

1) Family number: 29378058 (US6142008A)

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Title: AIR BUBBLE SENSOR

**Abstract:** A system and a method for detecting the presence of air bubbles in an intravenous (IV) line supplying a medicinal liquid to a patient. An air bubble sensor includes an ultrasonic transmitter acoustically coupled to an ultrasonic receiver to detect the presence of a gas (e.g., air) in a portion of a tube comprising the IV line. The transmitter and receiver are mounted on pivoting transducers that are disposed on opposite sides of the tube. A spring biases the transducers inwardly toward each other so that the transmitter and receiver contact opposite sides of the tubing. This assembly automatically accommodates different sizes of tubing and tubing of a relatively wide range of stiffness. The tube is connected to a disposable pumping cassette that is engaged in a pump chassis on which the transducers are pivotally mounted. A user actuated plunger on the pump chassis is depressed to cause the transmitter and receiver to move away from the tube when the pumping cassette is removed from or inserted into the interior of the pump chassis. A controller precisely monitors the flow of medicinal liquid through the tubing to detect the size of gas bubbles and total volume of gas infused. The controller automatically compensates for minor contamination of the exterior surface of the tube, e.g., if the surface is wet with a liquid.

**Classifications:**

**International (IPC 8-9):** A61M5/00 A61M5/142 A61M5/36 G01N29/02 G01N29/032 G01N29/22 (Advanced/Invention);

A61M5/00 (Advanced/Non-invention);

A61M5/00 A61M5/36 G01N29/02 G01N29/22 (Core/Invention)

**International (IPC 1-7):** A61M5/00 A61M5/142 A61M5/36 F04B4/308 F04B43/08 G01N29/02

**CPC:** A61M5/14224 Y10S128/13 A61M5/365 A61M2205/12

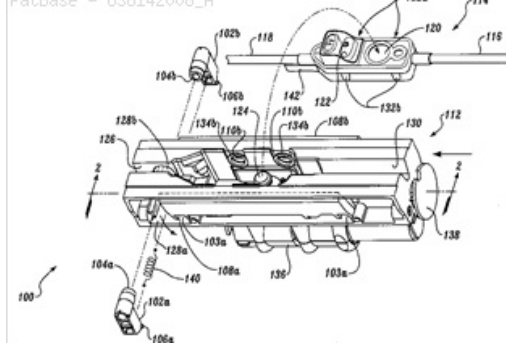
G01N29/02 G01N29/222 G01N2291/02433 G01N2291/102

**European:** A61M5/142G4 A61M5/36B G01N29/02 G01N29/22F

K61M205/12 S01N291/024E S01N291/102

**US:** 128/DIG.13 417/477.2 604/122 604/65 604/67 73/1.83 73/19.03 73/190.3

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Family:

| Publication number | Publication date | Application number | Application date |
|--------------------|------------------|--------------------|------------------|
| AT304381 E         | 20050915         | AT19990927282T     | 19990604         |
| AU199944224 A1     | 19991230         | AU19990044224      | 19990604         |
| AU200043326 A1     | 20001117         | AU20000043326      | 20000406         |
| AU200043326 A5     | 20001117         | AU20000043326D     | 20000406         |
| AU759455 B2        | 20030417         | AU19990044224      | 19990604         |
| CA2334295 AA       | 20001205         | CA19992334295      | 19990604         |
| CA2334295 C        | 20081209         | CA19992334295      | 19990604         |
| DE69927263 D1      | 20051020         | DE19996027263T     | 19990604         |
| DE69927263 D1      | 20051020         | DE19996027263      | 19990604         |
| DE69927263 T2      | 20060622         | DE19996027263T     | 19990604         |
| EP1085922 A1       | 20010328         | EP19990927282      | 19990604         |
| EP1085922 B1       | 20050914         | EP19990927282      | 19990604         |
| ES2249009 T3       | 20060316         | ES19990927282T     | 19990604         |
| JP2002517290 T2    | 20020618         | JP20000553160T     | 19990604         |
| US6142008 A        | 20001107         | US19980097068      | 19980612         |
| US6231320 BA       | 20010515         | US19990302710      | 19990430         |
| WO0066203 A1       | 20001109         | WO2000US09245      | 20000406         |
| WO9964093 A1       | 19991216         | WO1999US12642      | 19990604         |

Priority:

