



US010687745B1

(12) **United States Patent**  
**Al-Ali**

(10) **Patent No.:** **US 10,687,745 B1**  
(45) **Date of Patent:** **\*Jun. 23, 2020**

(54) **PHYSIOLOGICAL MONITORING DEVICES, SYSTEMS, AND METHODS**

(71) Applicant: **MASIMO CORPORATION**, Irvine, CA (US)

(72) Inventor: **Ammar Al-Ali**, San Juan Capistrano, CA (US)

(73) Assignee: **Masimo Corporation**, Irvine, CA (US)

(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **16/835,772**

(22) Filed: **Mar. 31, 2020**

**Related U.S. Application Data**

(63) Continuation of application No. 16/791,963, filed on Feb. 14, 2020, which is a continuation of application (Continued)

(51) **Int. Cl.**  
*A61B 5/1455* (2006.01)  
*A61B 5/024* (2006.01)  
(Continued)

(52) **U.S. Cl.**  
CPC ..... *A61B 5/14552* (2013.01); *A61B 5/0002* (2013.01); *A61B 5/02416* (2013.01);  
(Continued)

(58) **Field of Classification Search**  
None  
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,960,128 A 10/1990 Gordon et al.  
4,964,408 A 10/1990 Hink et al.  
(Continued)

FOREIGN PATENT DOCUMENTS

CN 101484065 B 7/2009  
CN 101564290 B 10/2009  
(Continued)

OTHER PUBLICATIONS

US 8,845,543 B2, 09/2014, Diab et al. (withdrawn)  
(Continued)

*Primary Examiner* — Eric F Winakur

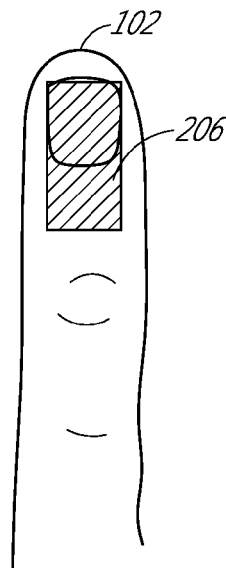
*Assistant Examiner* — Marjan Fardanesh

(74) *Attorney, Agent, or Firm* — Knobbe, Martens, Olson & Bear, LLP

(57) **ABSTRACT**

A non-invasive, optical-based physiological monitoring system is disclosed. One embodiment includes an emitter configured to emit light. A diffuser is configured to receive and spread the emitted light, and to emit the spread light at a tissue measurement site. The system further includes a concentrator configured to receive the spread light after it has been attenuated by or reflected from the tissue measurement site. The concentrator is also configured to collect and concentrate the received light and to emit the concentrated light to a detector. The detector is configured to detect the concentrated light and to transmit a signal representative of the detected light. A processor is configured to receive the transmitted signal and to determine a physiological parameter, such as, for example, arterial oxygen saturation, in the tissue measurement site.

**27 Claims, 7 Drawing Sheets**



**Related U.S. Application Data**

- No. 16/532,065, filed on Aug. 5, 2019, now Pat. No. 10,646,146, which is a continuation of application No. 16/226,249, filed on Dec. 19, 2018, now Pat. No. 10,470,695, which is a continuation of application No. 15/195,199, filed on Jun. 28, 2016, now Pat. No. 10,448,871.
- (60) Provisional application No. 62/188,430, filed on Jul. 2, 2015.
- (51) **Int. Cl.**  
*A61B 5/00* (2006.01)  
*A61B 5/145* (2006.01)
- (52) **U.S. Cl.**  
 CPC ..... *A61B 5/14532* (2013.01); *A61B 5/14546* (2013.01); *A61B 5/4875* (2013.01); *A61B 5/6826* (2013.01); *A61B 5/7278* (2013.01); *A61B 5/742* (2013.01); *A61B 2562/04* (2013.01)

