



US009294448B2

(12) **United States Patent**  
**Miller et al.**

(10) **Patent No.:** **US 9,294,448 B2**  
(45) **Date of Patent:** **Mar. 22, 2016**

(54) **CRYPTOGRAPHIC SECURITY FUNCTIONS  
BASED ON ANTICIPATED CHANGES IN  
DYNAMIC MINUTIAE**

(58) **Field of Classification Search**  
CPC .. H04L 63/0876; H04L 9/0861; H04L 9/0866  
USPC ..... 380/255  
See application file for complete search history.

(71) Applicant: **mSignia, Inc.**, Irvine, CA (US)

(56) **References Cited**

(72) Inventors: **Paul Timothy Miller**, Irvine, CA (US);  
**George Allen Tuvell**, Thompson's  
Station, TN (US)

U.S. PATENT DOCUMENTS

(73) Assignee: **mSignia, Inc.**, Irvine, CA (US)

6,041,133 A \* 3/2000 Califano ..... G06K 9/00067  
382/124  
6,185,316 B1 \* 2/2001 Buffam ..... G06F 21/32  
382/100

(\* ) Notice: Subject to any disclaimer, the term of this  
patent is extended or adjusted under 35  
U.S.C. 154(b) by 32 days.

(Continued)

FOREIGN PATENT DOCUMENTS

(21) Appl. No.: **14/458,123**

WO WO 2010/035202 4/2010  
WO WO 2013/138714 9/2013  
WO WO 2013/154936 10/2013

(22) Filed: **Aug. 12, 2014**

*Primary Examiner* — Dao Ho

(65) **Prior Publication Data**

(74) *Attorney, Agent, or Firm* — Haynes and Boone, LLP

US 2015/0033027 A1 Jan. 29, 2015

**Related U.S. Application Data**

(63) Continuation of application No. 13/366,197, filed on  
Feb. 3, 2012, now Pat. No. 8,817,984.

(60) Provisional application No. 61/462,474, filed on Feb.  
3, 2011.

(51) **Int. Cl.**  
**H04L 29/06** (2006.01)  
**H04L 9/16** (2006.01)

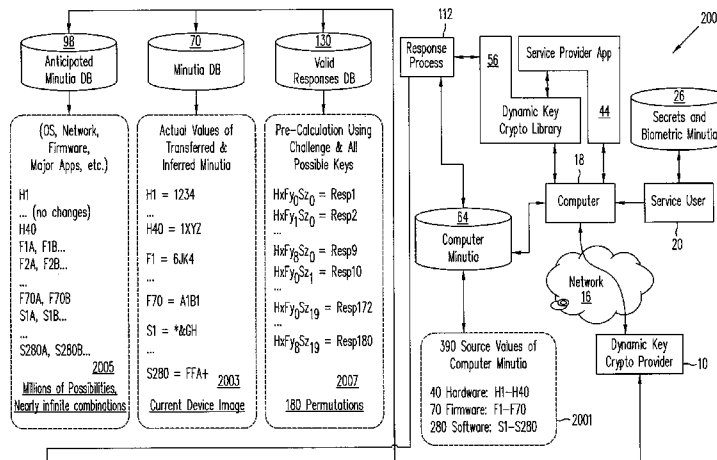
(Continued)

(52) **U.S. Cl.**  
CPC ..... **H04L 63/0428** (2013.01); **H04L 9/0861**  
(2013.01); **H04L 9/0866** (2013.01); **H04L**  
**9/0872** (2013.01); **H04L 9/16** (2013.01); **H04L**  
**9/3231** (2013.01); **H04L 9/3247** (2013.01);  
**H04L 9/3271** (2013.01); **H04L 63/0876**  
(2013.01)

(57) **ABSTRACT**

Dynamic key cryptography validates mobile device users to  
cloud services by uniquely identifying the user's electronic  
device using a very wide range of hardware, firmware, and  
software minutiae, user secrets, and user biometric values  
found in or collected by the device. Processes for uniquely  
identifying and validating the device include: selecting a sub-  
set of minutia from a plurality of minutia types; computing a  
challenge from which the user device can form a response  
based on the selected combination of minutia; computing a  
set of pre-processed responses that covers a range of all actual  
responses possible to be received from the device if the com-  
bination of the particular device with the device's collected  
actual values of minutia is valid; receiving an actual response  
to the challenge from the device; determining whether the  
actual response matches any of the pre-processed responses;  
and providing validation, enabling authentication, data pro-  
tection, and digital signatures.

