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JOSE LLOREDA CAMACHO & CO.

ABOGADOS

Calle 72 No. 5-83 Piso 5, Bogotá,

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO



No. 07-001941- -00003-0000

Fecha: 2008-06-23 16:43:59 Dep. 2020 NUECREACION
Tra. 11 PATENTEIYII Eve: 378 FASENACIONALI
Act. 538 PETICION Folios: 3

Señor

SUPERINTENDENTE DE INDUSTRIA Y COMERCIO

DIVISION DE NUEVAS CREACIONES

E. _____ S. _____ D. _____

Re: P1.-M-I L.L.C.-Solicitud de Patente de Invención en Fase
Nacional PCT para "MÉTODO Y APARATO PARA
DETERMINAR LA INTEGRIDAD DEL SISTEMA PARA UNA
MAQUINA DE CAMPO PETROLERO".-Clase G01N 3/62.-
Expediente número 07-001.941.-

1. Me refiero a mi memorial de 10 de Abril de 2007.
2. De conformidad con lo dispuesto en el Artículo 5.2.12 de la Circular Externa No. 03 de 28 de Abril de 2003, y estando dentro del plazo de seis meses contados desde la fecha de la publicación de la solicitud en la Gaceta de la Propiedad Industrial número **587** de 18 de Enero de 2008, solicito a ese Despacho proceder a realizar el examen de patentabilidad de la presente invención.
3. De otro modo, atentamente me permito manifestar a usted que en el extracto de la solicitud arriba nombrada, publicado en la Gaceta de la Propiedad Industrial número **587** de 18 de Enero de 2008, página 266, el nombre del solicitante de la patente arriba mencionada aparece publicado en forma equivocada, el nombre correcto del solicitante es como sigue a continuación: **M-I** L.L.C.
4. En vista de lo anterior, muy comedidamente solicito a usted que las aclaraciones correspondientes sean incluidas en la Fe de Erratas de la próxima Gaceta de la Propiedad Industrial.
5. Me permito recordar a usted, que tal como se informó en el Petitorio de la invención, la presente solicitud corresponde a Capítulo I.

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6. Anexo me permito presentar recibo número 08-45.200, expedido por la Superintendencia de Industria y Comercio, que acredita el pago de la tasa que dicho examen causa.

7. Ruego a usted tomar atenta nota de lo anterior y proceder de conformidad.

Señor Superintendente,


ALICIA LLOREDA RICAURTE

T.P. 53.215

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SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO



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SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO

NIT : 800176089-2

RECIBO OFICIAL DE CAJA : 08 - 45,200
HA : JUNIO 6 DE 2008

***** CONSIGNACION *****

DEPOSITANTE	TIPO PAGO	BANCO	CUENTA	No. PAGO	FECHA PGO	Vr. PAGO
LOUREDA Y CIA S. A	CONSIGNACION	BANCO DE BOGOTA	062754387	2756088	06/06/2008	8,815,200.00

***** CONCEPTO *****

RENTISTICO	CONCEPTO	TOTAL CONCEPTO
1 50005-01-01 SOLICITUDES	85 EXAMEN DE PATENTABILIDAD DE INVEN	420,000.00
	TOTAL :	\$ 420,000.00

SON: CUATROCIENTOS VEINTE MIL PESOS

RESPONSABLE : 

RECIBO DE CAJA APLICADO AL EXPEDIENTE No. _____

DIVISIÓN DE NUEVAS CREACIONES

RADICACIÓN EXPEDIENTE No. 07-01941

EL EXTRACTO DE LA PRESENTE SOLICITUD DE **PATENTE DE INVENCIÓN**

FUE PUBLICADO EN LA GACETA DE PROPIEDAD INDUSTRIAL No **587** DE

FECHA **18 DE ENERO DE 2008** EL TÉRMINO HÁBIL SEÑALADO POR LA LEY

EXPIRA EL **16 DE ABRIL DE 2008**

NOTA: Dentro del plazo de los seis (6) meses siguientes a partir de la fecha de publicación en la gaceta de Propiedad Industrial, deberá solicitar y cancelar el examen de patentabilidad so pena de que la solicitud caiga en abandono, de acuerdo con lo establecido en el Artículo 44 de la Decisión 486/2000.

SE PRESENTARON OPOSICIONES POR PARTE DE TERCEROS.

SI _____ NO X



(12) **United States Patent**
Okazaki et al.

(10) **Patent No.: US 6,398,509 B1**
(45) **Date of Patent: Jun. 4, 2002**

(54) **LUBRICATING DEVICE**
(75) **Inventors:** Yuki Yoshi Okazaki; Taikou
Nawamoto; Kenichi Sugiyama;
Satoshi Dairokuno, all of Kanagawa
(JP)
(73) **Assignee:** NSK Ltd., Tokyo (JP)
(*) **Notice:** Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.