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,041,187 A 8/1991 Hink et al.  
 5,069,213 A 12/1991 Polczynski  
 5,099,842 A 3/1992 Mannheimer et al.  
 5,158,091 A 10/1992 Butterfield et al.  
 5,163,438 A 11/1992 Gordon et al.  
 5,203,329 A 4/1993 Takatani et al.  
 5,228,449 A 7/1993 Christ et al.  
 5,319,355 A 6/1994 Russek  
 5,337,744 A 8/1994 Branigan  
 5,341,805 A 8/1994 Stavridi et al.  
 D353,195 S 12/1994 Savage et al.  
 D353,196 S 12/1994 Savage et al.  
 5,377,676 A 1/1995 Vari et al.  
 D359,546 S 6/1995 Savage et al.  
 5,431,170 A 7/1995 Mathews  
 D361,840 S 8/1995 Savage et al.  
 D362,063 S 9/1995 Savage et al.  
 5,452,717 A 9/1995 Branigan et al.  
 D363,120 S 10/1995 Savage et al.  
 5,456,252 A 10/1995 Vari et al.  
 5,462,051 A 10/1995 Oka et al.  
 5,479,934 A 1/1996 Imran  
 5,482,036 A 1/1996 Diab et al.  
 5,490,505 A 2/1996 Diab et al.  
 5,494,043 A 2/1996 O'Sullivan et al.  
 5,497,771 A 3/1996 Rosenheimer  
 5,533,511 A 7/1996 Kaspari et al.  
 5,534,851 A 7/1996 Russek  
 5,561,275 A 10/1996 Savage et al.  
 5,562,002 A 10/1996 Lalin  
 5,564,429 A 10/1996 Bornn et al.  
 5,584,296 A 12/1996 Cui et al.  
 5,590,649 A 1/1997 Caro et al.  
 5,601,079 A 2/1997 Wong et al.  
 5,602,924 A 2/1997 Durand et al.  
 5,623,925 A 4/1997 Swenson et al.  
 5,632,272 A 5/1997 Diab et al.  
 5,638,816 A 6/1997 Kiani-Azarbayjany et al.  
 5,638,818 A 6/1997 Diab et al.  
 5,645,440 A 7/1997 Tobler et al.  
 5,685,299 A 11/1997 Diab et al.  
 5,699,808 A 12/1997 John  
 5,729,203 A 3/1998 Oka et al.  
 D393,830 S 4/1998 Tobler et al.  
 5,743,262 A 4/1998 Lepper, Jr. et al.  
 5,758,644 A 6/1998 Diab et al.  
 5,760,910 A 6/1998 Lepper, Jr. et al.  
 5,769,785 A 6/1998 Diab et al.

5,791,347 A 8/1998 Flaherty et al.  
 5,792,052 A 8/1998 Isaacson et al.  
 5,800,349 A 9/1998 Isaacson et al.  
 5,810,734 A 9/1998 Caro et al.  
 5,823,950 A 10/1998 Diab et al.  
 5,830,131 A 11/1998 Caro et al.  
 5,830,137 A 11/1998 Scharf  
 5,833,618 A 11/1998 Caro et al.  
 5,860,919 A 1/1999 Kiani-Azarbayjany et al.  
 5,890,929 A 4/1999 Mills et al.  
 5,904,654 A 5/1999 Wohltmann et al.  
 5,919,134 A 7/1999 Diab  
 5,934,925 A 8/1999 Tobler et al.  
 5,940,182 A 8/1999 Lepper, Jr. et al.  
 5,987,343 A 11/1999 Kinast  
 5,995,855 A 11/1999 Kiani et al.  
 5,997,343 A 12/1999 Mills et al.  
 6,002,952 A 12/1999 Diab et al.  
 6,011,986 A 1/2000 Diab et al.  
 6,027,452 A 2/2000 Flaherty et al.  
 6,036,642 A 3/2000 Diab et al.  
 6,045,509 A 4/2000 Caro et al.  
 6,067,462 A 5/2000 Diab et al.  
 6,081,735 A 6/2000 Diab et al.  
 6,088,607 A 7/2000 Diab et al.  
 6,102,856 A 8/2000 Groff et al.  
 6,110,522 A 8/2000 Lepper, Jr. et al.  
 6,124,597 A 9/2000 Shehada  
 6,128,521 A 10/2000 Marro et al.  
 6,129,675 A 10/2000 Jay  
 6,144,868 A 11/2000 Parker  
 6,151,516 A 11/2000 Kiani-Azarbayjany et al.  
 6,152,754 A 11/2000 Gerhardt et al.  
 6,157,850 A 12/2000 Diab et al.  
 6,165,005 A 12/2000 Mills et al.  
 6,184,521 B1 2/2001 Coffin, IV et al.  
 6,206,830 B1 3/2001 Diab et al.  
 6,223,063 B1 4/2001 Chaiken et al.  
 6,229,856 B1 5/2001 Diab et al.  
 6,232,609 B1 5/2001 Snyder et al.  
 6,236,872 B1 5/2001 Diab et al.  
 6,241,680 B1 6/2001 Miwa  
 6,241,683 B1 6/2001 Macklem et al.  
 6,253,097 B1 6/2001 Aronow et al.  
 6,256,523 B1 7/2001 Diab et al.  
 6,263,222 B1 7/2001 Diab et al.  
 6,278,522 B1 8/2001 Lepper, Jr. et al.  
 6,280,213 B1 8/2001 Tobler et al.  
 6,285,896 B1 9/2001 Tobler et al.  
 6,301,493 B1 10/2001 Marro et al.  
 6,308,089 B1 10/2001 von der Ruhr et al.  
 6,317,627 B1 11/2001 Ennen et al.  
 6,321,100 B1 11/2001 Parker  
 6,325,761 B1 12/2001 Jay  
 6,334,065 B1 12/2001 Al-Ali et al.  
 6,343,223 B1 1/2002 Chin et al.  
 6,343,224 B1 1/2002 Parker  
 6,349,228 B1 2/2002 Kiani et al.  
 6,356,203 B1 3/2002 Halleck et al.  
 6,360,114 B1 3/2002 Diab et al.  
 6,368,283 B1 4/2002 Xu et al.  
 6,371,921 B1 4/2002 Caro et al.  
 6,377,829 B1 4/2002 Al-Ali  
 6,388,240 B2 5/2002 Schulz et al.  
 6,397,091 B2 5/2002 Diab et al.  
 6,430,437 B1 8/2002 Marro  
 6,430,525 B1 8/2002 Weber et al.  
 6,463,311 B1 10/2002 Diab  
 6,470,199 B1 10/2002 Kopotic et al.  
 6,501,975 B2 12/2002 Diab et al.  
 6,505,059 B1 1/2003 Kollias et al.  
 6,515,273 B2 2/2003 Al-Ali  
 6,519,487 B1 2/2003 Parker  
 6,525,386 B1 2/2003 Mills et al.  
 6,526,300 B1 2/2003 Kiani et al.  
 6,541,756 B2 4/2003 Schulz et al.  
 6,542,764 B1 4/2003 Al-Ali et al.

