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Señora Jefe de la
DIVISION DE NUEVAS CREACIONES
Superintendencia de Industria y Comercio
E. S. D.

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO



No. 06-042079- -00002-0000

Fecha: 2008-02-18 17:04:53 Dep. 2020 NUECREACIONE
Tra. 11 PATENTEIYII Eve: 379 FASENACIONALI
Act. 538 PETICION Folios: 2

Trámite : 011
Evento : 379
Actuación : 538

Referencia : Expediente No. 06.042.079
Asunto : Solicitud de Patente para **SISTEMA DE DETECCION RAPIDA DE OCLUSION DE BOMBA DE JERINGA**
Solicitante : **MEDEX, INC.**
Clase : A61M 005/168
Publicada en : La Gaceta No. **581** Del 30 de octubre de 2007
Fecha de Solicitud : 4 de mayo de 2006

1. Yo, Emilio FERRERO, identificado como aparece al pie de mi firma, actuando como apoderado en el asunto de la referencia, atentamente, solicito se efectúe el examen de patentabilidad de la solicitud en referencia presentada de acuerdo con el Capítulo II del PCT y según lo establecido en el artículo 44 de la Decisión 486 de la Comisión de la Comunidad Andina. Para tal efecto presento junto con este escrito el recibo por valor de \$210.000.00, que corresponde a la tasa fijada según lo dispuesto en la resolución No. 44372 de 26 de diciembre de 2007.

2. Ruego atentamente a la Señora Jefe se sirva ordenar que se anexe este recibo para que se efectúe dicho examen y se continúe con el trámite de la solicitud.

Señora Jefe,

EMILIO FERRERO
T.P.A. No. 31.929

COLO-14343-841-002-7
ASG\AHP\ID-119081\WPC14343
No. M-2008-119081\ASG

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO

NIT : 800176089-2

RECIBO OFICIAL DE CAJA : 08 - 5,060
FECHA : ENERO 21 DE 2008

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO



No. 06-042079- -00002-0000

Fecha: 2008-02-18 17:04:53 Dep. 2020 NUECREACIONE
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***** CONSIGNACION *****

DEPOSITANTE	TIPO PAGO	BANCO	CUENTA	No. PAGO	FECHA PGO	Vr. PAGO
CAVELIER ABOGADOS	CONSIGNACION	BANCO DE BOGOTA	062754387	2808479	21/01/2008	39,545,000.00

***** CONCEPTO *****

CANT. RENTISTICO	CONCEPTO	TOTAL CONCEPTO
1 50005-01-01 SOLICITUDES	114 PTC CAP-II EXAMEN DE PATENTIBILID	210,000.00
	TOTAL :	\$ 210,000.00

EN: DOSCIENTOS DIEZ MIL PESOS

RESPONSABLE :

RECIBO DE CAJA APLICADO AL EXPEDIENTE No. _____

Cdo 14343-841-002-7

DIVISIÓN DE NUEVAS CREACIONES

RADICACIÓN EXPEDIENTE No. 06-42079

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

FUE PUBLICADO EN LA GACETA DE PROPIEDAD INDUSTRIAL No **581** DE

FECHA **31 DE OCTUBRE DE 2007** EL TÉRMINO HÁBIL SEÑALADO POR LA

LEY EXPIRA EL **31 DE ENERO 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



US005501665A

United States Patent [19]
Jhuboo et al.

[11] **Patent Number:** **5,501,665**
[45] **Date of Patent:** **Mar. 26, 1996**

[54] **PROCESS AND DEVICE FOR DETECTION OF OBSTRUCTIONS IN A PERFUSION LINE**

[52] **U.S. Cl.** 604/65
[58] **Field of Search** 604/30-34, 48, 604/49, 53, 65-67, 154, 250-256

[75] **Inventors:** Abdel-Nasser Jhuboo, St. Etienne de St. Geoirs; Pierre Rebours, Voiron, both of France

Primary Examiner—C. Fred Rosenbaum
Assistant Examiner—Manual Mendez
Attorney, Agent, or Firm—Alan W. Fiedler

[73] **Assignee:** Becton Dickinson and Company, Franklin Lakes, N.J.

[57] **ABSTRACT**

A process for detecting obstructions in a perfusion line, wherein a programmable syringe pump uses a selected gradient constant and first and second pressure measurements from the perfusion line to determine whether an obstruction has occurred in the perfusion line.

