

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SOTERA WIRELESS, INC.
Petitioner

v.

MASIMO CORPORATION
Patent Owner

Patent No. 9,788,735
Issue Date: October 17, 2017
Title: BODY WORN MOBILE MEDICAL PATIENT MONITOR

Inter Partes Review No. IPR2020-00954

**DECLARATION OF GEORGE E. YANULIS
IN SUPPORT OF PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 9,788,735**

TABLE OF CONTENTS

	<u>Page</u>
I. INTRODUCTION	1
II. BACKGROUND AND QUALIFICATIONS	2
A. Education and Work Experience.....	2
B. Engagement	6
III. MATERIALS CONSIDERED	7
IV. OVERVIEW OF THE PATENT AT ISSUE	8
V. LEVEL OF ORDINARY SKILL IN THE ART	11
A. Legal Principles	11
1. A Person Having Ordinary Skill in the Art.....	11
B. Opinion as to the Level of a Person Having Ordinary Skill in the Art of the '735 Patent	12
VI. CLAIM CONSTRUCTION	14
A. Legal Principles	14
B. Opinion of Claim Construction	14
VII. SUMMARY OF THE PRIOR ART	15
A. Goldberg	15
B. Kiani	16
C. Money	17
D. Akai	18
E. Fujisaki	19
F. Estep	19
VIII. OPINION ON GROUNDS OF UNPATENTABILITY	20
A. Legal Principles	20
B. Ground 1: Claims 1-2 and 7-9 are unpatentable under 35 U.S.C. § 103(a) as obvious in view of Goldberg and Kiani and Money	23
1. Independent Claim 1	24
a. “A body worn mobile medical monitoring device configured to minimize cable wiring from a sensor	

	by placement of one or more sensor communication ports, the mobile medical monitoring device comprising:”	24
b.	“a housing configured to be secured on a lower arm of a patient being monitored via a strap extending around the lower arm of the patient;”	27
c.	“a display positioned on a face of the housing, opposite the strap, so as to be visible to a user;”	28
d.	“a first sensor communication port positioned on a side of the housing and configured to face a hand of the lower arm of the patient when the mobile medical monitoring device is mounted to the lower arm of the patient, wherein: the side of the housing faces the hand of the lower arm of the patient of the patient when the mobile medical monitoring device is mounted to the lower arm of the patient,”	29
e.	“the first sensor communication port is configured to provide wired communication with a pulse oximetry sensor attached to a digit of the hand of the patient,” ...	33
f.	“the wired communication with the pulse oximetry sensor provided at least partly in the analog domain, and”	34
g.	“the first sensor communication port is positioned on the side of the housing such that a path from the first sensor communication port on the side of the housing to the digit of the patient is substantially perpendicular to the side of the housing and shorter than any other path from any other side of the housing to the digit of the patient;”	36
h.	“a plurality of additional sensor communications ports positioned on the housing and configured to provide wired communication with a plurality of additional physiological sensors at least partly in the digital domain; and”	38
i.	“one or more processors and a transmitter configured to:”	44

j.	“display, on the display, physiological measurements derived from the pulse oximetry sensor and the plurality of additional physiological sensors; and”	44
k.	“wirelessly transmit information indicative of the physiological measurements to a remote computing device.”	45
2.	Dependent Claim 2: “The mobile medical monitoring device of claim 1, wherein the wired communication with the pulse oximetry sensor is provided via a tail extending from the pulse oximetry sensor.”	45
3.	Dependent Claim 7: “The mobile medical monitoring device of claim 1, wherein the face of the housing comprises a single user interface.”	46
4.	Dependent Claim 8: “The mobile medical monitoring device of claim 7, wherein the single user interface comprises the display.”	46
5.	Dependent Claim 9:	47
a.	“The mobile medical monitoring device of claim 8, wherein: the housing comprises a back side that is opposite the face of the housing,”	47
b.	“the strap is mountable to the back side of the housing, and”	48
c.	“the face of the housing is raised from the strap and the lower arm of the patient to enable positioning of the first sensor communication port on the side of the housing between the lower arm of the patient and the face of the housing.”	50
C.	Ground 2: Claims 3-6 and 13-19 are unpatentable under 35 U.S.C. § 103(a) in view of Goldberg, Kiani, Money, and Fujisaki	50
1.	Dependent Claim 3: “The mobile medical monitoring device of claim 2, wherein the tail comprises a cable that is configured to be removably attachable to the first sensor communication port.”	51
2.	Dependent Claim 4: “The mobile medical monitoring device of claim 3, wherein a length of the cable corresponds to the	

	path from the sensor communication port on the side of the housing to the digit of the patient.”.....	53
3.	Dependent Claim 5: “The mobile medical monitoring device of claim 3, wherein the cable is appropriately sized based on the path from the sensor communication port on the side of the housing to the digit of the patient.”.....	54
4.	Dependent Claim 6: “The mobile medical monitoring device of claim 3, wherein the path from the sensor communication port on the side of the housing to the digit of the patient runs at least partly along a backside of the hand of the patient.”	55
5.	Independent Claim 13:.....	56
a.	“A body worn, battery-powered medical monitoring device configured to provide on-patient and remote monitoring of patient physiological parameters, the medical monitoring device comprising:”	56
b.	“a battery configured to provide power to the medical monitoring device such that the medical monitoring device may operate without a wired power connection;” ..	57
c.	“a case configured to house the battery;”	57
d.	“a strap configured to attach the case to an arm of a patient and be mountable to the case;”	57
e.	“a first communications port positioned on a face of a side of the case configured to be nearest to a hand of the arm of the patient when the case is mounted to the arm of the patient,”	58
f.	“the first communications port configured to removably couple with a cable of a finger- or thumb-type pulse oximetry sensor and positioned on the face of the side of the case to provide a path from the first communications port to a digit of the hand of the patient that avoids tangling of the cable,”	58
g.	“the first communications port configured such that the cable perpendicularly extends from the face of the side of the case when the cable is coupled to the first communications port;”	60

h.	“a second communications port configured to provide wired communications with a second physiological sensor arrangement at least partly via digital communications;”	60
i.	“a third communications port configured to provide wired communications with a third physiological sensor arrangement;”	60
j.	“a display configured to provide real time measurements of patient physiological parameters based at least in part on data obtained from at least the pulse oximetry sensor via the first communications port; and”	60
k.	“a transmitter configured to wirelessly transmit information indicative of real time measurements of patient physiological parameters based at least in part on data obtained from the pulse oximetry sensor via the first communications port.”	61
6.	Dependent Claim 14: “The medical monitoring device of claim 13, wherein the path from the first communications port to a digit of the hand is shorter than any path from any communications port located on any other side of the case to the digit of the hand.”	61
7.	Dependent Claim 15:	62
a.	“The medical monitoring device of claim 13 further comprising: one or more hardware processors configured to:”	62
b.	“process the data obtained from the pulse oximetry sensor; and”	62
c.	“determine, based at least in part on the data, the real time measurements of patient physiological parameters.”	62
8.	Dependent Claim 16:	62
a.	“The medical monitoring device of claim 15, wherein: the one or more hardware processors are further configured to receive additional data from at least the second physiological sensor arrangement and the third physiological sensor arrangement;”	62

b.	“determine, based at least in part on the additional data, real time measurements of additional patient physiological parameters; and”	63
c.	“cause to be displayed, on the display, the real time measurements of additional patient physiological parameters; and”	63
d.	“the transmitter is further configured to: wirelessly transmit information indicative of real time measurements of additional patient physiological parameters based at least in part on the additional data.”	64
9.	Dependent Claim 17: “The medical monitoring device of claim 16, wherein the display is positioned on a front, user-facing side of the case to enable a user to view the real time measurements of patient physiological parameters and the real time measurements of additional patient physiological parameters.”	64
10.	Dependent Claim 18: “The medical monitoring device of claim 17, wherein the second physiological sensor arrangement comprises an EKG sensor arrangement and the third physiological sensor arrangement comprises a blood pressure sensor arrangement.”	65
11.	Dependent Claim 19:	66
a.	“The medical monitoring device of claim 18, wherein the first, second, and third communication ports are communicatively coupled to respective first, second, and third sensor interfaces; and”	66
b.	“the first, second, and third sensor interfaces are uniquely configured to receive signals from the respective pulse oximetry sensor, EKG sensor arrangement, and blood pressure sensor arrangement.” ...	68
D.	Ground 3: Claims 10-12 are unpatentable under 35 U.S.C. § 103(a) over Goldberg, Kiani, Money, and Estep.....	68
1.	Dependent Claim 10:	68
a.	“The mobile medical monitoring device of claim 9, wherein: the front side of the housing comprises a bezel and the display, and”	68

b.	“a top of the first sensor communication port is located below the face of the housing.”	70
2.	Dependent Claim 11: “The mobile medical monitoring device of claim 10, wherein the display is positioned centrally on the face of the housing.”	70
3.	Dependent Claim 12: “The mobile medical monitoring device of claim 11, wherein the display positioned on the face of the housing is sized such that the display covers most of a length of a shortest dimension of the face of the housing.”	71
E.	Ground 4: Claim 20 is unpatentable under 35 U.S.C. § 103(a) over Goldberg, Kiani, Money, Fujisaki, and Estep	71
1.	Independent Claim 20:	72
a.	“A body worn portable patient monitoring device configured to provide on-patient and remote monitoring of patient physiological parameters, the portable patient monitoring device comprising:”	72
b.	“a pulse oximetry sensor configured to be wrapped around a digit of a patient, the pulse oximetry sensor including at least:”	72
c.	“a light emitter configured to emit light into a tissue site of the digit of the patient;”	72
d.	“a light detector configured output a first signal responsive to at least a portion of the emitted light after attenuation by tissue of the tissue site; and”	73
e.	“a cable extending from the pulse oximetry sensor and configured to electrically convey the first signal;”	74
f.	“a blood pressure sensor configured to output a second signal responsive to at least a blood pressure parameter of the patient;”	74
g.	“an additional sensor arrangement configured to output a third signal responsive to at least one additional physiological parameter of the patient other than blood pressure or oxygen saturation, the at least one additional physiological parameter including at least one of: temperature or respiration rate;”	74

- h. “a housing configured to be secured to a lower arm of the patient, the housing having a size and shape configured to be secured to the lower arm of the patient;”75
- i. “a strap mountable to the back side of the housing, the strap configured to secure the housing to the lower arm of the patient;”75
- j. “a display positioned on a front side of the housing that is opposite a back side of the housing, the display configured to show a status of the portable patient monitoring device and one or more parameter measurements so as to be viewable by a user,”75
- k. “wherein the display is positioned centrally on the front side of the display and is sized such that the display spans most of a length of a shortest dimension of the front side of the housing, and”79
- l. “wherein the front side of the housing comprises a single user interface and a bezel;”79
- m. “one or more user input mechanisms configured to control an operational mode of the portable patient monitoring device in response to inputs from a user;”79
- n. “a first sensor port positioned on a face of a first side of the housing, wherein: the face of the first side of the housing is configured to face toward a hand having the digit of the patient under measurement when the housing is secured to the lower arm of the patient,”79
- o. “the first sensor port is configured to removably physically couple with the pulse oximetry sensor via the cable and to electrically receive the first signal from the pulse oximetry sensor,”80
- p. “the cable is configured to run from the first sensor port, at least part way along a path substantially perpendicular to the face of the first side of the housing, down the arm of the patient, and to the digit of the patient to which the pulse oximetry sensor is configured to be wrapped around,”80

- q. “the front side of the housing is raised from the strap and the lower arm of the patient to enable positioning of the first sensor port on the first side of the housing between the lower arm of the patient and the front side of the housing, and”80
- r. “a top of the first sensor port is located below the front of the housing;”80
- s. “a second sensor port positioned on the housing and configured to provide wired electrical communication with the blood pressure sensor arrangement and to electrically receive second signal from the blood pressure sensor arrangement;”80
- t. “a third sensor port positioned on the housing and configured to provide electrical wired communication with the additional sensor arrangement and to electrically receive the third signal from the additional sensor arrangement;”81
- u. “a rechargeable battery positioned within the housing and configured to power the portable patient monitoring device such that the portable patient monitoring device is portable and wearable by the patient;”81
- v. “one or more signal processing arrangements positioned within the housing and configured to:”81
- w. “receive the first signal from the pulse oximetry sensor via one or more sensor interfaces,”82
- x. “wherein the first signal is provided at least partly as an analog signal;”82
- y. “process the first signal from the pulse oximetry sensor to determine measurements of oxygen saturation and pulse rate;”82
- z. “receive the second signal from the blood pressure sensor arrangement via the one or more sensor interfaces, the second signal responsive to at least a blood pressure parameter of the patient;”84
- aa. “receive the third signal from the additional sensor arrangement via the one or more sensor interfaces, the third signal responsive to the at least one additional

	physiological parameter of the patient including at least one of: temperature or respiration rate,”	85
bb.	“wherein the third signal is provided at least partly as a digital signal; and”	85
cc.	“cause the measurements of oxygen saturation, pulse rate, blood pressure, and the at least one additional physiological parameter to all be displayed on the display of the portable patient monitoring device; and” ...	86
dd.	“a transmitter positioned within the housing and configured to:”	86
ee.	“wirelessly transmit a transmit signal including the information indicating the measurements of oxygen saturation, pulse rate, blood pressure, and the at least one additional physiological parameter to a separate computing device configured to display, on a remote display, the measurements of oxygen saturation, pulse rate, blood pressure, and the at least one additional physiological parameter.”	87
F.	Ground 5: Claims 1-2 and 7-9 are unpatentable under 35 U.S.C. § 103(a) as obvious in view of Money, Akai, and Kiani	87
1.	Independent Claim 1	88
a.	“A body worn mobile medical monitoring device configured to minimize cable wiring from a sensor by placement of one or more sensor communication ports, the mobile medical monitoring device comprising:”	88
b.	“a housing configured to be secured on a lower arm of a patient being monitored via a strap extending around the lower arm of the patient;”	92
c.	“a display positioned on a face of the housing, opposite the strap, so as to be visible to a user;”	94
d.	“a first sensor communication port positioned on a side of the housing and configured to face a hand of the lower arm of the patient when the mobile medical monitoring device is mounted to the lower arm of the patient, wherein: the side of the housing faces the hand of the lower arm of the patient of the patient	

	when the mobile medical monitoring device is mounted to the lower arm of the patient,”95
e.	“the first sensor communication port is configured to provide wired communication with a pulse oximetry sensor attached to a digit of the hand of the patient,”...99
f.	“the wired communication with the pulse oximetry sensor provided at least partly in the analog domain, and”100
g.	“the first sensor communication port is positioned on the side of the housing such that a path from the first sensor communication port on the side of the housing to the digit of the patient is substantially perpendicular to the side of the housing and shorter than any other path from any other side of the housing to the digit of the patient;”100
h.	“a plurality of additional sensor communications ports positioned on the housing and configured to provide wired communication with a plurality of additional physiological sensors at least partly in the digital domain; and”102
i.	“one or more processors and a transmitter configured to:”107
j.	“display, on the display, physiological measurements derived from the pulse oximetry sensor and the plurality of additional physiological sensors; and”108
k.	“wirelessly transmit information indicative of the physiological measurements to a remote computing device.”108
2.	Dependent Claim 2: “The mobile medical monitoring device of claim 1, wherein the wired communication with the pulse oximetry sensor is provided via a tail extending from the pulse oximetry sensor.”109
3.	Dependent Claim 7: “The mobile medical monitoring device of claim 1, wherein the face of the housing comprises a single user interface.”109

4.	Dependent Claim 8: “The mobile medical monitoring device of claim 7, wherein the single user interface comprises the display.”	109
5.	Dependent Claim 9:	110
a.	“The mobile medical monitoring device of claim 8, wherein: the housing comprises a back side that is opposite the face of the housing,”	110
b.	“the strap is mountable to the back side of the housing, and”	111
c.	“the face of the housing is raised from the strap and the lower arm of the patient to enable positioning of the first sensor communication port on the side of the housing between the lower arm of the patient and the face of the housing.”	112
G.	Ground 6: Claims 3-6 and 13-19 are unpatentable under 35 U.S.C. § 103(a) in view of Goldberg, Kiani, Money, and Fujisaki	113
1.	Dependent Claim 3: “The mobile medical monitoring device of claim 2, wherein the tail comprises a cable that is configured to be removably attachable to the first sensor communication port.”	113
2.	Dependent Claim 4: “The mobile medical monitoring device of claim 3, wherein a length of the cable corresponds to the path from the sensor communication port on the side of the housing to the digit of the patient.”	115
3.	Dependent Claim 5: “The mobile medical monitoring device of claim 3, wherein the cable is appropriately sized based on the path from the sensor communication port on the side of the housing to the digit of the patient.”	116
4.	Dependent Claim 6: “The mobile medical monitoring device of claim 3, wherein the path from the sensor communication port on the side of the housing to the digit of the patient runs at least partly along a backside of the hand of the patient.” ...	117
5.	Independent Claim 13:	118
a.	“A body worn, battery-powered medical monitoring device configured to provide on-patient and remote	

	monitoring of patient physiological parameters, the medical monitoring device comprising;”	118
b.	“a battery configured to provide power to the medical monitoring device such that the medical monitoring device may operate without a wired power connection;”	119
c.	“a case configured to house the battery;”	119
d.	“a strap configured to attach the case to an arm of a patient and be mountable to the case;”	119
e.	“a first communications port positioned on a face of a side of the case configured to be nearest to a hand of the arm of the patient when the case is mounted to the arm of the patient,”	119
f.	“the first communications port configured to removably couple with a cable of a finger- or thumb-type pulse oximetry sensor and positioned on the face of the side of the case to provide a path from the first communications port to a digit of the hand of the patient that avoids tangling of the cable,”	120
g.	“the first communications port configured such that the cable perpendicularly extends from the face of the side of the case when the cable is coupled to the first communications port;”	121
h.	“a second communications port configured to provide wired communications with a second physiological sensor arrangement at least partly via digital communications;”	122
i.	“a third communications port configured to provide wired communications with a third physiological sensor arrangement;”	122
j.	“a display configured to provide real time measurements of patient physiological parameters based at least in part on data obtained from at least the pulse oximetry sensor via the first communications port; and”	122
k.	“a transmitter configured to wirelessly transmit information indicative of real time measurements of patient physiological parameters based at least in part	

	on data obtained from the pulse oximetry sensor via the first communications port.”	123
6.	Dependent Claim 14: “The medical monitoring device of claim 13, wherein the path from the first communications port to a digit of the hand is shorter than any path from any communications port located on any other side of the case to the digit of the hand.”	123
7.	Dependent Claim 15:	124
	a. “The medical monitoring device of claim 13 further comprising one or more hardware processors configured to:”	124
	b. “process the data obtained from the pulse oximetry sensor; and”	124
	c. “determine, based at least in part on the data, the real time measurements of patient physiological parameters.”	124
8.	Dependent Claim 16:	124
	a. “The medical monitoring device of claim 15, wherein: the one or more hardware processors are further configured to receive additional data from at least the second physiological sensor arrangement and the third physiological sensor arrangement;”	124
	b. “determine, based at least in part on the additional data, real time measurements of additional patient physiological parameters; and”	125
	c. “cause to be displayed, on the display, the real time measurements of additional patient physiological parameters; and”	125
	d. “the transmitter is further configured to wirelessly transmit information indicative of real time measurements of additional patient physiological parameters based at least in part on the additional data.”	125
9.	Dependent Claim 17: “The medical monitoring device of claim 16, wherein the display is positioned on a front, user-facing side of the case to enable a user to view the real time measurements of patient physiological parameters and the	

	real time measurements of additional patient physiological parameters.”	126
10.	Dependent Claim 18: “The medical monitoring device of claim 17, wherein the second physiological sensor arrangement comprises an EKG sensor arrangement and the third physiological sensor arrangement comprises a blood pressure sensor arrangement.”	127
11.	Dependent Claim 19:	127
	a. “The medical monitoring device of claim 18, wherein the first, second, and third communication ports are communicatively coupled to respective first, second, and third sensor interfaces; and”	127
	b. “the first, second, and third sensor interfaces are uniquely configured to receive signals from the respective pulse oximetry sensor, EKG sensor arrangement, and blood pressure sensor arrangement.”	127
H.	Ground 7: Claims 10-12 are unpatentable under 35 U.S.C. § 103(a) over Goldberg, Kiani, Money, and Estep.....	128
1.	Dependent Claim 10:	128
	a. “The mobile medical monitoring device of claim 9, wherein: the front side of the housing comprises a bezel and the display, and”	128
	b. “a top of the first sensor communication port is located below the face of the housing.”	129
2.	Dependent Claim 11: “The mobile medical monitoring device of claim 10, wherein the display is positioned centrally on the face of the housing.”	129
3.	Dependent Claim 12: “The mobile medical monitoring device of claim 11, wherein the display positioned on the face of the housing is sized such that the display covers most of a length of a shortest dimension of the face of the housing.”	130
I.	Ground 8: Claim 20 is unpatentable under 35 U.S.C. § 103(a) over Goldberg, Kiani, Money, Fujisaki, and Estep.....	131
1.	Independent Claim 20:	132