(56)

## References Cited

## U.S. PATENT DOCUMENTS

6,595,316	B2	7/2003	Cybulski et al.	7,142,901	B2	11/2006	Kiani et al.
6,597,932	B2	7/2003	Tian et al.	7,149,561	B2	12/2006	Diab
6,597,933	B2	7/2003	Kiani et al.	7,186,966	B2	3/2007	Al-Ali
6,606,511	B1	8/2003	Ali et al.	7,190,261	B2	3/2007	Al-Ali
6,632,181	B2	10/2003	Flaherty et al.	7,215,984	B2	5/2007	Diab
6,639,668	B1	10/2003	Trepagnier	7,215,986	B2	5/2007	Diab
6,640,116	B2	10/2003	Diab	7,221,971	B2	5/2007	Diab
6,643,530	B2	11/2003	Diab et al.	7,225,006	B2	5/2007	Al-Ali et al.
6,650,917	B2	11/2003	Diab et al.	7,225,007	B2	5/2007	Al-Ali
6,654,624	B2	11/2003	Diab et al.	RE39,672	E	6/2007	Shehada et al.
6,658,276	B2	12/2003	Kiani et al.	7,227,156	B2	6/2007	Colvin, Jr. et al.
6,661,161	B1	12/2003	Lanzo et al.	7,239,905	B2	7/2007	Kiani-Azarbayjany et al.
6,671,526	B1	12/2003	Aoyagi et al.	7,245,953	B1	7/2007	Parker
6,671,531	B2	12/2003	Al-Ali et al.	7,254,429	B2	8/2007	Schurman et al.
6,678,543	B2	1/2004	Diab et al.	7,254,431	B2	8/2007	Al-Ali
6,684,090	B2	1/2004	Ali et al.	7,254,433	B2	8/2007	Diab et al.
6,684,091	B2	1/2004	Parker	7,254,434	B2	8/2007	Schulz et al.
6,697,656	B1	2/2004	Al-Ali	7,272,425	B2	9/2007	Al-Ali
6,697,657	B1	2/2004	Shehada et al.	7,274,955	B2	9/2007	Kiani et al.
6,697,658	B2	2/2004	Al-Ali	D554,263	S	10/2007	Al-Ali
RE38,476	E	3/2004	Diab et al.	7,280,858	B2	10/2007	Al-Ali et al.
6,699,194	B1	3/2004	Diab et al.	7,289,835	B2	10/2007	Mansfield et al.
6,714,804	B2	3/2004	Al-Ali et al.	7,292,883	B2	11/2007	De Felice et al.
RE38,492	E	4/2004	Diab et al.	7,295,866	B2	11/2007	Al-Ali
6,721,582	B2	4/2004	Trepagnier et al.	7,328,053	B1	2/2008	Diab et al.
6,721,585	B1	4/2004	Parker	7,332,784	B2	2/2008	Mills et al.
6,725,075	B2	4/2004	Al-Ali	7,340,287	B2	3/2008	Mason et al.
6,728,560	B2	4/2004	Kollias et al.	7,341,559	B2	3/2008	Schulz et al.
6,735,459	B2	5/2004	Parker	7,343,186	B2	3/2008	Lamego et al.
6,745,060	B2	6/2004	Diab et al.	D566,282	S	4/2008	Al-Ali et al.
6,760,607	B2	7/2004	Al-Ali	7,355,512	B1	4/2008	Al-Ali
6,770,028	B1	8/2004	Ali et al.	7,356,365	B2	4/2008	Schurman
6,771,994	B2	8/2004	Kiani et al.	7,371,981	B2	5/2008	Abdul-Hafiz
6,785,568	B2	8/2004	Chance	7,373,193	B2	5/2008	Al-Ali et al.
6,792,300	B1	9/2004	Diab et al.	7,373,194	B2	5/2008	Weber et al.
6,801,799	B2	10/2004	Mendelson	7,376,453	B1	5/2008	Diab et al.
6,813,511	B2	11/2004	Diab et al.	7,377,794	B2	5/2008	Al Ali et al.
