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(54) **NON-INVASIVE BLOOD COMPONENT MEASUREMENT SYSTEM**

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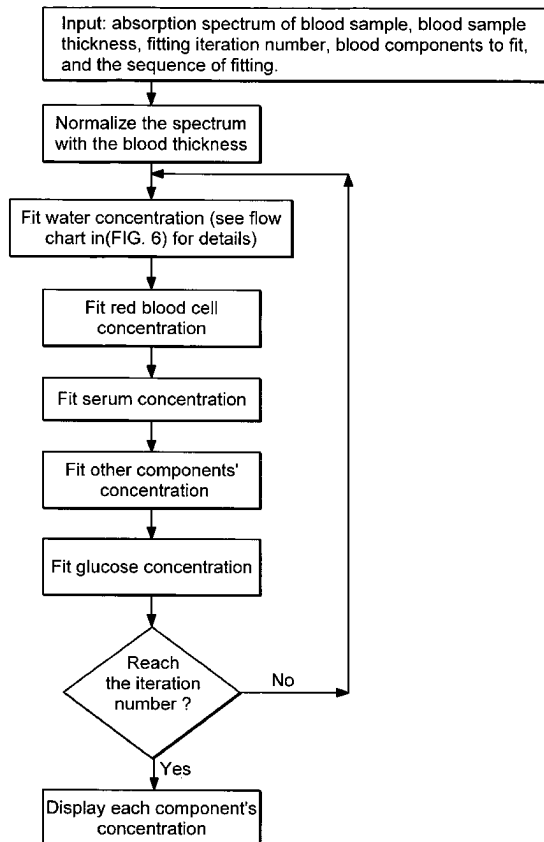(21) Appl. No.: **11/048,005**

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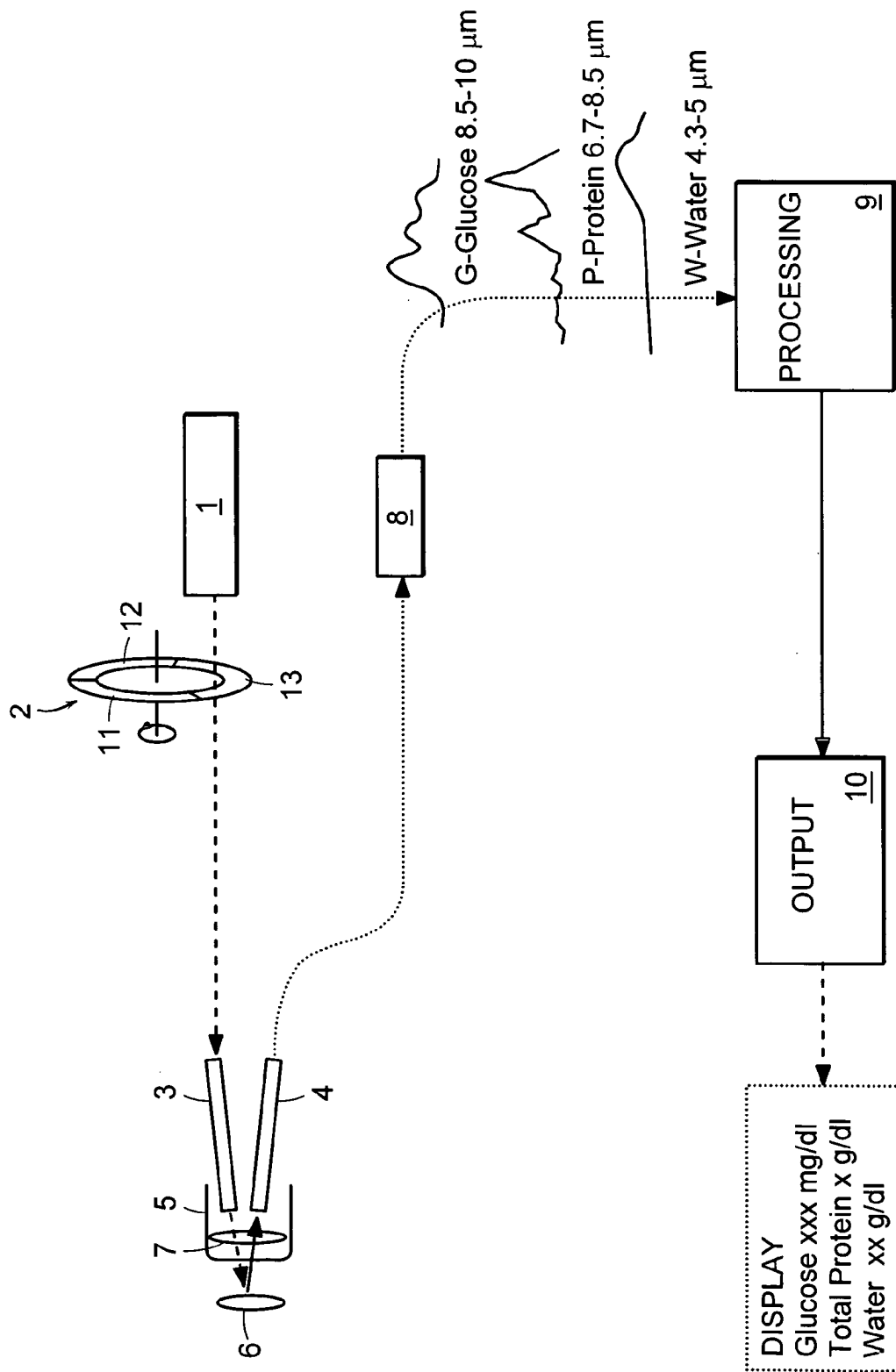
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(57) **ABSTRACT**