- a. “A body worn portable patient monitoring device configured to provide on-patient and remote monitoring of patient physiological parameters, the portable patient monitoring device comprising:”132
- b. “a pulse oximetry sensor configured to be wrapped around a digit of a patient, the pulse oximetry sensor including at least:”132
- c. “a light emitter configured to emit light into a tissue site of the digit of the patient;”132
- d. “a light detector configured output a first signal responsive to at least a portion of the emitted light after attenuation by tissue of the tissue site; and”132
- e. “a cable extending from the pulse oximetry sensor and configured to electrically convey the first signal;”133
- f. “a blood pressure sensor configured to output a second signal responsive to at least a blood pressure parameter of the patient;”133
- g. “an additional sensor arrangement configured to output a third signal responsive to at least one additional physiological parameter of the patient other than blood pressure or oxygen saturation, the at least one additional physiological parameter including at least one of: temperature or respiration rate;”133
- h. “a housing configured to be secured to a lower arm of the patient, the housing having a size and shape configured to be secured to the lower arm of the patient;”133
- i. “a strap mountable to the back side of the housing, the strap configured to secure the housing to the lower arm of the patient;”134
- j. “a display positioned on a front side of the housing that is opposite a back side of the housing, the display configured to show a status of the portable patient monitoring device and one or more parameter measurements so as to be viewable by a user,”134
- k. “wherein the display is positioned centrally on the front side of the display and is sized such that the display

- spans most of a length of a shortest dimension of the front side of the housing, and”135
- l. “wherein the front side of the housing comprises a single user interface and a bezel;”135
 - m. “one or more user input mechanisms configured to control an operational mode of the portable patient monitoring device in response to inputs from a user;” ...135
 - n. “a first sensor port positioned on a face of a first side of the housing, wherein: the face of the first side of the housing is configured to face toward a hand having the digit of the patient under measurement when the housing is secured to the lower arm of the patient,”135
 - o. “the first sensor port is configured to removably physically couple with the pulse oximetry sensor via the cable and to electrically receive the first signal from the pulse oximetry sensor,”136
 - p. “the cable is configured to run from the first sensor port, at least part way along a path substantially perpendicular to the face of the first side of the housing, down the arm of the patient, and to the digit of the patient to which the pulse oximetry sensor is configured to be wrapped around,”136
 - q. “the front side of the housing is raised from the strap and the lower arm of the patient to enable positioning of the first sensor port on the first side of the housing between the lower arm of the patient and the front side of the housing, and”136
 - r. “a top of the first sensor port is located below the front of the housing;”136
 - s. “a second sensor port positioned on the housing and configured to provide wired electrical communication with the blood pressure sensor arrangement and to electrically receive second signal from the blood pressure sensor arrangement;”136
 - t. “a third sensor port positioned on the housing and configured to provide electrical wired communication with the additional sensor arrangement and to

	electrically receive the third signal from the additional sensor arrangement;”	137
u.	“a rechargeable battery positioned within the housing and configured to power the portable patient monitoring device such that the portable patient monitoring device is portable and wearable by the patient;”	137
v.	“one or more signal processing arrangements positioned within the housing and configured to:”	138
w.	“receive the first signal from the pulse oximetry sensor via one or more sensor interfaces,”	138
x.	“wherein the first signal is provided at least partly as an analog signal;”	138
y.	“process the first signal from the pulse oximetry sensor to determine measurements of oxygen saturation and pulse rate;”	138
z.	“receive the second signal from the blood pressure sensor arrangement via the one or more sensor interfaces, the second signal responsive to at least a blood pressure parameter of the patient;”	140
aa.	“receive the third signal from the additional sensor arrangement via the one or more sensor interfaces, the third signal responsive to the at least one additional physiological parameter of the patient including at least one of: temperature or respiration rate,”	141
bb.	“wherein the third signal is provided at least partly as a digital signal; and”	141
cc.	“cause the measurements of oxygen saturation, pulse rate, blood pressure, and the at least one additional physiological parameter to all be displayed on the display of the portable patient monitoring device; and”	141
dd.	“a transmitter positioned within the housing and configured to:”	142
ee.	“wirelessly transmit a transmit signal including the information indicating the measurements of oxygen saturation, pulse rate, blood pressure, and the at least one additional physiological parameter to a separate	

	computing device configured to display, on a remote display, the measurements of oxygen saturation, pulse rate, blood pressure, and the at least one additional physiological parameter.”	142
IX.	CONCLUSION.....	143

I, George E. Yanulis, offer this declaration in support of the Petition for *Inter Partes* Review of U.S. Patent No. 9,788,735 (“the ’735 patent”). I am over the age of 18, competent to make this declaration, and have personal knowledge of the facts set forth below. If called to testify, I could and would testify honestly, under oath, to the matters set forth herein.

I. INTRODUCTION

1. I am a technical expert in the field of biomedical engineering.
2. I have over 35 years of experience in biomedical engineering and designing medical devices. Particularly, I have direct experience within the field of wearable medical monitors that measure physiological parameters and transmit those measured parameters wirelessly to another device. My experience was related specifically to electrocardiograms, cardiac echo imaging, and cardiac pressure/volume analysis, which are closely related to pulse oximetry/oxygen saturation. Through my experience, I have learned how to integrate medical monitoring technology into the medical profession. Specifically, I am extremely familiarly and knowledgeable in the research and design of ablation catheters for the treatment of atrial flutter and atrial fibrillation. All-in-all, my experience directly relates to the ’735 Patent and the technology described therein.
3. I am not an attorney, and I have not been asked to offer any legal opinions. I have been informed and understand the law to be applied for

determining invalidity, which I explain in places below. I have applied the law told to me in developing my technical opinions in this Declaration.

II. BACKGROUND AND QUALIFICATIONS

A. Education and Work Experience

4. I am a Medical Device Design and Development/Research Engineer. I received my Bachelor of Arts in Pre-medicine degree in 1977 from Syracuse University, which included a minor in Chemistry. Originally, I planned to go to medical school, but I found that my interests aligned more closely to medical devices than practicing medicine. So, I pivoted to biomedical engineering, and I received a Master's Degree in Biomedical Engineering from the University of Virginia in 1981. I closely studied medical devices while in graduate school at Virginia, including using preamplifiers to record evoked cortical signals to better understand the etiology of Epilepsy.

5. For approximately the next two decades, my professional experience included serving in the armed services as a 1st Lieutenant and Clinical Engineer for the Air Force (stationed at the Malcolm Grow Medical Center, Andrews Air Force Base), working as a Logistics Engineer for RCA, and conducting research within the education industry (at Syracuse, Alabama-Birmingham, Drexel, and the University of Pennsylvania). I was a Clinical Engineering Consultant involved with the Y2K Program at the Hospitals of the University of Pennsylvania from

1999-2000. Importantly, I continued as a research assistant at the University of Pittsburgh, but in 2002, I decided to pursue a doctorate. Even though I was leaving, my mentor at Pitt awarded me a Master of Science in Bioengineering for my research work rather than leave without a degree. I studied medical devices at Pitt, but also implantable devices, such as using elastomeric polymers to design artificial diaphragm muscles.

6. Still continuing my education, I received a Doctor of Engineering (D.Eng.) from Cleveland State University in 2008. For my Doctorate, I focused on Applied Biomedical Engineering. It was during my Doctorate that I developed a specialty in cardiovascular medical devices and treatments, with a focus on treating atrial fibrillation. At Cleveland State, we studied electrical stimulation (i.e., coupled pacing applied near the end of the T-wave, which represents the repolarization of the ventricles in electrocardiography to prevent rapid ventricle conduction during atrial fibrillation (AF)), and whether the benefits of coupled pacing could be used during persistent AF.

7. Since obtaining my D.Eng., I have taught the next generation of bright minds. From 2009-2013, I was an adjunct professor at the College of Staten Island teaching Engineering and Physics, and since 2015, I have been an Adjunct Professor at Temple University teaching Bioengineering.

8. However, my focus has been on clinical assessment of medical devices and monitoring systems. For example, I am currently involved in the research and development of heart rate monitoring system based on my earlier bench studies conducted related to my Doctoral research at the Cleveland Clinic (2005-2008) and now with Medical Device Consulting, LLC (2016-Present). I have consulted on heart bypass systems (2017-2018), and I served as a consultant on several cardiac pacemaker device related cases, which involved monitoring heart rate, pulse rate, ECG. I was involved in reviewing critical monitoring systems as both a member and peer reviewer of submitted manuscripts of the association for the advancement of Medical Instrumentation (2012-present). At Cleveland State, I was involved in the review of critical care monitoring systems used for heart failure therapy patients both from 2005-2008, as part of my Ph.D. and since 2014, as part of my research and the development of a heart monitoring system. Further still, from 2015-2017, I was also involved in mentoring Temple bio-engineering students in the design of critical care monitoring systems for both a cardiac systems course and biomedical instrumentation design course. Finally, I was involved in reviewing clinical care monitoring systems as a clinical engineer with the USAF from 1987-1989.

9. I also have continued to study cardiovascular devices and other medical devices as a consultant. Particularly, I collaborated with Data Science

Corporation to design a device that used a time elapsed interval between two consecutive R-waves of the QRS heart signal (R-R interval) to potentially use on heart failure therapy patients. I have assisted with 250 Cardiac Pacemaker Device Implants on dogs to develop pacing algorithms for heart failure therapy patients. Also, I have performed over 500 ECG signal detection sessions and cardiac pressure-volume analysis on dogs. Further still, I have intensely studied Heart Failure Cardiac Pressure/Flow Sensor Monitoring Systems.

10. Specifically related to pulse oximetry monitoring systems, I conducted pulse oximetry research at the University of South Florida from 1996-1997 under the direction of John E. Scharf, MD, who is an anesthesiologist associated with the James A. Haley Veterans Hospital, Tampa, Florida. Also, my Research and Development on the prototype development of a heart rate monitoring system for Medical Device Consulting, LLC includes a means for monitoring both oxygen saturation and pulse rate with over-the-counter portable sensing devices (2016-present).

11. Lastly, I have written six peer-reviewed articles in this area and other areas of medical device development. My publications from the last 10 years are listed in my CV (EX1004).

12. Thus, my background demonstrates an expertise and strong understanding of medical devices and how they can improve the health of patients.

B. Engagement

13. I have been retained as an independent expert consultant by Sotera Wireless, Inc. (“Petitioner”) in connection with a petition for *inter partes* review of U.S. Patent No. 9,788,735 (“the ’735 Patent,” EX1001).

14. Specifically, I was asked to investigate and opine on the technology claimed in, and the patentability or unpatentability of certain claims of the ’735 Patent. Specifically, I was asked to opine on the validity of claims 1-20 (the “Challenged Claims”) of the ’735 Patent.

15. Although I am being compensated for my services in this matter at my standard consulting rate of \$540 per hour, my compensation is not contingent upon the opinions I render or the outcome of this proceeding. I have no financial interest in any of the parties, and I have no other interest in this proceeding.

16. This report is based on information currently available to me. I reserve the right to amend or supplement my analysis in this report and/or to respond to any additional submissions prepared by or on behalf of the Patent Owner. I also reserve the right to amend or supplement my opinions based on further discovery and information provided in the case.

17. I reserve the right to create any additional summaries, tutorials, demonstrations, charts, drawings, tables, and/or animations that may be appropriate to supplement and demonstrate my opinions as necessary.

18. All of the opinions stated in this report are based on my own personal knowledge and professional judgment.

III. **MATERIALS CONSIDERED**

19. I have considered the following list of materials in formulating my opinions in this matter:

Ex #	Exhibit
1001	U.S. Patent No. 9,788,735 (“the ’735 patent”)
1002	Prosecution History of the ’735 Patent
1005	U.S. Patent No. 6,840,904 to Goldberg (“Goldberg”)
1006	PCT Publication No. WO 00/42911 to Kiani et al. (“Kiani”)
1007	EP0880936A2 to Akai (“Akai”)
1008	U.S. Patent No. 5,919,141 to Money (“Money”)
1009	PCT Publication No. WO 99/13698 to Estep (“Estep”)
1010	’735 Patent File History Excerpt, Application as filed on April 27, 2017
1011	’735 Patent File History Excerpt, Preliminary Amendment filed May 22, 2017
1012	’735 Patent File History Excerpt, Pre-Interview Office Action issued July 3, 2017
1013	U.S. Patent No. 6,241,684 to Amano (“Amano”)
1014	’735 Patent File History Excerpt, Notice of Allowance with Examiner’s Amendment issued Aug. 28, 2017
1015	Masimo’s Adversary Complaint, United States Bankruptcy Court for the Southern District of California, <i>In re: Sotera Wireless, Inc.</i> , No. 16-05968-LT11, filed October 7, 2016
1016	U.S. Patent No. 4,425,921 to Fujisaki (“Fujisaki”)
1017	International Publication No. WO00/44274
1018	Japanese Publication No. JP0558122A, with English Machine Translation

1019	U.S. Patent No. 4,338,950
1020	U.S. Patent No. 4,450,843
1021	U.S. Patent No. 4,807,639
1022	U.S. Patent No. 5,539,706
1023	U.S. Patent No. 6,850,788 (Parent to '108 Patent)
1024	U.S. Patent No. 7,844,314 (Parent to '108 Patent)
1025	U.S. Patent No. 7,844,315 (Parent to '108 Patent)
1026	U.S. Patent No. 8,548,548 (Parent to '108 Patent)
1027	U.S. Patent No. 9,113,831 (Parent to '108 Patent)
1028	U.S. Patent No. 9,113,832 (Parent to '108 Patent)
1029	Masimo's Complaint for Patent Infringement against Sotera (ECF No. 1), filed June 12, 2019
1030	Service of Summons and Complaint upon Sotera (ECF No. 5)
1031	U.S. Patent No. 10,213,108 ("the '108 patent")

IV. OVERVIEW OF THE PATENT AT ISSUE

20. I have read and considered the '735 patent, filed April 27, 2017, as well as its prosecution history. I have been told that the '735 Patent has a priority date of March 25, 2002.

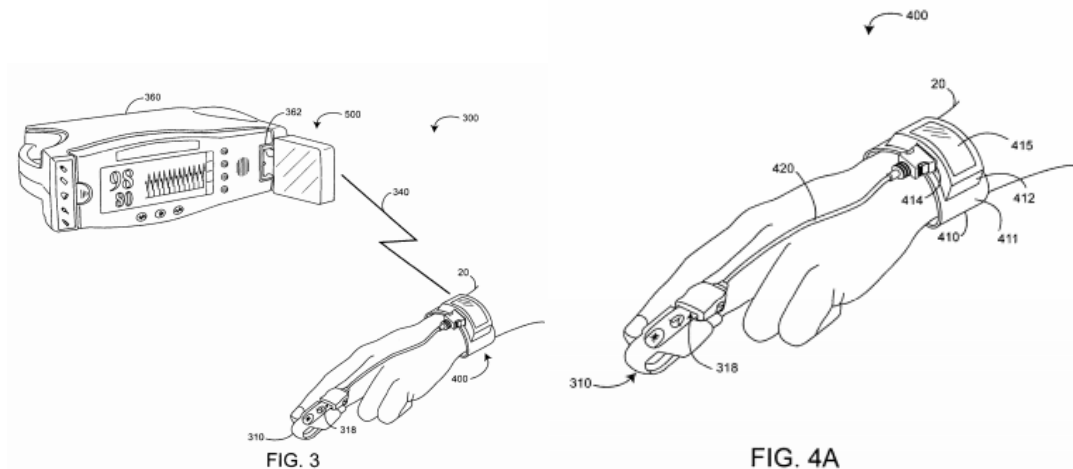
21. It is my understanding that the claims of the '735 Patent relate to a wearable patient monitoring device that communicates with multiple sensors and wirelessly transfers sensor data to another device. EX1001, Abstract. However, the claims include additional features other than the general idea of untethering patient sensors from a conventional bedside monitor. EX1001, 13:18-56. From the

perspective of a PHOSITA, these additional features merely describe the wearable housing's configuration, such as where one particular port is located on the housing, and its relationship to a pulse oximeter's wire. *Id.* However, many prior art references teach this exact configuration, even if the prosecution history's primary reference (U.S. Pat. No. 6,241,684 ("Amano") (EX1013)) did not precisely illustrate this basic and conventional housing configuration. *See* EX1005, FIG. 2; EX1006, FIGs 2 and 5; EX1007, FIG. 1; WO00/44274 (EX1017), FIG. 1a; JP0558122A (EX1018), FIG. 8; U.S. Patent No. 4,338,950 (EX1019), FIG. 1; U.S. Patent No. 4,450,843 (EX1020), FIG. 1; U.S. Patent No. 4,807,639 (EX1021), FIG. 1; U.S. Patent No. 5,539,706 (EX1022), FIG. 15b.

22. Notably, the patent specification focuses on the combined wireless transmitter/receiver system that allows a conventional pulse oximeter to communicate with a conventional bedside monitor even though the conventional pulse oximeter is not connected to the conventional bedside monitor via a traditional wire. EX1001, 4:54-64. The '735 Patent specification focuses on this transmitter/receiver system. *Id.* Indeed, nine figures of the '735 Patent focus solely on the unclaimed receiver module that plugs into a conventional bedside monitor. EX1001, FIGs. 3, 5A-C, 7, 9, 11, 12, and 14, 5:1-16. Also, I note that each of the seven parent patents all have claims directed to the receiver/transmitter system configuration. EX1023, 12:49-14:65; EX1024, 12:43-14:39; EX1025, 11:60-14:11;

EX1026, 12:45-14:21; EX1027, 12:49-14:48; EX1028, 12:48-13:26; EX1031, 13:9-16:54. The '735 Patent, however, does not have any limitations directed toward the receiver unit. EX1001, claims 1-20. From the perspective of a PHOSITA, the claimed housing configuration was not intended to be the source of novelty by the inventors back in 2002. EX1001, 4:49-5:26. This is not surprising because monitor design, its connection to a patient's body, and vital sign monitoring devices is basic. The monitor must attach to the patient somewhere. The monitor must include ports so vital sign monitors can be connected as needed in accordance with the needs of the patient. There must be a screen to view the status of vital signs.

23. In fact, almost nothing from the written description supports the claim amendment that resulted in an allowance. (e.g., “the wired connection configured to extend from the first sensor port along a path substantially perpendicular to the first side of the housing”). As far as I can tell, the only “support” for such claim limitations comes from that which was illustrated by FIGs. 3 and 4A.



24. The claims also include other features, which the Examiner found to be conventional or taught by the prior art. EX1012, pp. 2-6. Particularly, the Examiner did not find anything novel or non-obvious about a wearable device configured to interface with three sensors was (because it's not). EX1001, 11:56-12:35; EX1012, pp. 4-6. One skilled in the art would appreciate that the monitor should include enough ports to adequately monitor several vital signs of a patient.

V. LEVEL OF ORDINARY SKILL IN THE ART

A. Legal Principles

1. A Person Having Ordinary Skill in the Art

25. I have been information that patents are considered from the perspective of a person having ordinary skill in the art, and that this is a hypothetical person who is presumed to know the relevant prior art.

26. I have been informed that the following five factors inform the analysis for determining the level of ordinary skill in the art: (1) type of problems

encountered in the art; (2) prior art solutions to those problems; (3) rapidity with which innovations are made; (4) sophistication of the technology; and (5) educational level of active workers in the field. *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995). I apply these factors in the section below in providing my opinion as to the level of one having ordinary skill in the art.

B. Opinion as to the Level of a Person Having Ordinary Skill in the Art of the '735 Patent

27. I have knowledge relevant to what a person having ordinary skill in the art at the time of the invention would understand and do. In 2002, at the priority date of the '735 patent, I had 20 years of experience in this field and was a person having ordinary skill in the art.