US19980097068 19980612 US19990302710 19990430 WO1999US12642 19990604  
WO2000US09245 20000406

Probable Assignee: ICU MEDICAL INC

Assignee(s): (std): HOSPIRA INC ; ABBOTT LAB ; ABBOTT LABORATORIES

Assignee(s): COLE MARTIN A ; LAWLESS MICHAEL W ; SOBERON PETER A ; MO FRANK S C ; LYNCH CHRISTOPHER D ; ICU MEDICAL INC

Inventor(s): (std): COLE MARTIN A ; LAWLESS MICHAEL W ; LYNCH CHRISTOPHER D ; SCHERER ANDREW J ; MO FRANK S C ; SQUARCIA STEPHANIE R ; SOBERON PETER A ; FRANK S C MO ; MICHAEL W LAWLESS ; CHRISTOPHER D LYNCH ; PETER A SOBERON ; MARTIN A COLE ; LYNCH D ; MO S ; LAWLESS W ; COLE A ; SOBERON A

Inventor(s): STEPHANIE R SQUARCIA ; ANDREW J SCHERER ; MO FRANK S

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Designated states: AT AU BE CA CH CY DE DK ES FI FR GB GR IE IT JP LI LU MC NL PT SE

2) Family number: 43491198 (US2009177148A)

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Title: SYSTEM AND METHOD FOR DETECTING OCCLUSION USING FLOW SENSOR OUTPUT

**Abstract:** A method and system for detecting an inclusion within an infusion system. The method includes monitoring an output signal of a flowrate sensor as fluid flows through an infusion system. The output signal is then converted with a noise reduction filter to obtain a filtered output signal. The filtered output signal is compared to a threshold value and an alarm is activated if the filtered output signal falls below a desired threshold, thereby indicating an occlusion within the infusion system.

**Classifications:**

**International (IPC 8-9):** A61M5/14 A61M5/142 A61M5/168

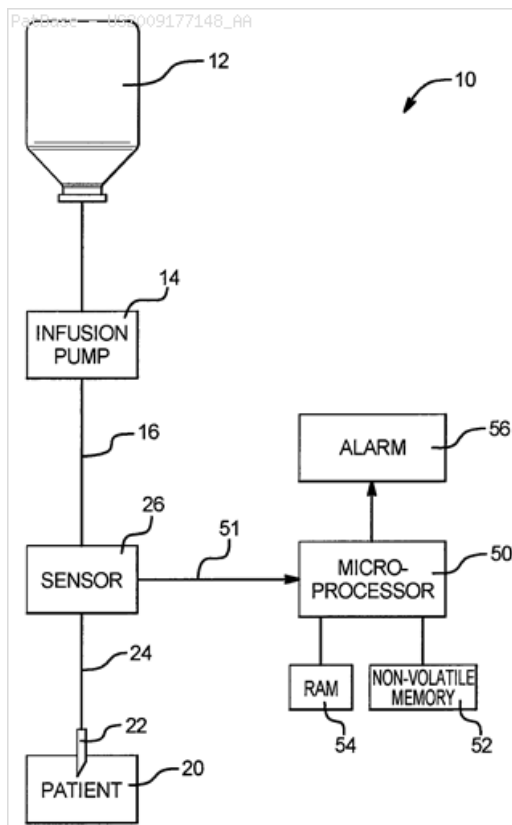
G08B21/00 (Advanced/Invention);

A61M5/14 A61M5/168 (Core/Invention)

**CPC:** A61M5/14212 A61M5/16831 A61M2205/3331 A61M2205/3334

**European:** A61M5/142G A61M5/168D K61M205/33P K61M205/33P1

**US:** 340/608 600/526 604/67 604/67P



**Family:**

| Publication number | Publication date | Application number | Application date |
|--------------------|------------------|--------------------|------------------|
| AU2009204243 AA    | 20090716         | AU20090204243      | 20090106         |
| AU2009204243 BB    | 20130131         | AU20090204243      | 20090106         |
| AU2013201419 AA    | 20130404         | AU20130201419      | 20130312         |
| AU2013201419 BB    | 20131010         | AU20130201419      | 20130312         |
| CA2711562 AA       | 20090716         | CA20092711562      | 20090106         |
| CA2711562 C        | 20160628         | CA20092711562      | 20090106         |
| DE602009016664 D1  | 20130822         | DE200960016664T    | 20090106         |
| EP2234660 A2       | 20101006         | EP20090701001      | 20090106         |
| EP2234660 B1       | 20130626         | EP20090701001      | 20090106         |
| EP2277575 A1       | 20110126         | EP20100075706      | 20090106         |
| ES2428714 T3       | 20131111         | ES20090701001T     | 20090106         |
| US2009177148 AA    | 20090709         | US20080971048      | 20080108         |
| US2011137241 AA    | 20110609         | US20110016370      | 20110128         |
| US7880624 BB       | 20110201         | US20080971048      | 20080108         |
| US8264363 BB       | 20120911         | US20110016370      | 20110128         |
| WO09089213 A2      | 20090716         | WO2009US30210      | 20090106         |
| WO09089213 A3      | 20100107         | WO2009US30210      | 20090106         |
| WO09089213 A4      | 20100304         | WO2009US30210      | 20090106         |