[21] **Appl. No.:** 276,300

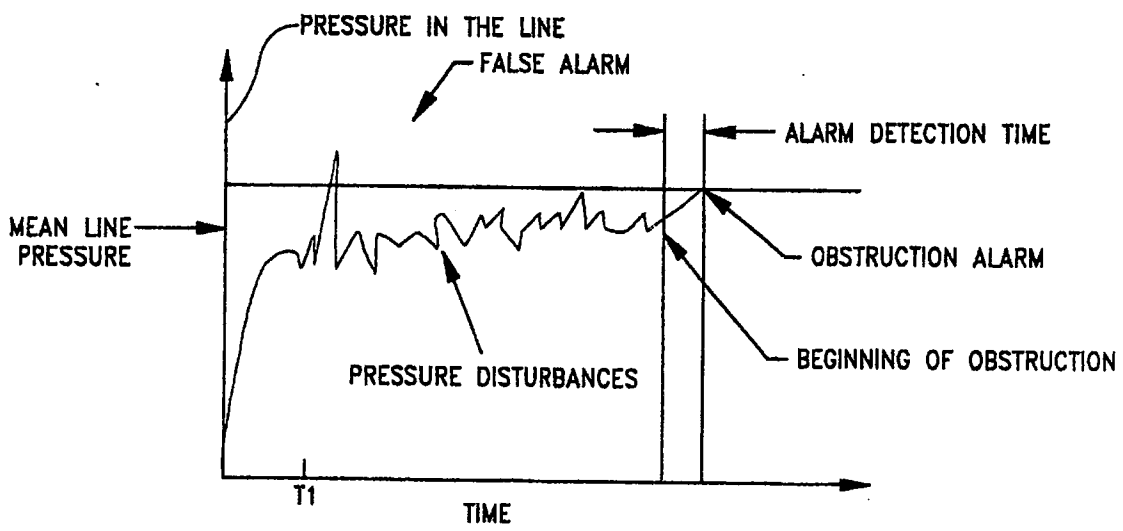
[22] **Filed:** Jul. 18, 1994

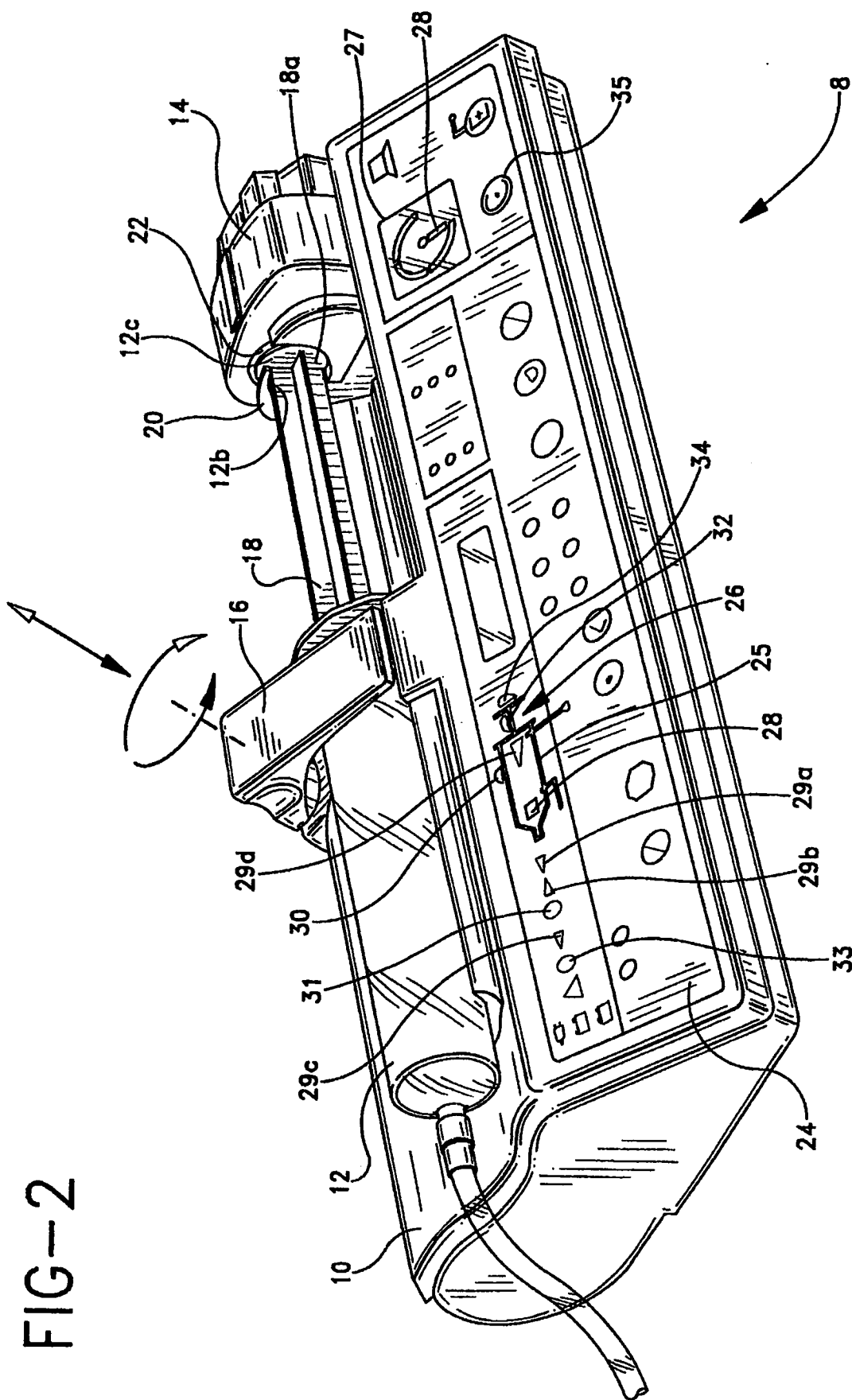
[30] **Foreign Application Priority Data**