28. In my opinion, and applying the factors set forth above in paragraph 26, a person of ordinary skill in the art at the time of the filing of the '735 patent would be: a person having at least a B.S. degree in electrical or biomedical engineering or a related field, with at least two (2) years' experience designing patient monitoring systems. If the person has a higher level of education, such as a Masters' degree, less work experience could be acceptable, and vice versa. My opinion is based on the following analysis:

29. Generally, the '735 Patent's specification is related to wearable, medical technology transmitting data wirelessly. But the claims' scope focuses on the housing's configuration, not on the electrical technology that facilitates

communication with medical sensors or wireless data transmission. Generally, when designing wearable technology, PHOSITAs mainly attempted to improve patient comfort when the device is being worn. However, the best way to improve patient comfort would be to minimize the size of the wearable device and the number of sensors attached to the patient. None of the claims are directed to this problem. Instead, the claims are directed to a conventional wired port's location on a housing. However, the location of a port and a wire does not minimize the size of a wearable device; it simply manages wiring, in a very basic way. Thus, the claims are directed mostly to wire management, which is a problem common to all wired devices and a problem encountered even by those without any skill in the art. Of course, ports are a basic way to connect and disconnect an electronic device.

30. There were numerous prior art solutions directed to wire management for medical devices. In fact, three of the prior art references used as Grounds herein illustrate systems that shorten wire lengths and choose the most direct path between a wearable housing and a medical sensor. E.g., EX1005, FIG. 2; EX1006, FIG. 2; EX1007, FIG. 1. And, of course, using the least amount of wire is an obvious design choice.

31. Finally, biomedical engineers frequently have graduate degrees, but those graduate degrees generally focus on advanced biology and physiology, not basic mechanical engineering concepts, like how to shorten a wire. As such, I do

not believe that a graduate degree is necessary to design the medical device claimed by the '735 Patent. In fact, how medical sensors measure physiological parameters was taught by the '735 Patent as prior art. EX1001, 1:40-2:18.

32. Therefore, in view of all these factors, I believe that a PHOSITA would have at least a B.S. degree in electrical or biomedical engineering or a related field, with at least two (2) years' experience designing patient monitoring systems. If the person has a higher level of education, such as a Masters' degree, less work experience could be acceptable, and vice versa.

VI. CLAIM CONSTRUCTION

A. Legal Principles

33. I have been informed that in a proceeding for *inter partes* review, claims terms in an unexpired patent are to be given their plain and ordinary meaning, as understood by a person having ordinary skill in the art, in view of the patents' specification. *See* 42 CFR §42.100(b); 83 FR 51340; *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc).

B. Opinion of Claim Construction

34. I believe that all claim terms, for the purposes of *inter partes* review can be given their plain and ordinary meaning.

35. It is my understanding that the parties disagree as to the construction of some claim terms of the '735 Patent. Particularly, the parties do not agree whether a "side" is flat, even though the claims specifically recite that the

extending direction of the cable running to the pulse oximetry sensor is perpendicular to the entire first side. If the first side were not flat, then the cable would not extend perpendicular to the first side (just a portion or part of the side). So, a side should be considered planar or flat, but that is the plain and ordinary meaning.

36. Generally, the disputes as to claim interpretation are irrelevant to the validity of the '735 Patent because it is my opinion that the '735 Patent is invalid as obvious under either party's proposed construction. As such, the Board need not construe the claims and may give each and every term its plain and ordinary meaning because the claims are invalid under the plain and ordinary meaning.

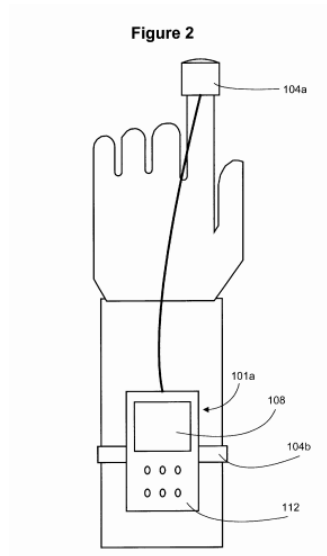
VII. SUMMARY OF THE PRIOR ART

A. Goldberg

37. Goldberg broadly discloses a wearable patient monitoring device. EX1005, Abstract. According to Goldberg, a portable device 100 receives data from three or more sensors, displays the sensor data, and wirelessly transmits sensor data or measurements to a remote computer. EX1005, 1:29-44, 2:27-29, 4:20-30, 4:50-56, 5:3-8, 2:37-42, 2:47-55. Thus, the system of Goldberg functions exactly as the '735 Patent.

38. In addition to functionality, Goldberg's housing is configured exactly as claimed by the '735 Patent. Goldberg includes a wire between a pulse oximeter

104a and the housing 112 that extends along a path substantially perpendicular to the side of the housing 112 facing the illustrated hand. EX1005, FIG. 2.



39. Therefore, in my opinion, Goldberg is exactly like the '735 Patent because Goldberg teaches a portable, wearable, wireless patient monitoring system collecting data from sensors and transmitting those sensor values to a remote computer system. EX1005, 1:29-44, 2:27-29, 4:20-30, 4:50-56, 5:3-8.

B. Kiani

40. Kiani is another one of Masimo's patents and generally discloses a portable pulse oximetry sensor that communicates with conventional bedside monitors. EX1006, Abstract. In most ways, Kiani is exactly like the '735 Patent, but Kiani describes a wired connection between the portable pulse oximeter and the conventional bedside monitor. EX1006, 5:33-6:2.

41. Importantly, Kiani discloses the conventional pulse oximetry technology and conventional portable device technology. Kiani explicitly teaches what Goldberg and Akai assumed to be understood by those skilled in the art, such as (1) that wired pulse oximetry sensors typically include ports for ease of connection and disconnection, (2) that portable devices include batteries to provide needed power to the portable device, and (3) that wired connections can be removable, indeed are desirably removable in a medical application like that involved here. EX1006, 3:21-23, 5:21-22, FIG. 5.

C. Money

42. Again, Money teaches a portable, wearable, patient monitoring device communicating with a plurality of sensors (including pulse oximetry, blood pressure, ECG, respiration rate, and temperature sensors), and Money's patient monitoring device communicates with both analog and digital medical sensors simultaneously. EX1008, 5:48-51, 7:4-8, 7:16-20, 7:58-62, 12:4-7, 13:24-32. Like the '735 Patent, Money teaches a portable patient monitoring system that communicates with a plurality of sensors, some of which can be analog and some of which can be digital. *Id.* Money teaches that the portable device 10 displays readings from all the connected sensors on a display 42 and wirelessly transmits those readings to a central monitoring station. EX1008, 5:10-13, 6:21-55. These are all the basic components in a wireless monitoring application.

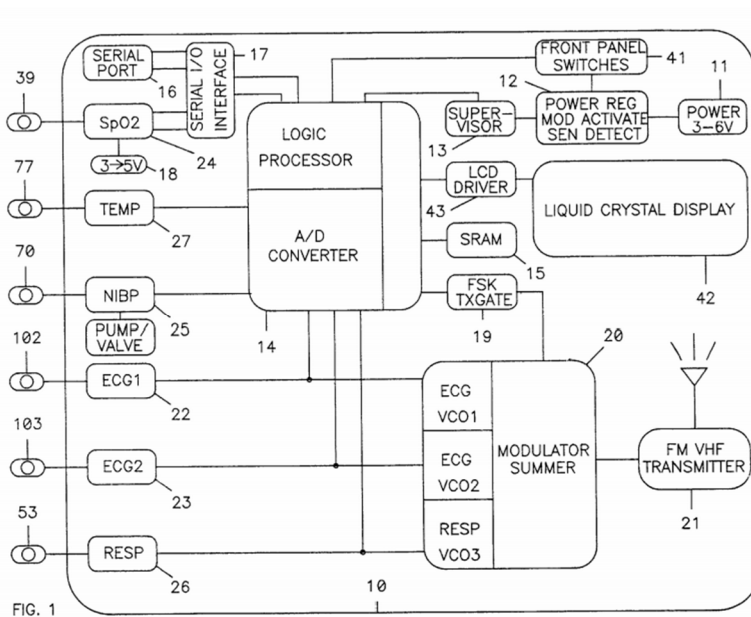


FIG. 1

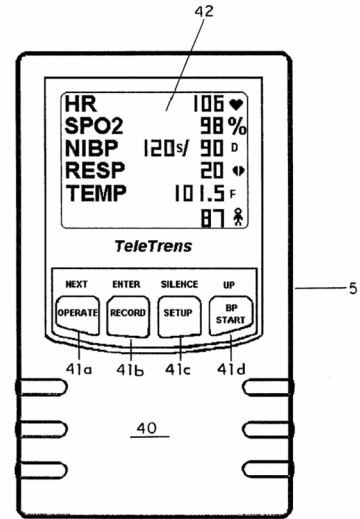


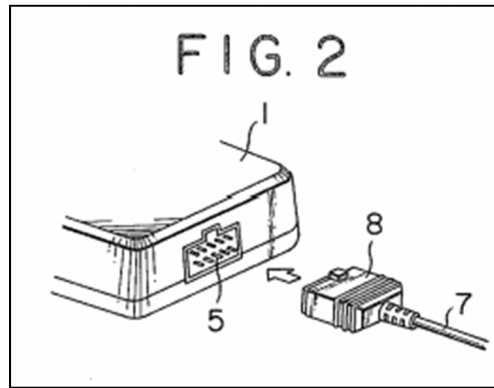
FIG. 10

D. Akai

43. Like all the previous references, Akai teaches a wearable monitoring device communicating with a plurality of sensors and wirelessly transmitting sensor measurements to a remote computer. EX1007, Abstract. Also, importantly, Akai illustrates the same housing configuration as claimed by the '735 Patent, namely that the wire between the housing and the pulse oximetry sensor extends substantially perpendicularly to the housing side that faces a patient's hand. EX1007, FIG. 1. In other words, Akai teaches the basic principle of minimizing the amount of wire between the monitor and sensor, i.e., the shortest distance between two points is a straight line. EX1007, FIG. 1.

E. Fujisaki

44. Fujisaki teaches that wearable devices include removable cables to interface with various sensors. EX1016, 5:37-44, FIGs. 2, 6.



F. Estep

45. Estep teaches a wearable device with a display 31 surrounded by a bezel. EX1009, 4:24-27, FIG. 3C. Estep confirms that a bezel is merely a border around a display. *Id*

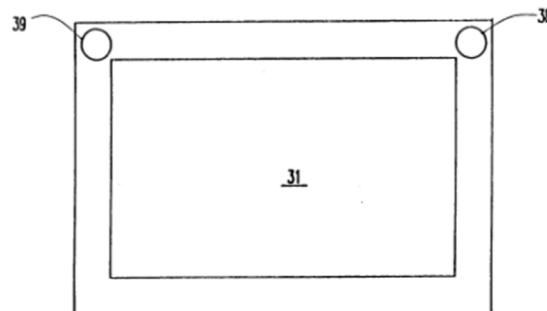


FIG.3C

VIII. OPINION ON GROUNDS OF UNPATENTABILITY

A. Legal Principles

46. I have been told that under 35 U.S.C. § 103(a), “[a] patent may not be obtained though the invention is not identically disclosed or described as set forth in Section 102, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.”

47. When considering the issues of obviousness, I have been told that I am to do the following:

- (a) determine the scope and content of the prior art;
- (b) ascertain the differences between the prior art and the claims at issue;
- (c) resolve the level of ordinary skill in the pertinent art; and
- (d) consider evidence of secondary indicia of non-obviousness (if available).

48. I have been told that the relevant time for considering whether a claim would have been obvious to a PHOSITA is the time of alleged invention.

49. I have been told that a reference may be modified or combined with other references or with the PHOSITA’s own knowledge if the person would have found the modification or combination obvious. A PHOSITA is presumed to know

all relevant prior art, and the obviousness analysis may consider the inferences and creative steps that a PHOSITA would employ.

50. In determining whether a prior-art reference could have been combined with another prior-art reference or other information known to a person having ordinary skill in the art, I have been told that the following principles may be considered:

- (a) a combination of familiar elements according to known methods is likely to be obvious if it yields predictable results;
- (b) the substitution of one known element for another is likely to be obvious if it yields predictable results;
- (c) the use of a known technique to improve similar items or methods in the same way is likely to be obvious if it yields predictable results;
- (d) the application of a known technique to a prior art reference that is ready for improvement is likely obvious if it yields predictable results;
- (e) any need or problem known in the field and addressed by the reference can provide a reason for combining the elements in the manner claimed;
- (f) a person of ordinary skill often will be able to fit the teachings of multiple references together like a puzzle; and

(g) the proper analysis of obviousness requires a determination of whether a person of ordinary skill in the art would have a “reasonable expectation of success”—not “absolute predictability” of success—in achieving the claimed invention by combining prior art references.

51. I have been told that whether a prior art reference renders a patent claim unpatentable as obvious is determined from the perspective of a PHOSITA. Further, I have been told that while there is no requirement that the prior art contain an express suggestion to combine known elements to achieve the claimed invention, a suggestion to combine known elements to achieve the claimed invention may come from the prior art as a whole or individually, as filtered through the knowledge of one skilled in the art. I have also been told that the inferences and creative steps a PHOSITA would employ are also relevant to the determination of obviousness.

52. I have been told that when a work is available in one field, design alternatives and other market forces can prompt variations of it, either in the same field or in another. If a PHOSITA can implement a predictable variation and would see the benefit of doing so, that variation is likely to be obvious. In many fields, there may be little discussion of obvious combinations, and in these fields market demand—not scientific literature—may drive design trends. When there is a design

need or market pressure and there are a finite number of predictable solutions, a PHOSITA has good reason to pursue those known options.

53. I have been told that there is no rigid rule that a reference or combination of references must contain a “teaching, suggestion, or motivation” to combine references. But I also have been told that the “teaching, suggestion, or motivation” test can be a useful guide in establishing a rationale for combining elements of the prior art. This test poses the question whether there is an express or implied teaching, suggestion, or motivation to combine prior art elements in a way that yields the claimed invention and avoids impermissible hindsight analysis.

B. Ground 1: Claims 1-2 and 7-9 are unpatentable under 35 U.S.C. § 103(a) as obvious in view of Goldberg and Kiani and Money

54. In my opinion, claims 1-2 and 7-9 would have been obvious to a PHOSITA in view of Goldberg along with Kiani and Money. This is because I believe that a PHOSITA, having knowledge of these three sources, would have found it obvious to combine the references to create the technology at issue in this case. Goldberg, Kiani, and Money represent a snapshot of the medical field before the filing date of the '735 Patent. Goldberg illustrates the movement of medical monitoring away from strictly bedside monitoring to a wireless setting, where patient vital signs are aggregated and monitored at a centralized computer. EX1005, 2:3-15, 5:9-24. Also, due to the miniaturization of electronic devices, continuing in the early aughts, medical monitors became small enough to wear,

which allowed clinician to monitor patient vitals in settings other than a hospital. EX1005, 2:16-26, FIG. 2; EX1006, 2:34-3:5; EX1008, 2:64-3:2. These three references further demonstrate the need for adaptability in monitoring different sets of vital signs depending on a patient or a patient's ailment. EX1006, 5:3-8. The use of wireless technology to eliminate the wires is not inventive. The remaining features of the claims are directed to basic components of a medical vital sign monitoring system and relate to basic design choices that are not only obvious design choices but are shown by prior art references as discussed herein.

1. Independent Claim 1

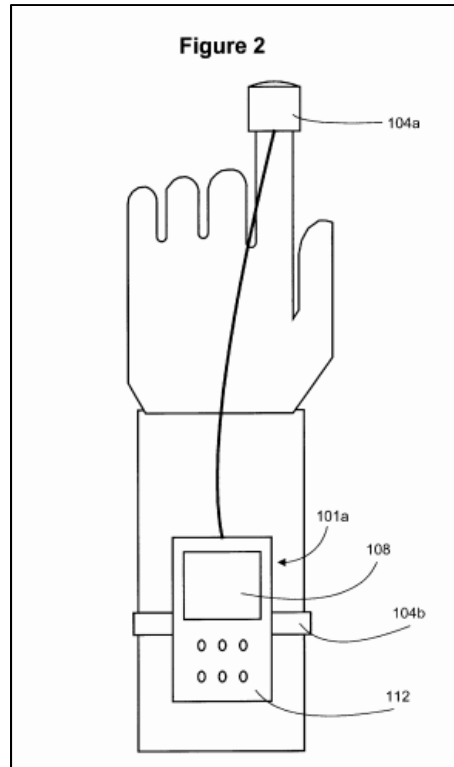
- a. “A body worn mobile medical monitoring device configured to minimize cable wiring from a sensor by placement of one or more sensor communication ports, the mobile medical monitoring device comprising:”**

55. I have been informed by counsel that claim preambles are generally not limiting when the content of the claimed preamble is an “intended use.” I have been informed by counsel that preambles are generally statements of intended use when the body of a claim fully sets forth all the limitations of the claimed invention, and the preamble merely states the purpose or intended use of the invention. Here the preamble merely states what the body worn, medical monitoring device is “configured to” do. In my opinion, this preamble is entirely a statement of use. Additionally, I note that all the limitations in the preamble are

also included in the body of the claim, another factor that I am told indicates the preamble should not be given patentable weight.

56. Even so, if the preamble is limiting, Goldberg teaches the entire preamble. Specifically, Goldberg teaches a body worn, mobile medical monitoring device. EX1005, 4:57-67. Goldberg teaches and illustrates that the housing 112 straps to a person's forearm or wrist, thus both showing and describing the portable device as "body worn." *Id.*

57. Regarding the preamble statement that the monitoring device "is configured to minimize cable wiring from a sensor by placement of one or more sensor communication ports," Goldberg positions its wire between the pulse oximetry sensor 104a and the housing 112 at the closest possible location to the patient's hand when the patient wears the portable device 100. EX1005, 4:26-29; 4:60-62, FIG. 2.



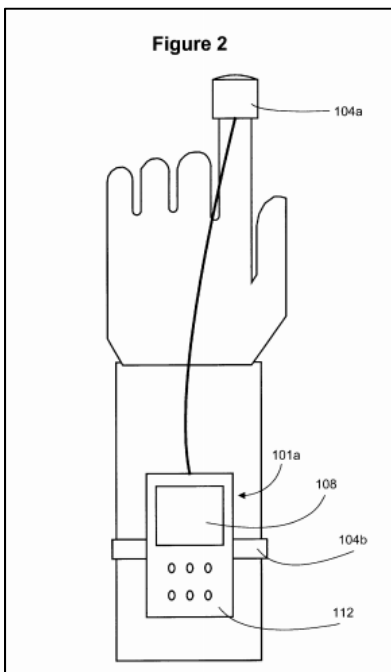
58. Because the wire is positioned at this particular location, the amount of wire necessary to connect a finger-worn pulse oximetry sensor, like the sensor 104a taught by Goldberg, is minimized. A PHOSITA would assume that this wired connection between the pulse oximetry sensor 104a and the housing 112 would include a port because in the medical field, it is extremely common to allow the sensors to be connected and disconnected quickly using ports. Even were it assumed that Goldberg took the impractical approach of hardwiring the sensor, it would have been obvious to modify Goldberg to include a port as part of this wired connection to facilitate connection and disconnection of the sensor. I will discuss the reasoning behind this assumption and obviousness conclusion in more detail below, in paragraphs 63-64.

- b. “a housing configured to be secured on a lower arm of a patient being monitored via a strap extending around the lower arm of the patient;”**

59. Goldberg teaches a housing 112 that secures to the forearm or wrist of the person under measurement. EX1005, 4:57-60; 4:19-30. Also, Goldberg teaches that the portable device 100 straps to the person’s arm via a blood pressure cuff 104b, which Goldberg specifically calls a strap. EX1005, 4:57-60, 4:64-67. Thus, Goldberg teaches that the housing is secured to a patient’s lower arm via a strap.

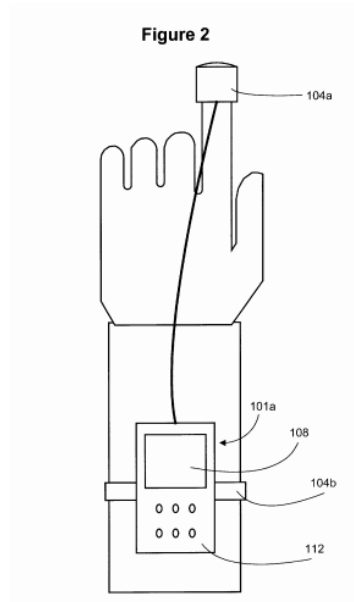
Id.

60. Furthermore, FIG. 2 clearly shows that the blood pressure strap 104b wraps around the patient’s wrist.



- c. **“a display positioned on a face of the housing, opposite the strap, so as to be visible to a user;”**

61. Goldberg clearly teaches a display 108 positioned on the front side of the housing, which is viewable as seen in FIG. 2.



62. Goldberg further teaches that the display 108 displays measurement data, statistical data, and sensor data (e.g., blood pressure readings, oxygen saturation readings, pulse readings). EX1005, 6:32-45, FIGs. 6A-B. Finally, Goldberg teaches a display positioned on the front side of the housing 112, opposite a back side (not shown but facing the patient’s wrist) so as to be visible to the user.

