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(54) **METHODS AND SYSTEMS FOR POWER OPTIMIZATION IN A MEDICAL DEVICE**

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This patent is subject to a terminal disclaimer.

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(51) **Int. Cl.**

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(52) **U.S. Cl.**

CPC **A61B 5/7285** (2013.01); **A61B 5/021** (2013.01); **A61B 5/02416** (2013.01); **A61B 5/02433** (2013.01); **A61B 5/14551** (2013.01)

(58) **Field of Classification Search**

CPC A61B 5/021; A61B 5/02416; A61B 5/14551; A61B 5/7285
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,343,818 A 9/1994 McCarthy et al.
5,349,952 A 9/1994 McCarthy et al.
5,351,685 A 10/1994 Potratz

5,485,847 A 1/1996 Baker, Jr.
5,515,847 A 5/1996 Braig et al.
5,560,355 A 10/1996 Merchant et al.
5,575,284 A 11/1996 Athan et al.
5,590,652 A 1/1997 Inai
5,746,697 A 5/1998 Swedlow et al.
5,766,127 A 6/1998 Pologe et al.
5,846,190 A 12/1998 Woehrl
5,924,979 A 7/1999 Swedlow et al.
6,005,658 A 12/1999 Kaluza et al.

(Continued)

FOREIGN PATENT DOCUMENTS

WO WO 2006/080856 8/2006
WO WO 2006/083180 8/2006

OTHER PUBLICATIONS

Takada, H. et al., "Acceleration Plethysmography to Evaluate Aging Effect in Cardiovascular System," Medical Progress Through Technology, vol. 21, pp. 205-210, 1997.

(Continued)

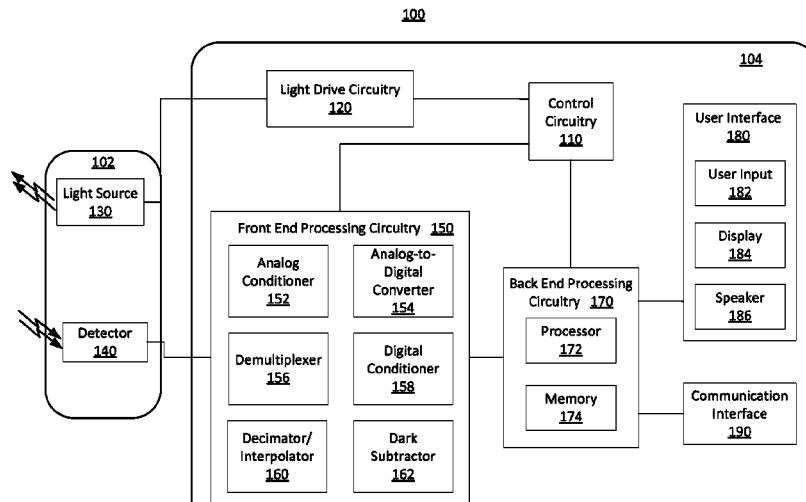
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(57) **ABSTRACT**

A physiological monitoring system may use photonic signals to determine physiological parameters. The system may vary parameters of a light drive signal used to generate the photonic signal from a light source such that power consumption is reduced or optimized. Parameters may include light intensity, firing rate, duty cycle, other suitable parameters, or any combination thereof. In some embodiments, the system may use information from a first light source to generate a light drive signal for a second light source. In some embodiments, the system may vary parameters in a way substantially synchronous with physiological pulses, for example, cardiac pulses. In some embodiments, the system may vary parameters in response to an external trigger.

32 Claims, 30 Drawing Sheets



(56)

References Cited

U.S. PATENT DOCUMENTS

6,217,523 B1 4/2001 Amano et al.
6,226,539 B1 5/2001 Potratz
6,697,655 B2 2/2004 Sueppel et al.
6,697,658 B2 2/2004 Al-Ali
6,731,967 B1 5/2004 Turcott
6,863,652 B2 3/2005 Huang et al.
6,912,413 B2 6/2005 Rantala et al.
7,003,339 B2 2/2006 Diab et al.
7,120,479 B2 10/2006 Chew et al.
7,162,288 B2 1/2007 Nordstrom et al.
7,295,866 B2 11/2007 Al-Ali
7,382,247 B2 6/2008 Welch et al.