Non-invasive, optical apparatus and methods for the direct measurement of hemoglobin derivatives and other analyte concentration levels in blood using diffuse reflection and transmission spectroscopy in the wavelength region 400-1350 nm which includes the transparent tissue window from approximately 610 to 1311 nanometers and, using diffuse reflection spectroscopy, the mid-infrared region from 4.3-12 microns in wavelength. Large area light collection techniques are utilized to provide a much larger pulsate signal than can be obtain with current sensor technology. Sensors used in separate or simultaneous precision measurements of both diffuse reflection and transmission, either separately or simultaneously, from pulsate, blood-perfused tissue for the subsequent determination of the blood analytes concentrations such as arterial blood oxygen saturation (SaO$_2$), carboxyhemoglobin (COHb), oxyhemoglobin (OHb), deoxyhemoglobin (dOHb), methemoglobin (metHb), water (H2O), hematocrit (HCT), glucose, cholesterol and proteins such as albumin and other analytes components.

FIG. 1

G-Glucose 8.5-10 μm

P-Protein 6.7-8.5 μm

W-Water 4.3-5 μm

PROCESSING
9

OUTPUT
10

DISPLAY
Glucose xxx mg/dl
Total Protein x g/dl
Water xx g/dl

1

8

2
11
12
13

3
4
5
6
7

Linear Variable Bandpass Filter
(Center Wavelength (CWL) Continuously
Changing in a Linear Fashion)

