

(56)

References Cited

U.S. PATENT DOCUMENTS

D756,373 S * 5/2016 Raskin D14/485
 D757,028 S * 5/2016 Goldenberg D14/485
 D759,063 S * 6/2016 Chen D14/486
 9,394,769 B2 7/2016 Nenniger
 D763,277 S * 8/2016 Ahmed D14/485
 D764,501 S * 8/2016 Dias D14/486
 D767,624 S * 9/2016 Lee D14/488
 D768,152 S * 10/2016 Gutierrez D14/485
 D770,476 S * 11/2016 Jitkoff D14/485
 D771,116 S * 11/2016 Dellinger D14/487
 D776,683 S * 1/2017 Gobinski D14/485
 D777,177 S * 1/2017 Chen D14/485
 D779,514 S * 2/2017 Baris D14/486
 D782,526 S * 3/2017 Rind D14/488
 D785,022 S * 4/2017 Vazquez D14/486
 D786,280 S * 5/2017 Ma D14/486
 D786,896 S * 5/2017 Kim D14/485
 D788,123 S * 5/2017 Shan D14/485
 D788,128 S * 5/2017 Wada D14/485
 D788,792 S * 6/2017 Alessandri D14/485
 9,745,833 B2 8/2017 Carvajal et al.
 D798,886 S * 10/2017 Prophete D14/485
 D800,742 S * 10/2017 Rhodes D14/485
 D800,744 S * 10/2017 Jitkoff D14/485
 D803,235 S * 11/2017 Markson D14/485
 D805,525 S * 12/2017 Dascola D14/485
 D806,108 S * 12/2017 Day D14/486
 D807,900 S * 1/2018 Raji D14/485
 D808,981 S * 1/2018 Hazam D14/485
 9,864,353 B2 1/2018 Tonkin et al.
 D822,678 S * 7/2018 Wu D14/485
 D823,326 S * 7/2018 Pinzon Garcia D14/486
 D823,860 S * 7/2018 Wiffen D14/485
 D830,382 S * 10/2018 Marohn D14/486
 D833,459 S * 11/2018 Blechschmidt D14/485
 D841,017 S * 2/2019 Bathla D14/485
 D849,014 S * 5/2019 Senders D14/485
 D853,412 S * 7/2019 Hofner D14/485
 D854,030 S * 7/2019 Dascola D14/485
 D888,739 S * 6/2020 Christiana D14/486
 D905,734 S * 12/2020 Christiana D14/488
 D906,358 S * 12/2020 Christiana D14/486
 10,982,516 B2 4/2021 Arukhe et al.
 11,188,209 B2 * 11/2021 Kaufthal G06F 9/451
 D938,974 S * 12/2021 Wang D14/486
 D941,849 S * 1/2022 Knowles G06F 9/451
 D14/492
 11,243,976 B2 * 2/2022 Beckham G06F 16/29
 11,250,176 B2 * 2/2022 Schwartz G06K 7/1413
 2005/0121190 A1 6/2005 Oberkircher et al.
 2007/0168056 A1 7/2007 Shayegi et al.
 2008/0236839 A1 10/2008 Oddie
 2008/0262737 A1 10/2008 Thigpen et al.
 2009/0308601 A1 12/2009 Poe et al.
 2010/0005411 A1 * 1/2010 Duncker G06F 3/0482
 715/769
 2010/0217575 A1 8/2010 Briers et al.
 2011/0042083 A1 2/2011 Sierra et al.
 2011/0301851 A1 12/2011 Briers et al.
 2012/0095603 A1 4/2012 Rashid et al.
 2012/0194558 A1 * 8/2012 Dykes G06T 11/206
 345/660
 2014/0039793 A1 2/2014 Querales
 2014/0358511 A1 12/2014 Waage et al.
 2016/0054713 A1 2/2016 Foss et al.
 2016/0061003 A1 3/2016 Gottumukkala et al.
 2016/0273315 A1 9/2016 Carvajal et al.
 2016/0312552 A1 10/2016 Early et al.
 2016/0328497 A1 11/2016 Hamza et al.
 2016/0369590 A1 12/2016 Tonkin et al.
 2017/0081950 A1 3/2017 Filatyev et al.
 2017/0177761 A1 6/2017 Early et al.
 2018/0030816 A1 2/2018 Devalve et al.
 2018/0066515 A1 3/2018 Balan et al.
 2018/0119533 A1 5/2018 Alhuthali et al.