6,816,741	B2	11/2004	Diab	7,377,899	B2	5/2008	Weber et al.
6,822,564	B2	11/2004	Al-Ali	7,383,070	B2	6/2008	Diab et al.
6,826,419	B2	11/2004	Diab et al.	7,415,297	B2	8/2008	Al-Ali et al.
6,830,711	B2	12/2004	Mills et al.	7,428,432	B2	9/2008	Ali et al.
6,831,266	B2	12/2004	Paritsky et al.	7,438,683	B2	10/2008	Al-Ali et al.
6,850,787	B2	2/2005	Weber et al.	7,440,787	B2	10/2008	Diab
6,850,788	B2	2/2005	Al-Ali	7,454,240	B2	11/2008	Diab et al.
6,852,083	B2	2/2005	Caro et al.	7,467,002	B2	12/2008	Weber et al.
6,861,639	B2	3/2005	Al-Ali	7,469,157	B2	12/2008	Diab et al.
6,898,452	B2	5/2005	Al-Ali et al.	7,471,969	B2	12/2008	Diab et al.
6,920,345	B2	7/2005	Al-Ali et al.	7,471,971	B2	12/2008	Diab et al.
6,931,268	B1	8/2005	Kiani-Azarbayjany et al.	7,483,729	B2	1/2009	Al-Ali et al.
6,934,570	B2	8/2005	Kiani et al.	7,483,730	B2	1/2009	Diab et al.
6,939,305	B2	9/2005	Flaherty et al.	7,489,958	B2	2/2009	Diab et al.
6,943,348	B1	9/2005	Coffin, IV	7,496,391	B2	2/2009	Diab et al.
6,950,687	B2	9/2005	Al-Ali	7,496,393	B2	2/2009	Diab et al.
6,961,598	B2	11/2005	Diab	D587,657	S	3/2009	Al-Ali et al.
6,970,792	B1	11/2005	Diab	7,499,741	B2	3/2009	Diab et al.
6,979,812	B2	12/2005	Al-Ali	7,499,835	B2	3/2009	Weber et al.
6,985,764	B2	1/2006	Mason et al.	7,500,950	B2	3/2009	Al-Ali et al.
6,993,371	B2	1/2006	Kiani et al.	7,509,154	B2	3/2009	Diab et al.
6,996,427	B2	2/2006	Ali et al.	7,509,494	B2	3/2009	Al-Ali
6,999,904	B2	2/2006	Weber et al.	7,510,849	B2	3/2009	Schurman et al.
7,003,338	B2	2/2006	Weber et al.	7,519,327	B2	4/2009	White
7,003,339	B2	2/2006	Diab et al.	7,526,328	B2	4/2009	Diab et al.
7,015,451	B2	3/2006	Dalke et al.	7,530,942	B1	5/2009	Diab
7,024,233	B2	4/2006	Ali et al.	7,530,949	B2	5/2009	Al Ali et al.
7,027,849	B2	4/2006	Al-Ali	7,530,955	B2	5/2009	Diab et al.
7,030,749	B2	4/2006	Al-Ali	7,563,110	B2	7/2009	Al-Ali et al.
7,039,449	B2	5/2006	Al-Ali	7,596,398	B2	9/2009	Al-Ali et al.
7,041,060	B2	5/2006	Flaherty et al.	7,601,123	B2	10/2009	Tweed et al.
7,044,918	B2	5/2006	Diab	7,613,490	B2	11/2009	Sarussi et al.
7,048,687	B1	5/2006	Reuss et al.	7,618,375	B2	11/2009	Flaherty
7,060,963	B2	6/2006	Maegawa et al.	D606,659	S	12/2009	Kiani et al.
7,067,893	B2	6/2006	Mills et al.	7,647,083	B2	1/2010	Al-Ali et al.
7,096,052	B2	8/2006	Mason et al.	D609,193	S	2/2010	Al-Ali et al.
				D614,305	S	4/2010	Al-Ali et al.
				RE41,317	E	5/2010	Parker
				7,726,209	B2	6/2010	Ruotoistenmäki
				7,729,733	B2	6/2010	Al-Ali et al.