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Patent Abstract of Japan 06197573 Jul. 15, 1994.
Patent Abstract of Japan 09310654 Dec. 2, 1997.

* cited by examiner

Primary Examiner—Charles G. Freay
Assistant Examiner—Michael K. Gray
(74) *Attorney, Agent, or Firm*—Sughrue Mion, PLLC

(21) **Appl. No.: 09/522,909**
(22) **Filed: Mar. 10, 2000**
(30) **Foreign Application Priority Data**
Jun. 21, 1999 (JP) 11-174305
Aug. 4, 1999 (JP) 11-221435
Feb. 29, 2000 (JP) 2000-054539
(51) **Int. Cl.⁷** **F04B 49/06; F04B 17/00;**
F01M 9/00
(52) **U.S. Cl.** **417/44.1; 322/410.1; 184/6.14**
(58) **Field of Search** **417/44.1, 322,**
417/410.1, 416, 417; 184/6.14, 6.22; 310/26

(57) **ABSTRACT**

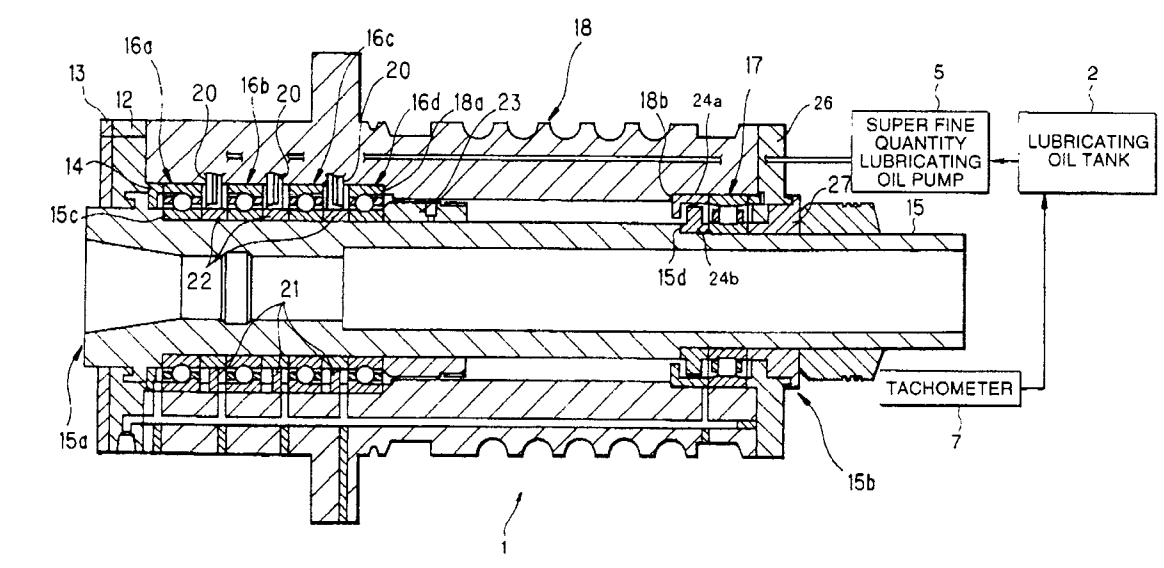
A rod body 30 is formed of magnetostrictive material and includes one end portion 30 fixed, and a piston 35 is fixed to the other end portion 30b of the rod body 30. The piston 35 is slidably disposed within a cylinder 36 in which there is formed a pump chamber 37. A suction port 39 for sucking lubricating oil into the pump chamber 37 is formed in the cylinder 36, while a suction valve 40 for preventing the lubricating oil from flowing out from the suction port 39 is disposed in the suction port 39. In the cylinder 36, there is disposed a nozzle 20 which communicates with the pump chamber 37 and has a sectional area smaller than the lubricating oil passage sectional area of the suction valve 40. There is disposed a coil 43 outside the rod body 30 and, to the coil 43, there is connected a control device 6 for controlling the supply of a current to be supplied to the coil 43.

