

[0008] An inverted bevel face locating ring or a bevel face cooperating with the roller is arranged below the roller.

50 **[0009]** The return apparatus comprises a sleeve, a return spring and a spacer pin. A guide channel cooperating with the spacer pin is arranged on the sleeve. The sleeve is fitted around the piston rod. The return spring is fitted around the sleeve and is limited in position by the spacer pin.

55 **[0010]** The present invention has the following advantages: firstly, the concrete piston is provided with a pressurizing mechanism which realizes lubrication of the concrete piston at given time and given position by means of the characteristic of periodical pressurizing caused by reciprocal movement of the concrete piston, thereby ensuring lubricating effect of the concrete piston and enhancing the lifetime of the same; secondly, the pressurizing mechanism is provided with a return apparatus, thereby ensuring equal pressurizing amount of the pressurizing mechanism each time and ensuring equal amount of lubricating grease being discharged each time; thirdly, by providing a roller arm, the impact exerted on the pressurizing mechanism can be reduced and the security and lifetime of the pressurizing mechanism can be enhanced; finally, lubrication of the concrete piston at given time and given position improves the service efficiency of the lubricating grease, economizes the amount of lubricating grease, and reduces the wasting of the lubricating grease.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] Figure 1 is a view schematically illustrating the operating principle of the invention;

Figure 2 is a view schematically illustrating the structure of the first embodiment of the invention in the state of sucking water;

Figure 3 is a view schematically illustrating the structure of the first embodiment of the invention in the state of pressing water;

Figure 4 is a view schematically illustrating the structure of the second embodiment of the invention in the state of sucking water;

Figure 5 is a view schematically illustrating the structure of the second embodiment of the invention in the state of pressing water;

Figure 6 is a view schematically illustrating the structure of the third embodiment of the invention in the state of pressing water;

Figure 7 is a view schematically illustrating the structure of the third embodiment of the invention in the state of sucking water.

Figure 8 is a partially enlarged view illustrating portion I of Fig 2.

List of Reference Number

1. water tank	2. concrete transport cylinder
3. concrete piston	4. link
5. main oil cylinder	6. grease injecting piston
7. pressurizing mechanism	8. grease storing cavity
9. pressurizing cavity	10. grease outlet
11. second one-way valve	12. stop rod
13. water pressing cylinder	14. first one-way valve
15. grease adding valve	16. cover plate
71. piston rod	72. water intake
73. roller	74. bevel face
75. return apparatus	751. return spring
76. roller arm	77. waist-shaped hole
78. sleeve	79. guide channel
70. spacer pin	80. inverted bevel face locating ring

DETAILED DESCRIPTION OF THE INVENTION

Embodiment 1

[0012] As shown in figure 2 and 3, the lubricating apparatus for concrete piston of the invention is provided within the water tank 1 of a concrete transport pump, the lubricating apparatus comprises a link 4, a grease injecting piston 6 and a grease adding valve 15. One end of the link 4 is connected with the concrete piston 3 arranged in the concrete transport cylinder 2, while the other end thereof is connected with a main oil cylinder 5 arranged in a water tank 1. The main oil cylinder 5, following the movement of the link 4, reciprocates in the concrete transport cylinder 2 together with the concrete piston 3. A cavity is arranged inside the link 4. A grease injecting piston 6 is arranged in the cavity and separates the cavity into a grease storing cavity 8 approximating to the concrete piston 3 and a pressurizing cavity 9 approximating to the main oil cylinder 5. The pressurizing cavity 9 is filled with pressurized water in this embodiment. The grease adding valve 15 is communicated with the grease storing cavity 8, and a grease outlet 10 is arranged on the cover plate 16 at the end of grease storing cavity 8. The pressurizing cavity 9 is communicated with a pressurizing mechanism 7 through a first one-way valve 14. The pressurizing mechanism 7 comprises a piston rod 71, a water pressing cylinder 13 and a

return apparatus 75. The water pressing cylinder 13 is communicated with the pressurizing cavity 9 through the first one-way valve 14. The first one-way valve 14 opens and the pressurized water flows into the pressurizing cavity 9 when the water pressure in the water pressurizing cylinder 13 increases. A water intake 72 communicated with the water tank 1 is arranged on the water pressing cylinder 13. One end of the piston rod 71 is arranged in the water pressing cylinder 13, while the other end thereof is provided with a roller 73. A bevel face 74 cooperating with the roller 73 is arranged in the inner wall of the water tank 1. The return apparatus 75 is fitted around the piston rod 71. The return apparatus 75 comprises a sleeve 78, a return spring 751 and a spacer pin 70 arranged on the piston rod 71. A guide channel 79 cooperating with the spacer pin 70 is arranged on the sleeve 78. The sleeve 78 is fitted around the piston rod 71. The return spring 751 is fitted around the sleeve 78 and is limited in position by the spacer pin 70. A second one-way valve 11 is arranged on the grease injecting piston 6. A stop rod 12 cooperating with the second one-way valve 11 is arranged in the pressurizing cavity 9. A cover plate 16 cooperating with the second valve 11 is arranged in the grease storing cavity 8.