(56)

## References Cited

## U.S. PATENT DOCUMENTS

7,740,589 B2	6/2010	Maschke et al.	8,255,026 B1	8/2012	Al-Ali
7,761,127 B2	7/2010	Al-Ali et al.	8,255,027 B2	8/2012	Al-Ali et al.
7,761,128 B2	7/2010	Al-Ali et al.	8,255,028 B2	8/2012	Al-Ali et al.
7,764,982 B2	7/2010	Dalke et al.	8,260,577 B2	9/2012	Weber et al.
D621,516 S	8/2010	Kiani et al.	8,265,723 B1	9/2012	McHale et al.
7,791,155 B2	9/2010	Diab	8,274,360 B2	9/2012	Sampath et al.
7,801,581 B2	9/2010	Diab	8,280,469 B2	10/2012	Baker, Jr. et al.
7,822,452 B2	10/2010	Schurman et al.	8,280,473 B2	10/2012	Al-Ali
RE41,912 E	11/2010	Parker	8,289,130 B2	10/2012	Nakajima et al.
7,844,313 B2	11/2010	Kiani et al.	8,301,217 B2	10/2012	Al-Ali et al.
7,844,314 B2	11/2010	Al-Ali	8,306,596 B2	11/2012	Schurman et al.
7,844,315 B2	11/2010	Al-Ali	8,310,336 B2	11/2012	Muhsin et al.
7,862,523 B2	1/2011	Ruotoistenmaki	8,315,683 B2	11/2012	Al-Ali et al.
7,865,222 B2	1/2011	Weber et al.	RE43,860 E	12/2012	Parker
7,869,849 B2	1/2011	Ollerlessen et al.	8,337,403 B2	12/2012	Al-Ali et al.
7,873,497 B2	1/2011	Weber et al.	8,346,330 B2	1/2013	Lamego
7,880,606 B2	2/2011	Al-Ali	8,353,842 B2	1/2013	Al-Ali et al.
7,880,626 B2	2/2011	Al-Ali et al.	8,355,766 B2	1/2013	MacNeish, III et al.
7,891,355 B2	2/2011	Al-Ali et al.	8,359,080 B2	1/2013	Diab et al.
7,894,868 B2	2/2011	Al-Ali et al.	8,364,223 B2	1/2013	Al-Ali et al.
7,899,507 B2	3/2011	Al-Ali et al.	8,364,226 B2	1/2013	Diab et al.
7,899,510 B2	3/2011	Hoarau	8,364,389 B2	1/2013	Dorogusker et al.
7,899,518 B2	3/2011	Trepagnier et al.	8,374,665 B2	2/2013	Lamego
7,904,132 B2	3/2011	Weber et al.	8,385,995 B2	2/2013	Al-Ali et al.
7,909,772 B2	3/2011	Popov et al.	8,385,996 B2	2/2013	Smith et al.
7,910,875 B2	3/2011	Al-Ali	8,388,353 B2	3/2013	Kiani et al.
7,919,713 B2	4/2011	Al-Ali et al.	8,399,822 B2	3/2013	Al-Ali
7,937,128 B2	5/2011	Al-Ali	8,401,602 B2	3/2013	Kiani
7,937,129 B2	5/2011	Mason et al.	8,405,608 B2	3/2013	Al-Ali et al.
7,937,130 B2	5/2011	Diab et al.	8,414,499 B2	4/2013	Al-Ali et al.
7,941,199 B2	5/2011	Kiani	8,418,524 B2	4/2013	Al-Ali
7,951,086 B2	5/2011	Flaherty et al.	8,423,106 B2	4/2013	Lamego et al.
7,957,780 B2	6/2011	Lamego et al.	8,428,967 B2	4/2013	Olsen et al.
7,962,188 B2	6/2011	Kiani et al.	8,430,817 B1	4/2013	Al-Ali et al.
7,962,190 B1	6/2011	Diab et al.	8,437,825 B2	5/2013	Dalvi et al.
7,976,472 B2	7/2011	Kiani	8,452,364 B2	5/2013	Hannula et al.
7,988,637 B2	8/2011	Diab	8,455,290 B2	6/2013	Siskavich
7,990,382 B2	8/2011	Kiani	8,457,703 B2	6/2013	Al-Ali