**20 Claims, 11 Drawing Sheets**



(51)	<b>Int. Cl.</b> <b>H04L 9/32</b> <b>H04L 9/08</b>	(2006.01) (2006.01)	2007/0240220 A1 2007/0240221 A1 2007/0240222 A1 2008/0086773 A1 2008/0086776 A1 2008/0175449 A1*	10/2007 10/2007 10/2007 4/2008 4/2008 7/2008	Tuvell et al. Tuvell et al. Tuvell et al. Tuvell et al. Tuvell et al. Fang .....		
(56)	<b>References Cited</b>						
	U.S. PATENT DOCUMENTS						
	7,330,871 B2	2/2008 Barber	2008/0196104 A1	8/2008	Tuvell et al.		
	7,333,871 B2	2/2008 Schwarm	2008/0235515 A1*	9/2008	Yedidia .....	G06K 9/00073	
	7,373,669 B2	5/2008 Eisen				382/124	
	7,908,662 B2	3/2011 Richardson	2008/0244744 A1	10/2008	Thomas et al.		
	7,937,467 B2	5/2011 Barber	2009/0138975 A1	5/2009	Richardson		
	8,312,157 B2	11/2012 Jakobsson et al.	2009/0310779 A1*	12/2009	Lam .....	G06K 9/00577	
	8,375,221 B1*	2/2013 Thom .....	2010/0027834 A1*	2/2010	Spitzig .....	G06K 9/00577	380/46
							382/100
	2006/0031676 A1*	2/2006 Vantalon .....	2010/0229224 A1	9/2010	Etchegoyen		
			2011/0082768 A1	4/2011	Eisen		
	2006/0104484 A1*	5/2006 Bolle .....	2011/0113388 A1	5/2011	Eisen et al.		
			2011/0293094 A1	12/2011	Os et al.		
	2007/0124801 A1	5/2007 Thomas et al.	2011/0296170 A1	12/2011	Chen		
	2007/0174206 A1*	7/2007 Colella .....	2012/0201381 A1*	8/2012	Miller .....	H04L 9/16	
						380/255	
	2007/0214151 A1	9/2007 Thomas et al.	2013/0340052 A1	12/2013	Jakobsson		
	2007/0240218 A1	10/2007 Tuvell et al.					
	2007/0240219 A1	10/2007 Tuvell et al.					