Figure 6b

Your Daily Averages	
Morning Values:	SpO2 95%
	BP 120/70 mmHg
	HR 80 BPM
	GLU 200 mg/dl
Afternoon Values:	SpO2 95%
	BP 140/80 mmHg
	HR 100 BPM
	GLU 220 mg/dl
Evening Values:	SpO2 70%
	BP 100/80 mmHg
	HR 70 BPM
	GLU 180 mg/dl

- d. **“a first sensor communication port positioned on a side of the housing and configured to face a hand of the lower arm of the patient when the mobile medical monitoring device is mounted to the lower arm of the patient, wherein: the side of the housing faces the hand of the lower arm of the patient of the patient when the mobile medical monitoring device is mounted to the lower arm of the patient,”**

63. Goldberg teaches that a pulse oximetry sensor 104a connects to a controller 102 of the portable device 100a via a wire. EX1005, 4:19-29. Although Goldberg does not expressly teach a port, a PHOSITA looking at FIG. 2 of Goldberg would assume that the wired connection between the pulse oximetry sensor 104a and the portable device 100a would occur via a first sensor port.

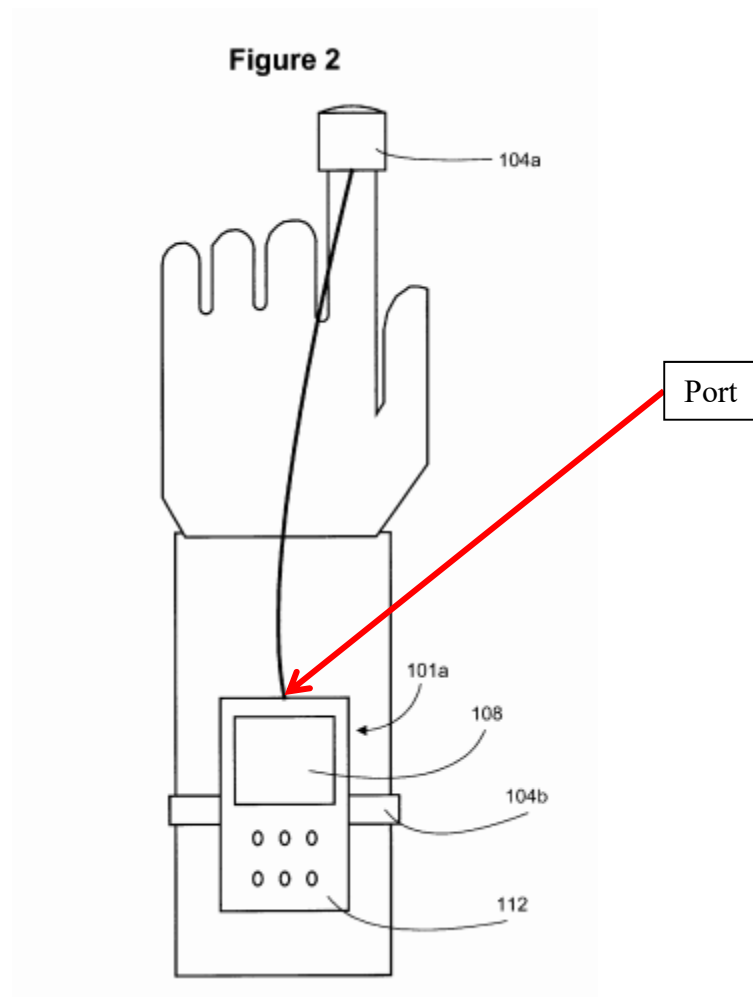
64. A port is typically a female connection or socket of a wired connection. EX1001, 5:33-36, FIG. 4B. Also, the controller 102 is clearly inside the housing 112 of Goldberg, and the controller 102 receives signals from the pulse oximetry sensor 104b, so the signals transmit into the housing and to the controller

through some connection (i.e., port). EX1005, 4:19-29. Thus, a PHOSITA reading Goldberg would assume that such a connection includes a port. More specifically, the male-female relationship of wired connections is a preferred method of electrical connection because it provides a more secure connection than merely contacting two electrical conductors. Ports are also preferable over hardwiring a sensor to a monitor because hardwiring a sensor to a monitor provides no adaptability. A PHOSITA would know that patients suffer from a variety of conditions, and different sets of vital signs correspond to different conditions and diseases. For example, a patient's body temperature is not particularly important if the patient is suffering from hypertension, and so a clinician may choose to ignore body temperature while caring for a patient with hypertension. Indeed, clinicians demand control over their patients and what vital signs to monitor, so a PHOSITA designing a medical monitor would know that the end user (clinicians, nurses, physicians, physician assistants) would expect an adaptable and configurable patient monitor that allows a clinician to utilize different sets of sensors to monitor the vital signs that the clinician deems most important in caring for a patient and monitoring the patient's health. One way to provide this adaptability is to connect wired connections through ports, which provide an end user the ability to disconnect and connect a variety of sensors as needed. Thus, because Goldberg

teaches an adaptable system, a PHOSITA would assume that the wired connections of this adaptable device 100 includes ports. EX1005, 5:3-8.

65. Kiani demonstrates the ubiquity of ports. Kiani shows that sensor input ports 540, 550 were a known vehicle for wired communication. EX1006, 3:21-27, 8:31-9:2. Kiani expressly teaches something that a PHOSITA would assume reading Goldberg. However, if for some reason Goldberg didn't teach a port, which it clearly does, it would have been obvious to combine Goldberg and Kiani to include a port on the housing as part of the wired connection between the pulse oximetry sensor 104a and the housing 112 of Goldberg. Like above, modifying Goldberg with Kiani would have been a combination of known concepts (wired electrical communication and wired electrical communication using ports) to yield predictable results (transmission of signals through wires and ports to the controller 102). EX1005, 4:19-29; EX1006, 3:21-27, 8:31-9:2. Particularly, including a port on Goldberg's housing (if it wasn't already there) would predictably enable wired communication with the pulse oximeter 104a while allowing easy removal and replacement of the sensor 104a and providing a secure, wired connection between the pulse oximetry sensor 104a and the housing 112. EX1006, 2:34-3:4. More specifically, ports generally provide removable wired connections, so a medical worker would replace the pulse oximeter 104a with a different sensor if a new physiological parameter is to be measured. *Id.*

66. Furthermore, as shown in FIG. 2, the first sensor port of Goldberg exists on the top side (first side) of the housing, which is the side of the housing closest to and facing the hand when the person is wearing the portable device 100a. EX1005, FIG. 2. Thus, both the port and the side of the housing on which the port is positioned face the patient's hand while the patient wears the portable device 100a. Notably, a PHOSITA would understand in reviewing Figure 2 that a basic diagram is shown reflecting a housing, display, buttons, strap for the wrist, and a sensor wired to the housing. From this basic diagram, a PHOSITA would readily understand the basic design choices to reduce the diagram to a commercial product.



Id. (annotated).

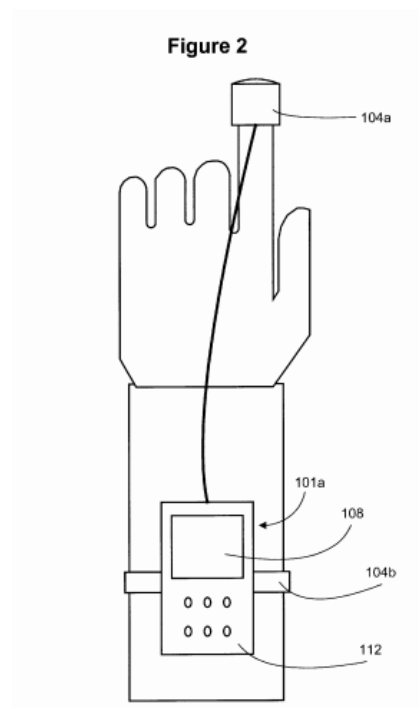
67. Therefore, Goldberg alone or Goldberg in view of Kiani renders this limitation obvious.

- e. “the first sensor communication port is configured to provide wired communication with a pulse oximetry sensor attached to a digit of the hand of the patient,”**

68. Goldberg teaches that the pulse oximetry sensor 104a transmits electrical signals representing oxygen saturation to the controller 102 via a wired

connection. EX1005, 4:19-29, FIG. 2. Such a wired connection would include a port for the reasons I explained in paragraphs 63-64 above.

69. Goldberg further teaches that the pulse oximetry sensor 104a attaches to a patient's finger. EX1005, 4:60-62, FIG. 2. Thus, Goldberg alone teaches this limitation.



f. “the wired communication with the pulse oximetry sensor provided at least partly in the analog domain, and”

70. Goldberg teaches that the pulse oximetry sensor 104a transmits signals to the controller 102. EX1005, 4:20-24. Typically, light-based pulse oximetry sensors operate in the analog domain and transmit analog signals, and a PHOSITA would understand this. Kiani expressly explains this well-known fact. EX1006, 1:26-28. Here, Kiani explains that the pulse oximeter receiving circuitry

includes an amplifier and a filter, which, as understood by a PHOSITA, are circuits only necessary for interpreting an analog signal. EX1006, 1:26-28. In fact, the '735 Patent even says as much. EX1001, 6:59-62. So, Goldberg teaches a pulse oximetry sensor transmitting analog information, or it would have been obvious for the pulse oximeter 104a to transmit analog information in view of Kiani.

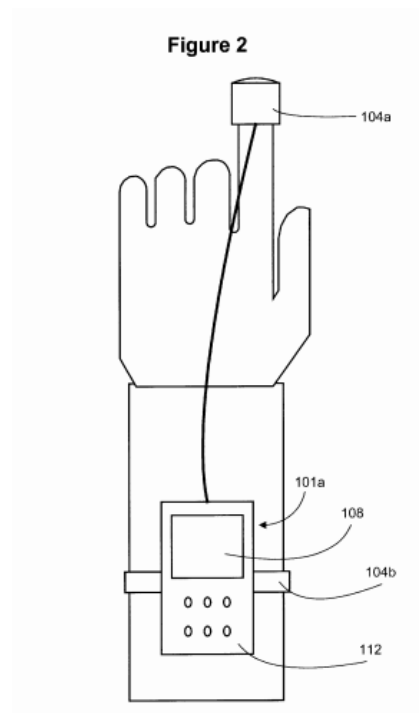
71. Furthermore, I fail to see how it matters whether the signals from sensors are received as either analog or digital. All of the '735 Patent, Goldberg, and Kiani teach a processor for deriving parameter values from sensor signals. A PHOSITA would understand that processors operate in the digital domain. So, a received analog signal would be converted to a digital signal before being fed to a digital processor. *See* EX1008, 7:49-52. It's irrelevant whether the signal received is analog or digital because it will eventually be converted into a digital signal regardless of what form it is received in.

72. Even if the pulse oximetry sensor 104a of Goldberg did operate in the digital domain, a PHOSITA need only include a digital-to-analog converter as part of the pulse oximetry sensor 104a to cause the signal to be *provided* in the analog domain. Analog-to-digital and digital-to-analog converters are one of the most fundamental and basic building blocks of any modern circuit. Circuitry for converting between the analog and digital domain have been known for decades.

73. Lastly, signals are either analog or digital. There are only two options, so it would have been obvious to transmit signals as either digital or analog signals. So, at the very least, it would have been obvious for the pulse oximeter to provide an analog signal because there are only two signal options.

- g. **“the first sensor communication port is positioned on the side of the housing such that a path from the first sensor communication port on the side of the housing to the digit of the patient is substantially perpendicular to the side of the housing and shorter than any other path from any other side of the housing to the digit of the patient;”**

74. Goldberg illustrates the wire between the pulse oximetry sensor 104a and the housing 112 as extending from the first sensor port along a path substantially perpendicular to the first side of the housing 112. EX1005, FIG. 2. Also, because the wire extends from the side facing the hand and closest to the hand, then the wired path from the housing 112 to the pulse oximetry sensor 104a is the shortest path from any side of the housing to the sensor 104. *Id.* Of course, using less wire is desirable for cost and the patient would, of course, not appreciate having more wire than necessary around the patient’s body. Using the least amount of wire in this application implicates the age-old design principle that the shortest distance between two points is a straight line, which no doubt explains why the prior art discussed herein expressly shows this design. EX1005, FIG. 2.



75. Lastly, the claim seems to suggest that the port is the reason for the extending direction of this wire. Such a suggestion runs contrary to both physics and common sense. The extending direction of the wire results from a force pulling the wire toward the pulse oximetry sensor 104, not from the configuration of the port itself. If the wire was not also tied to the pulse oximetry sensor, then the extending direction of the wire would simply fall as a result of the pull of gravity. So, a PHOSITA would understand this claim to be claiming the wire's extending direction due to the relationship of the port's placement on a wearable device and where a pulse oximetry sensor attaches to a patient. In Goldberg, exactly as claimed and shown in the '735 Patent, that wire extends along a direct line from the housing 112 strapped on a patient's wrist to the pulse oximetry sensor 104a

positioned on the patient's finger. There is nothing different about Goldberg and claim 1 in terms of housing configuration.

- h. “a plurality of additional sensor communications ports positioned on the housing and configured to provide wired communication with a plurality of additional physiological sensors at least partly in the digital domain; and”**

76. Goldberg teaches that all sensors, including pulse oximetry sensor 104a and blood pressure sensor 104b communicate with the controller 102 via a wired connection. EX1005, 4:19-29, 5:3-8. Thus, the connection between the controller 102 and the blood pressure sensor 104b would be a wired connection. *Id.* Goldberg teaches that the portable device 102 communicates with more than two sensors. EX1005, 4:19-29, 5:3-8. One specific example taught by Goldberg is the inclusion of an electrolyte sensor in combination with the pulse oximetry sensor 104a and the blood pressure sensor 104b. EX1005, 4:67-5:8. Beyond this example, Goldberg mentions that it can communicate with any number of sensors, including temperature, respiration rate, and ECG sensors. EX1005, 4:50-56. A PHOSITA reading Goldberg would understand that the portable device 102 communicates with at least three sensors. A PHOSITA would readily appreciate that the monitor should work in connection with the types of sensors that clinicians frequently need to use to monitor vital signs on patients. *Id.*

77. Furthermore, because the connection between the blood pressure and third sensors and the housing 112 is a wired connection, a PHOSITA would assume that the housing 112 includes two additional ports that facilitate the wired connections between blood pressure sensor 104b and the housing 112 and between the third sensor and the housing 112. As I said above in paragraphs 63-64, a PHOSITA looking at FIG. 2 of Goldberg would assume that the wired connections with sensors would occur via sensor ports.

78. Even so, Kiani shows that sensor input ports 550 were a known vehicle for wired communication. EX1006, 3:21-27, 8:31-9:2. Like I said before, Kiani expressly teaches something that a PHOSITA would assume reading Goldberg. Nevertheless, it would have been obvious to combine Goldberg and Kiani to include a second and third port on the housing 112 as part of the wired connections with the second and third sensors. Like above, modifying Goldberg with Kiani would have been a combination of known concepts (wired electrical communication and wired electrical communication using ports) to yield predictable results. EX1005, 4:19-29; EX1006, 3:21-27, 8:31-9:2. Particularly, including second and third ports on Goldberg's housing would have predictably enabled wired communication with the second and third sensors while allowing easy removal and replacement of the third sensor and providing a secure, wired

connection between the blood pressure sensor 104b and the housing 112. EX1006, 2:34-3:4; *See* paragraphs 63-64 above.

79. Furthermore, even though FIG. 2 doesn't expressly illustrate a third port or a third sensor, inclusion of a generic third port would have been obvious as a mere duplication of parts. I have been informed by counsel that duplication of substantially similar parts is an obvious modification to a device. A PHOSITA would understand that a third sensor and a third port would have been easily included with the portable device 100 just as the first or second sensor and the first and second port. EX1005, 4:50-5:8. As such, a PHOSITA would find the inclusion of additional (second, third) sensors and ports on the housing to be an obvious modification to any housing having a sensor and a port to allow the monitor to track multiple vital signs, as needed for proper patient care.

80. Lastly, I again fail to see how it matters from a patentability standard why the additional ports provide digital domain communication. There are only two signal options (analog or digital), and both are well-known to any PHOSITA. Indeed, a PHOSITA would have been well-versed with analog signal circuitry and digital signal circuitry. So, it would have been obvious to a PHOSITA to provide digital information via Goldberg's additional ports.

81. In the prosecution history, the Examiner seemed to believe that the prior art failed to teach a wearable patient monitoring system that receives analog

data from a first sensor and digital data from a second sensor. EX1015, pp. 6-7.

However, the prior art *does* teach a system configured to receive both analog signals and digital signals, as expected because there are devices that output analog signals and digital signals. Those skilled in the art understand both types of signals and when it is desirable to use one or the other, or both. For example, Money teaches a system that receives analog signals from some sensors and digital signals from others. EX1008, 5:48-51, 7:4-8, 7:16-20, 7:58-62, 12:4-7, 13:24-32.

Specifically, in the example taught by Money, Money receives digital signals from the pulse oximetry sensor cuff 39 through a RS232 serial port. EX1008, 7:58-62, 12:4-7, 13:24-32. Money teaches that the pulse oximetry sensor transmits packets of data, and a PHOSITA would understand that a packet is a digital construct. EX1008, 13:24-32. In fact, packets have to be digital because analog signals cannot be packetized. Thus, by teaching that the monitor 10 receives data packets from the pulse oximetry sensor 39, Money teaches a system that receives digital data from one sensor and analog data from another. EX1008, 5:48-51, 7:4-8, 13:24-32.

82. Money also explains the circuitry and power used to communicate with both analog and digital sensors. EX1008, 7:4-20. So, Money fully teaches a portable, wearable patient monitoring device that receives analog data from one a

sensor and digital data from another sensor. EX1008, 5:48-51, 7:4-8, 7:16-20, 7:58-62, 12:4-7, 13:24-32.

83. Additionally, Money teaches a temperature interface circuit and an analog-to-digital converter that allow the processor to display a digital value of the patient's temperature. EX1008, 10:59-11:5, FIG. 1, 7:49-52. Thus, Money specifically teaches that the end result of the temperature interface is to display a digital value for the patient's temperature. EX1008, 11:2-5. While Money teaches that the temperature detection circuit interface 27 and the A2D converter are within the monitor 10, Money fully teaches the requisite circuitry 27 to output a digital signal representative of patient's temperature and the requisite digital standard (RS232) necessary to communicate serial digital data. EX1008, 10:59-11:5, FIG. 1, 7:49-52, 6:11-20, 11:51-53. Lastly, Money teaches how to send digital packets via the RS232 protocol to be received by the serial port. EX1008, 6:11-20. Thus, Money teaches how to receive digital data from a temperature sensor: by including an RS232 port and circuitry to convert analog temperature signals into a discrete temperature value. EX1008, 10:59-11:5, FIG. 1, 7:49-52, 6:11-20, 11:51-53.

84. Money shows that generating a digital value measured by a sensor measuring a discrete physiological parameter value is simply a design choice as to *where* to digitize the data (inside or outside the monitor). Money shows an example where a pulse oximetry sensor digitizes the parameter value before transmitting the

signal to the monitor so that the monitor 10 can receive the data via an RS232 serial port. EX1008, 6:11-20, 13:24-32. Alternatively, Money teaches that the analog temperature sensor value is digitized within the monitor. EX1008, 10:59-11:5. A PHOSITA would recognize that either sensor could transmit digital data via the RS232 port, and it is simply a design choice as to which sensor to connect to the RS232 port. Notably, the same cannot be said for sensors that do not measure discrete data, such as an ECG sensor. An ECG generates a waveform representing a heart rate and electrical pulses of the heart. This signal is best represented by an analog signal, lest some data be lost in the digital conversion, filtering or the like. Money recognizes this limitation, even suggesting that the RF transmitter transmits ECG data as an analog signal. EX1008, 6:2-10.

85. It would have been obvious to modify Goldberg with Money so that the system of Goldberg would function with more sensors and more sensor types. Goldberg teaches that it wishes to communicate with any conventional sensor. EX1005, 4:50-56. Some conventional sensors communicate digital data, and some conventional sensors communicate using analog data. EX1008, 5:48-51, 7:4-8, 7:16-20, 13:24-32. So, Goldberg provides the motivation to adopt the teachings of Money so that Goldberg's portable device would be able to communicate with any conventional sensors (both analog and digital). EX1005, 4:50-56. That said, all of Money's teachings regarding power requirements RS232 protocol, and circuitry to

communicate with both analog and digital sensors are extremely basic electrical engineering concepts that would be well-known to a PHOSITA. So, Goldberg likely included such circuitry but omitted the description of this circuitry because it was so basic and unnecessary to enable his invention.

