



US 20160058312A1

(19) **United States**

(12) **Patent Application Publication**  
HAN et al.

(10) **Pub. No.: US 2016/0058312 A1**  
(43) **Pub. Date: Mar. 3, 2016**

(54) **MULTIPLE LIGHT PATHS ARCHITECTURE AND OBSCURATION METHODS FOR SIGNAL AND PERFUSION INDEX OPTIMIZATION**

*A61B 5/00* (2006.01)  
*G01N 21/55* (2006.01)

(52) **U.S. CL.**  
CPC ..... *A61B 5/02433* (2013.01); *G01N 21/55* (2013.01); *G01N 21/4738* (2013.01); *A61B 5/7264* (2013.01); *A61B 5/6898* (2013.01); *A61B 5/7203* (2013.01); *G01N 2201/062* (2013.01); *G01N 2201/068* (2013.01); *G01N 2201/0638* (2013.01); *A61B 2562/0233* (2013.01)

(71) Applicant: **Apple Inc.**, Cupertino, CA (US)

(72) Inventors: **Chin San HAN**, Mountain View, CA (US); **Ueyn BLOCK**, Menlo Park, CA (US); **Brian R. LAND**, Woodside, CA (US); **Nevzat Akin KESTELLI**, San Jose, CA (US); **Serhan ISIKMAN**, Sunnyvale, CA (US); **Albert WANG**, Sunnyvale, CA (US); **Justin SHI**, Sunnyvale, CA (US)

(21) Appl. No.: **14/569,235**

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

**Related U.S. Application Data**

(60) Provisional application No. 62/044,515, filed on Sep. 2, 2014.

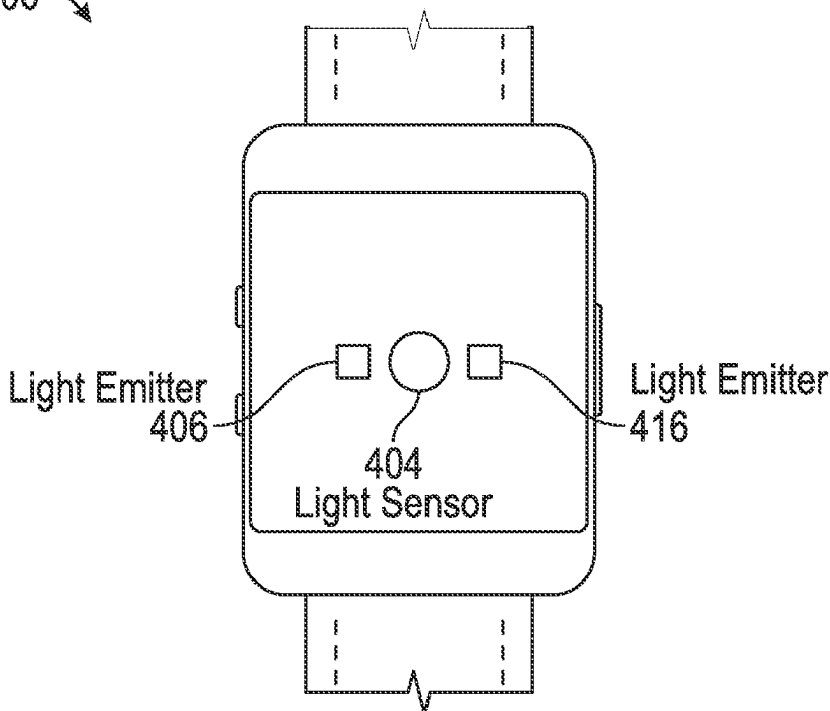
**Publication Classification**

(51) **Int. Cl.**  
*A61B 5/024* (2006.01)  
*G01N 21/47* (2006.01)

(57) **ABSTRACT**

A photoplethysmographic (PPG) device is disclosed. The PPG device can include one or more light emitters and one or more light sensors to generate the multiple light paths for measuring a PPG signal and perfusion indices of a user. The multiple light paths between each pair of light emitters and light detectors can include different separation distances to generate both an accurate PPG signal and a perfusion index value to accommodate a variety of users and usage conditions. In some examples, the multiple light paths can include the same separation distances for noise cancellation due to artifacts resulting from, for example, tilt and/or pull of the device, a user's hair, a user's skin pigmentation, and/or motion. The PPG device can further include one or more lenses and/or reflectors to increase the signal strength and/or to obscure the optical components and associated wiring from being visible to a user's eye.