7,991,446 B2	8/2011	Al-Ali et al.	8,457,707 B2	6/2013	Kiani
8,000,761 B2	8/2011	Al-Ali	8,463,349 B2	6/2013	Diab et al.
8,008,088 B2	8/2011	Bellott et al.	8,466,286 B2	6/2013	Bellot et al.
RE42,753 E	9/2011	Kiani-Azarbayjany et al.	8,471,713 B2	6/2013	Poeze et al.
8,019,400 B2	9/2011	Diab et al.	8,473,020 B2	6/2013	Kiani et al.
8,028,701 B2	10/2011	Al-Ali et al.	8,483,787 B2	7/2013	Al-Ali et al.
8,029,765 B2	10/2011	Bellott et al.	8,489,364 B2	7/2013	Weber et al.
8,036,727 B2	10/2011	Schurman et al.	8,496,595 B2	7/2013	Jornod
8,036,728 B2	10/2011	Diab et al.	8,498,684 B2	7/2013	Weber et al.
8,046,040 B2	10/2011	Ali et al.	8,504,128 B2	8/2013	Blank et al.
8,046,041 B2	10/2011	Diab et al.	8,509,867 B2	8/2013	Workman et al.
8,046,042 B2	10/2011	Diab et al.	8,515,509 B2	8/2013	Bruinsma et al.
8,048,040 B2	11/2011	Kiani	8,515,515 B2	8/2013	McKenna et al.
8,050,728 B2	11/2011	Al-Ali et al.	8,523,781 B2	9/2013	Al-Ali
8,071,935 B2	12/2011	Besko et al.	8,529,301 B2	9/2013	Al-Ali et al.
RE43,169 E	2/2012	Parker	8,532,727 B2	9/2013	Ali et al.
8,118,620 B2	2/2012	Al-Ali et al.	8,532,728 B2	9/2013	Diab et al.
8,126,528 B2	2/2012	Diab et al.	D692,145 S	10/2013	Al-Ali et al.
8,128,572 B2	3/2012	Diab et al.	8,547,209 B2	10/2013	Kiani et al.
8,130,105 B2	3/2012	Al-Ali et al.	8,548,548 B2	10/2013	Al-Ali
8,145,287 B2	3/2012	Diab et al.	8,548,549 B2	10/2013	Schurman et al.
8,150,487 B2	4/2012	Diab et al.	8,548,550 B2	10/2013	Al-Ali et al.
8,175,672 B2	5/2012	Parker	8,560,032 B2	10/2013	Al-Ali et al.
8,180,420 B2	5/2012	Diab et al.	8,560,034 B1	10/2013	Diab et al.
8,182,443 B1	5/2012	Kiani	8,570,167 B2	10/2013	Al-Ali
8,185,180 B2	5/2012	Diab et al.	8,570,503 B2	10/2013	Vo et al.
8,190,223 B2	5/2012	Al-Ali et al.	8,571,617 B2	10/2013	Reichgott et al.
8,190,227 B2	5/2012	Diab et al.	8,571,618 B1	10/2013	Lamego et al.
8,203,438 B2	6/2012	Kiani et al.	8,571,619 B2	10/2013	Al-Ali et al.
8,203,704 B2	6/2012	Merritt et al.	8,577,431 B2	11/2013	Lamego et al.
8,204,566 B2	6/2012	Schurman et al.	8,581,732 B2	11/2013	Al-Ali et al.
8,219,172 B2	7/2012	Schurman et al.	8,584,345 B2	11/2013	Al-Ali et al.
8,224,411 B2	7/2012	Al-Ali et al.	8,588,880 B2	11/2013	Abdul-Hafiz et al.
8,228,181 B2	7/2012	Al-Ali	8,591,426 B2	11/2013	Onoe et al.
8,229,533 B2	7/2012	Diab et al.	8,600,467 B2	12/2013	Al-Ali et al.
			8,606,342 B2	12/2013	Diab
			8,615,290 B2	12/2013	Lin et al.
			8,626,255 B2	1/2014	Al-Ali et al.
			8,630,691 B2	1/2014	Lamego et al.