Operating principle

[0013] As shown in figure 1, 2 and 3, the concrete piston 3 and the link 4 reciprocate in the concrete transport cylinder 2 under the action of the main oil cylinder 5, and the pressurizing mechanism 7 moves simultaneously following the link 4. When the concrete piston 3 is advancing, the roller 73 pushes the piston rod 74 under the effect of the bevel face 74 arranged on the water tank 1 to press the water in the water pressing cylinder 13, and the pressurized water opens the first one-way valve 14 and flows into the pressurizing cavity 9. At this time, the pressure inside the pressurizing cavity 9 increases such that the grease injecting piston 6 pushes the grease inside the grease storing cavity 8 to lubricate the concrete piston 3, and a lubricating procedure at given time and given position for the concrete piston 3 is carried out by the lubricating apparatus for concrete piston. The roller 73 disengages with the bevel face 74 when the concrete piston 3 recedes. The piston rod 71 brings the roller 73 back to the original position under the action of the return apparatus 75, and the water in the water tank 1 is supplied to the water pressing cylinder through the water intake 72. When the concrete piston 3 advances again, the next cycle starts, and the lubricating apparatus for concrete piston carries out a lubricating procedure at given time and given position for the concrete piston 3 again. After the grease inside the grease storing cavity 8 is used up, the grease injecting piston 6 is also pushed to the end of the grease outlet 10 by the pressurized water in the pressurizing cavity 9. At this time, the second one-way valve 11 opens, and the pressurized water in the pressurizing cavity 9 releases the pressure through the grease outlet 10, wherein most of the water returns to the water tank 1, and a few water is mixed with the grease to lubricate. Then the grease adding valve 15 opens, and the grease is added into the grease storing cavity 8. The grease pushes the grease injecting piston 6 to recede. When the stop rod 12 abuts the second one-way valve 11, the second one-way valve 11 closes, and the grease adding procedure is finished.

Embodiment 2

[0014] As shown in figure 4 and 5, the lubricating apparatus for concrete piston of the invention is provided within the water tank 1 of a concrete transport pump, the lubricating apparatus comprises a link 4, a grease injecting piston 6 and a grease adding valve 15. One end of the link 4 is connected with the concrete piston 3 arranged in the concrete transport cylinder 2, while the other end thereof is connected with a main oil cylinder 5 arranged in a water tank 1. The main oil cylinder 5, following the movement of the link 4, reciprocates in the concrete transport cylinder 2 together with the concrete piston 3. A cavity is arranged inside the link 4. A grease injecting piston 6 is arranged in the cavity and separates the cavity into a grease storing cavity 8 approximating to the concrete piston 3 and a pressurizing cavity 9 approximating to the main oil cylinder 5. The pressurizing cavity 9 is filled with pressurized water in this embodiment. The grease adding valve 15 is communicated with the grease storing cavity 8, and a grease outlet 10 is arranged on the cover plate 16 at the end of grease storing cavity 8. The pressurizing cavity 9 is communicated with a pressurizing mechanism 7 through a first one-way valve 14. The pressurizing mechanism 7 comprises a piston rod 71, a water pressing cylinder 13, a roller 73, a roller arm 76 and a return apparatus 75. The water pressing cylinder 13 is communicated with the pressurizing cavity 9 through the first one-way valve 14. The first one-way valve 14 opens and the pressurized water flows into the pressurizing cavity 9 when the water pressure in the water pressurizing cylinder 13 increases. A water intake 72 communicated with the water tank 1 is arranged on the water pressing cylinder 13. One end of the piston rod 71 is arranged in the water pressing cylinder 13, while the other end thereof is slidably arranged in the waist-shaped hole 77 arranged in the roller arm 76. One end of the roller arm 76 is connected with the link 4, while the other end thereof is connected with the roller 73. A bevel face 74 cooperating with the roller 73 is arranged in the inner wall of the water tank 1. The return apparatus 75 is fitted around the piston rod 71. The return apparatus 75 comprises a sleeve 78, a return spring 751 and a spacer pin 70 arranged on the piston rod 71. A guide channel 79 cooperating with the spacer pin 70 is arranged on the sleeve 78. The sleeve 78 is fitted around the piston rod 71. The return spring 751 is fitted around the sleeve 78 and is limited in position by the spacer pin 70. A second one-way valve 11 is arranged on the grease injecting piston 6.

A stop rod 12 cooperating with the second one-way valve 11 is arranged in the pressurizing cavity 9. A cover plate 16 cooperating with the second valve 11 is arranged in the grease storing cavity 8.

Operating principle

[0015] As shown in figure 1, 4 and 5, the concrete piston 3 and the link 4 reciprocate in the concrete transport cylinder 2 under the action of the main oil cylinder 5, and the pressurizing mechanism 7 moves simultaneously following the link 4. When the concrete piston 3 is advancing, the roller 73 brings the roller arm 76 to rotate under the effect of the bevel face 74 arranged on the water tank 1, then the roller arm 76 pushes the piston rod 71 to press the water in the water pressing cylinder 13, and the pressurized water opens the first one-way valve 14 and flows into the pressurizing cavity 9. At this time, the pressure inside the pressurizing cavity 9 increases such that the grease injecting piston 6 pushes the grease inside the grease storing cavity 8 to lubricate the concrete piston 3, and a lubricating procedure at given time and given position for the concrete piston 3 is carried out by the lubricating apparatus for concrete piston. The roller 73 disengages with the bevel face 74 when the concrete piston 3 recedes. The piston rod 71 pushes the roller arm 76 which in turn brings the roller 73 back to the original position under the action of the return apparatus 75, and the water in the water tank 1 is supplied to the water pressing cylinder through the water intake 72. When the concrete piston 3 advances again, the next cycle starts, and the lubricating apparatus for concrete piston carries out a lubricating procedure at given time and given position for the concrete piston 3 again. After the grease inside the grease storing cavity 8 is used up, the grease injecting piston 6 is also pushed to the end of the grease outlet 10 by the pressurized water in the pressurizing cavity 9. At this time, the second one-way valve 11 opens, and the pressurized water in the pressurizing cavity 9 releases the pressure through the grease outlet 10, wherein most of the water returns to the water tank 1, and a few water is mixed with the grease to lubricate. Then the grease adding valve 15 opens, and the grease is added into the grease storing cavity 8. The grease pushes the grease injecting piston 6 to recede. When the stop rod 12 abuts the second one-way valve 11, the second one-way valve 11 closes, and the adding grease procedure is finished.