86. The combination of Money and Goldberg would have predictably allowed for the portable device of Goldberg to communicate with both analog and digital sensors. The circuitry described by Money provides exactly the necessary electrical infrastructure to allow for this compatibility with both analog and digital sensors. EX1008, 5:48-51, 7:4-8, 7:16-20, 7:58-62, 12:4-7, 13:24-32. Thus, Goldberg in view of Kiani and Money fully teaches and renders obvious this claim limitation.

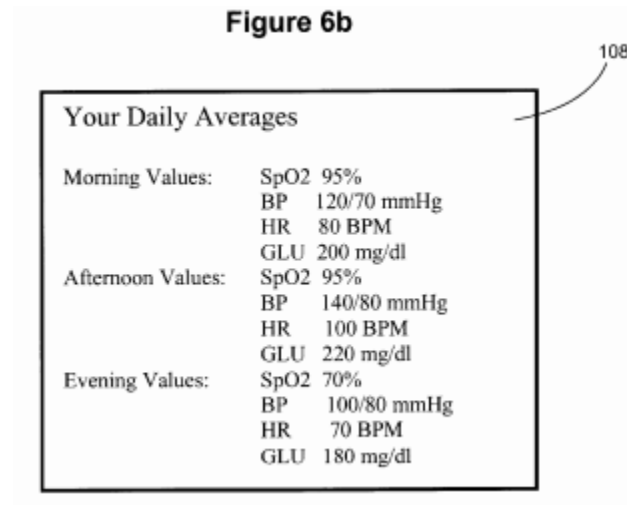
i. “one or more processors and a transmitter configured to:”

87. Goldberg teaches a controller 102 that receives and processes signals from the sensors 104. EX1005, 4:34-36. A PHOSITA would understand that a controller 102 is a processor. *Id.*

j. “display, on the display, physiological measurements derived from the pulse oximetry sensor and the plurality of additional physiological sensors; and”

88. Goldberg teaches that the controller 102 displays oxygen saturation measurements on the display 108. EX1005, 4:19-23, 4:30-36, 4:50-56, FIG. 6A-C.

Goldberg teaches that these physiological parameter values can include oxygen saturation and a plurality of additional parameter (e.g., blood pressure and glucose). EX1005, 4:19-29, 4:57-5:8, FIGs. 6a-c.



- k. **“wirelessly transmit information indicative of the physiological measurements to a remote computing device.”**

89. Goldberg teaches that the communication unit 110 wirelessly transmits sensor data and measurements, which can include oxygen saturation, glucose, blood pressure, and temperature (physiological measurements) to a remote computer 302. EX1005, 4:50-56, 5:9-21. By the time of the invention, wireless transmission was well known, as Goldberg shows, and, of course, the information is transmitted to a remote computer so hospital staff can monitor all patients from a central location. *Id.*

2. **Dependent Claim 2: “The mobile medical monitoring device of claim 1, wherein the wired communication with the pulse**

oximetry sensor is provided via a tail extending from the pulse oximetry sensor.”

90. A PHOSITA would not understand how a tail is any different than a wire. Nor does the specification of the '735 patent explain the difference between a tail and a wire in its single, passing mention of a tail. EX1001, 5:45-47. Thus, while likely indefinite, a PHOSITA would, at best, understand this term to be equivalent to a wire.

91. Goldberg teaches a wire between the pulse oximetry sensor 104a and the housing 112, so Goldberg teaches a “tail.” EX1005, 4:19-29.

3. Dependent Claim 7: “The mobile medical monitoring device of claim 1, wherein the face of the housing comprises a single user interface.”

92. Goldberg teaches a single display for displaying data to a user on the front side (“face”) of the housing. EX1005, 4:30-34, 6:32-46. A PHOSITA would understand that the display 108 is a user interface, as dependent claim 8 also makes clear.

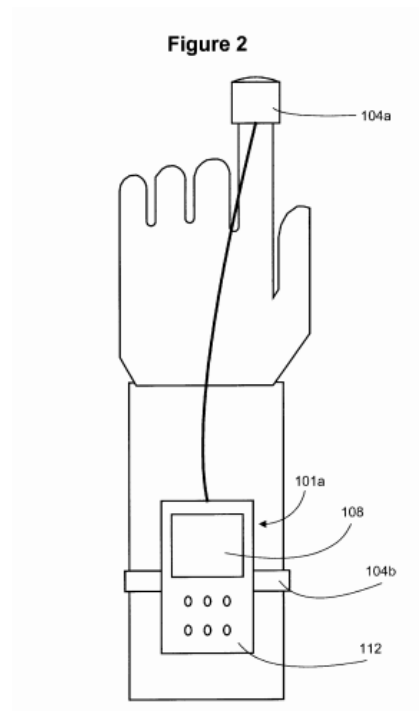
4. Dependent Claim 8: “The mobile medical monitoring device of claim 7, wherein the single user interface comprises the display.”

93. The user interface of Goldberg is the display 108. *Id.*

5. Dependent Claim 9:

- a. “The mobile medical monitoring device of claim 8, wherein: the housing comprises a back side that is opposite the face of the housing,”**

94. Goldberg teaches a three-dimensional, box-shaped housing 112 having six sides. EX1005, FIG. 2. The illustrated front side (face) shown in FIG. 1 is equivalent to the claimed “face of the housing”. Because Goldberg’s housing 112 is three dimensional, the housing 112 would also include a back side, opposite the face of the housing. *Id.* A PHOSITA would understand that the back side, while not illustrated, would face into the patient’s arm while the portable device 100 is being worn. Thus, Goldberg teaches “a back side opposite the face of the housing”.

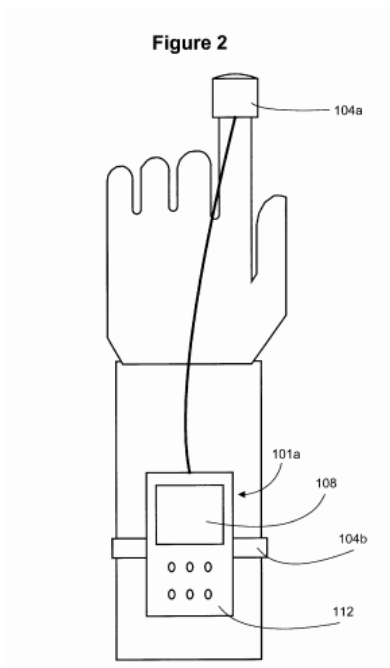


b. “the strap is mountable to the back side of the housing, and”

95. Goldberg teaches that the portable device 100 straps to the person’s arm via a blood pressure cuff 104b, which Goldberg specifically calls a strap. EX1005, 4:57-60, 4:64-67. Thus, Goldberg teaches a strap mountable to the housing. *Id.*

96. Additionally, by reviewing FIG. 2, a PHOSITA would understand that the blood pressure cuff 104b mounts to the back of the housing 112. A PHOSITA would assume that the blood pressure cuff 104b is mounted to the back side of the housing 112 because the housing 112 is illustrated over the strap 104b. EX1005, FIG. 2.

97. Additionally, a PHOSITA would instantly recognize that the blood pressure cuff 104b is mounted to the back side of the housing because a blood pressure cuff must wrap entirely around a person’s wrist to engage the artery running through a patient’s arm. If the blood pressure cuff mounted to the sides of the housing, then the blood pressure cuff 104b would only partially wrap around the person’s arm. Without wrapping 100% around the patient’s arm, the solid housing 112 would press against the patient’s arm as the blood pressure sensor applied pressure, cause a pressure gap on the arm and artery, and thereby provide inaccurate blood pressure readings. Thus, a PHOSITA would look at Goldberg and know that the blood pressure cuff 104b mounts to the back of the housing 112.



98. Additionally, it would have been particularly obvious for a PHOSITA to mount the strap to the housing 112 to the back side of the housing. There are only two places where the strap 104b could mount: either to the back of the housing 112 or to the left and right sides of the housing 112. Obviously, the strap can't mount to the front side of the housing in view of FIG. 2 of Goldberg, lest the strap block either the display 108 or the user interface buttons. As I said above, mounting the strap 104b to the left and right sides of the housing 112 would result in inaccurate blood pressure readings, but regardless, choosing from one of two places on a housing to mount the strap 104b is a simple design choice, not anything inventive. Either mounting option would predictably secure the housing 112 to the patient's arm, so both would have been equally effective in securing the housing

112 to the patient's arm (although both are not equally effective in measuring blood pressure), and a PHOSITA would instantly recognize this fact.

99. Therefore, this limitation is both taught by Goldberg and obvious in view of Goldberg.

- c. **“the face of the housing is raised from the strap and the lower arm of the patient to enable positioning of the first sensor communication port on the side of the housing between the lower arm of the patient and the face of the housing.”**

100. As I explained in paragraph 94, the housing 112 is three-dimensional. The wire's extension into the housing 112 proves that there is a vertical side, having some length, where the wire connects to the housing 112. EX1005, FIG. 2. The existence of this vertical side and the inherent three-dimensional nature of the housing 112 means that the front side of Goldberg's housing 112 (“face”) is raised from the strap and the lower arm to enable positioning of the first sensor communication port on the side of the housing 112. *Id.* FIG. 2 of Goldberg clearly illustrates this trivial claim limitation.

C. Ground 2: Claims 3-6 and 13-19 are unpatentable under 35 U.S.C. § 103(a) in view of Goldberg, Kiani, Money, and Fujisaki

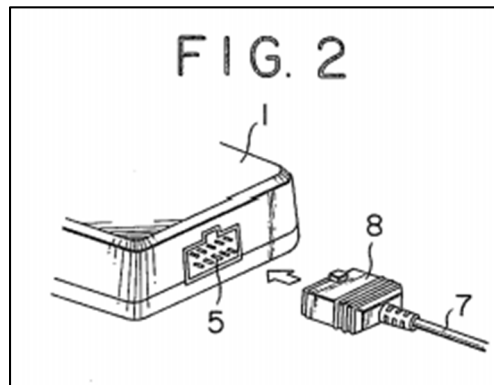
101. In my opinion, claims 3-6 and 13-19 would have been obvious to a PHOSITA in view of Goldberg along with Kiani, Money, and Fujisaki. This is because I believe that a PHOSITA, having knowledge of these four sources, would have found it obvious to combine the references to create the technology at issue in

this case. Fujisaki teaches removable cables from ports, a concept so utterly basic that anyone with or without skill would recognize. Therefore, a PHOSITA would have been easily motivated to combine the modified system of Goldberg with this reference demonstrating such a basic and easily implemented concept.

1. Dependent Claim 3: “The mobile medical monitoring device of claim 2, wherein the tail comprises a cable that is configured to be removably attachable to the first sensor communication port.”

102. Goldberg teaches a wired connection (“tail”) between the portable device and the pulse oximetry sensor. EX1005, 4:26-29. A PHOSITA reading Goldberg would assume that the wired connection is removable.

103. Regardless, Fujisaki teaches removable wired connections. EX1016, 5:37-44, FIGs. 2, 6. Specifically, Fujisaki shows a wearable device having cable removably connected with a connector plug (i.e., port). *Id.*



104. Fujisaki teaches that a removable cable allows for replacement of a sensor with another sensor. *Id.* Such interchangeability is important because not all patients have the same ailments, meaning that a set of monitored physiological

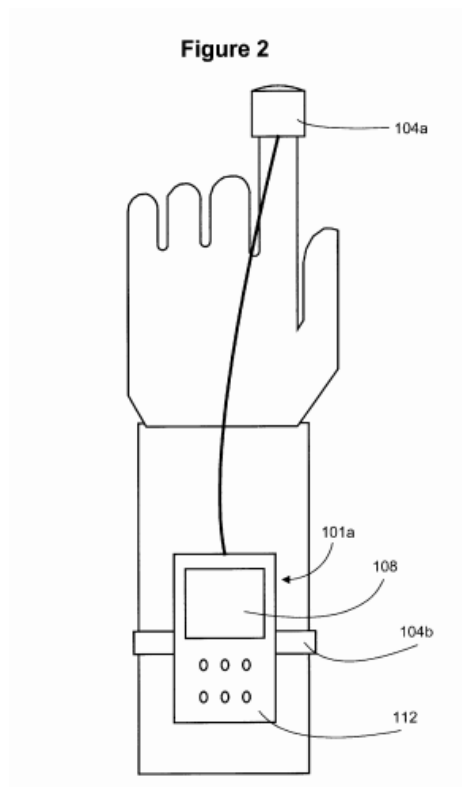
parameters can change from patient-to-patient. So, a caregiver would mix-and-match sensors with a wearable unit depending on which physiological parameters matter for a given patient. For example, a patient with an irregular heartbeat might need a pulse oximetry sensor and an ECG sensor, whereas, a patient suffering from a diabetes might need a glucose sensor. Having removable cables would allow a caregiver to connect the appropriate set of sensors to a wearable device and allow the wearable device to monitor patients having different ailments. Goldberg teaches that the portable device 100a can communicate with numerous sensors. EX1005, 5:9-24. Thus, one having ordinary skill would combine the teachings of Goldberg and Fujisaki to allow a caregiver to build a set of medical sensors appropriate for a patient's condition. *Id.*

105. Also, medical sensors can sometimes fail or malfunction. If an individual sensor fails, medical personnel would not want to remove and replace all sensors connected to a patient (which can be numerous); they only want to remove and replace the malfunctioning or broken sensor. A removable cable allows for replacement of a sensor without replacement of the monitoring device, such as the portable device 100 of Goldberg. Plug-and-play wired connections eliminate the need to commission and set up a new portable device, including setting up a patient profile and connecting the portable device 100a to the network. *Id.*

106. For either reason, it would have been obvious to modify Goldberg (if it didn't already have one) to include a removable wire to predictably yield a portable device that removably communicates with a sensor.

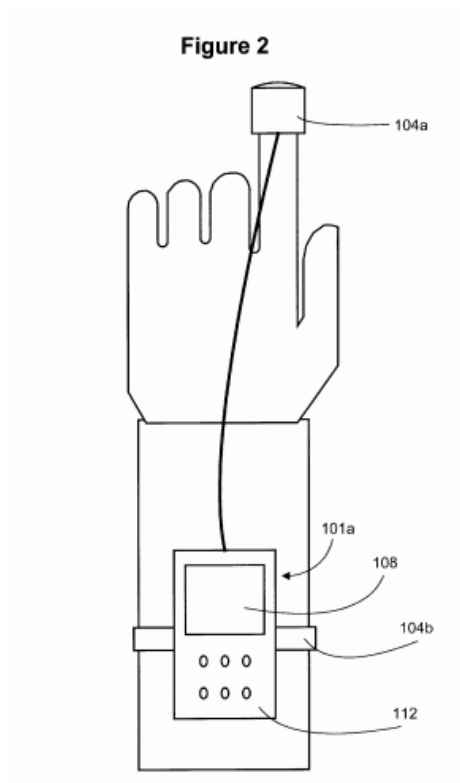
2. **Dependent Claim 4: “The mobile medical monitoring device of claim 3, wherein a length of the cable corresponds to the path from the sensor communication port on the side of the housing to the digit of the patient.”**

107. FIG. 2 of Goldberg shows the wire between the pulse oximetry sensor 104a and the housing 112 running from the first sensor port to a finger where the pulse oximetry sensor is attached. EX1005, FIG. 2. As shown, the length of the wire corresponds to the path between the housing and the patient's finger. *Id.* This concept is basic geometry.



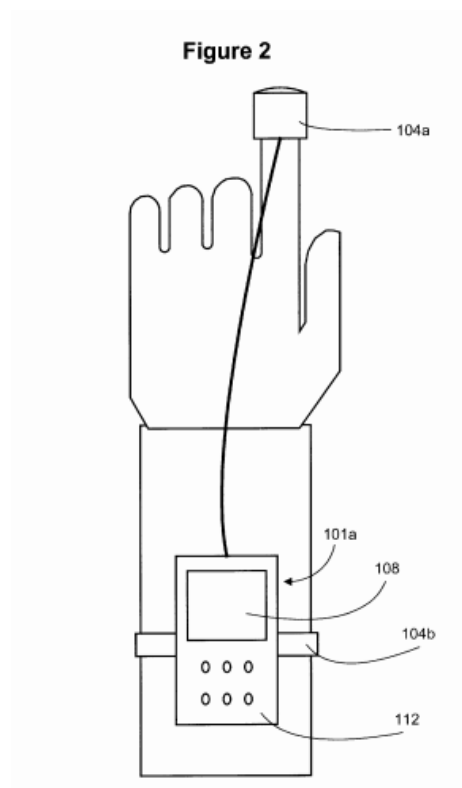
3. **Dependent Claim 5: “The mobile medical monitoring device of claim 3, wherein the cable is appropriately sized based on the path from the sensor communication port on the side of the housing to the digit of the patient.”**

108. FIG. 2 of Goldberg shows the wire between the pulse oximetry sensor 104a and the housing 112 running from the first sensor port to a finger where the pulse oximetry sensor is attached. EX1005, FIG. 2. As shown, the length of the cable is appropriately sized based on the length between the housing and the patient’s finger. *Id.*



4. **Dependent Claim 6: “The mobile medical monitoring device of claim 3, wherein the path from the sensor communication port on the side of the housing to the digit of the patient runs at least partly along a backside of the hand of the patient.”**

109. FIG. 2 of Goldberg shows the wire between the pulse oximetry sensor 104a and the housing 112 running from the first sensor port part way along a backside of the hand of the patient and to a finger where the pulse oximetry sensor is attached. EX1005, FIG. 2.



5. Independent Claim 13:

- a. “A body worn, battery-powered medical monitoring device configured to provide on-patient and remote monitoring of patient physiological parameters, the medical monitoring device comprising:”**

110. I fully explained above in paragraphs 55-58 how Goldberg in view of Kiani and Money teaches a body worn medical monitoring device to provide on-patient monitoring of physiological parameters.

111. Goldberg also teaches that measured parameters are transmitted to a remote computer 302. EX1005, 5:9-24, 4:19-23, 4:50-56, FIGs. 6A-C. Also, Goldberg teaches that the remote computer 302 stores and processes data received from the portable device. EX1005, 5:15-17. Thus, Goldberg teaches on-patient and remote monitoring of patient physiological parameters.

112. Lastly, Goldberg teaches a portable, wireless monitoring device 100. EX1005, Abstract, 4:13-16. A PHOSITA would understand that any portable, electronic device includes a battery. Without a battery, an electronic device would be tethered to a wall outlet, and thereby, not be portable. Thus, Goldberg implicitly teaches a battery to power all electronic subcomponents of the portable device 100, including the display and the sensor port. The use of batteries to power portable devices dates back decades.

113. Kiani specifically teaches that batteries power portable, electronic devices and the portable, electronic device’s subcomponents (e.g., displays and

ports). EX1006, 5:21-22, 9:11-13. It would have been obvious to include a battery within the portable device 100 of Goldberg to ensure that it was actually portable. Therefore, Goldberg in view of Kiani teaches a battery-powered medical monitoring device.

114. Therefore, even though the preamble should not be limiting, Goldberg teaches the entire preamble.

b. “a battery configured to provide power to the medical monitoring device such that the medical monitoring device may operate without a wired power connection;”

115. As I just explained in paragraphs 112-113, Goldberg in view of Kiani teaches a battery that powers a medical monitoring device.

c. “a case configured to house the battery;”

116. Goldberg teaches a housing 112 that secures to the forearm or wrist of the person under measurement. EX1005, 4:57-60, 4:57-60. Goldberg’s housing 112 clearly houses a battery, as there are not any other illustrated containers to hold a battery. Alternatively, as “modified” by Kiani, the housing 112 would obviously house the battery.

d. “a strap configured to attach the case to an arm of a patient and be mountable to the case;”

117. Goldberg teaches that the portable device 100 straps to the person’s arm via a blood pressure cuff 104b, which Goldberg specifically calls a strap.