(56)

## References Cited

## U.S. PATENT DOCUMENTS

8,652,060	B2	2/2014	Al-Ali	8,996,085	B2	3/2015	Kiani et al.
8,655,004	B2	2/2014	Prest et al.	8,998,809	B2	4/2015	Kiani
8,663,107	B2	3/2014	Kiani	9,028,429	B2	5/2015	Telfort et al.
8,666,468	B1	3/2014	Al-Ali	9,037,207	B2	5/2015	Al-Ali et al.
8,667,967	B2	3/2014	Al-Ali et al.	9,060,721	B2	6/2015	Reichgott et al.
8,670,811	B2	3/2014	O'Reilly	9,066,666	B2	6/2015	Kiani
8,670,814	B2	3/2014	Diab et al.	9,066,680	B1	6/2015	Al-Ali et al.
8,676,286	B2	3/2014	Weber et al.	9,072,437	B2	7/2015	Paalasmaa
8,682,407	B2	3/2014	Al-Ali	9,072,474	B2	7/2015	Al-Ali et al.
RE44,823	E	4/2014	Parker	9,078,560	B2	7/2015	Schurman et al.
RE44,875	E	4/2014	Kiani et al.	9,081,889	B2	7/2015	Ingrassia, Jr. et al.
8,690,799	B2	4/2014	Telfort et al.	9,084,569	B2	7/2015	Weber et al.
8,700,111	B2	4/2014	LeBoeuf et al.	9,095,316	B2	8/2015	Welch et al.
8,700,112	B2	4/2014	Kiani	9,106,038	B2	8/2015	Telfort et al.
8,702,627	B2	4/2014	Telfort et al.	9,107,625	B2	8/2015	Telfort et al.
8,706,179	B2	4/2014	Parker	9,107,626	B2	8/2015	Al-Ali et al.
8,712,494	B1	4/2014	MacNeish, III et al.	9,113,831	B2	8/2015	Al-Ali
8,715,206	B2	5/2014	Telfort et al.	9,113,832	B2	8/2015	Al-Ali
8,718,735	B2	5/2014	Lamego et al.	9,119,595	B2	9/2015	Lamego
8,718,737	B2	5/2014	Diab et al.	9,131,881	B2	9/2015	Diab et al.
8,718,738	B2	5/2014	Blank et al.	9,131,882	B2	9/2015	Al-Ali et al.
8,720,249	B2	5/2014	Al-Ali	9,131,883	B2	9/2015	Al-Ali
8,721,541	B2	5/2014	Al-Ali et al.	9,131,917	B2	9/2015	Telfort et al.
8,721,542	B2	5/2014	Al-Ali et al.	9,138,180	B1	9/2015	Coverston et al.
8,723,677	B1	5/2014	Kiani	9,138,182	B2	9/2015	Al-Ali et al.
8,740,792	B1	6/2014	Kiani et al.	9,138,192	B2	9/2015	Weber et al.
8,754,776	B2	6/2014	Poeze et al.	9,142,117	B2	9/2015	Muhsin et al.
8,755,535	B2	6/2014	Telfort et al.	9,153,112	B1	10/2015	Kiani et al.
8,755,856	B2	6/2014	Diab et al.	9,153,121	B2	10/2015	Kiani et al.
8,755,872	B1	6/2014	Marinow	9,161,696	B2	10/2015	Al-Ali et al.
8,760,517	B2	6/2014	Sarwar et al.	9,161,713	B2	10/2015	Al-Ali et al.
8,761,850	B2	6/2014	Lamego	9,167,995	B2	10/2015	Lamego et al.
8,764,671	B2	7/2014	Kiani	9,176,141	B2	11/2015	Al-Ali et al.
8,768,423	B2	7/2014	Shakespeare et al.	9,186,102	B2	11/2015	Bruinsma et al.
8,768,426	B2	7/2014	Haisley et al.	9,192,312	B2	11/2015	Al-Ali
8,771,204	B2	7/2014	Telfort et al.	9,192,329	B2	11/2015	Al-Ali
8,777,634	B2	7/2014	Kiani et al.	9,192,351	B1	11/2015	Telfort et al.
8,781,543	B2	7/2014	Diab et al.	9,195,385	B2	11/2015	Al-Ali et al.
8,781,544	B2	7/2014	Al-Ali et al.	9,210,566	B2	12/2015	Ziemianska et al.
8,781,549	B2	7/2014	Al-Ali et al.	9,211,072	B2	12/2015	Kiani
8,788,003	B2	7/2014	Schurman et al.	9,211,095	B1	12/2015	Al-Ali
