US009410422B2

(12) **United States Patent**
Sondhi

(10) **Patent No.: US 9,410,422 B2**
(45) **Date of Patent: Aug. 9, 2016**

(54) **ALTERNATIVE GAUGING SYSTEM FOR PRODUCTION WELL TESTING AND RELATED METHODS**

(71) Applicant: **Chevron U.S.A. Inc.**, San Ramon, CA (US)

(72) Inventor: **Amit Sondhi**, Bakersfield, CA (US)

(73) Assignee: **CHEVRON U.S.A. INC.**, San Ramon, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 252 days.

(21) Appl. No.: **14/026,941**

(22) Filed: **Sep. 13, 2013**

(65) **Prior Publication Data**

US 2015/0075273 A1 Mar. 19, 2015

(51) **Int. Cl.**
E21B 49/08 (2006.01)
E21B 49/00 (2006.01)

(52) **U.S. Cl.**
CPC ***E21B 49/008*** (2013.01)

(58) **Field of Classification Search**
CPC E21B 49/008
USPC 73/152.29; 166/75.12, 250.01
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,149,492	A	9/1964	Weinberg
3,851,521	A	12/1974	Ottenstein
4,080,837	A	3/1978	Alexander
4,114,439	A	9/1978	Fick
4,144,768	A	3/1979	Andersson
4,159,646	A	7/1979	Paulsen
4,164,865	A	8/1979	Hall
4,236,406	A	12/1980	Reed
4,275,602	A	6/1981	Fujishiro
4,445,389	A	5/1984	Potzick
4,499,418	A	2/1985	Helms
4,515,473	A	5/1985	Mermelstein
4,520,320	A	5/1985	Potzick
4,546,649	A	10/1985	Kantor
4,706,501	A	11/1987	Atkinson
4,788,852	A	12/1988	Martin
4,813,270	A	3/1989	Baillie
4,862,750	A	9/1989	Nice
4,864,868	A	9/1989	Khalifa
4,884,457	A	12/1989	Hatton
4,896,540	A	1/1990	Shakkottai
4,932,262	A	6/1990	Wlodarczyk
4,947,127	A	8/1990	Helms
4,950,883	A	8/1990	Glenn
4,976,151	A	12/1990	Morishita
4,996,419	A	2/1991	Morey
5,024,099	A	6/1991	Lee
5,031,460	A	7/1991	Kanenobu

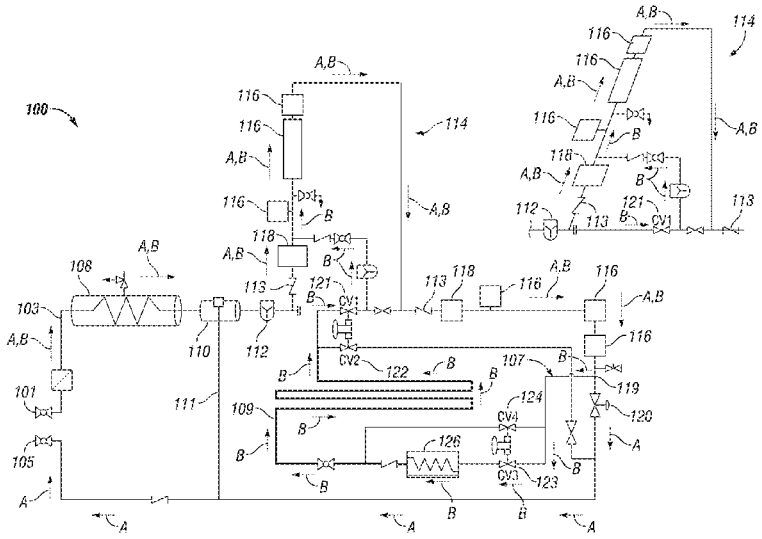
(Continued)

FOREIGN PATENT DOCUMENTS

WO	2008078996	A1	7/2008
WO	2010117549	A1	10/2010
WO	2010120258	A2	10/2010

Primary Examiner — Peter Macchiarolo
Assistant Examiner — Anthony W Megna Fuentes

(57) **ABSTRACT**

A method for measuring a well fluid parameter includes diverting a fluid through a first loop comprising one or more fluid parameter measurement components, determining a gross flow rate of the fluid, recirculating the fluid through a second loop upon determining the gross flow rate is below a threshold amount, and measuring the fluid parameter upon the gross flow rate reaching or exceeding the threshold amount.

22 Claims, 4 Drawing Sheets