Embodiment 3

[0016] As shown in figure 6 and 7, the lubricating apparatus for concrete piston of the invention is provided within the water tank 1 of a concrete transport pump, the lubricating apparatus comprises a link 4, a grease injecting piston 6 and a grease adding valve 15. One end of the link 4 is connected with the concrete piston 3 arranged in the concrete transport cylinder 2, while the other end thereof is connected with a main oil cylinder 5 arranged in a water tank 1. The main oil cylinder 5, following the movement of the link 4, reciprocates in the concrete transport cylinder 2 together with the concrete piston 3. A cavity is arranged inside the link 4. A grease injecting piston 6 is arranged in the cavity and separates the cavity into a grease storing cavity 8 approximating to the concrete piston 3 and a pressurizing cavity 9 approximating to the main oil cylinder 5. The pressurizing cavity 9 is filled with pressurized water in this embodiment. The grease adding valve 15 is communicated with the grease storing cavity 8, and a grease outlet 10 is arranged on the cover plate 16 at the end of grease storing cavity 8. The pressurizing cavity 9 is communicated with a pressurizing mechanism 7 through a first one-way valve 14. The pressurizing mechanism 7 comprises a piston rod 71, a water pressing cylinder 13 and a return apparatus 75. The water pressing cylinder 13 is communicated with the pressurizing cavity 9 through the first one-way valve 14. The first one-way valve 14 opens and the pressurized water flows into the pressurizing cavity 9 when the water pressure in the water pressurizing cylinder 13 increases. A water intake 72 communicated with the water tank 1 is arranged on the water pressing cylinder 13. One end of the piston rod 71 is arranged in the water pressing cylinder 13, while the other end thereof is provided with a roller 73. An inverted bevel face locating ring 80 cooperating with the roller 73 is arranged in the water tank 1. The return apparatus 75 is fitted around the piston rod 71. The return apparatus 75 comprises a sleeve 78, a return spring 751 and a spacer pin 70 arranged on the piston rod 71. A guide channel 79 cooperating with the spacer pin 70 is arranged on the sleeve 78. The sleeve 78 is fitted around the piston rod 71. The return spring 751 is fitted around the sleeve 78 and is limited in position by the spacer pin 70. A second one-way valve 11 is arranged on the grease injecting piston 6. A stop rod 12 cooperating with the second one-way valve 11 is arranged in the pressurizing cavity 9. A cover plate 16 cooperating with the second valve 11 is arranged in the grease storing cavity 8.

Operating principle

[0017] As shown in figure 1, 6 and 7, the concrete piston 3 and the link 4 reciprocate in the concrete transport cylinder 2 under the action of the main oil cylinder 5, and the pressurizing mechanism 7 moves simultaneously following the link 4. When the concrete piston 3 recedes, the roller 73 pushes the piston rod 71 under the effect of the inverted bevel face locating ring 80 arranged in the water tank 1 to press the water in the water pressing cylinder 13, and the pressurized water opens the first one-way valve 14 and flows into the pressurizing cavity 9. At this time, the pressure inside the pressurizing cavity 9 increases such that the grease injecting piston 6 pushes the grease inside the grease storing cavity

8 to lubricate the concrete piston 3, and a lubricating procedure at given time and given position for the concrete piston 3 is carried out by the lubricating apparatus for concrete piston. The piston rod 71 brings the roller 73 back to the original position under the action of the return apparatus 75 when the concrete piston 3 is advancing, and the water in the water tank 1 is supplied to the water pressing cylinder through the water intake 72. When the concrete piston 3 recedes again, the next cycle starts, and the lubricating apparatus for concrete piston carries out a lubricating procedure at given time and given position for the concrete piston 3 again. After the grease inside the grease storing cavity 8 is used up, the grease injecting piston 6 is also pushed to the end of the grease outlet 10 by the pressurized water in the pressurizing cavity 9. At this time, the second one-way valve 11 opens, and the pressurized water in the pressurizing cavity 9 releases the pressure through the grease outlet 10, wherein most of the water returns to the water tank 1, and a few water is mixed with the grease to lubricate. Then the grease adding valve 15 opens, and the grease is added into the grease storing cavity 8. The grease pushes the grease injecting piston 6 to recede. When the stop rod 12 abuts the second one-way valve 11, the second one-way valve 11 closes, and the adding grease procedure is finished.