Sep. 30, 1993 [FR] France 93 11654

[51] **Int. Cl.⁶** A61M 31/00

22 Claims, 14 Drawing Sheets





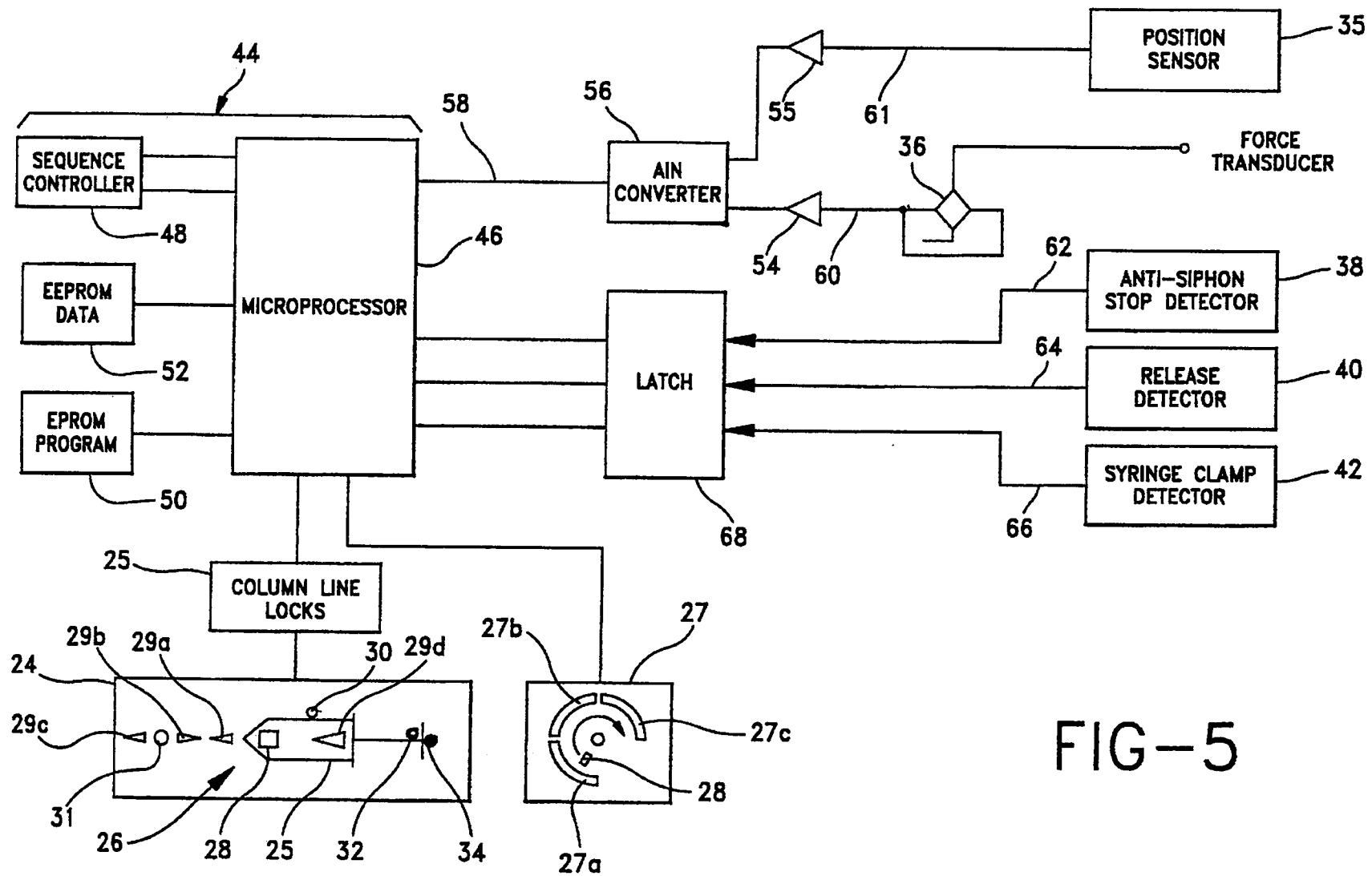


FIG-5

5,501,665

3

nism 14, and a syringe clip 16. The syringe clip 16 holds syringe 12 in position on case 10. Plunger 18 of syringe 12 is pushed by a pushing mechanism 14 which is driven by an electric motor via a feed screw (cf. FIG. 2).

Pushing mechanism 14 is equipped with an antisiphon stop device 20 which cooperates with a flange 18a of plunger 18, thereby preventing plunger 18 from moving independently of pushing mechanism 14. Pushing mechanism 14 is also equipped with a pressure plate 22 to push directly against flange 18a, thereby pumping fluid from syringe 12.

FIG. 3 represents the frame and the mechanical constituents of the pump 8. Frame 226 has a motor 230 and a feed screw 222. Motor 230 drives the feed screw 222 via the gear train 232. Pushing mechanism 14 is driven by the interaction of plunger block 228 with feed screw 222. The plunger block contains half-nuts which interact with feed screw 222.

FIG. 4 represents in greater detail the force transducer 36. The force transducer 36 consists of four strain gauges mounted on a Wheatstone bridge. The bridge has an impedance of 350 ohms or 1 Kohm with a tolerance of $\pm 15\%$. The force measurement range is 0 to 150 N. The sensitivity of the bridge is 1.7 mV/V to 2.4 mV/V under a load of 150 N at 20° C. The bridge is powered intermittently under the control of a microprocessor 46 (line CDANA on FIGS. 6a and 6d) to economize energy.

As may be seen on FIG. 4, the strain gauges 112 are fastened to a bar 113. When a force is applied to the pressure plate 22, the bar 113 bends, causing a distortion of the strain gauges 112, which deliver an output signal 60.