8,790,268	B2	7/2014	Al-Ali	9,218,454	B2	12/2015	Kiani et al.
8,801,613	B2	8/2014	Al-Ali et al.	9,226,696	B2	1/2016	Kiani
8,821,397	B2	9/2014	Al-Ali et al.	9,241,662	B2	1/2016	Al-Ali et al.
8,821,415	B2	9/2014	Al-Ali et al.	9,245,668	B1	1/2016	Vo et al.
8,830,449	B1	9/2014	Lamego et al.	9,259,185	B2	2/2016	Abdul-Hafiz et al.
8,831,700	B2	9/2014	Schurman et al.	9,267,572	B2	2/2016	Barker et al.
8,838,210	B2	9/2014	Wood et al.	9,277,880	B2	3/2016	Poeze et al.
8,840,549	B2	9/2014	Al-Ali et al.	9,289,167	B2	3/2016	Diab et al.
8,847,740	B2	9/2014	Kiani et al.	9,295,421	B2	3/2016	Kiani et al.
8,849,365	B2	9/2014	Smith et al.	9,307,928	B1	4/2016	Al-Ali et al.
8,852,094	B2	10/2014	Al-Ali et al.	9,311,382	B2	4/2016	Varoglu et al.
8,852,994	B2	10/2014	Wojtczuk et al.	9,323,894	B2	4/2016	Kiani
8,868,147	B2	10/2014	Stippick et al.	D755,392	S	5/2016	Hwang et al.
8,868,150	B2	10/2014	Al-Ali et al.	9,326,712	B1	5/2016	Kiani
8,870,792	B2	10/2014	Al-Ali et al.	9,333,316	B2	5/2016	Kiani
8,886,271	B2	11/2014	Kiani et al.	9,339,220	B2	5/2016	Lamego et al.
8,888,539	B2	11/2014	Al-Ali et al.	9,339,236	B2	5/2016	Frix et al.
8,888,708	B2	11/2014	Diab et al.	9,341,565	B2	5/2016	Lamego et al.
8,892,180	B2	11/2014	Weber et al.	9,351,673	B2	5/2016	Diab et al.
8,897,847	B2	11/2014	Al-Ali	9,351,675	B2	5/2016	Al-Ali et al.
8,909,310	B2	12/2014	Lamego et al.	9,357,665	B2	5/2016	Myers et al.
8,911,377	B2	12/2014	Al-Ali	9,364,181	B2	6/2016	Kiani et al.
8,912,909	B2	12/2014	Al-Ali et al.	9,368,671	B2	6/2016	Wojtczuk et al.
8,920,317	B2	12/2014	Al-Ali et al.	9,370,325	B2	6/2016	Al-Ali et al.
8,920,332	B2	12/2014	Hong et al.	9,370,326	B2	6/2016	McHale et al.
8,921,699	B2	12/2014	Al-Ali et al.	9,370,335	B2	6/2016	Al-Ali et al.
8,922,382	B2	12/2014	Al-Ali et al.	9,375,185	B2	6/2016	Ali et al.
8,929,964	B2	1/2015	Al-Ali et al.	9,386,953	B2	7/2016	Al-Ali
8,942,777	B2	1/2015	Diab et al.	9,386,961	B2	7/2016	Al-Ali et al.
8,948,834	B2	2/2015	Diab et al.	9,392,945	B2	7/2016	Al-Ali et al.
8,948,835	B2	2/2015	Diab	9,397,448	B2	7/2016	Al-Ali et al.
8,965,471	B2	2/2015	Lamego	9,408,542	B1	8/2016	Kinast et al.
				9,436,645	B2	9/2016	Al-Ali et al.
				9,445,759	B1	9/2016	Lamego et al.
				9,466,919	B2	10/2016	Kiani et al.
				9,474,474	B2	10/2016	Lamego et al.

# Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

## Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

## Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

## Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

## API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

## LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

## FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

## E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.