

***Apple Inc. v AliveCor,***

**IPR2021-00970**

**IPR2021-00971**

**IPR2021-00972**

**U.S. Patent Nos. 9,572,499; 10,595,499**

**Patent Owner's Demonstration**

# '499 and '731 Patents – Background

- The '499 and '731 patents describe arrhythmia detection through a combination of PPG detection, ECG confirmation, and

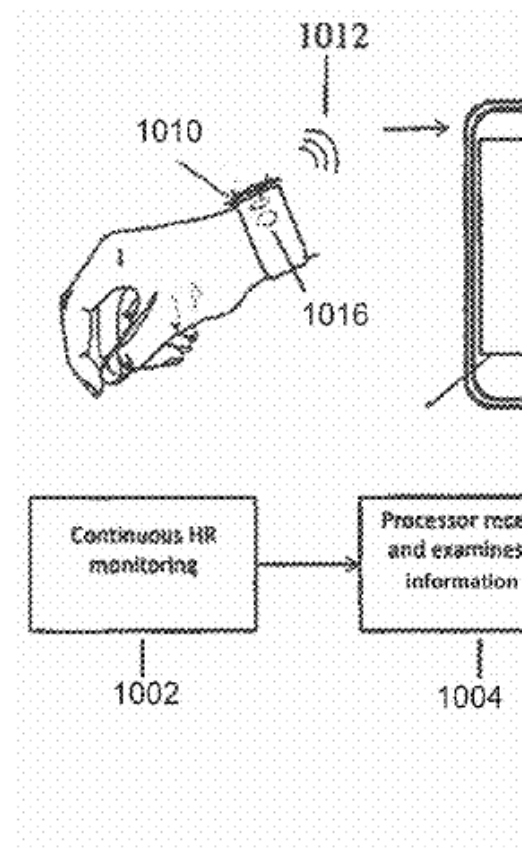
## (12) United States Patent Gopalakrishnan et al.

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### (54) METHODS AND SYSTEMS FOR ARRHYTHMIA TRACKING AND SCORING

#### (57) ABSTRACT

A dashboard centered around **arrhythmia or atrial fibrillation tracking** is provided. The dashboard includes a heart or cardiac health score that can be calculated in response to data from the user such as their ECG and other personal information and cardiac health influencing factors. The dashboard also provides to the user recommendations or goals, such as daily goals, for the user to meet and thereby improve their heart or cardiac health score. These goals and recommendations may be set by the user or a medical professional and routinely updated as his or her heart or cardiac health score improves or otherwise changes. The dashboard is generally displayed from an application provided on a smartphone or tablet computer of the user.



## '731 Patent Claims

1. A smart watch to detect the presence of an arrhythmia of a user, comprising:
  - a processing device;
  - a photoplethysmography (“PPG”) sensor operatively coupled to the processing device;
  - an ECG sensor, comprising two or more ECG electrodes, the ECG sensor operatively coupled to the processing device;
  - a display operatively coupled to the processing device; and
  - a memory, operatively coupled to the processing device, the memory having instructions stored thereon that, when executed by the processing device, cause the processing device to:
    - receive PPG data from the PPG sensor;
    - detect, based on the PPG data, the presence of an arrhythmia;
    - receive ECG data from the ECG sensor; and
    - confirm the presence of the arrhythmia based on the ECG data.

3. The smart watch to detect the presence of the arrhythmia, comprising:
  - a processing device, configured to input the PPG data;
  - a memory, operatively coupled to the processing device, trained to detect the presence of the arrhythmia based on the PPG data;

## '499 Patent Claims

1. A method of determining a presence of an arrhythmia of a first user, said method comprising sensing a heart rate of said first user with a heart rate sensor coupled to said first user; transmitting said heart rate of said first user to a mobile computing device, wherein said mobile computing device is configured to sense an electrocardiogram; determining, using said mobile computing device, a heart rate variability of said first user based on said heart rate of said first user; sensing an activity level of said first user with a motion sensor; comparing, using said mobile computing device, said heart rate variability of said first user to said activity level of said first user; and alerting said first user to sense an electrocardiogram of said first user, using said mobile computing device, in response to an irregularity in said heart rate variability of said first user.

7. The method of claim 1, wherein said determining a presence of an arrhythmia of said first user is performed using said algorithm.

# Challenged Patents: AliveCor's Invention

Cardiovascular diseases are the leading cause of death in the world. In 2008, 30% of all global death can be attributed to cardiovascular diseases. It is also estimated that by 2030, over 23 million people will die from cardiovascular diseases annually. Cardiovascular diseases are prevalent in the populations of high-income and low-income countries alike.

IPR2021-00971 POR at 4  
Ex. 1001 ('731 Patent) at 1:34-39  
Ex. 1001 ('499 Patent) at 1:25-30.

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