\* cited by examiner

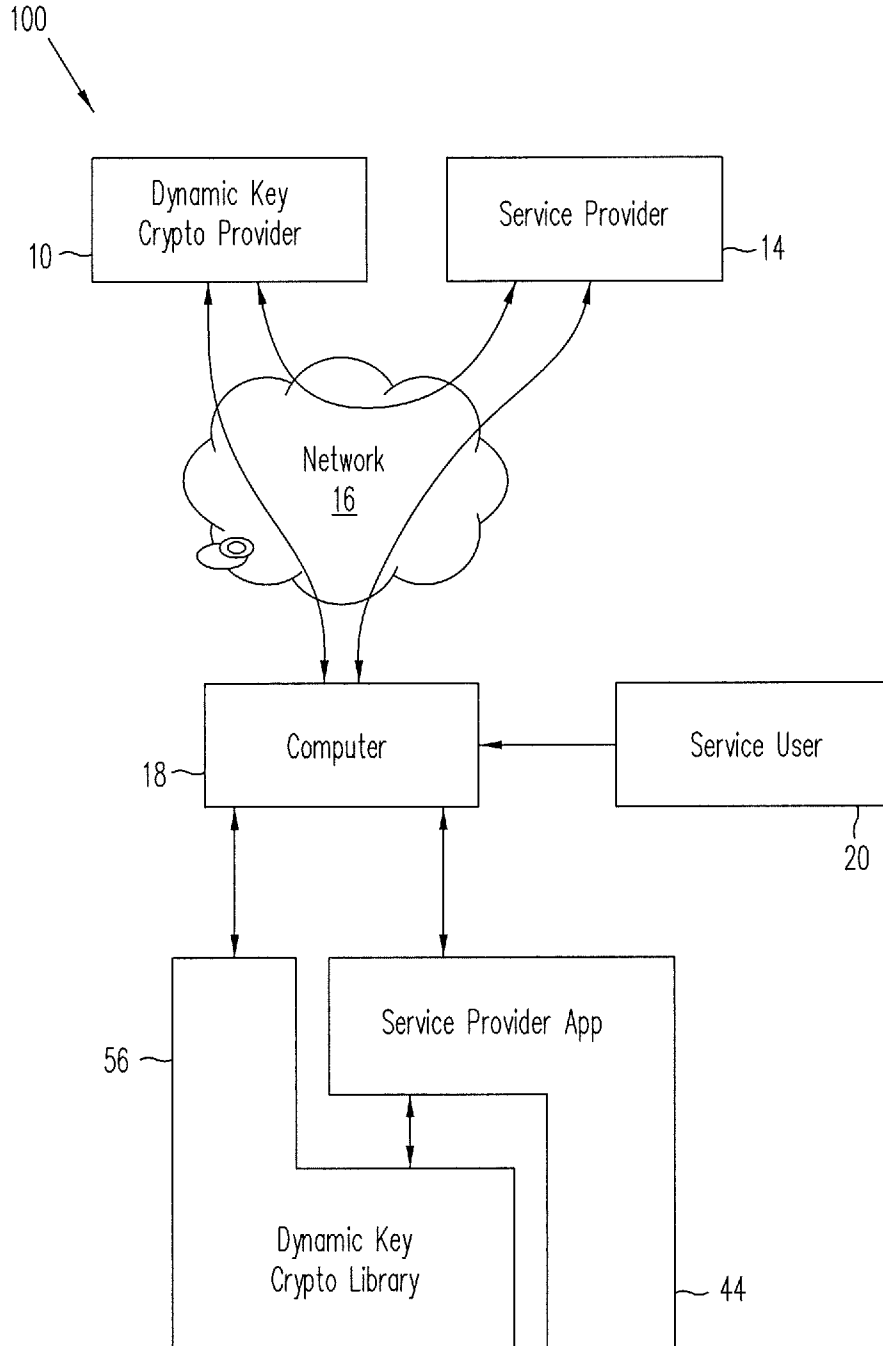
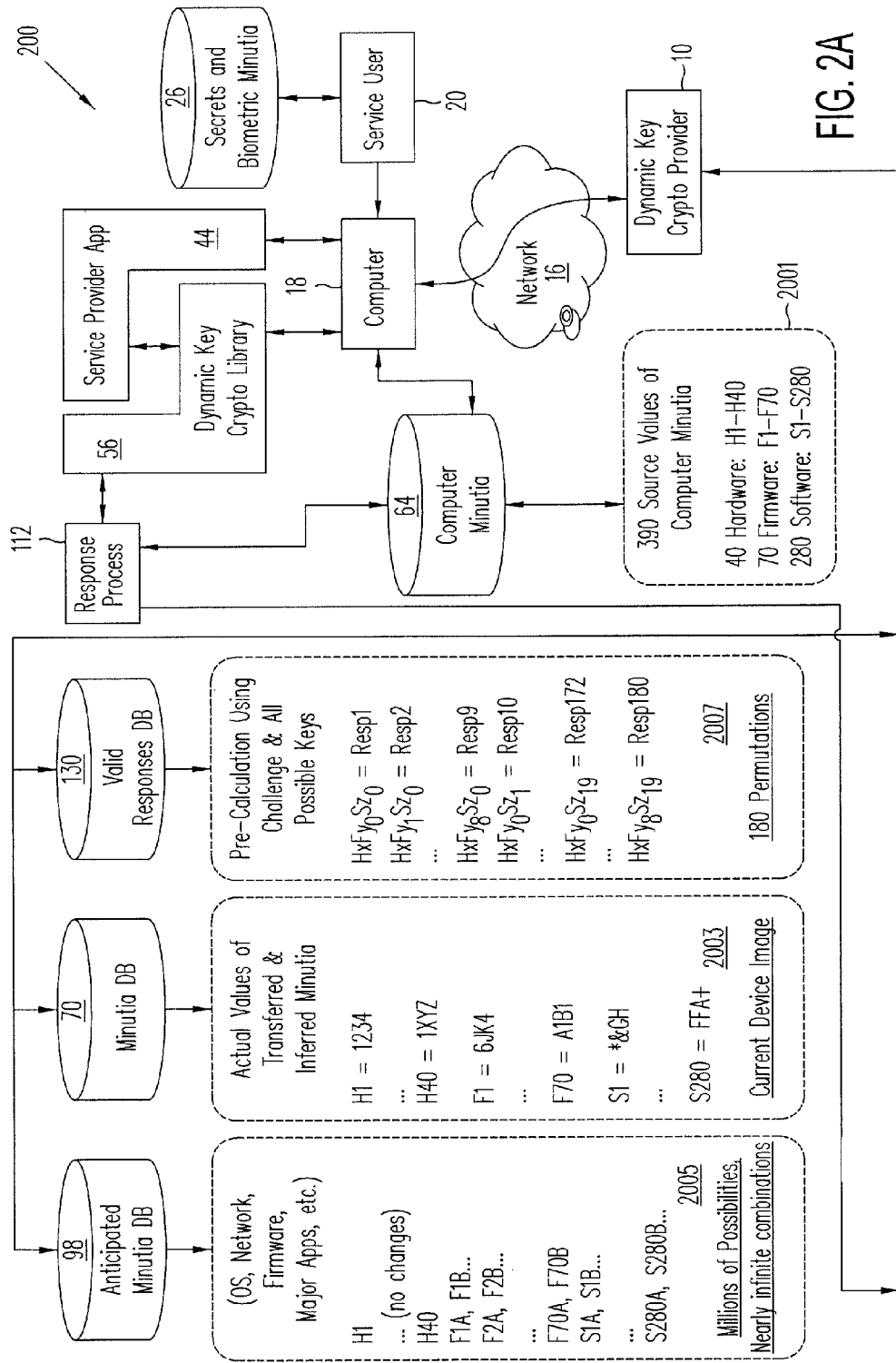