**Priority:**

|               |          |               |          |               |          |
|---------------|----------|---------------|----------|---------------|----------|
| US20080971048 | 20080108 | AU20090204243 | 20090106 | EP20090701001 | 20090106 |
| WO2009US30210 | 20090106 | US20110016370 | 20110128 | AU20130201419 | 20130312 |

**Probable Assignee:** BAXTER HEALTHCARE SA

**Assignee(s):** (std): BAXTER HEALTHCARE SA ; BAXTER INT ; BAXTER INT INC ; DELCASTILLO JORGE ; YARDIMCI ATIF ; DELCASTILLO JORGE A

**Assignee(s):** BAXTER INT INC DEERFIELD ; BAXTER INTERNATIONAL INC ; BAXTER HEALTHCARE S A

**Inventor(s):** (std): DELCASTILLO JORGE A ; YARDIMCI ATIF ; DELCASTILLO JORGE

**Inventor(s):** JORGE DELCASTILLO ; ATIF YARDIMCI

**Agent(s):** PETER MAXWELL AND ASSOCIATES; MAXWELLS PATENT AND TRADE MARK ATTORNEYS PTY LTD; SIM AND MCBURNEY; MUELLER BORE AND PARTNER PATENTANWALTE PARTG MBB; PUGH ROBERT IAN; AZNAREZ PABLO; BAXTER HEALTHCARE CORP; K AND L GATES LLP; FOLEY AUSTIN

**Designated states:** AE AG AL AM AO AT AU AZ BA BB BE BF BG BH BJ BR BW BY BZ CA CF CG CH CI CM CN CO CR CU CY CZ DE DK DM DO DZ EC EF EG ES FI FR GA GB GD GE GH GM GN GQ GR GT GW HN HR HU ID IE IL IN IS IT JP KE KG KM KN KP KR KZ LA LC LI LK LR LS LT LU LV LY MA MC MD ME MG MK ML MN MR MT MW MX MY MZ NA NE NG NI NL NO NZ OM PG PH PL PT RO RS RU SC SD SE SG SI SK SL SM SN ST SV SY SZ TD TG TJ TM TN TR TT TZ UA UG US UZ VC VN ZA ZM ZW



**Agent(s):** SPRUSON AND FERGUSON; MBM INTELLECTUAL PROPERTY LAW LLP; FARAGO PATENTANWAELTE; MODIANO MICAELA NADIA; MICHAEL R; WOODWORTH BRIAN ET AL

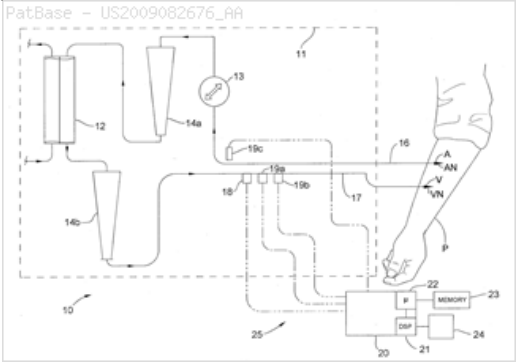
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**5) Family number: 43047560 (US2009082676A)** © PatBase

**Title:** ACOUSTIC ACCESS DISCONNECT DETECTION SYSTEM

**Abstract:** An acoustic access disconnect detection system is useful for detecting when an access needle has become dislodged or when blood is leaking. The acoustic disconnect detection system includes an acoustic transmitter and one or more acoustic sensors placed upstream of an access site of a patient, the sensors suitable for generating and detecting an acoustic signal that is intended to pass unobstructed through the access site. The acoustic transmitter may be placed on a therapy machine for generating an acoustic signal. The acoustic sensor is mounted downstream of the transmitter, such as on the therapy machine where blood is pumped to or returned from the patient, on the patient, or on the therapy machine where blood is entering the therapy machine. The therapy machine, such as a dialysis machine, may be programmed not to start or continue operation unless the acoustic signal is within certain parameters.