7,623,990 B2 11/2009 Anderson et al.
2005/0084202 A1 4/2005 Smith et al.
2005/0109339 A1 5/2005 Stahmann et al.
2006/0264720 A1 11/2006 Chew et al.
2007/0038049 A1 2/2007 Huang
2007/0149871 A1 6/2007 Sarussi et al.
2007/0208240 A1 9/2007 Nordstrom et al.
2011/0213397 A1 9/2011 Mathonnet
2011/0237911 A1 9/2011 Lamego et al.
2011/0245636 A1 10/2011 Li et al.

OTHER PUBLICATIONS

International Search Report and Written Opinion of the International Searching Authority for application No. PCT/US 2013/043338, mailed on Oct. 2, 2013.

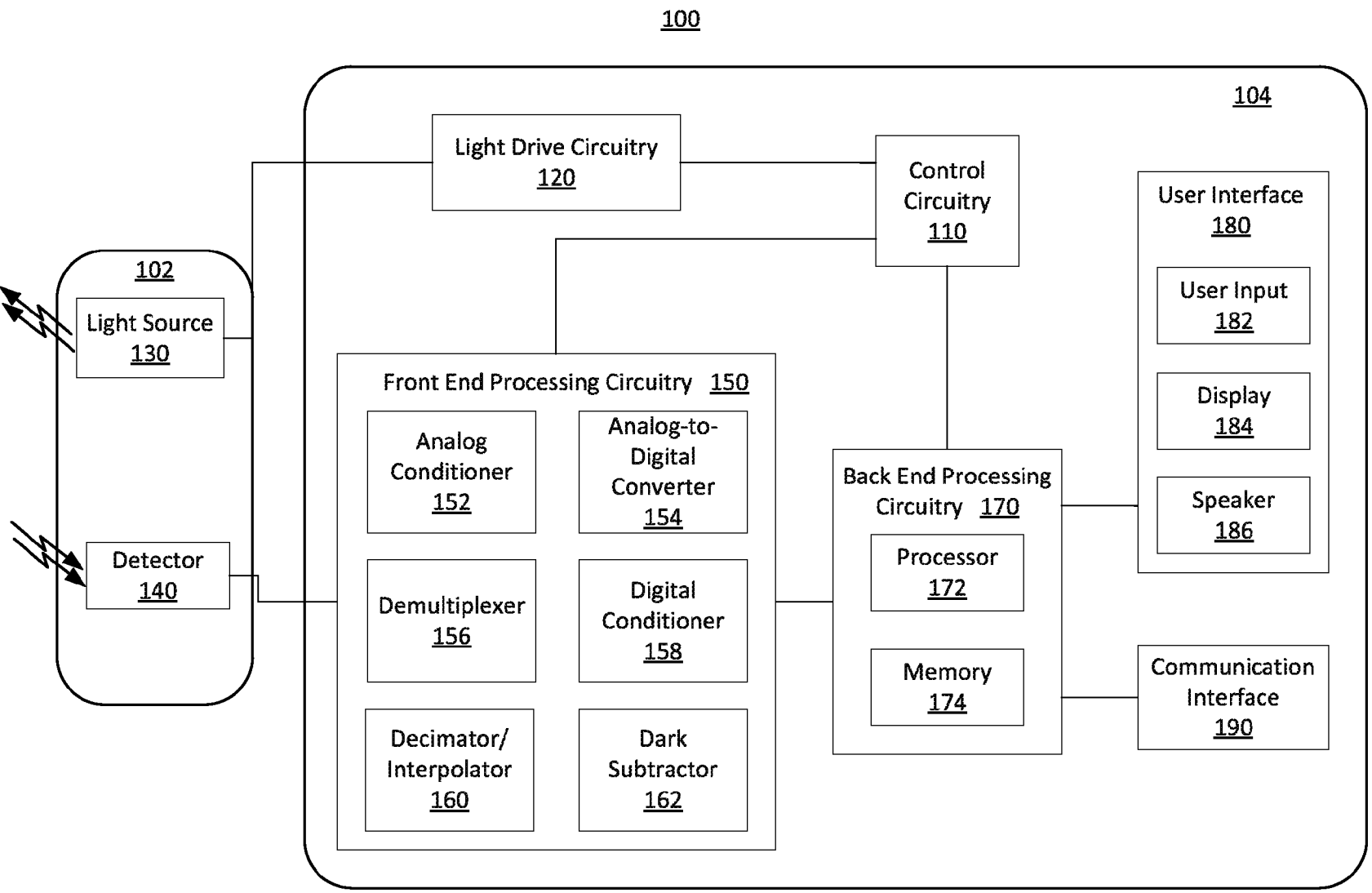


FIG. 1

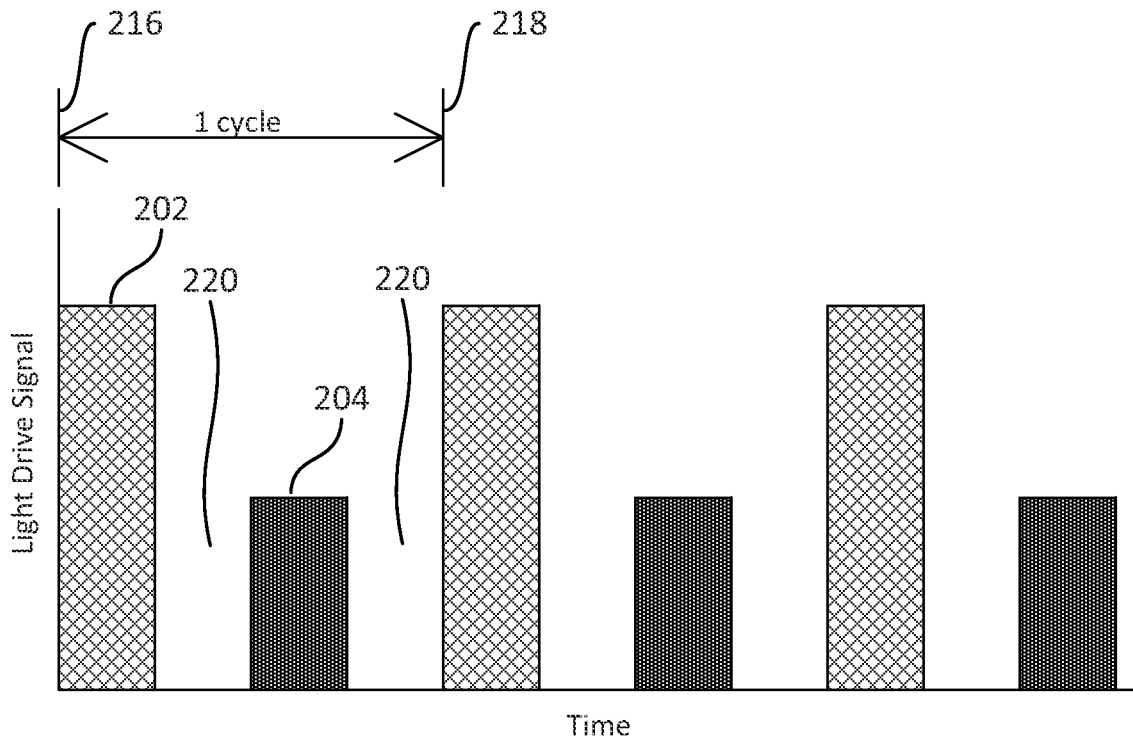


FIG. 2A

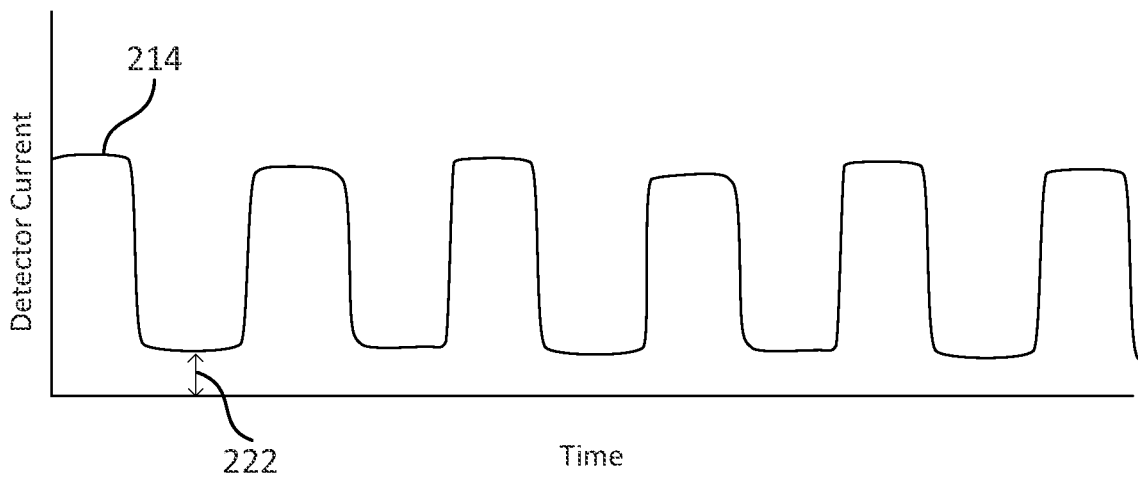


FIG. 2B

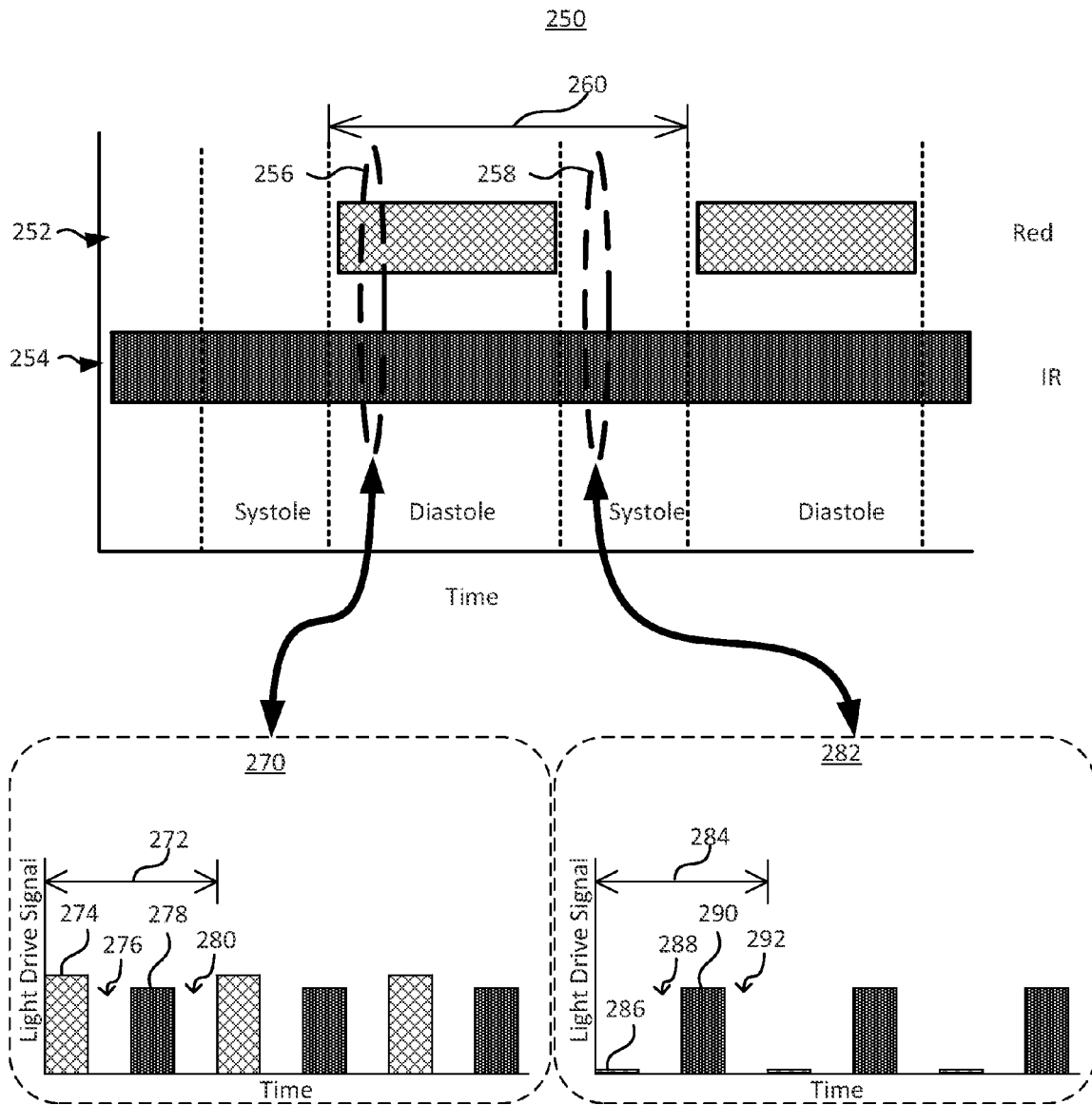


FIG. 2C

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