2018/0285515 A1 10/2018 Isichei
 2018/0347326 A1 12/2018 Shammari et al.
 2020/0242497 A1 7/2020 Shahkarami et al.
 2020/0362670 A1 11/2020 Alanazi et al.
 2020/0362674 A1 11/2020 Alanazi et al.
 2020/0362697 A1 11/2020 Alanazi et al.
 2021/0102446 A1 4/2021 Alghazali
 2021/0148196 A1 5/2021 Bukhamseen et al.
 2021/0277747 A1 9/2021 Al Naimi et al.

FOREIGN PATENT DOCUMENTS

WO 2016205158 12/2016
 WO WO 2016195846 12/2016
 WO WO 2020232218 11/2020

OTHER PUBLICATIONS

Ranjith et al., "Production Optimization Through Utilization of Smart Wells in Intelligent Fields," SPE 185709, presented at the SPE Western Regional Meeting, Bakersfield, CA, Apr. 23, 2017, 29 pages.
 PCT International Search Report and Written Opinion in International Appln. No. PCT/US2020/032833, dated Aug. 11, 2020, 16 pages.
 Abukhamsin et al., "Inflow profiling and production optimization in smart wells using distributed acoustic and temperature measurements," A dissertation submitted to the Department of Energy Resources Engineering the Committee on Graduate Studies of Stanford University, Jun. 2017, 190 pages.
 Bukhamsin et al., "Optimization of multilateral well design and location in a real field using a continuous genetic algorithm," SPE 136944, presented at the SPE/DGS Annual Saudi Arabia Section Technical Symposium and Exhibition, Apr. 4-7, 2010, 16 pages.
 Cetkovic et al., "A methodology for multilateral wells optimization—field case study," SPE 183004, presented at the Abu Dhabi International Petroleum Exhibition & Conference, Abu Dhabi, UAE, Nov. 7-10, 2016, 18 pages.
 PCT International Search Report and Written Opinion in International Appln. No. PCT/US2020/032831, dated Aug. 11, 2020, 16 pages.
 PCT International Search Report and Written Opinion in International Appln. No. PCT/US2020/032835, dated Aug. 11, 2020, 16 pages.
 Al-Anazi et al., "Innovative Production Optimization Technique for Smart Well Completions Using Real-Time Nodal Analysis Applications," SPE-189198-MS, presented at the SPE Symposium: Production Enhancement and Cost Optimisation held in Kuala Lumpur, Malaysia, Nov. 7-8, 2017, 14 pages.
 PCT International Search Report and Written Opinion in International Appln. No. PCT/US2020/060864, dated Mar. 3, 2021, 19 pages.
 Brouwer et al., "Recovery Increase through Water Flooding with Smart Well Technology," SPE 68979 presented at the SPE European Formation Damage Conference, The Neatherlands, May 21-22, 2001, 10 pages.
 Edabi and Davies, "Techniques for Optimum Placement of Interval Control Valve(s) in an Intelligent Well," SPE 100191 presented at the SPE Europe/EAGE Annual Conference and Exhibition, Austria, Jun. 12-15, 2006, 11 pages.
 Elmsallati and Davies, "Automatic Optimization of Infinite Variable Control Valves," IPTC-10319, presented at the International Petroleum Technology Conference, Qatar, Nov. 21-23, 2005, 7 pages.
 Farshi, "Improving Genetic Algorithms for Optimum Well Placement," Master's Report, Department of Energy Resources Engineering, Stanford University, California, Jun. 2008, 94 pages.
 Ghosh and King, "Optimization of Smart Well Completion Design in the Presence of Uncertainty," SPE 166008, presented at the SPE Reservoir Characterization and simulation Conference and Exhibition held in Abu Dhabi, Sep. 16-18, 2013, 17 pages.
 Glandt, "Reservoir Aspects of Smart Wells," SPE 81107 presented at the SPE Latin America and Caribbean Petroleum Engineering Conference, Trinidad, Apr. 27-30, 2003, 11 pages.