**Classifications:**  
**International (IPC 8-9):** A61B8/06 A61B8/14 A61M1/36 A61M37/00 A61M5/168 G06Q50/00 G08B21/02 (Advanced/Invention); A61B8/06 A61M5/168 G06Q50/00 G08B21/02 (Advanced/Non-invention); A61B8/06 A61B8/14 A61M1/36 A61M5/168 G06Q50/00 G08B21/00 (Core/Invention)  
**CPC:** A61M1/3653 A61M1/3656 A61M5/16836 A61M2205/12 A61M2205/15 A61M2205/3375  
**European:** A61M1/36C7 A61M5/168D2 K61M1/36C7C K61M205/12 K61M205/15 K61M205/33U  
**US:** 600/462 600/462P 604/6.06



**Family:**

| Publication number | Publication date | Application number | Application date |
|--------------------|------------------|--------------------|------------------|
| AU2008302742 AA    | 20090326         | AU20080302742      | 20080606         |
| AU2008302742 BB    | 20111020         | AU20080302742      | 20080606         |
| AU2012200167 AA    | 20120202         | AU20120200167      | 20120113         |
| AU2012200167 BB    | 20140109         | AU20120200167      | 20120113         |
| BRPI0817114 A2     | 20150331         | BR2008PI17114      | 20080606         |
| CA2698647 AA       | 20100305         | CA20082698647      | 20080606         |
| CA2698647 C        | 20130924         | CA20082698647      | 20080606         |
| DE602008061071 D1  | 20190919         | DE200860061071T    | 20080606         |
| EP2211935 A1       | 20100804         | EP20080780765      | 20080606         |
| EP2211935 B1       | 20170222         | EP20080780765      | 20080606         |
| EP3175873 A1       | 20170607         | EP20160203533      | 20080606         |
| EP3175873 B1       | 20190828         | EP20160203533      | 20080606         |
| KR101163302 B1     | 20120705         | KR20107006656      | 20080606         |
| KR20100047335 A    | 20100507         | KR20107006656      | 20080606         |
| MX2010003120 A1    | 20100401         | MX20100003120      | 20080606         |
| US2009082676 AA    | 20090326         | US20070859561      | 20070921         |
| US8197431 BB       | 20120612         | US20070859561      | 20070921         |
| WO09038834 A1      | 20090326         | WO2008US66051      | 20080606         |

**Priority:**  
US20070859561 20070921 AU20080302742 20080606 EP20160203533 20080606  
WO2008US66051 20080606 EP20080780765 20080606 AU20120200167 20120113

**Probable Assignee:** BAXTER HEALTHCARE SA

**Assignee(s):** (std): BAXTER HEALTHCARE SA ; BAXTER INT ; BENNISON CORRIE

**Assignee(s):** BAXTER INT INC DEERFIELD ; BATTELLE MEMORIAL INST ; BAXTER HEALTHCARE S A ; BAXTER INT INC ; BAXTER INTERNATIONAL INC

**Inventor(s):** (std): BENNISON CORRIE ; CORRIE BENNISON

**Inventor(s):** BENNISON CORRIE LEWIS CENTER

**Agent(s):** PETER MAXWELL AND ASSOCIATES; MAXWELLS PATENT AND TRADE MARK ATTORNEYS PTY LTD; SIM AND MCBURNEY; MUELLER BORE AND PARTNER PATENTANWAELTE PARTG MBB; DEE IAN MARK; POTTER CLARKSON LLP; POTTER CLARKSON; BAXTER HEALTHCARE CORP; K AND L GATES LLP; PRICE BRADFORD R L

**Designated states:** AE AG AL AM AO AT AU AZ BA BB BE BF BG BH BJ BR BW BY BZ CA CF CG CH CI CM CN CO CR CU CY CZ DE DK DM DO DZ EC EE EG ES FI FR GA GB GD GE GH GM GN GQ GR GT GW HN HR HU ID IE IL IN IS IT JP KE KG KM KN KP KR KZ LA LC LI LK LR LS LT LU LV LY MA MC MD ME MG MK ML MN MR MT MW MX MY MZ NA NE NG NI NL NO NZ OM PG PH PL PT RO RS RU SC SD SE SG SI SK SL SM SN SV SY SZ TD TG TJ TM TN TR TT TZ UA UG US UZ VC VN ZA ZM ZW