Device  
400



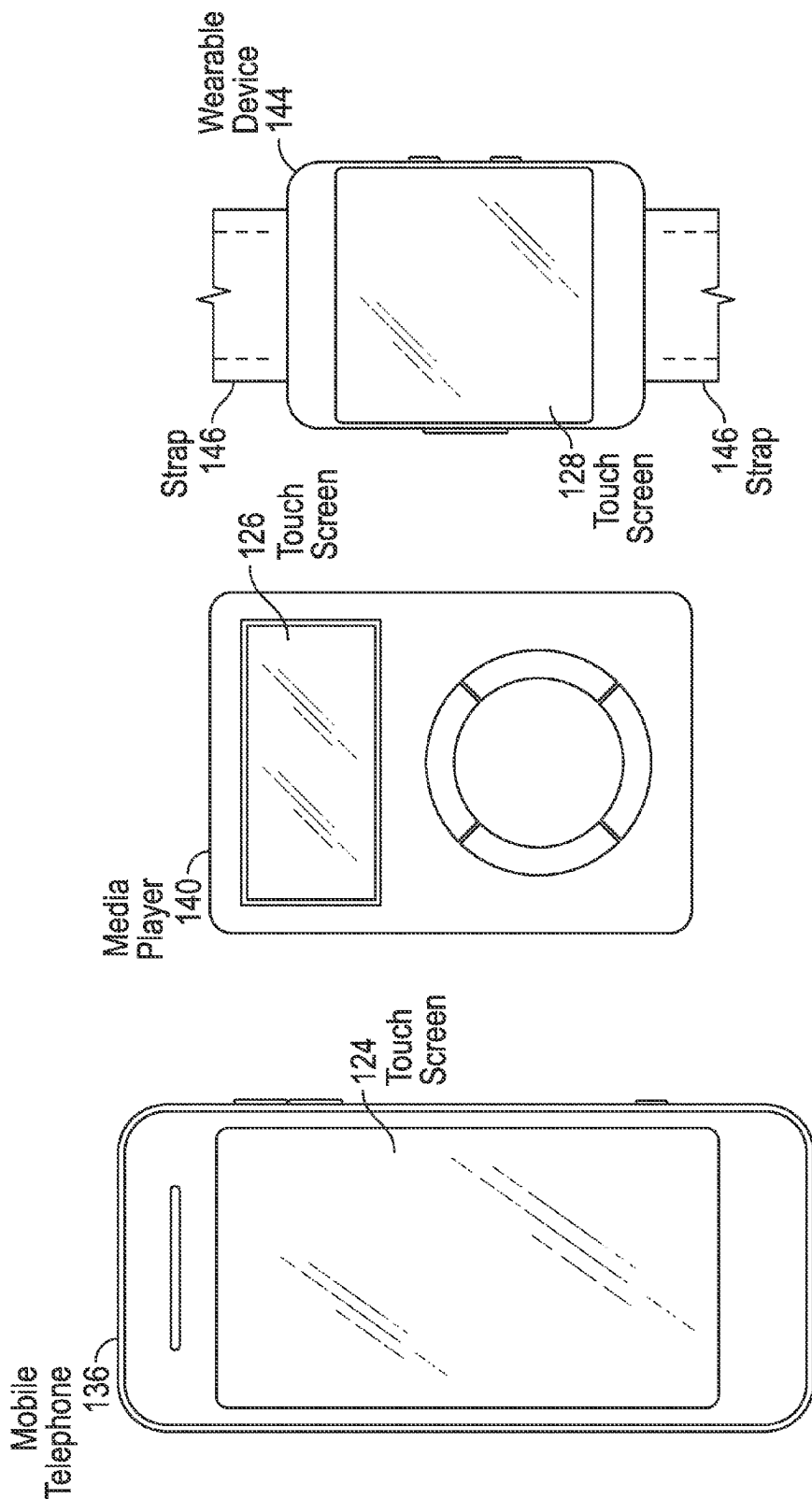


FIG. 1A

FIG. 1B

FIG. 1C

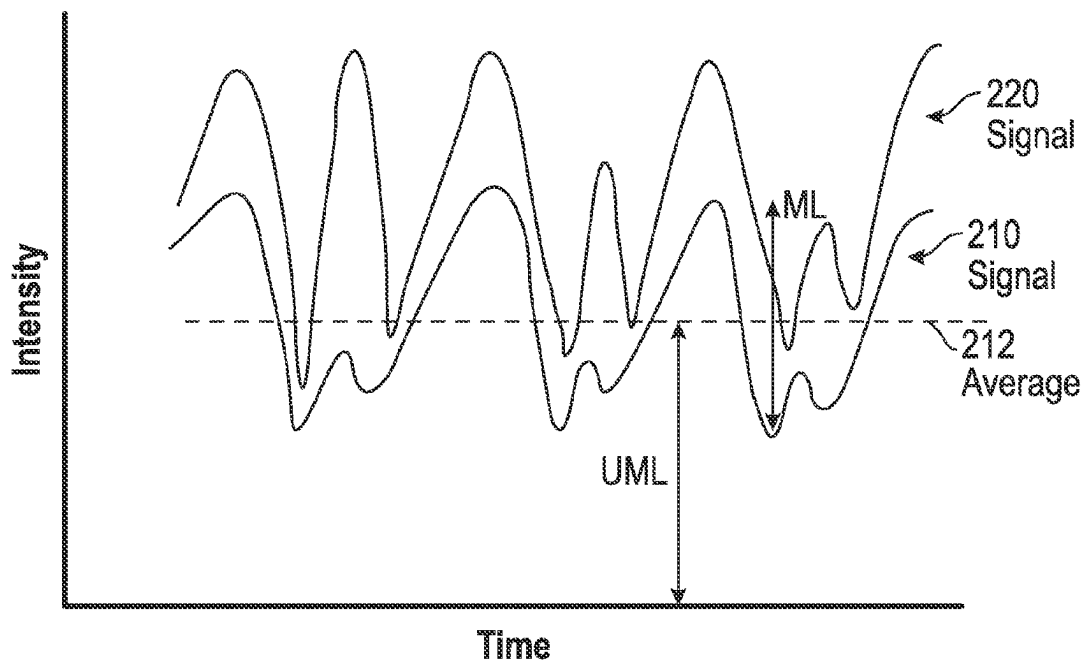


