



US010247670B2

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

(10) **Patent No.:** US 10,247,670 B2
(45) **Date of Patent:** *Apr. 2, 2019

(54) **REFLECTIVE SURFACE TREATMENTS FOR OPTICAL SENSORS**

A61B 5/024 (2006.01)
A61B 5/08 (2006.01)
A61B 5/145 (2006.01)

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

(52) **U.S. Cl.**
CPC **G01N 21/55** (2013.01); **A61B 5/00** (2013.01); **A61B 5/0059** (2013.01); **G01N 21/4738** (2013.01); **A61B 5/0002** (2013.01); **A61B 5/021** (2013.01); **A61B 5/024** (2013.01); **A61B 5/0816** (2013.01); **A61B 5/14532** (2013.01); **A61B 5/14542** (2013.01); **A61B 5/681** (2013.01); **A61B 5/7203** (2013.01); **G01N 2201/0221** (2013.01); **G01N 2201/0625** (2013.01)

(72) Inventors: **Trevor J. Ness**, Santa Cruz, CA (US); **Chin San Han**, Mountain View, CA (US); **David I. Nazzaro**, Groveland, MA (US); **Marcelo M. Lamego**, Cupertino, CA (US); **Naoto Matsuyuki**, Kasugai (JP); **Wolf Oetting**, San Jose, CA (US)

(73) Assignee: **Apple Inc.**, Cupertino, CA (US)

(58) **Field of Classification Search**
USPC 600/476
See application file for complete search history.

(*) 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.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,115,621 A 9/2000 Chin
6,343,233 B1 1/2002 Chin et al.
6,491,647 B1 * 12/2002 Bridger A61B 5/021 128/900
7,890,153 B2 2/2011 Hoarau
8,005,624 B1 8/2011 Starr
(Continued)

(21) Appl. No.: **16/114,003**

(22) Filed: **Aug. 27, 2018**

(65) **Prior Publication Data**
US 2018/0364162 A1 Dec. 20, 2018

Related U.S. Application Data

(63) Continuation of application No. 14/740,196, filed on Jun. 15, 2015, now Pat. No. 10,078,052.

(60) Provisional application No. 62/043,294, filed on Aug. 28, 2014.

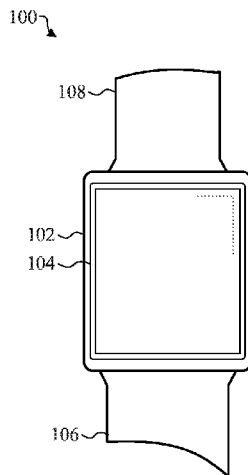
(51) **Int. Cl.**
A61B 5/04 (2006.01)
G01N 21/55 (2014.01)
G01N 21/47 (2006.01)
A61B 5/00 (2006.01)
A61B 5/021 (2006.01)

Primary Examiner — Nicole F Lavert
(74) Attorney, Agent, or Firm — Joseph F. Guihan

(57) **ABSTRACT**

An electronic device includes one or more light emitters for emitting light toward an object and one or more light detectors for collecting light exiting the object. A reflective coating, surface, or surface finish can be applied adjacent to the area to which light is emitted and/or through which light exits in order to increase the light collected by the light detector. The reflective coating can be oriented so as to reflect light back into the object.

20 Claims, 6 Drawing Sheets



(56)

References Cited

U.S. PATENT DOCUMENTS

9,314,197 B2 4/2016 Eisen et al.
2005/0230603 A1* 10/2005 Langland G01V 8/14
2013/0006074 A1 1/2013 Pologe 250/221