Intensity

CWL   Wavelength

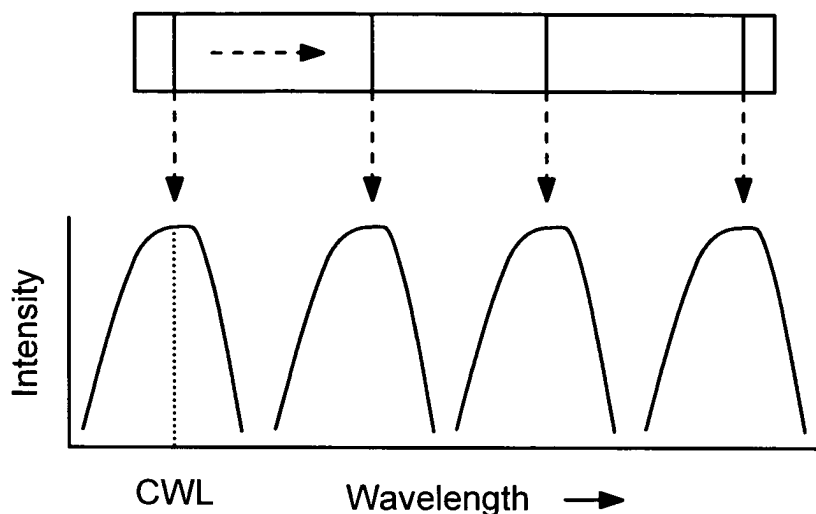FIG. 2A

Circular Variable Bandpass Filter
(Center Wavelength (CWL)
Continuously Changing in a
Circumferential Fashion)

Intensity

CWL   Wavelength
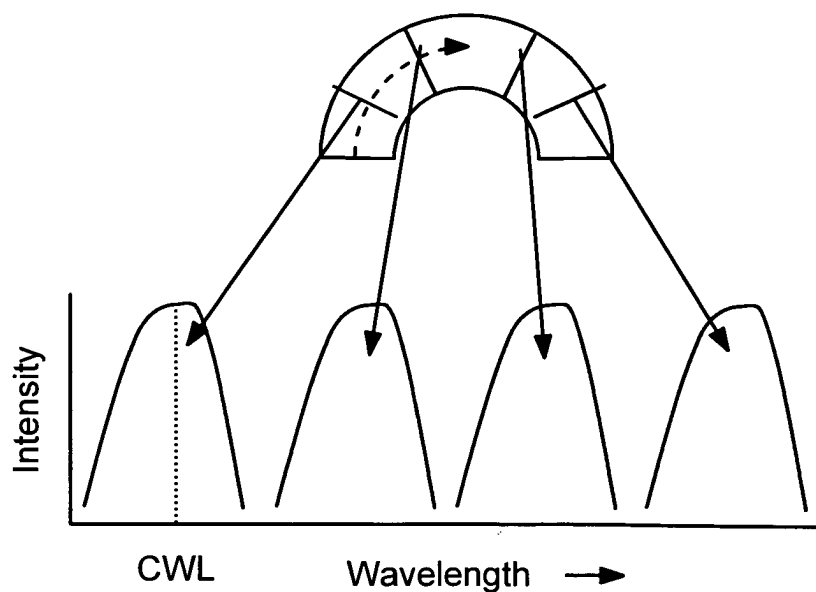
FIG. 2B

Discrete Bandpass Filters
(Each Filter Separate and Mounted in Wheel)