EX1005, 4:57-60, 4:64-67. Thus, Goldberg teaches a strap mountable to the housing and configured to secure the housing to the arm of the patient. *Id.*

- e. **“a first communications port positioned on a face of a side of the case configured to be nearest to a hand of the arm of the patient when the case is mounted to the arm of the patient,”**

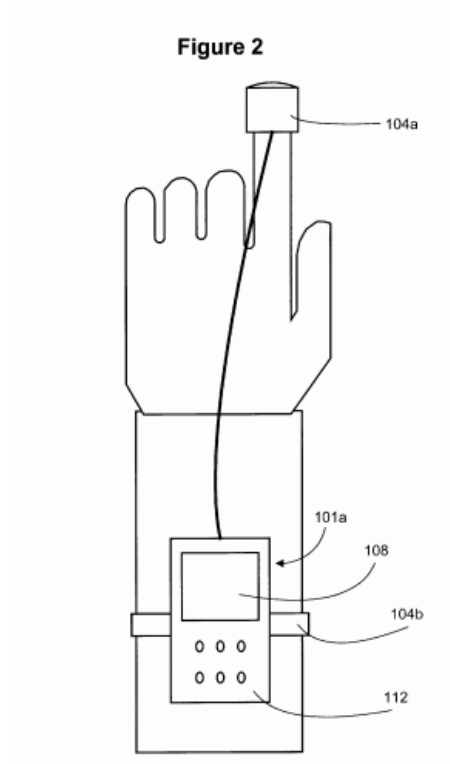
118. I fully explained how Goldberg in view of Kiani and Money teaches this limitation above in paragraphs 63-67.

- f. **“the first communications port configured to removably couple with a cable of a finger- or thumb-type pulse oximetry sensor and positioned on the face of the side of the case to provide a path from the first communications port to a digit of the hand of the patient that avoids tangling of the cable,”**

119. I fully explained how Goldberg in view of Kiani and Money teaches that a first communication port couples with a cable of a pulse oximetry sensor, and that the first communication port is positioned on a side of the housing 112 above in paragraphs 63-67 and 74-75.

120. Furthermore, Goldberg teaches a “finger-type” pulse oximetry sensor, which a PHOSITA would assume is merely a pulse oximetry sensor that attaches to and measures oxygen saturation at a patient’s finger. EX1005, 4:60-64. Also, the wire between the pulse oximetry sensor 104a and the housing 112 would clearly avoid tangling because it is not long enough to tangle, as shown. EX1002, FIG. 2. Said differently, Goldberg illustrates the wire as taut, and a taut wire cannot tangle

with itself. *Id.* As such, Goldberg teaches a wire that avoids tangling. Also, the direct path, along which the cable runs, between the face of the housing 112 positioned closest to the hand and the sensor 104a further avoids tangling as there is nothing that the wire could tangle with. All-in-all this claim limitation merely recites an intended use of the monitor – a limitation, which counsel has informed me, should carry no patentable weight.



121. Lastly, I fully explained how Goldberg in view of Fujisaki renders obvious a removable wire in paragraphs 102-106.

- g. “the first communications port configured such that the cable perpendicularly extends from the face of the side of the case when the cable is coupled to the first communications port;”**

122. I fully explained how Goldberg in view of Kiani and Money teaches this limitation above in paragraphs 74-75.

- h. “a second communications port configured to provide wired communications with a second physiological sensor arrangement at least partly via digital communications;”**

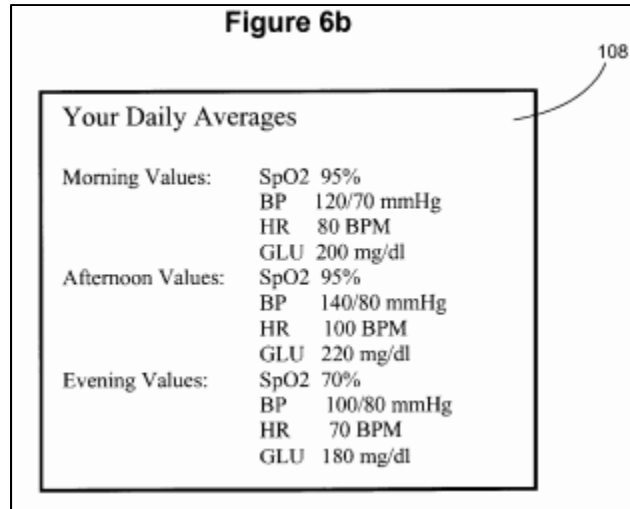
123. I fully explained how Goldberg in view of Kiani and Money teaches this limitation above in paragraphs 76-86.

- i. “a third communications port configured to provide wired communications with a third physiological sensor arrangement;”**

124. I fully explained how Goldberg in view of Kiani and Money teaches this limitation above in paragraphs 76-79.

- j. “a display configured to provide real time measurements of patient physiological parameters based at least in part on data obtained from at least the pulse oximetry sensor via the first communications port; and”**

125. I fully explained how Goldberg in view of Kiani and Money teaches a display above in paragraphs 61-62. More specifically, Goldberg teaches that the display 108 displays real-time measurement data, statistical data, and sensor data (e.g., oxygen saturation readings) based on data obtained by the pulse oximetry sensor 104a. EX1005, 4:19-23, 4:30-36, 50-55, 6:32-45, FIG. 6A-C.



- k. **“a transmitter configured to wirelessly transmit information indicative of real time measurements of patient physiological parameters based at least in part on data obtained from the pulse oximetry sensor via the first communications port.”**

126. Goldberg teaches that the communication unit 110 wirelessly transmits real-time sensor data and measurements, which can include oxygen saturation, (patient physiological measurements) to a remote computer 302 based at least in part on signals received from the pulse oximetry sensor. EX1005, 4:50-56, 4:60-64, 5:9-21.

- 6. Dependent Claim 14: “The medical monitoring device of claim 13, wherein the path from the first communications port to a digit of the hand is shorter than any path from any communications port located on any other side of the case to the digit of the hand.”**

127. I fully explained how Goldberg in view of Kiani teaches the limitation of claim 14 above in paragraphs 74-75.

7. Dependent Claim 15:

- a. “The medical monitoring device of claim 13 further comprising: one or more hardware processors configured to:”**

128. I fully explained how Goldberg teaches this limitation above in paragraph 87.

- b. “process the data obtained from the pulse oximetry sensor; and”**

129. The controller 102 of Goldberg processes data obtained from the pulse oximetry sensor. EX1005, 4:30-36, 4:62-64.

- c. “determine, based at least in part on the data, the real time measurements of patient physiological parameters.”**

130. The controller 102 of Goldberg determines real time oxygen saturation data based on signals from the pulse oximetry sensor. EX1005, 4:30-36, 4:62-64. Thus, Goldberg fully teaches claim 15.

8. Dependent Claim 16:

- a. “The medical monitoring device of claim 15, wherein: the one or more hardware processors are further configured to receive additional data from at least the second physiological sensor arrangement and the third physiological sensor arrangement;”**

131. I fully explained how Goldberg in view of Kiani and Money teaches a portable monitoring device 100 that communicates with at least three physiological sensors above in paragraphs 76-79.

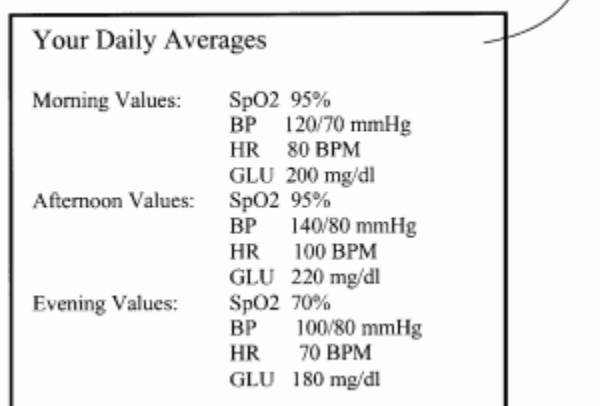
- b. “determine, based at least in part on the additional data, real time measurements of additional patient physiological parameters; and”**

132. The controller 102 of Goldberg determines real time blood pressure and, for example, glucose data based on signals from the blood pressure sensor and glucose sensor. EX1005, 4:30-36, 4:64-5:8, FIG. 6a-c. Also, Goldberg teaches that the third sensor arrangement alternatively is any of ECG, temperature, respiration rate, etc. EX1005, 4:50-56, 5:3-8.

- c. “cause to be displayed, on the display, the real time measurements of additional patient physiological parameters; and”**

133. Goldberg teaches that the controller 102 receives signals from all connected sensors, which can include, for example, a pulse oximeter 104a, a blood pressure sensor 104b, temperature, and electrolyte sensor. EX1005, 4:19-29, 4:57-5:8. Alternatively, Goldberg teaches that the third sensor arrangement is an ECG sensor. EX1005, 4:50-56, 5:3-8. Goldberg further teaches that the controller 102 displays physiological parameter values determined based on signals received from all connected sensors on the display 108. EX1005, 4:19-29, 5:3-8, 5:36-53, 6:32-46, FIGs. 6a-c. It is, of course, obvious to configure a monitor to work with multiple sensors to track needed vital signs of a patient. *See* EX1005, 4:24-30, 4:57-5:8

Figure 6b

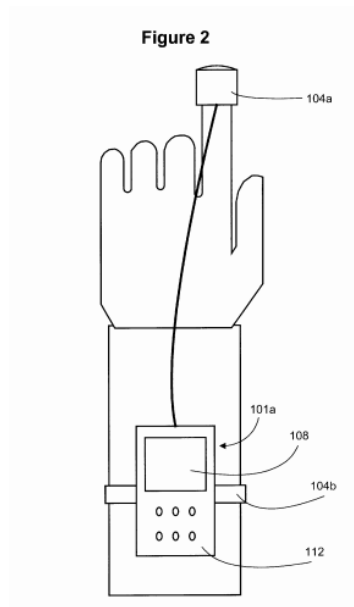


- d. **“the transmitter is further configured to: wirelessly transmit information indicative of real time measurements of additional patient physiological parameters based at least in part on the additional data.”**

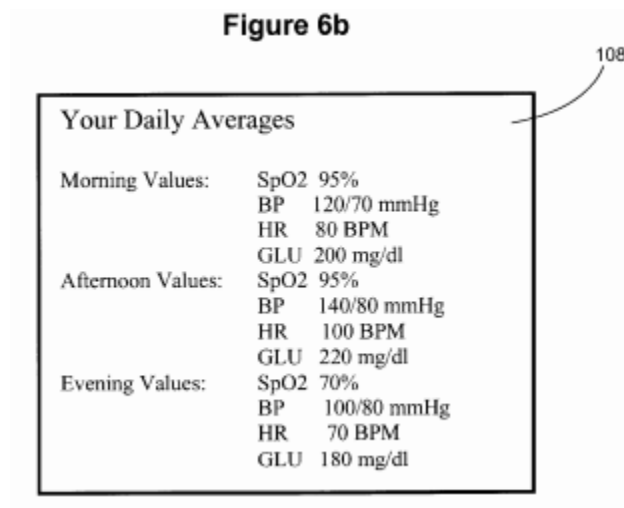
134. Goldberg teaches that the communication unit 110 wirelessly transmits sensor data and measurements, which can include blood pressure (additional physiological parameter), oxygen saturation, temperature, pulse rate, glucose, ECG, etc., to a remote computer 302. EX1005, 4:50-56, 5:9-21.

9. **Dependent Claim 17: “The medical monitoring device of claim 16, wherein the display is positioned on a front, user-facing side of the case to enable a user to view the real time measurements of patient physiological parameters and the real time measurements of additional patient physiological parameters.”**

135. Goldberg clearly teaches a display 108 positioned on the front, user-facing side of the housing 112, as seen in FIG. 2.



136. Goldberg further teaches that the display 108 displays measurement data, statistical data, and sensor data from multiple sensors (e.g., blood pressure readings, oxygen saturation readings, pulse readings, temperature, ECG readings, etc.). EX1005, 4:50-56, 5:3-8, 6:32-45, FIGs. 6A-B.



- 10. Dependent Claim 18: “The medical monitoring device of claim 17, wherein the second physiological sensor arrangement comprises an EKG sensor arrangement and**

the third physiological sensor arrangement comprises a blood pressure sensor arrangement.”

137. Goldberg’s portable device is highly customizable. EX1005, 4:50-56, 5:3-8. Goldberg specifically mentions that the portable device can communicate with any physiological sensor arrangement, including ECG and blood pressure sensors. EX1005, 4:64-67, 1:37-44, 4:50-56, 5:5-8, FIG. 2. Thus, Goldberg teaches or renders obvious claim 18.

11. Dependent Claim 19:

- a. “The medical monitoring device of claim 18, wherein the first, second, and third communication ports are communicatively coupled to respective first, second, and third sensor interfaces; and”**

138. Goldberg teaches that the portable device 100 communicates with a plurality of sensors or various types. EX1005, 4:34-36, 4:57-5:8. A PHOSITA would assume that the portable device 100 includes sensor interfaces because a PHOSITA would understand that a sensor interface would be necessary to receive and understand signals transmitted by the connected sensors. A PHOSITA would understand that a sensor interface is simply circuitry that receives signals and transmits those signals to a processing device or logic, and it might include basic signal processing, like filtering, buffering, analog-to-digital conversion, etc., which is exactly how the ’735 Patent describes a sensor interface. EX1001, 6:44-47, 7:12-21. As such, Goldberg implicitly teaches that the portable device includes sensor

interfaces because Goldberg teaches that the portable device 100 can communicate with physiological sensors.

139. Money explicitly explains the baseline understanding of a PHOSITA. Money teaches that each connection with a physiological sensor includes a sensor interface. EX1008, 3:14-24, 5:28-51. Money teaches a highly specific monitor where the monitor 10 receives sensor signals via a respective sensor interface. EX1008, Abstract, 5:38-51.

140. Even though Money merely represents the implicit teachings of Goldberg, Goldberg would be obviously modified by Money such that Goldberg would include a plurality of sensor interface circuits to respectively communicate with the physiological sensors already taught by Goldberg. EX1005, 5:3-8; EX1008, 2:15-25. Goldberg wishes to communicate with “any” conventional sensor. EX1005, 5:3-8. Therefore, a PHOSITA would have been motivated to modify Goldberg based on the teachings of Money to include sensor interface circuits (if they weren’t already there) to predictably communicate with physiological sensors. Therefore, the combination of Goldberg and Money represents a combination prior art elements according to known methods (wired communication with sensors and wired communication with sensors through sensor interfaces) to yield predictable results (the portable device of Goldberg would predictably receive signals from various sensors).

- b. “the first, second, and third sensor interfaces are uniquely configured to receive signals from the respective pulse oximetry sensor, EKG sensor arrangement, and blood pressure sensor arrangement.”**

141. As I said above, Money teaches respective sensor interfaces for communicating with a pulse oximetry sensor, an ECG sensor, and a blood pressure sensor. EX1008, 5:28-44. Thus, Goldberg in view of Money renders obvious Claim 19.

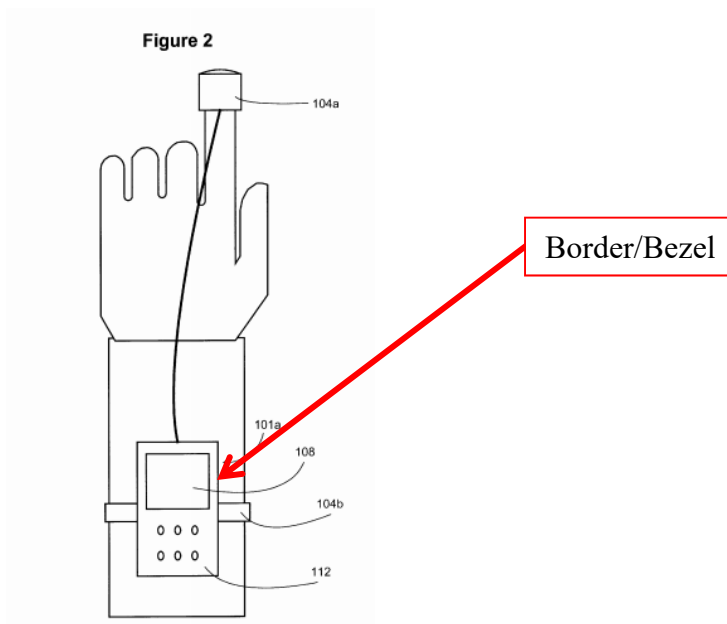
D. Ground 3: Claims 10-12 are unpatentable under 35 U.S.C. § 103(a) over Goldberg, Kiani, Money, and Estep

142. In my opinion, claims 10-12 would have been obvious to a PHOSITA in view of Goldberg along with Kiani, Money, and Estep. This is because I believe that a PHOSITA, having knowledge of these four sources, would have found it obvious to combine the references to create the technology at issue in this case.

1. Dependent Claim 10:

- a. “The mobile medical monitoring device of claim 9, wherein: the front side of the housing comprises a bezel and the display, and”**

143. Goldberg teaches a display 108, and FIG. 2 illustrates a border of the housing 112 surrounding the display 108. A PHOSITA would understand that a bezel is simply a border around a display 108. Thus, Goldberg teaches a bezel.



144. As proof that those of skill in the art understand a bezel to simply be a border around a display, I offer Estep. Estep teaches a wearable device having a display with a bezel surrounding it. EX1009, 4:24-27, FIG. 3C. Estep expressly describes a bezel, but simply describes it as a border around a display. *Id.* As such, Estep proves that Goldberg teaches a bezel. Indeed, bezels are common on watches, which are similarly attached to the wrist by a strap or band.

145. Alternatively, it would have been obvious to combine the bezel taught by Estep with the housing/display taught by Goldberg. Bezels, in some situations (but not all), securely hold any display glass or screen in place. Thus, inclusion of a bezel around a display would securely hold the display in place, and combining Goldberg and Estep represents a combination of prior art elements (displays and

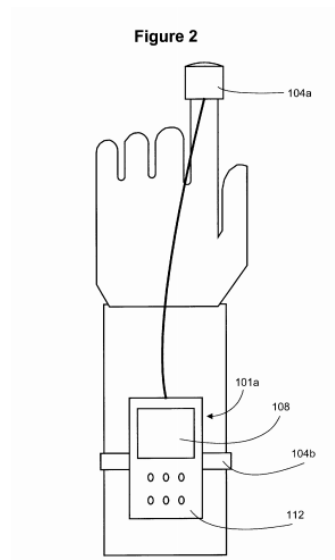
displays held in place by a bezel) according to known methods to yield predictable results.

b. “a top of the first sensor communication port is located below the face of the housing.”

146. I fully explained the three-dimensional nature of Goldberg’s housing above in paragraph 94. For the same reasons, Goldberg’s FIG. 2 illustrates the entire sensor port being located below the front face of Goldberg’s housing 112.

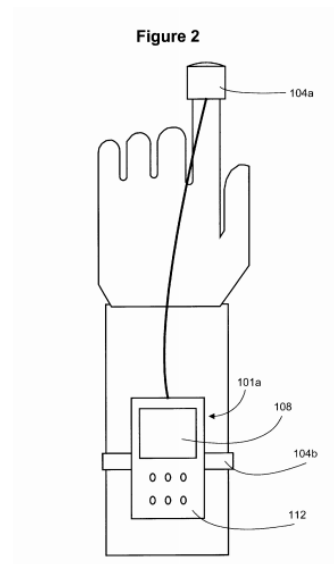
2. Dependent Claim 11: “The mobile medical monitoring device of claim 10, wherein the display is positioned centrally on the face of the housing.”

147. The display 108 of Goldberg is positioned centrally on the front side of the housing 112.



3. **Dependent Claim 12: “The mobile medical monitoring device of claim 11, wherein the display positioned on the face of the housing is sized such that the display covers most of a length of a shortest dimension of the face of the housing.”**

148. Goldberg also illustrates the display sized and positioned on the front side such that it covers most of the shortest dimension of the front side of the housing. EX1005, FIG. 2.



E. Ground 4: Claim 20 is unpatentable under 35 U.S.C. § 103(a) over Goldberg, Kiani, Money, Fujisaki, and Estep

149. In my opinion, claim 20 would have been obvious to a PHOSITA in view of Goldberg along with Kiani, Money, Fujisaki, and Estep. This is because I believe that a PHOSITA, having knowledge of these five sources, would have found it obvious to combine the references to create the technology at issue in this case. Thus, claim 20 merely represents an omnibus claim including all the elements

I described above. This omnibus combination is just as obvious as its sub-combinations.

1. Independent Claim 20:

- a. “A body worn portable patient monitoring device configured to provide on-patient and remote monitoring of patient physiological parameters, the portable patient monitoring device comprising:”**

150. I fully explained how Goldberg in view of Kiani and Money teaches this preamble above in paragraphs 110-114.

- b. “a pulse oximetry sensor configured to be wrapped around a digit of a patient, the pulse oximetry sensor including at least:”**

151. Goldberg teaches and illustrates a pulse oximetry sensor wrapping around a patient’s finger. EX1005, 4:60-64, FIG. 2.