(56)

References Cited

OTHER PUBLICATIONS

Haupt and Haupt, "Practical Genetic Algorithms," 2nd Edition, John Wiley & Sons, New York, 2004, 261 pages.

Holland, "Genetic algorithms," Scientific American, pp. 66-79, Jul. 1992, 14 pages.

Jalali et al., "Intelligent Completion System—The Reservoir Rationale," SPE 50587, presented at the SPE European Petroleum Conference, The Netherlands, Oct. 20-22, 1998, 6 pages.

Lorenz et al., "Uniform Inflow Completion System Extended Economic Field Life: A Field Case Study and Technology Overview," SPE 101895, presented at the SPE Annual Technical Conference and Exhibition, Texas, Sep. 24-27, 2006, 9 pages.

Mitchell, "An Introduction to Genetic Algorithms," Chapter 1-4, Chapter 6, Appendix A-B, MIT Press, 1996, 162 pages.

Naus et al., "Optimization of Commingled Production using Infinitely Variable Inflow Control Valves," SPE 90959, presented at the SPE Annual Technical Conference and Exhibition, Texas, Sep. 26-29, 2004, 12 pages.

Radcliff, "Formal Analysis and Random Respectful Recombination," proceedings of 4th International Conference and Genetic Algorithms, San Mateo, CA, 1991, 9 pages.

Rudolph, "Convergence Analysis of Canonic Genetic Algorithms," IEEE Transactions on Neural Networks, special issue on Evolutionary Computational vol. No. 1, Jan. 1994, 6 pages.

Sinha et al., "Flow Equilibration Toward Horizontal Well Using Downhole Valves," SPE 68635 presented at the SPE Asia Pacific Oil and Gas Conference and Exhibition, Indonesia, Apr. 17-19, 2001, 6 pages.

Yeten and Jalali, "Effectiveness of Intelligent Completions in a Multiwell Development," 2001 SPE Middle East Oil Show, Bahrain, Mar. 17-20, 2017 pages.

GCC Examination Report in GCC Appln. No. GC 2020-40905, dated Oct. 18, 2021, 4 pages.

GCC Examination Report in GCC Appln. No. GC 2020-39758, dated Nov. 4, 2021, 4 pages.

GCC Examination Report in GCC Appln. No. GC 2020-39751, dated Aug. 19, 2021, 4 pages.

GCC Examination Report in GCC Appln. No. GC 2020-39756, dated Aug. 23, 2021, 5 pages.

Sampaio et al., "Optimization of proactive control valves of producer and injector intelligent wells under economic uncertainty," presented at the SPE Europec/EAGE Annual Conference, Copenhagen, Denmark, Jun. 2012, 13 pages.

Alghareeb et al., "Proactive Optimization of Oil Recovery in Multilateral Wells Using Real Time Production Data," SPE 124999, presented at the SPE Annual Technical Conference and Exhibition, New Orleans, Louisiana, 16 pages.

Carvajal et al., "A Smart Flow for SmartWells: Reactive and Proactive Modes," presented at the SPE Intelligent Energy Conference & Exhibition, Utrecht, The Netherlands, Apr. 2014, 15 pages.

Das et al., "A Novel Workflow for Intelligent Well Inflow Control Valve Design by Integrating Reservoir Dynamics to Facilitate Proactive Reservoir Management in Minagish Field, West Kuwait," presented at the SPE Annual Technical Conference and Exhibition, Amsterdam, 2014, 15 pages.

* cited by examiner