CWL   Wavelength

FIG. 2C

Stage II

I_s

Systolic

I_d

Diastolic

$I_{blood} = I_d - I_s$

Stage III

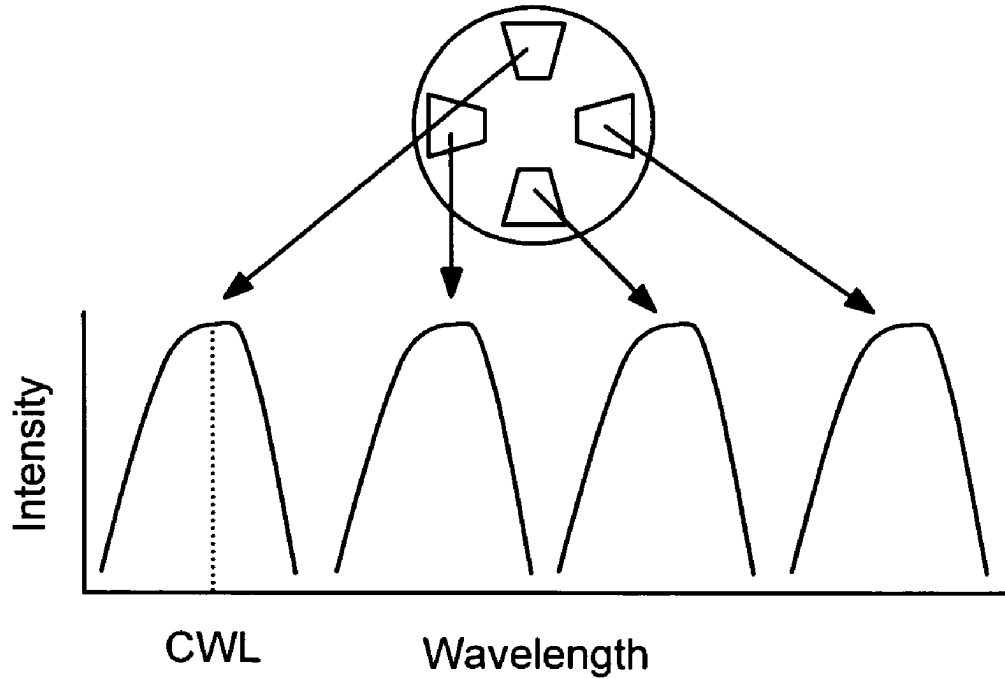I

I_c

Clamp
Device

$I_{blood} = I_c - I$

FIG. 3

DOCKET ALARM
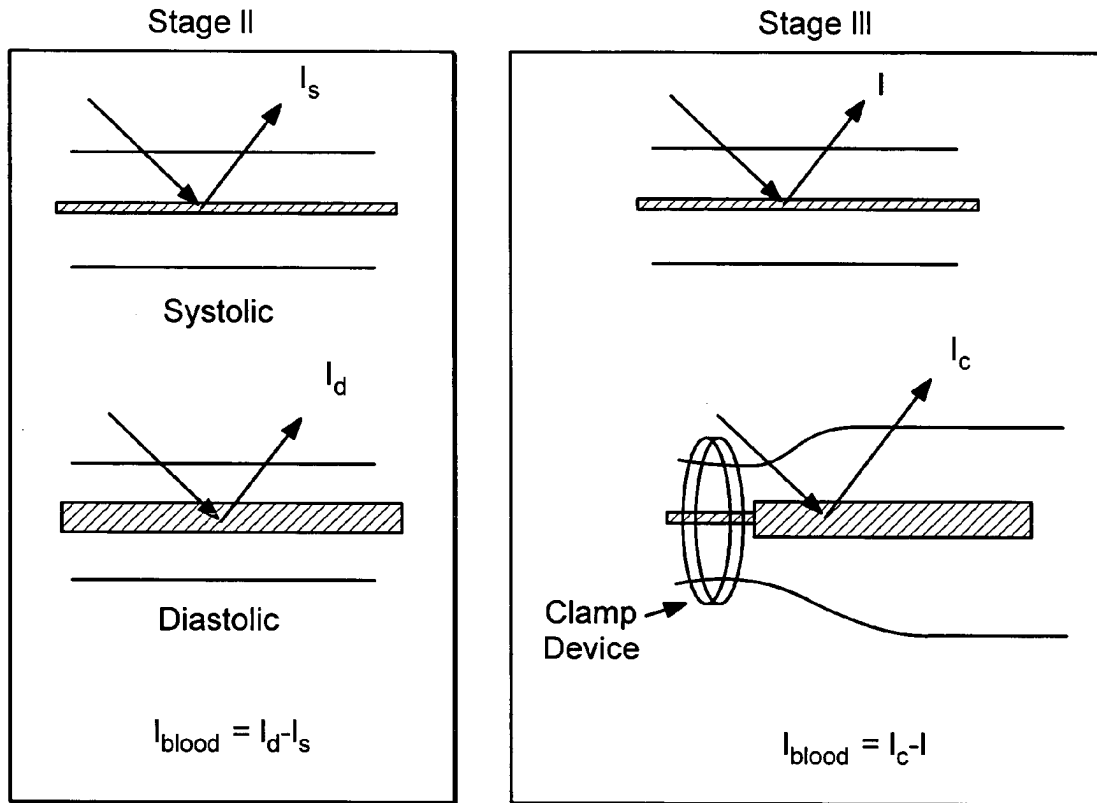
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