- c. “a light emitter configured to emit light into a tissue site of the digit of the patient;”**

152. Goldberg teaches and illustrates a pulse oximetry sensor wrapping around a patient’s finger. EX1005, 4:60-64, FIG. 2. A PHOSITA would assume that this pulse oximetry sensor 104a is a non-invasive, light-based pulse oximetry sensor having a light emitter and a transmitter because it is illustrated and taught as being placed on a patient’s finger. The only pulse oximetry sensors of which I am aware that attach to fingers are light-based pulse oximetry sensors (prior pulse oximetry sensors measured oxygen saturation using cuffs (like a blood pressure cuff). Therefore, a PHOSITA reading Goldberg would assume that the finger-

placed, pulse oximetry sensor 104a includes a light emitter configured to emit light into the finger's tissue.

153. Kiani expressly explains the knowledge of a PHOSITA. Kiani teaches a pulse oximetry sensor that attaches to a patient's finger and Kiani includes a light emitter configured to emit light into finger tissue. EX1006, 1:15-19.

154. While I am convinced that Goldberg's pulse oximetry sensor 104a already includes a light emitter, even if it didn't, it would have been obvious to substitute the pulse oximetry sensor 104a taught by Goldberg with the light-based, pulse oximetry sensor taught by Kiani to predictably detect oxygen saturation using light attenuation. EX1006, 1:15-2:23. A PHOSITA would have been motivated to use a light-based pulse oximetry sensor as opposed to any other in order to non-invasively measure pulse oxygen saturation, and thereby increase patient comfort. EX1006, 1:3-8.

d. "a light detector configured output a first signal responsive to at least a portion of the emitted light after attenuation by tissue of the tissue site; and"

155. Kiani teaches that light-based pulse oximetry sensors include light detectors that output a signal based on the amount of light that attenuated through a finger's tissue from the light emitter. EX1006, 1:15-2:23.

- e. **“a cable extending from the pulse oximetry sensor and configured to electrically convey the first signal;”**

156. Goldberg teaches and illustrates a cable connecting the pulse oximetry sensor 104a and the housing 112 that conveys signals from the pulse oximetry sensor. EX1005, 4:26-29, 4:57-67.

- f. **“a blood pressure sensor configured to output a second signal responsive to at least a blood pressure parameter of the patient;”**

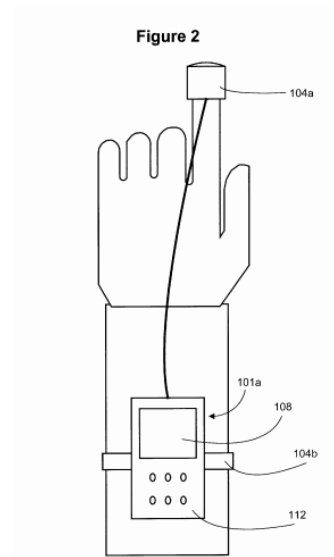
157. Goldberg also teaches a blood pressure sensor configured to output a signal representative of a patient’s blood pressure. EX1005, 4:19-29, 4:64-67, FIG. 2.

- g. **“an additional sensor arrangement configured to output a third signal responsive to at least one additional physiological parameter of the patient other than blood pressure or oxygen saturation, the at least one additional physiological parameter including at least one of: temperature or respiration rate;”**

158. Goldberg’s portable device 100a connects to and communicates with three or more sensors. EX1005, 4:19-29, 5:3-8. Specifically, Goldberg teaches both a temperature sensor and a respiration rate sensor configured to respectively output a signal representative of the patient’s respiration rate or temperature. EX1005, 4:19-29, 4:64-67, FIG. 2.

- h. “a housing configured to be secured to a lower arm of the patient, the housing having a size and shape configured to be secured to the lower arm of the patient;”**

159. Goldberg teaches a housing 112 that secures to the forearm or wrist of the person under measurement. EX1005, 4:19-30, 4:57-60. As shown, the housing 112 is sized and shaped to be worn on a patient’s wrist. EX1005, FIG. 2. Thus, Goldberg teaches this claim limitation.



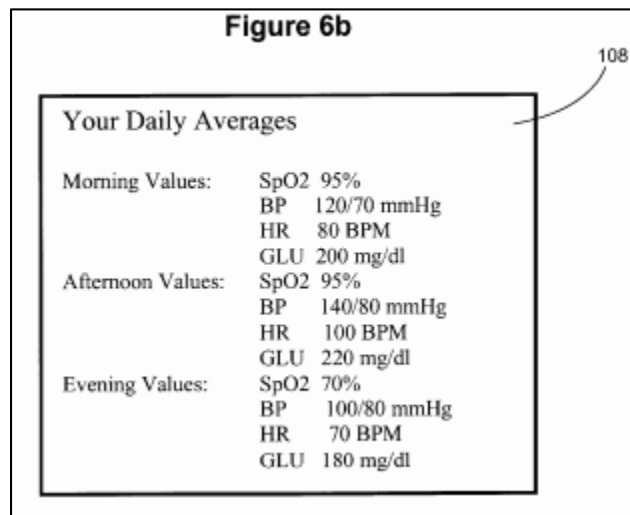
- i. “a strap mountable to the back side of the housing, the strap configured to secure the housing to the lower arm of the patient;”**

160. I fully explained above in paragraphs 117 and 94-99 how Goldberg in view of Kiani and Money teaches a strap mountable to the back side of the housing and configured to secure the housing to the patient’s wrist.

- j. “a display positioned on a front side of the housing that is opposite a back side of the housing, the display configured to show a status of the portable patient**

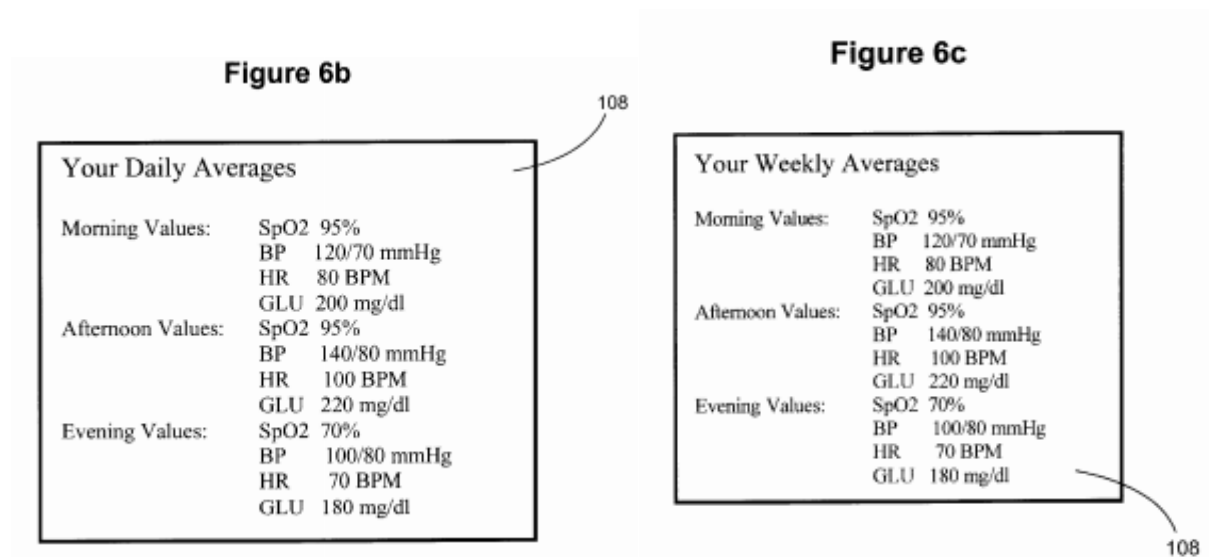
monitoring device and one or more parameter measurements so as to be viewable by a user,”

161. I fully explained how Goldberg in view of Kiani and Money teaches a display positioned on a front side of the housing that is opposite a back side of the housing and configured to shown one or more parameter measurements so as to be viewable by a user above in paragraphs 61-62 and 125.



162. Additionally, Goldberg teaches that the display 108 displays status. More specifically, the display 108 indicates whether it is displaying daily or weekly averages, thereby indicating whether the device is operating in either a daily or weekly display mode. EX1005, FIGs. 6B-C. These words, “daily averages” or “weekly averages,” indicate status because they indicate the portable device’s display mode, and a PHOSITA would understand that displayed status is merely displayed data indicating some mode or status about the portable device.

Because the display 108 displays this status information, a PHOSITA would understand these indicators to show status.



163. In addition, there is nothing inventive about displaying status. Patent Owner's own reference, Kiani, demonstrates this. Specifically, Kiani teaches a portable medical monitoring device that displays low battery and alarm enabled *status indicators* 572, 574. EX1006, 8:33-9:2. Low battery and alarm enabled status indicators merely display data about the portable device's mode or status (e.g., whether its battery is low or whether an alarm is enabled). *Id.* Displaying this information isn't revolutionary, it's just an indication of some state of the device displayed on a screen. EX1005, FIGs. 6B-C; EX1006, 8:33-9:2. Many portable electronic devices, including phones in the 1990s, indicated status. The whole point of monitoring anything, whether it be time or patient vital signs, is to display status on the monitor.

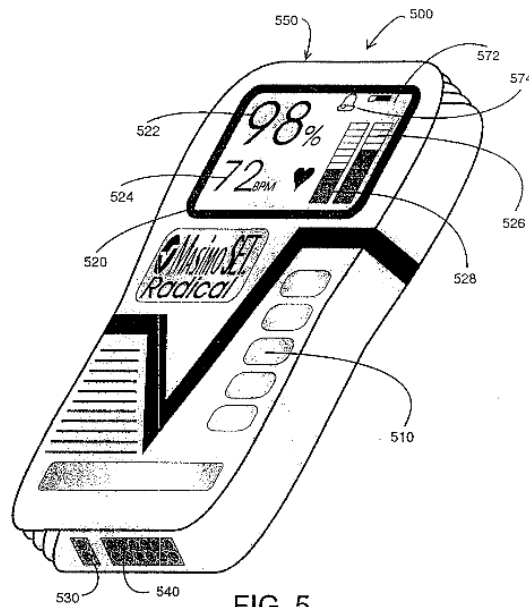


FIG. 5

164. Regardless, I have been informed by counsel that obviousness can be shown when combining prior art elements according to known methods yields predictable results. In my opinion, modifying Goldberg with the teachings of Kiani combines a display configured to display data according to known methods (displaying low battery and alarm enabled status) to predictably display additional status, such as low battery and alarm enabled status. Modifying these two references would predictably result in Goldberg's display displaying more information about the status or mode of the portable device 100.

- k. “wherein the display is positioned centrally on the front side of the display and is sized such that the display spans most of a length of a shortest dimension of the front side of the housing, and”**

165. I fully explained how Goldberg in view of Kiani and Money teaches these limitations above in paragraphs 147-148.

- l. “wherein the front side of the housing comprises a single user interface and a bezel;”**

166. I fully explained how Goldberg in view of Kiani, Money, and Estep teaches these limitations above in paragraphs 92-93 and 143-145.

- m. “one or more user input mechanisms configured to control an operational mode of the portable patient monitoring device in response to inputs from a user;”**

167. The portable device 100a of Goldberg includes buttons (input mechanisms) for controlling the portable device 100a. EX1005, 5:36-53. Goldberg provides a few examples as to how the buttons control the portable device. *Id.* For example, the display choice button 121 dictates an operational mode of the portable device (i.e. whether the portable device 100a displays graphical or textual data). EX1005, 5:47-53.

- n. “a first sensor port positioned on a face of a first side of the housing, wherein: the face of the first side of the housing is configured to face toward a hand having the digit of the patient under measurement when the housing is secured to the lower arm of the patient,”**

168. I fully explained how Goldberg in view of Kiani and Money teaches this limitation above in paragraphs 63-67.

- o. “the first sensor port is configured to removably physically couple with the pulse oximetry sensor via the cable and to electrically receive the first signal from the pulse oximetry sensor,”**

169. I fully explained how Goldberg in view of Kiani, Money, and Fujisaki teaches this limitation above in paragraphs 102-106.

- p. “the cable is configured to run from the first sensor port, at least part way along a path substantially perpendicular to the face of the first side of the housing, down the arm of the patient, and to the digit of the patient to which the pulse oximetry sensor is configured to be wrapped around,”**

170. I fully explained how Goldberg in view of Kiani teaches this limitation above in paragraphs 74-75, 109, and 122.

- q. “the front side of the housing is raised from the strap and the lower arm of the patient to enable positioning of the first sensor port on the first side of the housing between the lower arm of the patient and the front side of the housing, and”**

171. I fully explained how Goldberg teaches this limitation above in paragraph 100.

- r. “a top of the first sensor port is located below the front of the housing;”**

172. I fully explained how Goldberg in view of Kiani teaches this limitation above in paragraph 146.

- s. “a second sensor port positioned on the housing and configured to provide wired electrical communication with the blood pressure sensor arrangement and to**

electrically receive second signal from the blood pressure sensor arrangement;”

173. I fully explained how Goldberg in view of Kiani teaches this limitation above in paragraphs 76-86 and 123. Also, Kiani teaches how to position sensor ports 530, 540, 550 on a housing 500. EX1006, FIG. 5.

t. “a third sensor port positioned on the housing and configured to provide electrical wired communication with the additional sensor arrangement and to electrically receive the third signal from the additional sensor arrangement;”

174. I fully explained how Goldberg in view of Kiani teaches this limitation above in paragraph 124. Also, Kiani teaches how to position sensor ports 530, 540, 550 on a housing 500. EX1006, FIG. 5.

u. “a rechargeable battery positioned within the housing and configured to power the portable patient monitoring device such that the portable patient monitoring device is portable and wearable by the patient;”

175. I fully explained how Goldberg in view of Kiani teaches this limitation above in paragraphs 112-114. Also, Kiani specifically teaches a rechargeable battery. EX1006, 5:21-22.

v. “one or more signal processing arrangements positioned within the housing and configured to:”

176. Goldberg teaches a controller 102 that receives and processes signals from the sensors 104. EX1005, 4:34-36. A PHOSITA would understand that a controller 102 is a processor. *Id.*

- w. **“receive the first signal from the pulse oximetry sensor via one or more sensor interfaces,”**

177. Goldberg teaches that the controller 102 receives signals from the pulse oximetry sensor. EX1005, 4:19-23, 4:62-64. Additionally, it would have been obvious to receive this signal via a sensor interface in view of Money, as I discussed above in paragraphs 138-141.

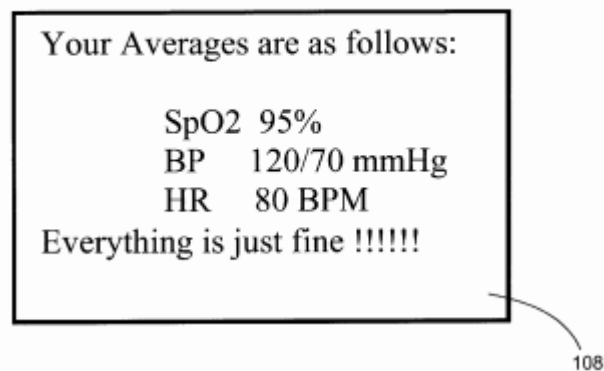
- x. **“wherein the first signal is provided at least partly as an analog signal;”**

178. I fully explained how Goldberg in view of Kiani teaches this limitation above in paragraphs 70-73.

- y. **“process the first signal from the pulse oximetry sensor to determine measurements of oxygen saturation and pulse rate;”**

179. Goldberg teaches that the controller 102 processes signals from all connected sensors including the pulse oximetry sensor 104a. EX1005, 4:19-23, 4:50-55, FIGs. 6A-C.

Figure 6a



180. A PHOSITA would understand that the heart rate value (HR) and the oxygen saturation (SpO₂) both come from the pulse oximetry sensor 104a because a PHOSITA knows that pulse oximetry sensors measure both pulse rate and oxygen saturation together. Kiani explicitly teaches this implicitly understood fact. Kiani explains that a pulse oximeter measures both pulse rate and oxygen saturation. EX1006, 6:7-9. A PHOSITA would assume that the pulse oximetry sensor 104a taught by Goldberg also measures both pulse rate and oxygen saturation because Goldberg teaches that values for both are displayed on the display 108. EX1005, FIGs. 6A-C.

181. Technically, a sensor doesn't determine both pulse rate and oxygen saturation. Instead, the pulse oximetry sensor transmits signals, and a processor can determine a pulse rate by noticing peaks in the signal emitted. As Goldberg explains, the portable device *computes* statistical data representing physiological values from the signals it receives from connected sensors. EX1005, 1:45-49. So, because Goldberg teaches that pulse rate and oxygen saturation both sensed, derived, and displayed by display 108, Goldberg teaches that the controller determines the pulse rate and the oxygen saturation from signals received from the pulse oximetry sensor. EX1005, 4:34-36, 4:50-56, FIGs. 6A-C. Of note, Goldberg seems to equate pulse rate and heart rate, but one skilled in the art would know that

pulse oximetry sensors only calculate pulse rate by detecting pulses through blood vessels.

182. Even if the pulse oximetry sensor 104a of Goldberg wasn't able to measure both pulse rate and oxygen saturation, it would have been obvious to determine pulse rate from the pulse oximetry sensor in view of Kiani. Kiani teaches that conventional pulse oximetry sensors detect pulse rate and oxygen saturation simultaneously. EX1006, 6:7-9. It would have been obvious to modify the pulse oximetry sensor 104a and controller 102 to detect both parameters based on signals from the pulse oximetry sensor 104a in view of Kiani to minimize the number of sensors attached to the patient. A PHOSITA would know that attaching numerous sensors to a patient increases patient discomfort and increases the chances that one of the sensors falls off or becomes disconnected.

183. Modifying Goldberg with Kiani substitutes one known sensor (Goldberg's pulse oximetry sensor 104a) for another (Kiani's pulse oximetry sensor) to predictably detect both oxygen saturation and pulse rate by the same sensor. EX1005, 4:60-64; EX1006, 6:7-9.

z. "receive the second signal from the blood pressure sensor arrangement via the one or more sensor interfaces, the second signal responsive to at least a blood pressure parameter of the patient;"

184. Goldberg teaches that the controller 102 receives signals from the blood pressure sensor. EX1005, 4:19-23, 4:64-67. Additionally, it would have been

obvious to receive this signal via a sensor interface in view of Money, as I discussed above in paragraphs 138-141.

- aa. “receive the third signal from the additional sensor arrangement via the one or more sensor interfaces, the third signal responsive to the at least one additional physiological parameter of the patient including at least one of: temperature or respiration rate,”**

185. Goldberg teaches that the controller 102 receives signals from all connected sensors, which can include either a temperature sensor or a respiration rate sensor. EX1005, 1:37-44, 4:19-23, 4:50-55, 5:1-8. Additionally, it would have been obvious to receive this signal via a sensor interface in view of Money, as I discussed above in paragraphs 138-141.

- bb. “wherein the third signal is provided at least partly as a digital signal; and”**

186. Money teaches that the monitor receives digital signals via an RS232 port. EX1008, 6:11-20, 13:24-32. It would have been obvious to output a digital signal indicative of any discrete parameter, including temperature, so that the monitor could receive data according to conventional, and standardized digital connection ports, such as the RS232 serial port. EX1008, 7:4-8, 6:11-20, 7:58-62, 13:24-32. Use of standardized ports and cables would allow for easier to purchase equipment, like cabling to connect sensors to the monitor 10. *See* paragraphs 80-86. Additionally, transmitting data via digital data packets is an extremely efficient,

and predictable way for electronic devices to communicate. Money teaches how to receive digital data from a sensor via the RS232 port. EX1008, 6:11-20. Thus, modifying Goldberg with Money would have been a combination of prior art elements (receiving data from sensors and receiving digital data) according to known methods (receiving digital data via RS232) to yield predictable results (the controller 102 of Goldberg would predictably receive temperature values via the RS232 port by interpreting standardized data packets).

cc. “cause the measurements of oxygen saturation, pulse rate, blood pressure, and the at least one additional physiological parameter to all be displayed on the display of the portable patient monitoring device; and”

187. I fully explained how Goldberg in view of Kiani and Money teaches this limitation above in paragraphs 61-62, 125, and 133.

dd. “a transmitter positioned within the housing and configured to:”

188. Goldberg teaches a transmitter positioned within the housing 112. EX1005, 4:40-42.

- ee. **“wirelessly transmit a transmit signal including the information indicating the measurements of oxygen saturation, pulse rate, blood pressure, and the at least one additional physiological parameter to a separate computing device configured to display, on a remote display, the measurements of oxygen saturation, pulse rate, blood pressure, and the at least one additional physiological parameter.”**

189. I fully explained how Goldberg in view of Kiani and Money teaches this limitation above in paragraphs 126 and 134. Additionally, Goldberg teaches that the remote computer 302 is configured to display received physiological parameters, including oxygen saturation, pulse rate, blood pressure, and respiration rate. EX1005, 6:29-31. Thus, Goldberg in view of Kiani, Money, Fujisaki, and Estep teaches and renders obvious claim 20.