FIG. 5 is a synoptic diagram representing the principal electronic components of the invention. Transducers are provided to detect different parameters of the syringe pump which are displayed on a panel 24. The transducers are: the force transducer 36, the antisiphon stop device detector 38, the release detector 40, and the syringe clip detector 42. The output signals from these transducers 60, 62, 64, and 66 respectively are applied to a central treatment unit 44 by different signal treatment modules. Diagrams of the different electronic modules are depicted in FIGS. 6a-c. The values and the types of the components are indicated on the diagrams.

The output signal 60 from force transducer 36 is applied to the processing module 54 (FIG. 6d) and then to an analog-to-digital converter 56 which converts the process output signal from the force detector 36 into the serial output signal 58. The serial output signal 58 is then applied to the input 60 of the microprocessor 46.

The central treatment unit 44 consists of the microprocessor 46 (FIG. 6a) with a random access memory 53 (FIG. 6a), a sequence controller 48 (FIG. 6b), an electrically programmable read-only memory 50 (FIG. 6a), and an electrically-erasable programmable read-only memory 52 (FIG. 6c). The sequence controller 48 monitors the microprocessor 46 to ensure that it functions correctly. The electrically-erasable programmable read-only memory 52 contains data concerning the syringe parameters used in the pump. The electrically programmable read-only memory 50 contains a software program which controls the operation of the syringe pump.