* cited by examiner

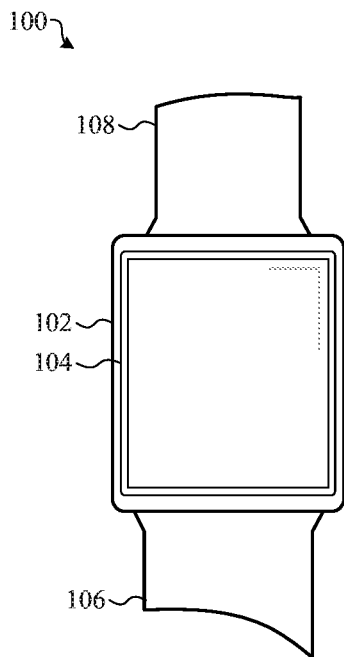


FIG. 1A

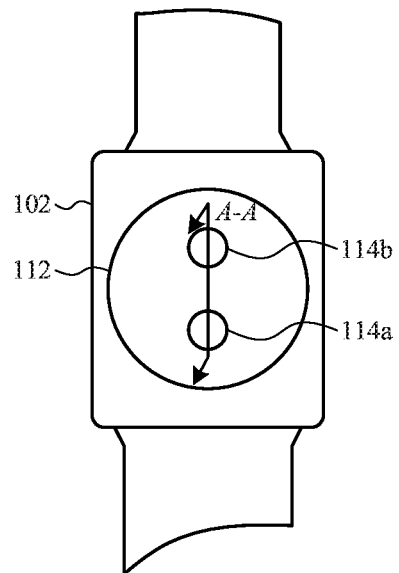


FIG. 1B

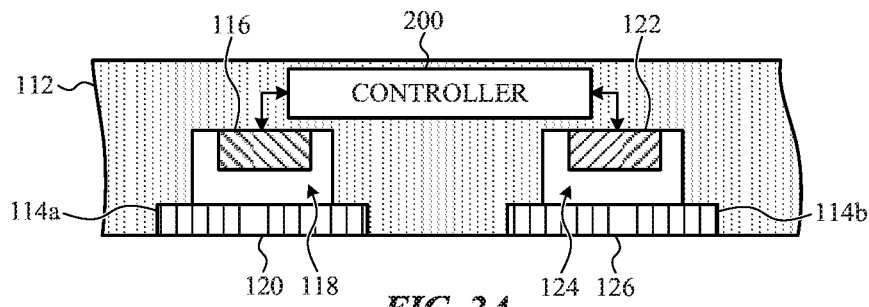


FIG. 2A

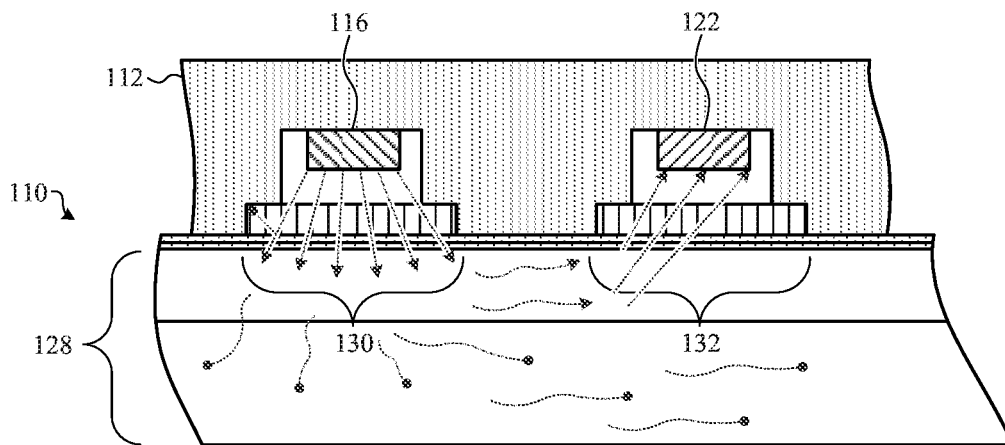


FIG. 2B

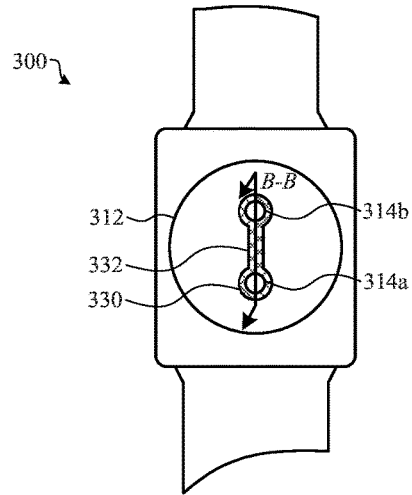


FIG. 3A

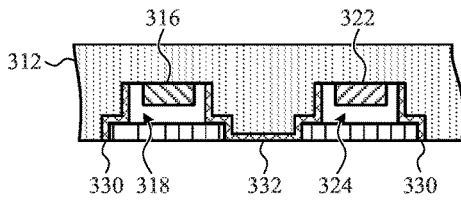


FIG. 3B

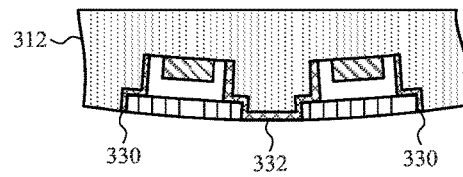


FIG. 3C

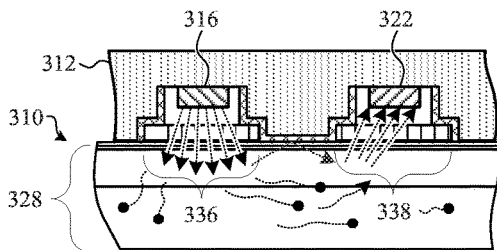


FIG. 3D

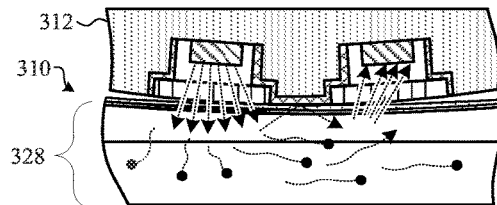


FIG. 3E

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.