Claims

1. A lubricating apparatus for concrete piston, comprising a link (4), a grease injecting piston (6) and a grease adding valve (15), a cavity being formed inside the link (4), the grease injecting piston (6) being arranged in the cavity and separating the cavity into a grease storing cavity (8) and a pressurizing cavity (9); the grease adding valve (15) being communicated with the grease storing cavity (8) provided with a grease outlet (10), **characterized in that** the pressurizing cavity (9) is communicated with a pressurizing mechanism (7) through a first one-way valve (14).
2. The lubricating apparatus for concrete piston of Claim 1, **characterized in that** a second one-way valve (11) is arranged on the grease injecting piston (6), a stop rod (12) cooperating with the second one-way valve (11) is arranged in the pressurizing cavity (9), and a cover plate (16) cooperating with the second one-way valve (11) is arranged in the grease storing cavity (8).
3. The lubricating apparatus for concrete piston of Claim 1 or 2, **characterized in that** the pressurizing mechanism (7) comprises a piston rod (71), a water pressing cylinder (13), a roller (73), and a return apparatus (75); the water pressing cylinder (13) being communicated with the pressurizing cavity (9) through the first one-way valve (14); a water intake (72) being arranged on the water pressing cylinder (13); one end of the piston rod (71) being arranged in the water pressing cylinder (13), while the other end thereof being connected with the roller (73); the return apparatus (75) being fitted around the piston rod (71).
4. The lubricating apparatus for concrete piston of Claim 3, **characterized in that** an inverted bevel face locating ring (80) or a bevel face (74) cooperating with the roller (73) is arranged below the roller (73).
5. The lubricating apparatus for concrete piston of Claim 4, **characterized in that** the return apparatus (75) comprises a sleeve (78), a return spring (751) and a spacer pin (70) arranged on the piston rod (71); a guide channel (79) cooperating with the spacer pin (70) being arranged on the sleeve (78); the sleeve (78) being fitted around the piston rod (71); the return spring (751) being fitted around the sleeve (78) and being limited in position by the spacer pin (70).
6. The lubricating apparatus for concrete piston of Claim 1 or 2, **characterized in that** the pressurizing mechanism (7) comprises a piston rod (71), a water pressing cylinder (13), a roller (73), a roller arm (76) and a return apparatus (75); the water pressing cylinder (13) being communicated with the pressurizing cavity (9) through the first one-way valve (14); a water intake (72) being arranged on the water pressing cylinder (13); one end of the piston rod (71) being arranged in the water pressing cylinder (13), while the other end thereof being slidably arranged in a waist-shaped hole (77) formed in the roller arm (76); one end of the roller arm (76) being connected with the link (4), while the other end thereof being connected with the roller (73); the return apparatus (75) being fitted around the piston rod (71).
7. The lubricating apparatus for concrete piston of Claim 6, **characterized in that** an inverted bevel face locating ring (80) or a bevel face (74) cooperating with the roller (73) is arranged below the roller (73).
8. The lubricating apparatus for concrete piston of Claim 7, **characterized in that** the return apparatus (75) comprises a sleeve (78), a return spring (751) and a spacer pin (70) arranged on the piston rod (71); a guide channel (79) cooperating with the spacer pin (70) being arranged on the sleeve (78); the sleeve (78) being fitted around the piston rod (71); the return spring (751) being fitted on the sleeve (78) and being limited in position by the spacer pin (70).