FIG. 1



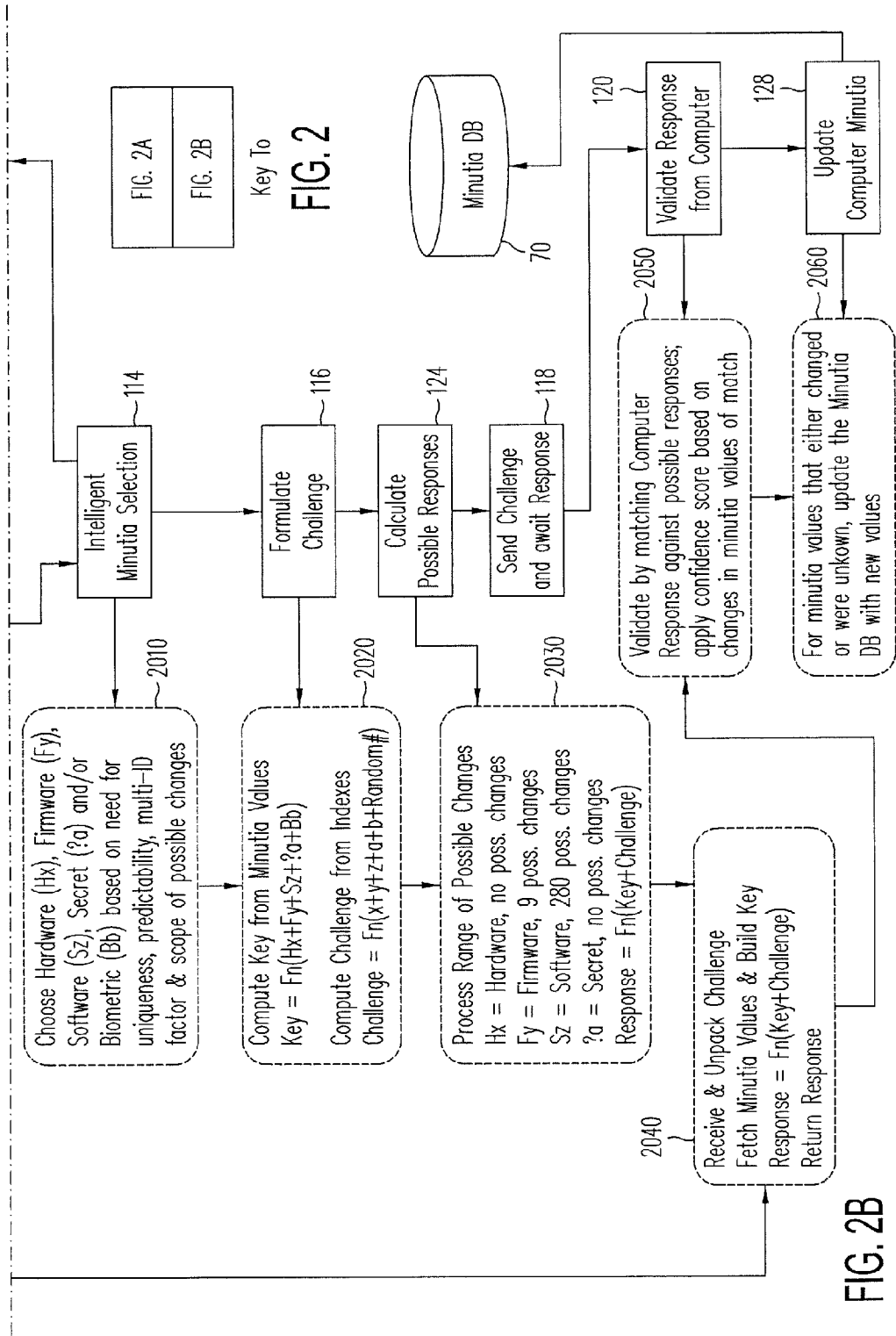


FIG. 2B

# 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.