The output signal from the force transducer 36 is processed by a signal processing 54 (FIG. 6d), which converts the output signal from the force transducer 36 into an appropriate form for application to an analog-to-digital converter 56 (FIG. 6e). The analog-to-digital converter 56 digitizes the analog output signal and delivers a serial output signal 58 which is in turn applied at the input connection point 60 of the microprocessor 46.

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The electrically programmable read-only memory 50 has a software program for the microprocessor 46 which calculates the pressure inside the syringe 12 continuously, since the force on the plunger 18 is measured by the force transducer 36. Certain parameters which are used by the program to calculate the pressure in the syringe are stored in the electrically erasable programmable read-only memory 52. Since the syringe pump 8 is programmable to receive different types of syringes, a set of parameters for each type of syringe is stored in the electrically erasable programmable read-only memory 52.

The parameters stored in the electrically erasable programmable read-only memory 52 include:

Ff=mean force of friction between the syringe plunger and the barrel of the syringe at zero pressure (atmospheric).

Pc=the pressure in the syringe when a calibration force is applied to the plunger. The calibration force is typically 50 N and produces a Pc value of approximately 0.7 bar, a common pressure threshold.

Fc=the force with which the plunger is charged to obtain a pressure of Pc in the syringe.

The program in the electrically programmable read-only memory 50 is used by the microprocessor 46 to calculate the pressure in the syringe. The microprocessor 46 then compares the pressure calculated at a pressure value among the values stored in the electrically erasable programmable read-only memory 52 for this syringe. If the calculated pressure exceeds the stored pressure, an obstruction alarm is generated by the microprocessor 46.

The algorithm to calculate the pressure in the syringe is:

$$P = \frac{(F - F_f)}{F_c - F_f} \cdot P_c$$

where F is the force measured by the force transducer 36 and Fc, Ff, and Pc are the parameters described above.

If an obstruction is produced in the fluid pathway, the pressure in the fluid pathway will increase. If the motor 230 continues to drive the pushing mechanism 14, the pressure in the fluid pathway will increase over time. FIG. 7 shows a graph of the pressure in the fluid line as a function of the time. During perfusion, the pressure in the fluid line may be subject to disturbances which are not caused by an obstruction. For example, since the friction force between the syringe stop 12 and the inner wall of the syringe varies nonlinearly, a disturbance in pressure (designated "A" on FIG. 7) may occur. Disturbances may also be produced by the presence of other perfusion devices on the line. Such a disturbance is designated by "B" on FIG. 7.

An obstruction is detected by determining the "S" gradient of the pressure-time curve depicted in FIG. 7 and by comparing it to a predetermined gradient. The pressure in the fluid line is measured in the manner described above.

The following pressure measurements are done at the following time intervals:

P_i=mean pressure in the interval

[t_i; t_iΔt]

P_{i+1}=mean pressure during the interval

[t_i+Δt; t_i+2Δt]

P_{i+2}=mean pressure during the interval

[t_i+2Δt; t_i+3Δt]

These steps are represented as steps 120, 122, and 124 in the

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
4 October 2001 (04.10.2001)

PCT

(10) International Publication Number
WO 01/72357 A2

- (51) International Patent Classification⁷: A61M 5/00 (74) Agent: TALBOT, Cary; MiniMed INC., 18000 Devonshire Street, Northridge, CA 91325-1219 (US).
- (21) International Application Number: PCT/US01/09893 (81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW.
- (22) International Filing Date: 28 March 2001 (28.03.2001)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
60/192,901 29 March 2000 (29.03.2000) US
60/243,392 26 October 2000 (26.10.2000) US
- (84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).
- (71) Applicant: MINIMED, INC. [US/US]; 18000 Devonshire Street, Northridge, CA 91325-1219 (US).
- (72) Inventors: MOBERG, Sheldon, B.; 11828 Paso Robles Avenue, Granada Hills, CA 91344 (US). CAUSEY, James, III, D.; 2107 Cushman Court, Simi Valley, CA 93063 (US). BARE, Rex, O.; 22467 Overlake Drive, Lake Forest, CA 92630 (US). SCHERER, Andrew, J.; 111 Marshall Court, San Demas, CA 91773 (US). SARGENT, Bradley, J.; 27562 Pasatiempo, Mission Viejo, CA 92692 (US).
- Published:
— without international search report and to be republished upon receipt of that report
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.