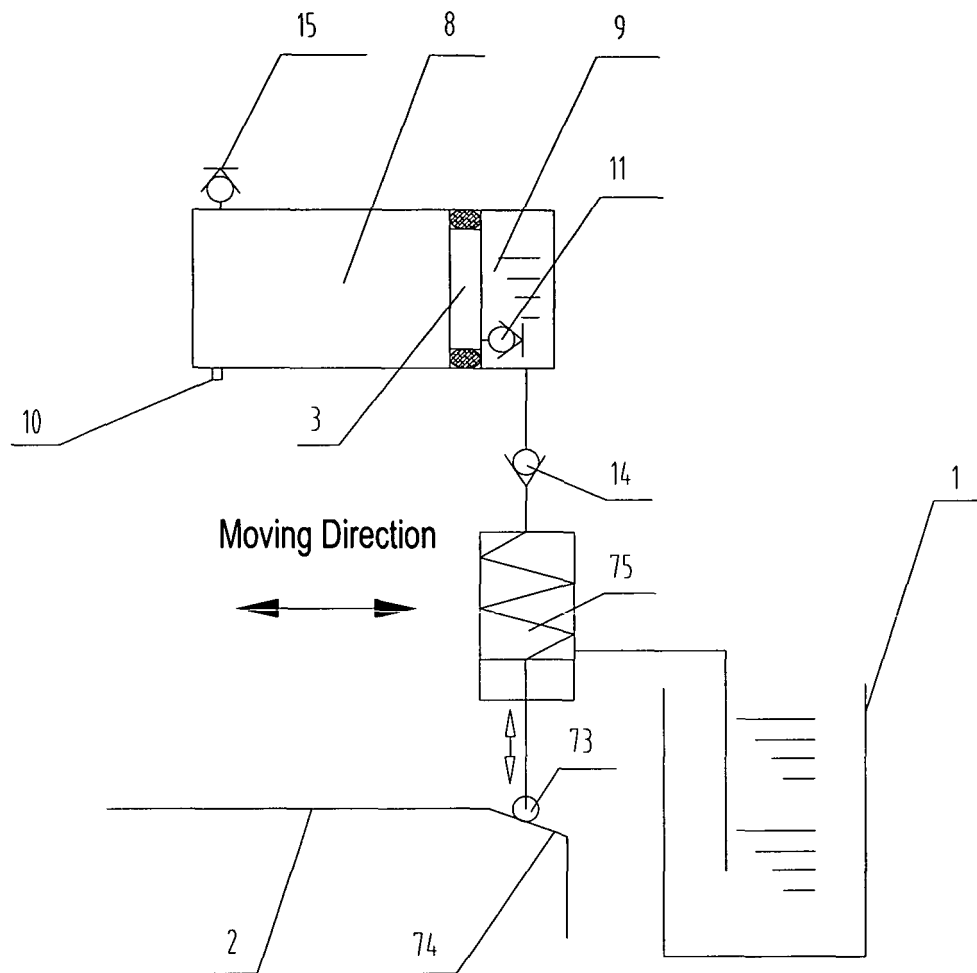


Fig. 1

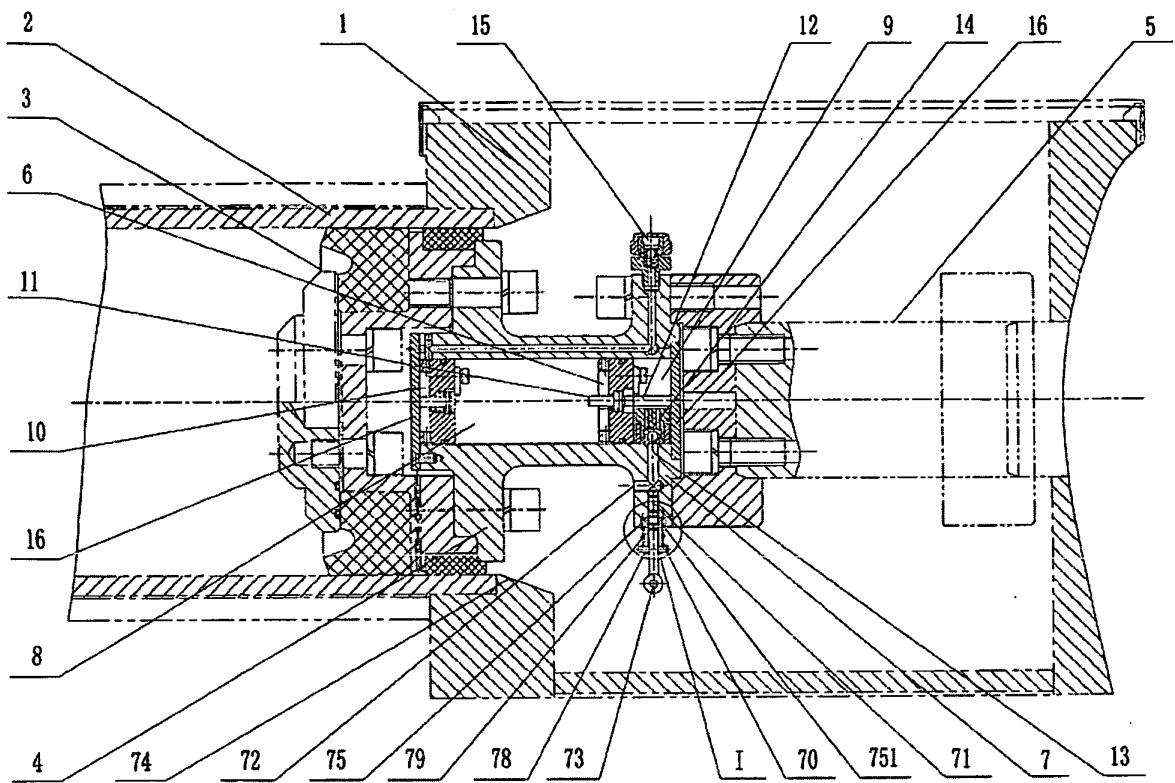


Fig. 2

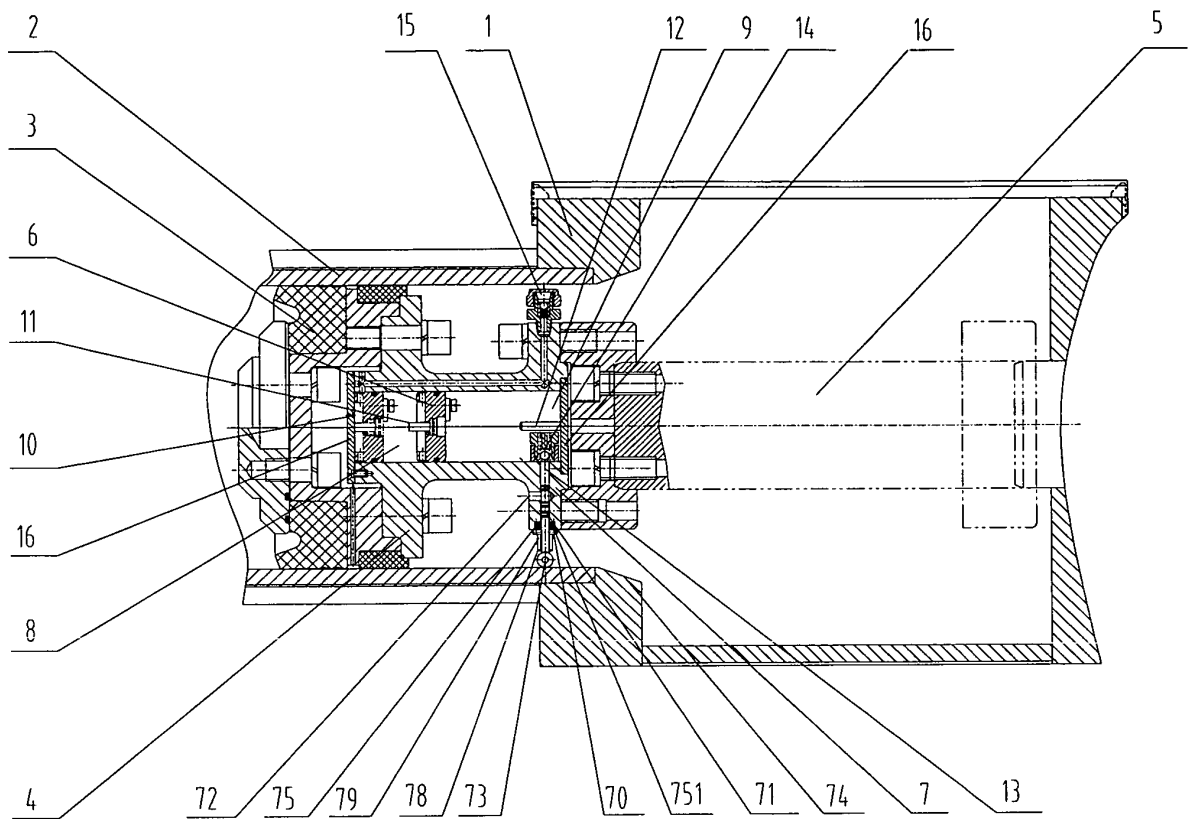


Fig. 3

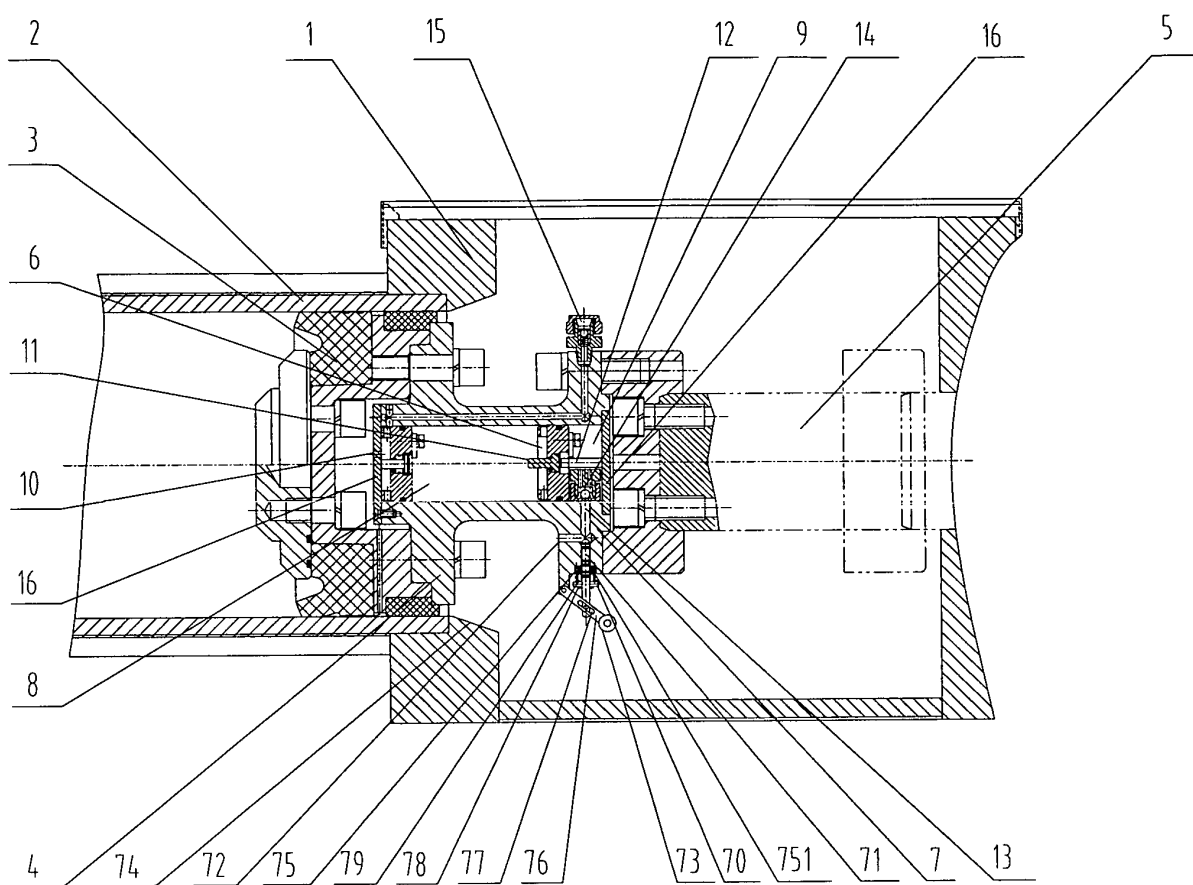


Fig. 4

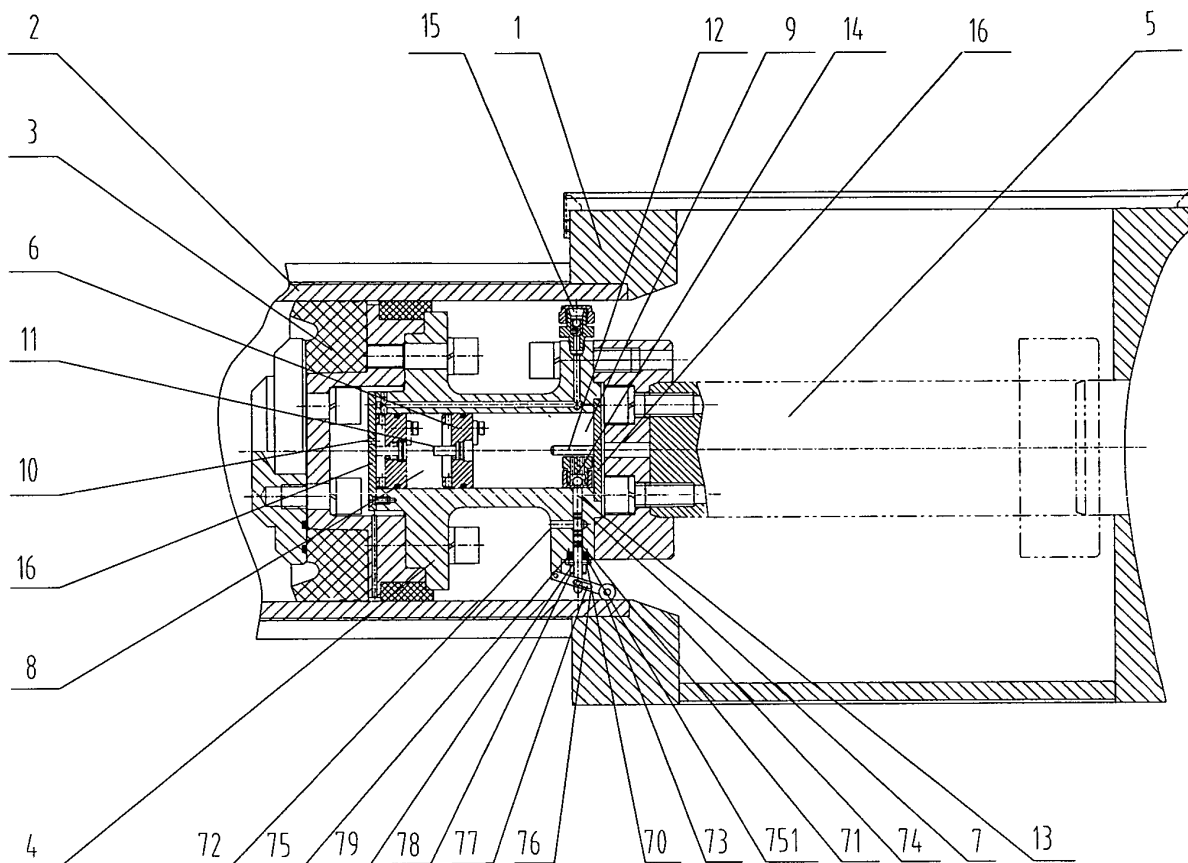


Fig. 5

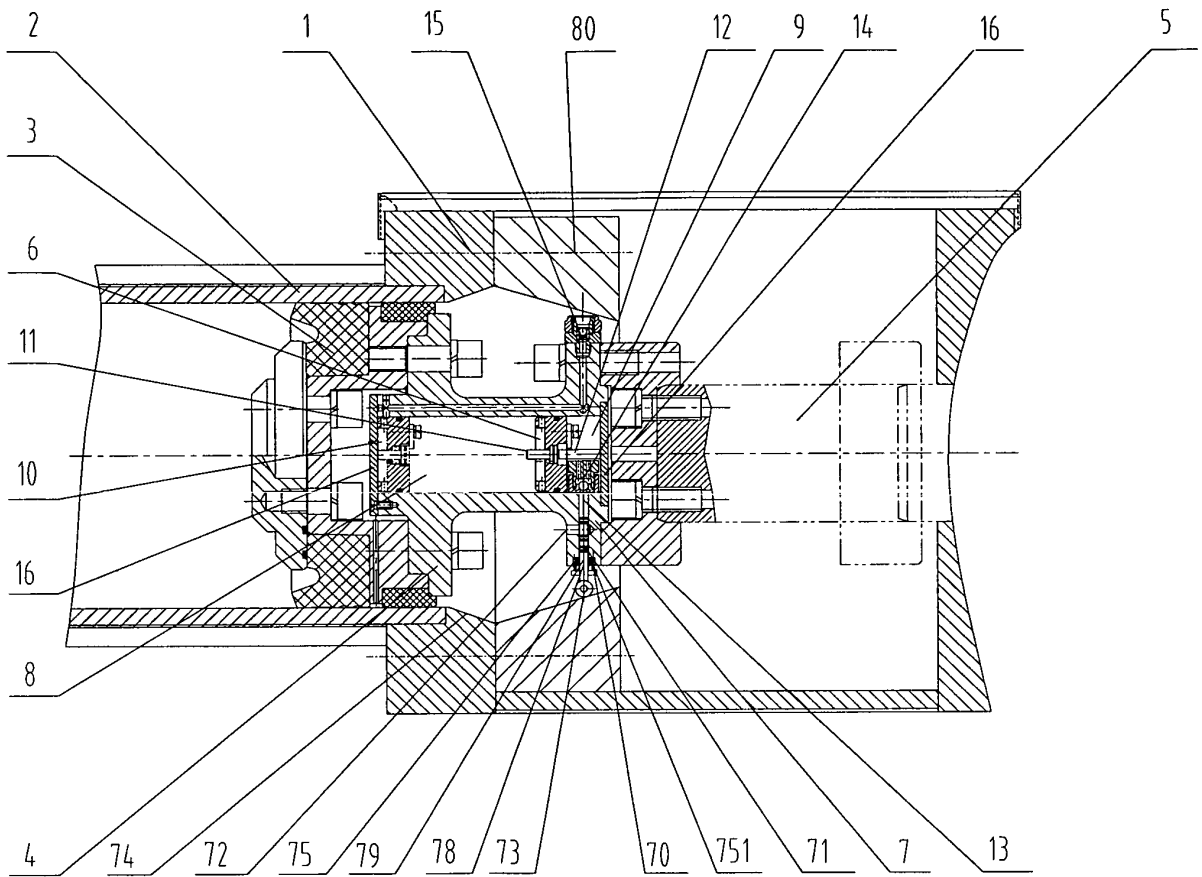


Fig. 6

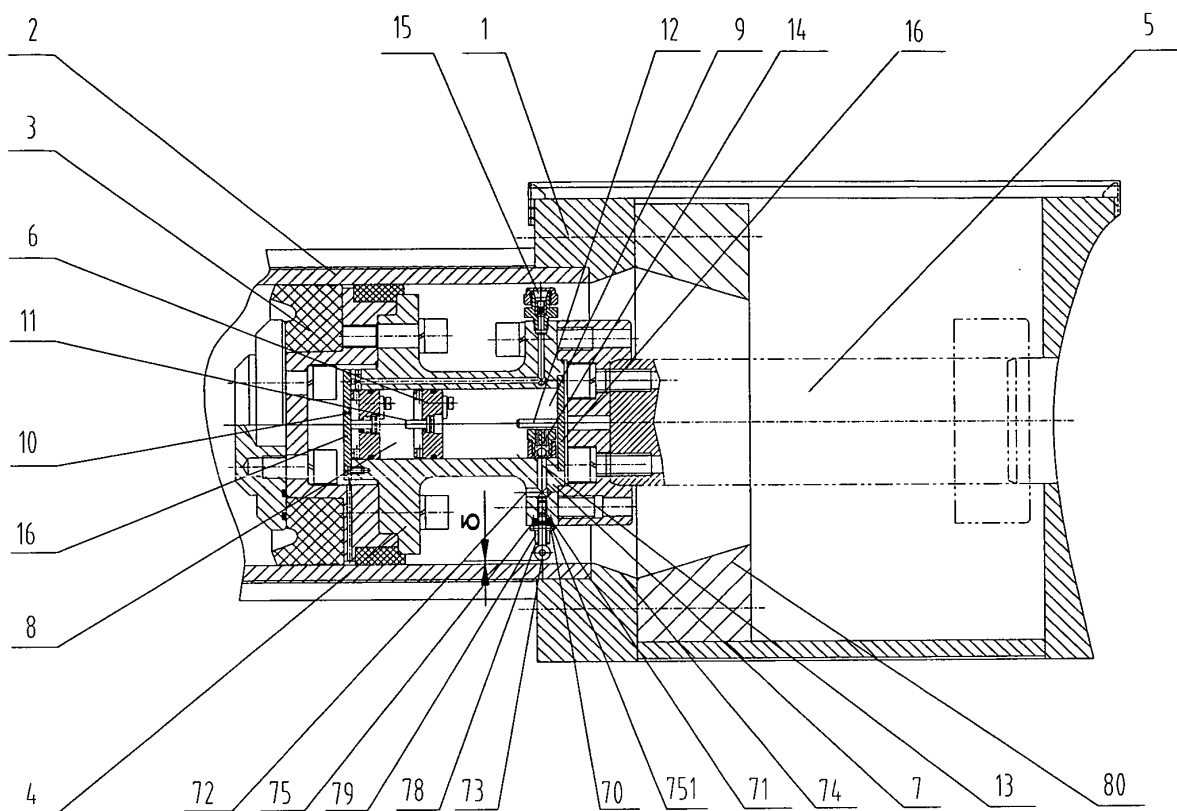


Fig. 7

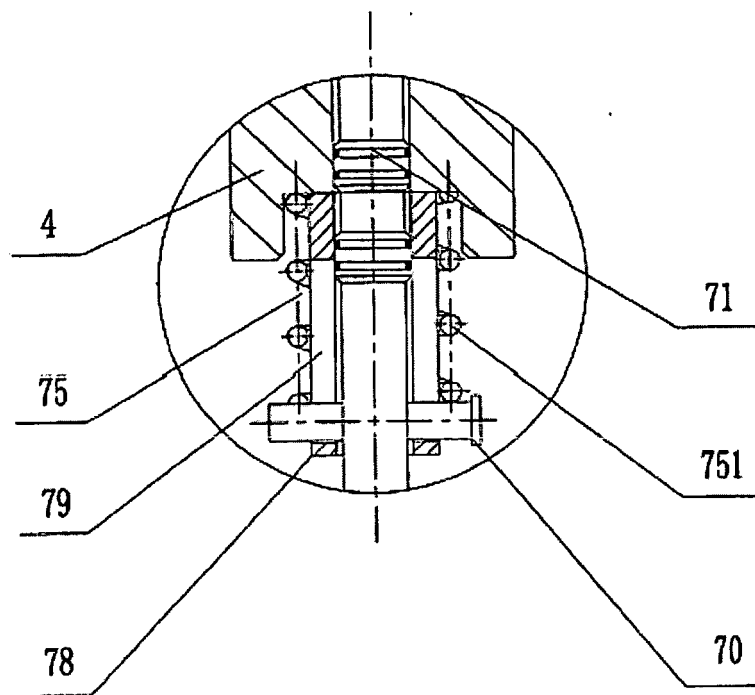


Fig.8

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2007/000329

A. CLASSIFICATION OF SUBJECT MATTER

F04B 53/18 (2006.01) i

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)

F04B 53/18, 53/00, 15/02, 15/00, F16N13/02, 13/00

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)

EPODOC, WPI, PAJ, CNPAT concrete, pump, piston, valve, lubricat+, pressure

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN2485452Y(SANY HEAVY IND CO LTD) 10. Apr 2002(10.04.2002) see the whole document	1-8
A	CN2799909Y(HE, Yangdong) 26. Jul 2006(26.07.2006) see the whole document	1-8
A	CN1485565A(SANY HEAVY IND CO LTD) 31. Mar 2004(31.03.2004) see the whole document	1-8
A	US4174928A(AUSTIN R D) 20. Nov 1979(20.11.1979) see the whole document	1-8

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

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"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search
11 May 2007(11.05.2007)Date of mailing of the international search report
07 Jun. 2007 (07.06.2007)Name and mailing address of the ISA/CN
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SUN, Hongxia
Telephone No. (86-10)62085457

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2007/000329

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
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Form PCT/ISA/210 (patent family annex) (April 2007)