FIG. 2

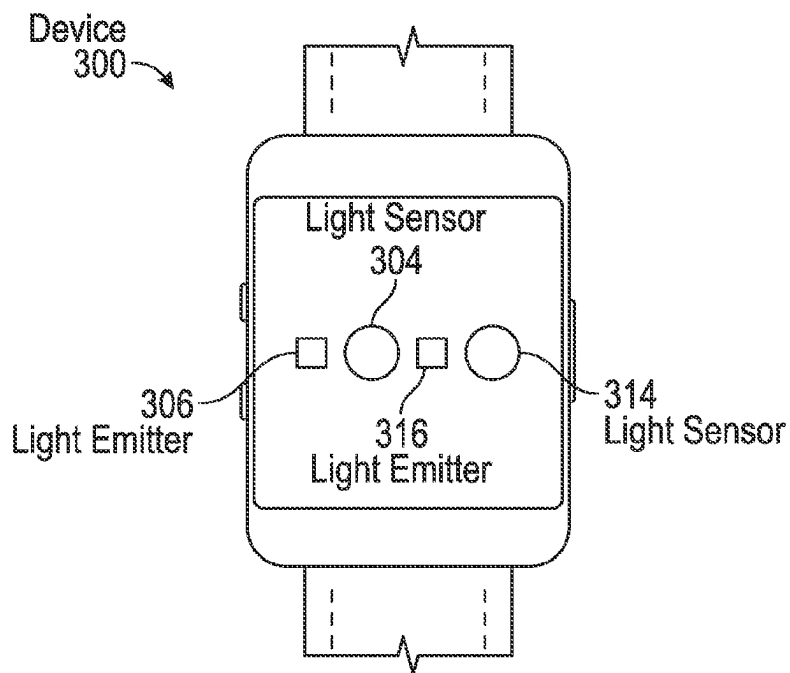


FIG. 3A

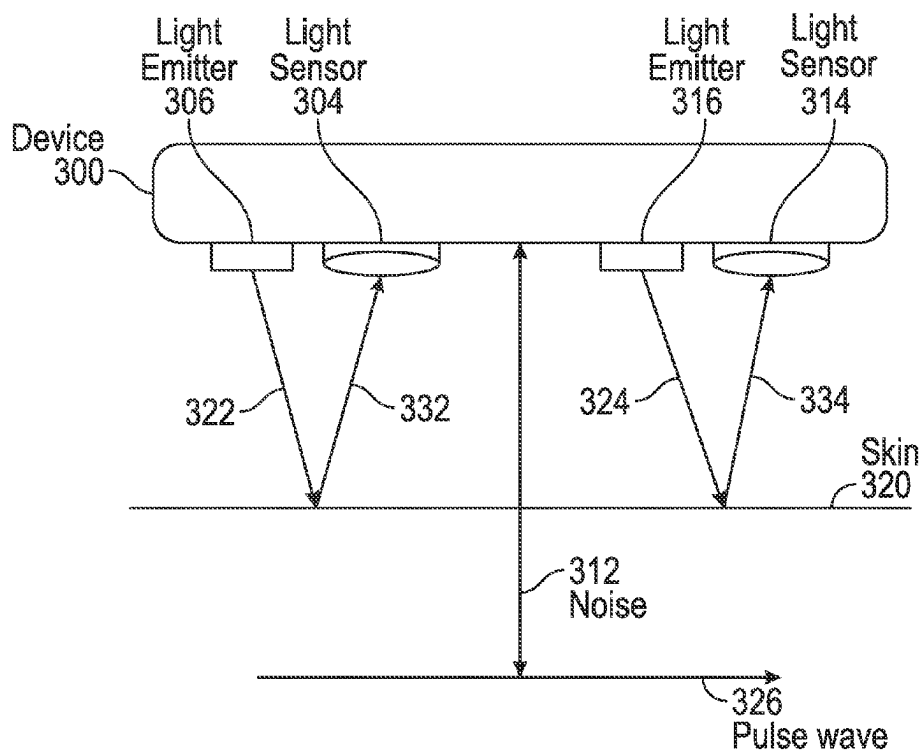