(56) **References Cited**

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15 Claims, 26 Drawing Sheets



US 6,398,509 B1

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- a pump for pressurizing said lubricant;
- a check valve disposed in the intermediate portion of a flow passage for supplying said lubricant to said pump for preventing said lubricant from flowing out of the pump; and
- said nozzle is disposed on the lubricant discharge side of said pump and having a flow passage sectional area smaller than the lubricant flow passage sectional area of said check valve.
3. A spindle apparatus as set forth in claim 1, wherein said pump is a magnetostrictive pump, comprising:
- a rod body formed of magnetostrictive material and expandable and contractible by applying a magnetic field to said rod body and removing said magnetic field from said rod body; and,
- a pump chamber for pressurizing said lubricant by means of the expanding and contracting operations of said rod body.
4. A spindle apparatus as set forth in claim 3, wherein said rod body is fixed on one end side thereof, and said pump chamber comprises:
- a piston connected on the other end of said rod body; and,
- a cylinder in which said piston is slidably disposed, the cross sectional area of the inner surface of said cylinder being set smaller than the cross sectional area of said rod body.
5. A spindle apparatus as set forth in claim 3, wherein the decreased capacity of said pump chamber caused by the expansion of said rod body is set equal to the sum of the quantity of the air flowing into said pump chamber from said nozzle when said rod body is contracted, a decreased volume caused by the compression of the lubricant existing within an internal capacity defined between said check valve and the outlet of said nozzle, the increased capacity of said internal capacity caused by the pressure deformation of said rod body and a pipe for communicating said nozzle with said pump defining said internal capacity, and a required discharge quantity of said lubricant.
6. A spindle apparatus as set forth in claim 3, wherein said magnetostrictive pump comprises:
- a coil applying a magnetic field; and,
- a control device controlling a current to be supplied to said coil so as to expand and contract said rod body, and wherein said control device, in the initial excitation stage of said coil, supplies the current until said lubricant existing within said pump chamber reaches such a pressure as to allow said magnetostrictive pump to obtain a desired discharge speed,
- after reaching said pressure, said control device supplies the current so as to maintain the pressure of said lubricant constant according to the discharge quantity of said lubricant, and further,
- after a desired lubricant discharge quantity is obtained, said control device cuts off the supply of said current.
7. A spindle apparatus as set forth in claim 3, wherein said magnetostrictive pump comprises:
- a coil applying a magnetic field; and,
- a control device controlling a current to be supplied to said coil so as to expand and contract said rod body, and wherein said lubricating device further includes:
- a measuring device measuring any one of the value of a current to be supplied to said coil, a voltage value proportional to said current, and the value of a magnetic flux caused by said current; and,

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- an abnormal condition judging device comparing the measured value with respect to an elapsed time measured by said measuring device with a measured value in a normal condition to thereby judge whether an abnormal condition has occurred or not, and
- when said abnormal condition judging device judges that an abnormal condition has occurred, said lubricant device issues an abnormal condition signal.
8. A spindle apparatus as set forth in claim 3, wherein said magnetostrictive pump comprises:
- a coil applying a magnetic field; and,
- a control device controlling a current to be supplied to said coil so as to expand and contract said rod body, and wherein said lubricating device further includes:
- a measuring device for measuring any one of the value of a current to be supplied to said coil, a voltage value proportional to said current, and the value of a magnetic flux caused by said current; and,
- an air mixture judging device comparing the measured value with respect to an elapsed time measured by said measuring device with a measured value in an air non-mixture condition to thereby judge whether the air is mixed or not, and
- until said air mixture judging device judges in the start of the operation of said lubricating device that the air is not mixed, said control device increases said current to be supplied to said coil or increases the supply frequency of said current.
9. A spindle apparatus as set forth in claim 1, wherein said pump comprises:
- a rod body formed of piezo-electric element and expandable and contractible by applying a voltage to said rod body and removing said voltage from said rod body; and,
- a pump chamber pressurizing said lubricant by means of the expanding and contracting operations of said rod body.
10. A spindle apparatus as set forth in claim 1, wherein said pump comprises:
- an electromagnet;
- a movable body reciprocable linearly due to the attraction by said electromagnet; and,
- a pump chamber pressurizing said lubricant by means of the reciprocating motion of said movable body.
11. A spindle apparatus as set forth in claim 1, wherein the discharge diameter of said nozzle is 0.08 mm–0.6 mm.
12. A spindle apparatus as set forth in claim 11, wherein the discharge diameter of said nozzle is 0.1 mm–0.5 mm.
13. A spindle apparatus as set forth in claim 1, further including a pump for pressuring said lubricant; and a pipe for communicating said nozzle with said pump, wherein said pipe is formed such that a ratio of the length L of said pipe to the inside diameter d thereof is $5 \text{ mm}^{-3} < L/d^4 < 12000 \text{ mm}^{-3}$.
14. A spindle apparatus as set forth in claim 13, wherein said pipe is formed such that a ratio of the length L of said pipe to the inside diameter d of said pipe is $5 \text{ mm}^{-3} \leq L/d^4 \leq 1000 \text{ mm}^{-3}$.
15. A spindle apparatus as set forth in claim 1, wherein the supply quantity and supply interval of said lubricant discharged from said lubricating device are controlled according to the rotation speed of the relative rotation between said housing and said shaft.

* * * * *