WO 01/72357 A2

(54) Title: IMPROVED METHODS, APPARATUSES, AND USES FOR INFUSION PUMP FLUID PRESSURE AND FORCE DETECTION

(57) Abstract: An occlusion detection system detects an occlusion in a fluid path of an infusion pump. The infusion pump is for delivering fluid to a user. The infusion pump includes a housing, a motor, a reservoir, one or more drive train components, a sensor, and an electronics system. The motor is contained within the housing. The reservoir contains the fluid to be delivered. The one or more drive train components react to stimulus from the motor to force the fluid from the reservoir into the user. The sensor is positioned to measure a parameter associated with the motor or a drive train component, and the sensor produces three or more output levels across a range of measurements. The electronics system processes the sensor output levels to declare when an occlusion exists.

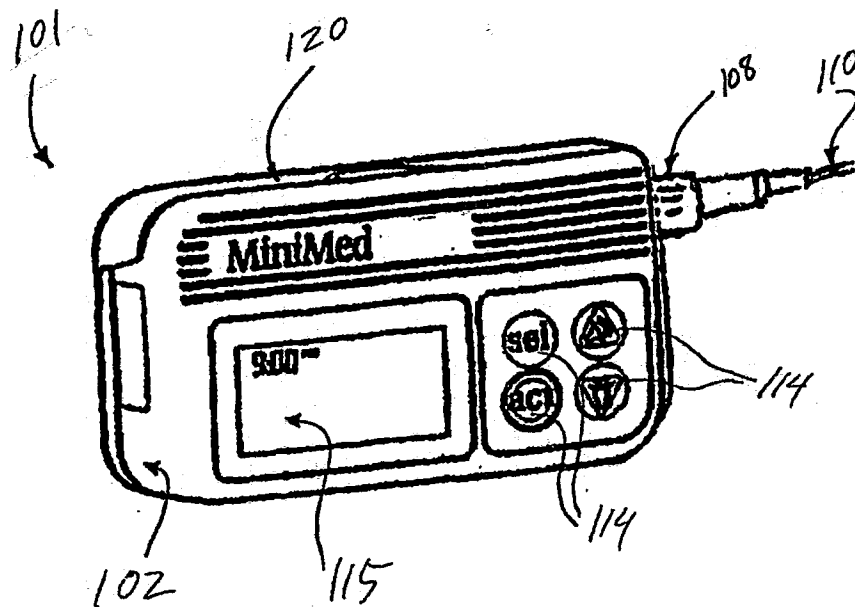


FIG. 1

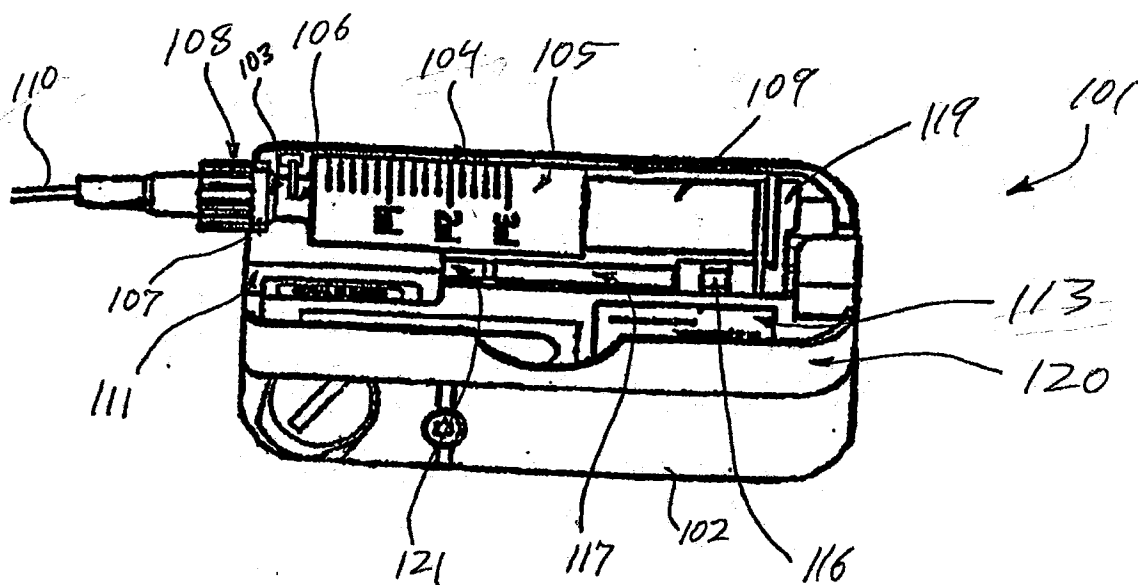


FIG. 2

motor 111 is a solenoid motor. Alternatively, the motor may be a DC motor, AC motor, stepper motor, piezoelectric caterpillar drive, shape memory actuator drive, electrochemical gas cell, thermally driven gas cell, bimetallic actuator, or the like. In alternative embodiments, the drive train includes one or more lead
5 screws, cams, ratchets, jacks, pulleys, pawls, clamps, gears, nuts, slides, bearings, levers, beams, stoppers, plungers, sliders, brackets, guides, bearings, supports, bellows, caps, diaphragms, bags, heaters, or the like. Preferably, the power supply is one or more batteries. Alternatively, the power supply may be a solar panel, capacitor, AC or DC power supplied through a power cord, or the like.

10 The programmable controller 113 may be programmed by a care provider such as a physician or trained medical personnel, or by the user. In preferred embodiments, programming is conducted using an array of buttons 114 and a display 115 located on a face of the housing 102. The display 115 provides information regarding program parameters, delivery profiles, pump operation,
15 alarms, warnings, statuses, or the like. In preferred embodiments, the programmable controller 113 operates the motor 111 in a stepwise manner, typically on an intermittent basis; to administer discrete precise doses of the fluid to the user according to programmed delivery profiles. In alternative embodiments, the programmable controller operates the motor continuously.