FIG. 3B

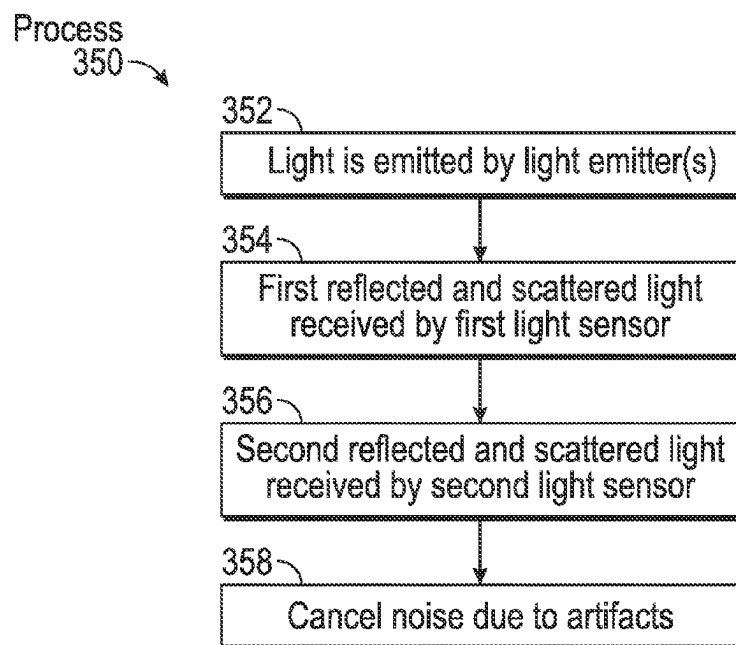


FIG. 3C

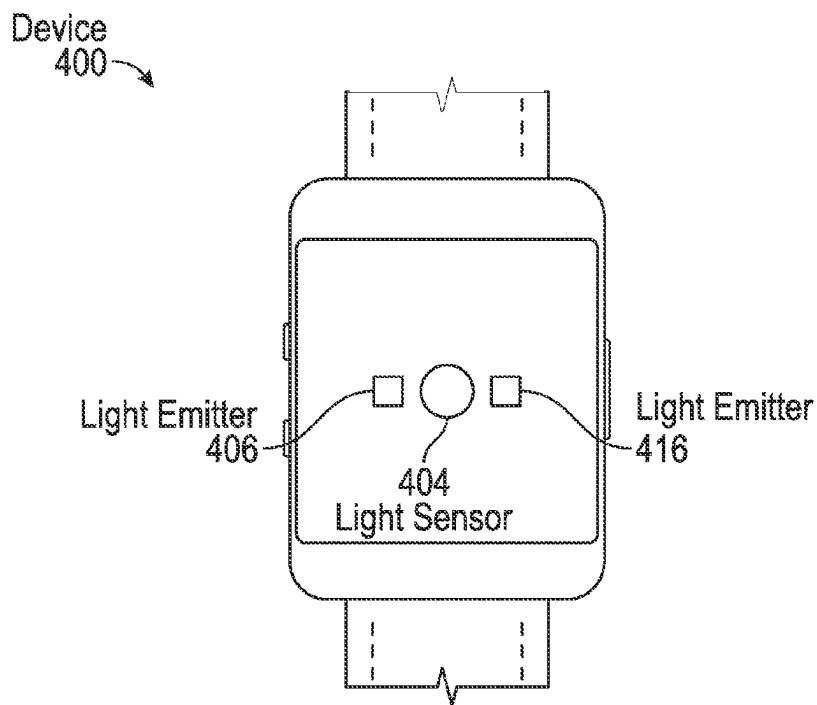