**6) Family number: 57879795 (US2014350513A)** © PatBase

**Title:** MULTI-SENSOR INFUSION SYSTEM FOR DETECTING AIR OR AN OCCLUSION IN THE INFUSION SYSTEM

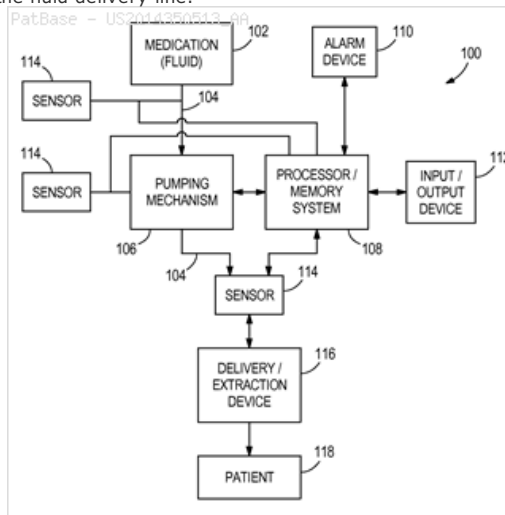
**Abstract:** An infusion system for being operatively connected to a fluid delivery line and to an infusion container includes a pump, a plurality of different types of sensors connected to the pump or the fluid delivery line, at least one processor, and a memory. The plurality of different types of sensors are configured to indicate whether air is in the fluid delivery line. The memory includes programming code for execution by the at least one processor. The programming code is configured to, based on measurements taken by the plurality of different types of sensors, determine: whether there is air in the fluid delivery line; whether there is a partial occlusion or a total occlusion in the fluid delivery line; or a percentage of the air present in the fluid delivery line or the probability of the air being in the fluid delivery line.

**Classifications:**

**International (IPC 8-9):** A61M5/168 A61M5/172 A61M5/36 A61M5/50 G06F19/00 (Advanced/Invention); G06F19/00 (Advanced/Non-invention)

**CPC:** A61M5/16854 A61M5/365 A61M2005/16863 A61M2005/16868 A61M2005/16872 A61M2205/18 A61M2205/332 A61M2205/3331 A61M2205/3351 A61M2205/3355 A61M5/5086 A61M2205/3317 A61M2205/3576 A61M2205/52 G16H40/63

**US:** 1/1 604/111 604/505



**Family:**

| Publication number | Publication date | Application number | Application date |
|--------------------|------------------|--------------------|------------------|
| AU2014268355 AA    | 20160121         | AU20140268355      | 20140523         |
| AU2014268355 BB    | 20180614         | AU20140268355      | 20140523         |
| CA2913421 A1       | 20151124         | CA20142913421      | 20140523         |
| EP3003429 A1       | 20160413         | EP20140801282      | 20140523         |
| EP3003429 A4       | 20170111         | EP20140801282      | 20140523         |
| EP3003429 B1       | 20200226         | EP20140801282      | 20140523         |
| US2014350513 AA    | 20141127         | US20140285797      | 20140523         |
| US2019117890 AA    | 20190425         | US20180039637      | 20180719         |
| US10046112 BB      | 20180814         | US20140285797      | 20140523         |
| WO14190264 A1      | 20141127         | WO2014US39347      | 20140523         |

**Priority:**

US20130827111P 20130524      US20140285797 20140523      WO2014US39347 20140523  
US20180039637 20180719

**Probable Assignee:** ICU MEDICAL INC

**Assignee(s):** (std): BELKIN ANATOLY S ; HOSPIRA INC ; ICU MEDICAL INC ; KOTNIK PAUL T ; MARKEY BRIAN G ; ORUKLU MERIYAN ; RUCHTI TIMOTHY L

**Inventor(s):** (std): RUCHTI TIMOTHY L ; BELKIN ANATOLY S ; ORUKLU MERIYAN ; MARKEY BRIAN G ; KOTNIK PAUL T

**Agent(s):** SPRUSON AND FERGUSON; MBM INTELLECTUAL PROPERTY LAW LLP; MODIANO MICAELA NADIA; INVENT HORIZON IP; KNOBBE MARTENS OLSON AND BEAR LLP; WOODWORTH BRIAN R ET AL