20 In preferred embodiments of the present invention, the lead screw 117 includes a support pin 130 that extends through one or more bearings 132 and maintains contact with a sensor 134 positioned to detect forces applied by the lead screw 117 along the axis of the lead screw 117. The one or more bearings 132 and the coupler 121 are designed to allow the lead screw some translational
25 freedom of movement along its axis while providing lateral support. The sensor 134 is therefore subjected to all axial forces applied to the lead screw 117 in the direction away from the motor 111. The axial force exerted by the lead screw 117 on the sensor 134 is generally correlated with the fluid pressure in the reservoir 109. For example, if an occlusion developed within the fluid path, blocking fluid
30 delivery from the infusion pump to the body of the user, the fluid pressure would increase as the slide 109 is forced forward by the drive system 138. Each time the programmable controller 113 commands power to be supplied to the motor 111,

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**SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO
DIRECCIÓN DE NUEVAS CREACIONES**

2020
Bogotá, D.C.

Doctor(a)
EMILIO FERRERO
Apoderado.

ASUNTO	Radicación	06-042079
	Trámite	011
	Evento	379
	Actuación	519
	Oficio	
	Folios	12 878

Patente de Invención	☒	Patente de Modelo de Utilidad	☐
Vía Nacional	☐		
Vía PCT (fase nacional)	☒	Cap. I	☐
		Cap. II	☒
No. Sol. Internacional	PCT/US2004/034960		
Fecha de Presentación Internal.	2004-10-21		

Como resultado del examen de fondo, realizado con fundamento en el artículo 45 de la Decisión 486 de la Comisión de la Comunidad Andina, se le comunica:

1. Documentos estudiados

Descripción: Folios: 39 - 68

Reivindicaciones: Folios: 121 - 132

Dibujos: Folios: 33 - 38

Prioridad: Se presentó prioridad de Estados Unidos con número de registro US 10/700738 y fecha 2003-11-04 (folio 10).

El peticionario presentó una solicitud de examen de patentabilidad de acuerdo con lo estipulado por el artículo 44 de la Decisión 486. (Folio 160-161)

2. Objeto de la invención

La presente solicitud fue titulada originalmente: "Sistema de detección rápida de oclusión de bomba de jeringa", folio 1.

De acuerdo con el texto de la descripción, los dibujos y las reivindicaciones, el objeto de la presente solicitud es proporcionar una "bomba de infusión de droga con la cual se puede detectar una oclusión en una senda de fluido de tales bombas y evitar así la detención del suministro de medicamento a un paciente determinado". (Folio 39).