FIG. 4A

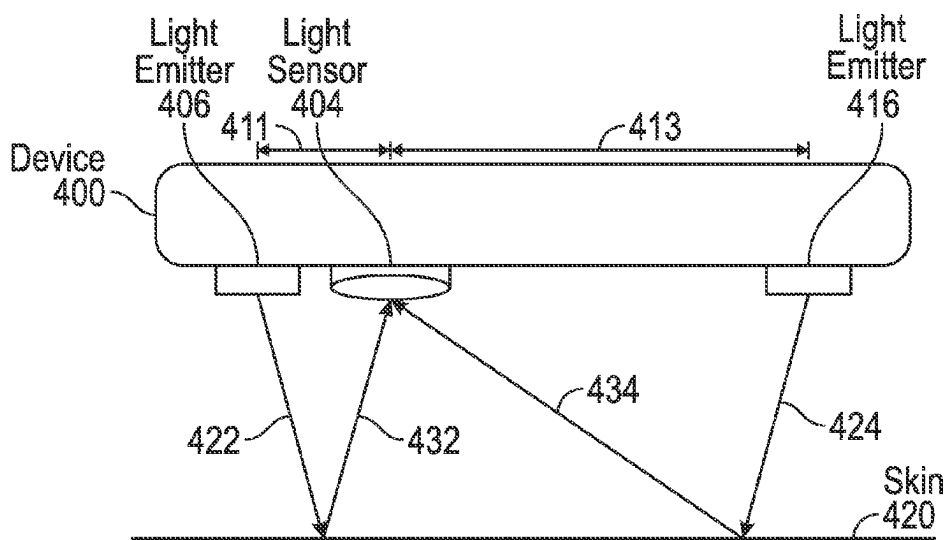


FIG. 4B

# 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.