**Designated states:** AE AG AL AM AO AT AU AZ BA BB BE BF BG BH BJ BN BR BW BY BZ CA CF CG CH CI CL CM CN CO CR CU CY CZ DE DK DM DO DZ EC EE EG ES FI FR GA GB GD GE GH GM GN GQ GR GT GW HN HR HU ID IE IL IN IR IS IT JP KE KG KM KN KP KR KZ LA LC LI LK LR LS LT LU LV LY MA MC MD ME MG MK ML MN MR MT MW MX MY MZ NA NE NG NI NL NO NZ OM PA PE PG PH PL PT QA RO RS RU RW SA SC SD SE SG SI SK SL SM SN ST SV SY SZ TD TG TH TJ TM TN TR TT TZ UA UG US UZ VC VN ZA ZM ZW

**7) Family number: 45170994 (US2010141460A)**

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**Title:** ACOUSTIC FLUID PRESENCE/ABSENCE DETECTION

**Abstract:** An acoustic sensor detects presence and/or absence of fluid in a fluid delivery medium. The acoustic sensor detects fluid absence based on the difference of the speed of sound between air and a fluid. For example, the acoustic sensor may detect fluid absence based on a phase shift between acoustic signals transmitted through the fluid delivery medium when fluid is present as compared to acoustic signals transmitted through the fluid delivery medium when fluid is absent, e.g., when air or bubbles are present in the fluid delivery medium.

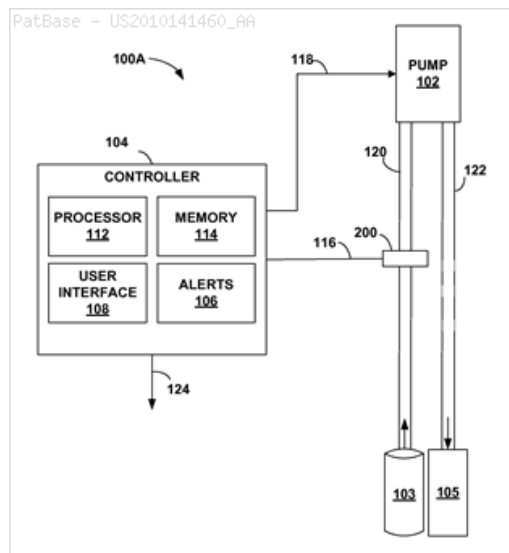
**Classifications:**

**International (IPC 8-9):** D06F39/00 G01F23/296 G01N29/024 G01N29/48 G08B21/00 (Advanced/Invention); D06F39/00 G01F23/296 G01N29/02 G01N29/44 G08B21/00 (Core/Invention)

**CPC:** A61M5/1684 A61M2205/3375 G01F23/0007 G01F23/2961

**European:** A61M5/168D3 G01F23/00A G01F23/296B K61M205/33U

**US:** 340/612 340/618 340/621 340/621P 702/55 702/55S



# Family:

| Publication number | Publication date | Application number | Application date |
|--------------------|------------------|--------------------|------------------|
| US2010141460 AA    | 20100610         | US20080329788      | 20081208         |
| US8120500 BB       | 20120221         | US20080329788      | 20081208         |
| WO10067304 A2      | 20100617         | WO2009IB55557      | 20091207         |
| WO10067304 A3      | 20100812         | WO2009IB55557      | 20091207         |

# Priority:

US20080329788 20081208

**Probable Assignee:** ECOLAB INC

**Assignee(s):** (std): ECOLAB INC ; OWEN CHRISTOPHER J ; PILIPCHENKO ANNA ; SKIRDA ANATOLY ; SLOBODYAN VIKTOR ; TOKHTUEV EUGENE

**Inventor(s):** (std): SKIRDA ANATOLY ; TOKHTUEV EUGENE ; SLOBODYAN VIKTOR ; OWEN CHRISTOPHER J ; PILIPCHENKO ANNA

**Agent(s):** SHUMAKER AND SIEFFERT P A; SHUMAKER AND SIEFFERT PA; SORENSEN ANDREW D

**Designated states:** AE AG AL AM AO AT AU AZ BA BB BE BF BG BH BJ BR BW BY BZ CA CF CG CH CI CL CM CN CO CR CU CY CZ DE DK DM DO DZ EC EE EG ES FI FR GA GB GD GE GH GM GN GQ GR GT GW HN HR HU ID IE IL IN IS IT JP KE KG KM KN KP KR KZ LA LC LK LR LS LT LU LV LY MA MC MD ME MG MK ML MN MR MT MW MX MY MZ NA NE NG NI NL NO NZ OM PE PG PH PL PT RO RS RU SC SD SE SG SI SK SL SM SN ST SV SY SZ TD TG TJ TM TN TR TT TZ UA UG US UZ VC VN ZA ZM ZW