F. Ground 5: Claims 1-2 and 7-9 are unpatentable under 35 U.S.C. § 103(a) as obvious in view of Money, Akai, and Kiani

190. In my opinion, claims 1-2 and 7-9 would have been obvious to a PHOSITA in view of Money along with Akai and Kiani. This is because I believe that a PHOSITA, having knowledge of these three sources, would have found it obvious to combine the references to create the technology at issue in this case. Money, Akai, and Kiani represent a snapshot of the medical field before the filing date of the '108 Patent. Money illustrates the movement of medical monitoring away from strictly bedside monitoring to a wireless setting, where patient vital signs are aggregated and monitored at a centralized computer. EX1008, 2:64-3:2.

Also, due to the miniaturization of electronic devices, continuing in the early aughts, medical monitors became small enough to wear, which allowed clinician to monitor patient vitals in settings other than a hospital. EX1008, 2:9-14, 2:64-3:2; EX1006, 2:34-3:5. These references further demonstrate the need for adaptability in monitoring different sets of vital signs depending on a patient or a patient's ailment. EX1008, Abstract; EX1007, 11:12-22; EX1006, 5:3-8.

1. Independent Claim 1

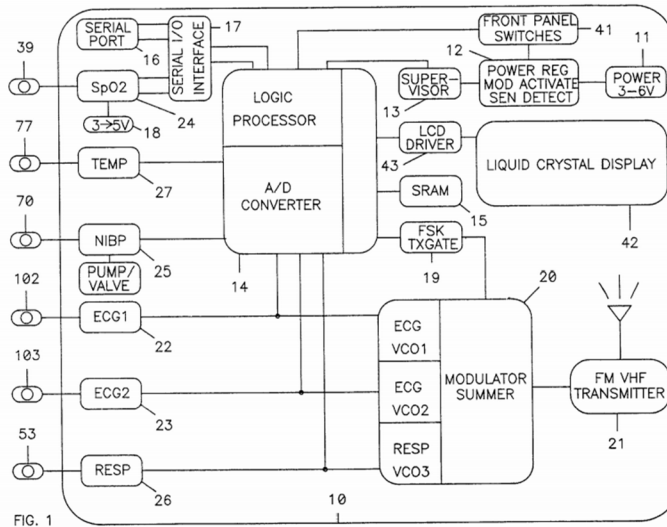
- a. “A body worn mobile medical monitoring device configured to minimize cable wiring from a sensor by placement of one or more sensor communication ports, the mobile medical monitoring device comprising:”**

191. As I explained above in paragraph 55, the preamble is entirely a statement of use.

192. Even if the preamble was limiting, Money teaches the entire preamble. Specifically, Money teaches a body worn, mobile medical monitoring device 10. EX1008, 5:3-10.

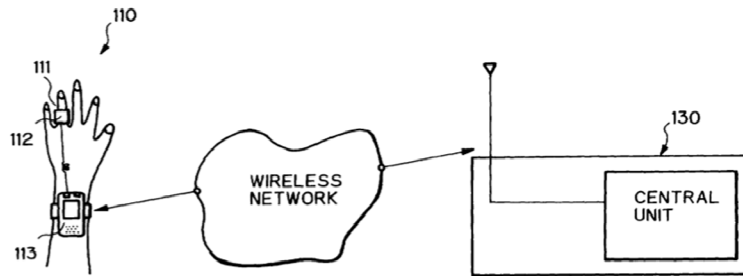
193. Money teaches that the remote patient monitoring device 10 connects to numerous sensors through wired connections. EX1008, 5:23-28, FIG. 1. Money also shows the wired connectors (i.e., ports) on the housing. EX1008, FIGs. 17A-B. However, Money does not teach how much wiring is required to connect the monitor 10 to all sensors. Money seems to teach that all sensor ports are positioned

on the same side of the housing. EX1008, FIG. 17A-B. It's entirely possible that Money's port positioning in fact minimizes wiring (an obvious design objective), but because Money never illustrates the monitor 10 while worn on a patient, I cannot definitively say.



194. Nevertheless, regarding the preamble statement that the monitoring device “is configured to minimize cable wiring from a sensor by placement of one or more sensor communication ports,” Akai positions its wire between a pulse oximetry sensor 112 and a housing 113 at the closest possible location to the patient’s hand when the patient wears the portable device 100. EX1007, 5:14-19, FIG. 1.

Fig. 1



Specifically, as shown in FIG. 1, the first sensor port of Akai exists on the top side (first side) of the housing, which is the side of the housing closest to and facing the person's hand when the person is wearing the portable device 110. EX1007, FIG.

1. Because the wire and port are positioned in this way, the amount of wire necessary to connect a finger-worn, pulse oximetry sensor 112 taught by Akai, is minimized. A PHOSITA would assume that this wired connection between the pulse oximetry sensor 112 and the housing 113 would include a port or it would have been obvious to include a port as part of this wired connection. I will discuss the reasoning behind this assumption and obviousness conclusion in more detail below, in paragraphs 204-208.

195. It would have been obvious to modify Money's housing in view of Akai primarily because it would have been obvious to substitute a pulse oximetry cuff transducer 39, as taught by Money, with a light-based pulse oximetry sensor 112 that is positioned on a patient's finger, as taught by Akai. Pulse oximetry cuff

transducers are largely obsolete in modern medicine and were largely obsolete even in 2002 (the priority date of the '735 Patent). Pulse oximetry cuff transducers, like the one taught in Money, are bulky and uncomfortable when worn by a patient. In contrast, light-based pulse oximetry sensors are completely non-invasive, far smaller, and thereby, more comfortable when worn by a patient. EX1007, 8:26-33, 11:19-21. I have been informed by counsel that a simple substitution of one known, equivalent element with another to obtain predictable results demonstrates obviousness. Here, it would have been obvious to replace the equivalent pulse oximetry cuff 39 of Money with the light-based pulse oximetry sensor 112 of Akai to predictably measure oxygen saturation using light. EX1007, 8:26-33, 11:19-21.

196. After substituting the pulse oximetry cuff with a non-invasive, light-based sensor that attaches to a patient's finger, a PHOSITA would have been further motivated to augment Money's housing in view of Akai so that the housing attached to a patient's wrist, and the port corresponding to the pulse oximetry sensor faced the patient's hand, thereby providing a direct line for the wired connection between housing and the pulse oximetry sensor. Money doesn't teach where the wearable monitor 10 is worn by a patient, but it would have been obvious to position the wearable monitor 10 on a patient's wrist after modified by Akai because the pulse oximetry measurement site would be moved to the patient's finger. The reason the wrist is highly desirable is it makes it easy for the patient to

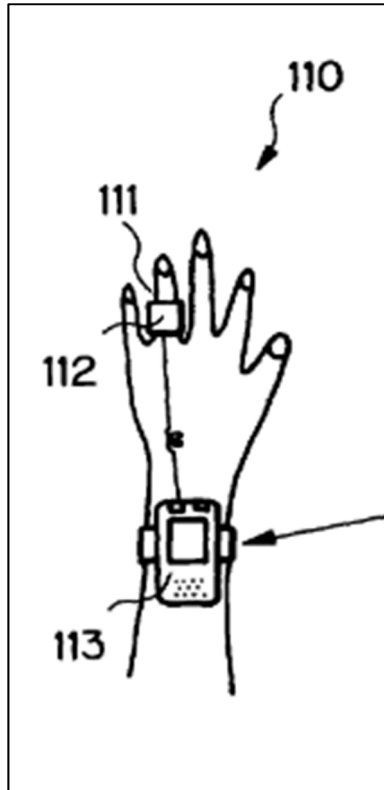
show the monitor to the physician, and the patient can also view the monitor. *See* EX1007, 5:51-55, 7:44-46, FIG. 1. Akai also illustrates an efficient position of a wire between a housing 113 and a pulse oximetry sensor 112 positioned on a patient's finger. EX1007, FIG. 1. Such a reconfiguration of the sensor ports is a logical modification in view of the obvious change to the pulse oximetry sensor, which would move the pulse oximetry measurement site from a patient's arm to a patient's finger. Providing a direct line between a wire's socket and a sensor reduces wire length, avoids tangling, and improves a patient's quality of life and comfort while wearing Money's patient monitoring device 10. EX1007, 3:4-6, 5:7-9, FIG. 1.

b. “a housing configured to be secured on a lower arm of a patient being monitored via a strap extending around the lower arm of the patient;”

197. Money teaches a housing 5 intended to be worn by a patient. EX1008, 5:4-8. Money does not expressly teach a specific or intended location where a patient is to wear the monitor 10, but Money does teach the housing's dimensions (3" x 6" x 1"). A PHOSITA would know that a housing of this size would easily be worn on a patient's wrist.

198. Nevertheless, Akai teaches a similarly sized housing 113 that attaches to a person's wrist via a strap. EX1007, 7:44-46, FIG. 1. Thus, Akai teaches a strap mountable to the housing and configured to secure the housing to the arm of the

patient. EX1007, FIG. 1. Akai also illustrates the strap wrapping around the patient's wrist. *Id.*



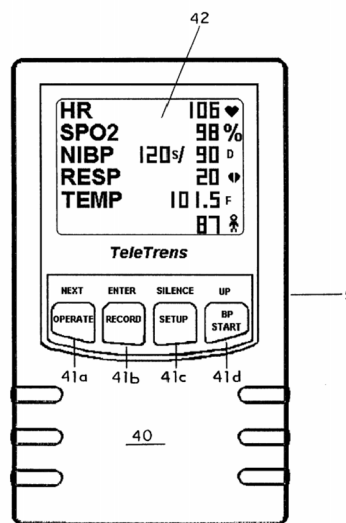
199. It would have been particularly obvious to modify Money's housing to include a strap so that the housing taught by Money could be worn on a patient's wrist. Also, wearing a monitoring device on a patient's wrist is a logical position considering that the pulse oximetry sensor is positioned on a patient's finger. EX1007, 5:7-9. Straps are a conventional method of strapping wearable technology to a human's wrist. For example, wrist watches have been known since the 19th century. The housing 5 of Money would have to be attached to a patient somehow in order for the housing 5 to be wearable, as taught by Money. EX1008, Abstract. A

strap would have been a commonsense solution, and Akai provides that motivation.

EX1007, 5:7-9, FIG. 1.

- c. **“a display positioned on a face of the housing, opposite the strap, so as to be visible to a user;”**

200. Money clearly teaches a display 42 positioned on the front side of the housing 5, which is viewable as seen in FIG. 10.



201. Money further teaches that the display 42 simultaneously displays data from all connected sensors. EX1008, 6:27-33, FIG. 10. Finally, Money teaches a display 42 positioned on a front panel, which would be visible to the user. EX1008, 6:24-27, FIG. 10.

202. As I explained above in paragraphs 197-199, it would have been obvious to include a strap on Money’s housing to render the monitoring device 10

wearable on a patient's wrist. Akai illustrates that its display is visible when the monitor unit 110 is worn and that the display is positioned opposite the strap.

EX1007, FIG. 1. Thus, it would have been obvious to position the strap in the same way as taught by Akai when modifying Money in view of Akai, especially considering that Money's housing 5 looks so similar to Akai's housing 113.

Compare EX1008, FIG. 10; EX1007, FIG. 1.

203. Therefore, Money in view of Akai renders obvious this limitation.

- d. “a first sensor communication port positioned on a side of the housing and configured to face a hand of the lower arm of the patient when the mobile medical monitoring device is mounted to the lower arm of the patient, wherein: the side of the housing faces the hand of the lower arm of the patient of the patient when the mobile medical monitoring device is mounted to the lower arm of the patient,”**

204. Money teaches that a pulse oximetry sensor 37 connects to a processor 14 via a wire. EX1008, FIG. 1. Although Money does not expressly teach a port, a PHOSITA looking at FIG. 1 of Money would assume that the wired connection between the pulse oximetry sensor 37 and the monitor 10 would occur via a first sensor port.

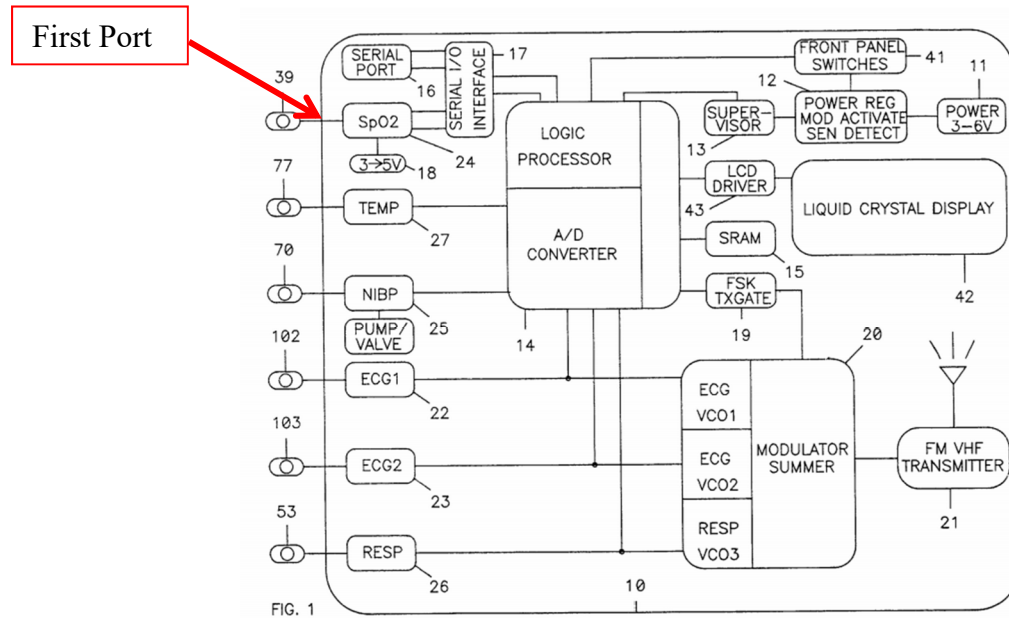
205. A port is typically a female connection or socket of a wired connection. EX1001, 5:33-36, FIG. 4B. The male-female relationship (e.g., wall socket/plug) of wired connections is a preferred method of electrical connection because it provides a more secure connection than merely contacting two electrical

conductors. It also allows for electrocution protection because the conductor-to-conductor contact occurs within the female socket, which is surrounded by non-conductive, protective material (e.g., plastic).

206. Ports are also preferable over hardwiring a sensor to a monitor because hardwiring a sensor to a monitor provides no adaptability. A PHOSITA would know that patients suffer from a variety of conditions, and different sets of vital signs correspond to different conditions and diseases. For example, a patient's body temperature is not particularly important if the patient is suffering from hypertension, and so a clinician may choose to ignore body temperature while caring for a patient with hypertension. Indeed, clinicians demand control over their patients and what vital signs to monitor, so a PHOSITA designing a medical monitor would know that the end user (clinicians, nurses, physicians, physician assistants) would expect an adaptable and configurable patient monitor that allows a clinician to utilize different sets of sensors to monitor the vital signs that the clinician deems most important in caring for a patient and monitoring the patient's health. One way to provide this adaptability is to connect wired connects through ports, which provide an end user the ability to disconnect and connect a variety of sensors as needed.

207. Adding further evidence of a port, Money teaches that the processor 14 is clearly inside the housing 10, and the processor 14 receives signals from the

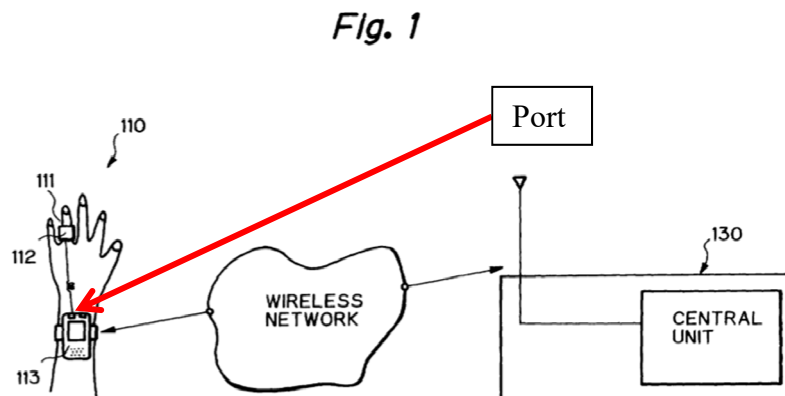
pulse oximetry sensor 39, so the signals transmit into the housing and to the processor through some connection (i.e., port). EX1008, 5:20-28, FIG. 1. Thus, a PHOSITA reading Money would assume that such a connection includes a port.



208. Kiani demonstrates the ubiquity of ports. Kiani shows that sensor input ports 550 were a known vehicle for wired communication. EX1006, 3:21-27, 8:31-9:2. Again, Kiani expressly teaches something that a PHOSITA would assume reading Money. However, if for some reason Money didn't teach a port, which it clearly does, it would have been obvious to combine Money and Kiani to include a port on the housing as part of the wired connection between the pulse oximetry sensor 39 and the housing 10 of Money. Modifying Money with Kiani would have been a combination of known concepts (wired electrical communication and wired electrical communication using ports) to yield predictable results. EX1008, 5:20-

28, FIG. 1; EX1006, 3:21-27, 8:31-9:2. Particularly, including a port on Money's housing (if it wasn't already there) would predictably enable wired communication with the pulse oximeter 39 while allowing easy removal and replacement of the sensor 39 while providing a secure, wired connection between the pulse oximetry sensor 39 and the housing 10. EX1006, 2:34-3:4. More specifically, ports generally provide removable wired connections, so a medical worker would replace the pulse oximeter 39 with a different sensor if a new physiological parameter is to be measured. *Id.*

209. As I explained above in paragraphs 192-196, it would have been obvious to modify Money's connector/port positioning in view of Akai. As shown in FIG. 1 of Akai, the first sensor port exists on the top side (first side) of the housing, which is the side of the housing closest to and facing the hand when the person is wearing the portable device 100a, thereby facilitating a wired connection. EX1007, FIG. 1.



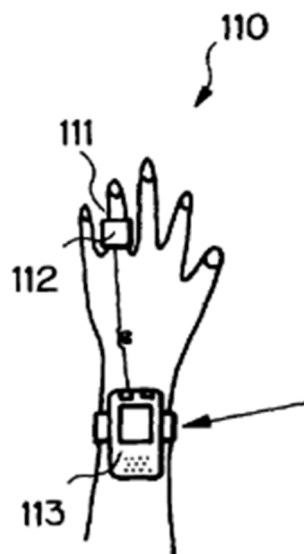
Id. (annotated).

210. Therefore, Money in view of Kiani and Akai renders this limitation obvious.

- e. **“the first sensor communication port is configured to provide wired communication with a pulse oximetry sensor attached to a digit of the hand of the patient,”**

211. Money teaches that the pulse oximetry sensor 39 transmits electrical signals representing oxygen saturation to the processor 14 via a wired connection. EX1008, 5:23-28, 5:42-44. Such a wired connection would include a port for the reasons I explained in paragraphs 204-208 above.

212. As I explained above in paragraphs 192-196, it would have been obvious to modify Money to include a finger-placed, pulse oximetry sensor in view of Akai.

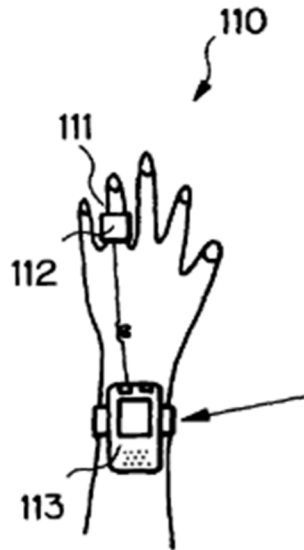


- f. “the wired communication with the pulse oximetry sensor provided at least partly in the analog domain, and”**

213. Akai teaches that the pulse oximetry sensor transmits an analog signal, which is subsequently converted into a digital signal by an analog-to-digital converter. EX1007, 5:30-34. As I explained above in paragraphs 192-196, it would have been obvious to substitute the pulse oximetry cuff 39 of Money for the light-based pulse oximetry sensor 112 of Akai.

- g. “the first sensor communication port is positioned on the side of the housing such that a path from the first sensor communication port on the side of the housing to the digit of the patient is substantially perpendicular to the side of the housing and shorter than any other path from any other side of the housing to the digit of the patient;”**

214. Akai illustrates the wire between the pulse oximetry sensor 112 and the housing 113/213 as extending from the first sensor port along a path substantially perpendicular to the first side of the housing 113/213. EX1007, FIG. 1.

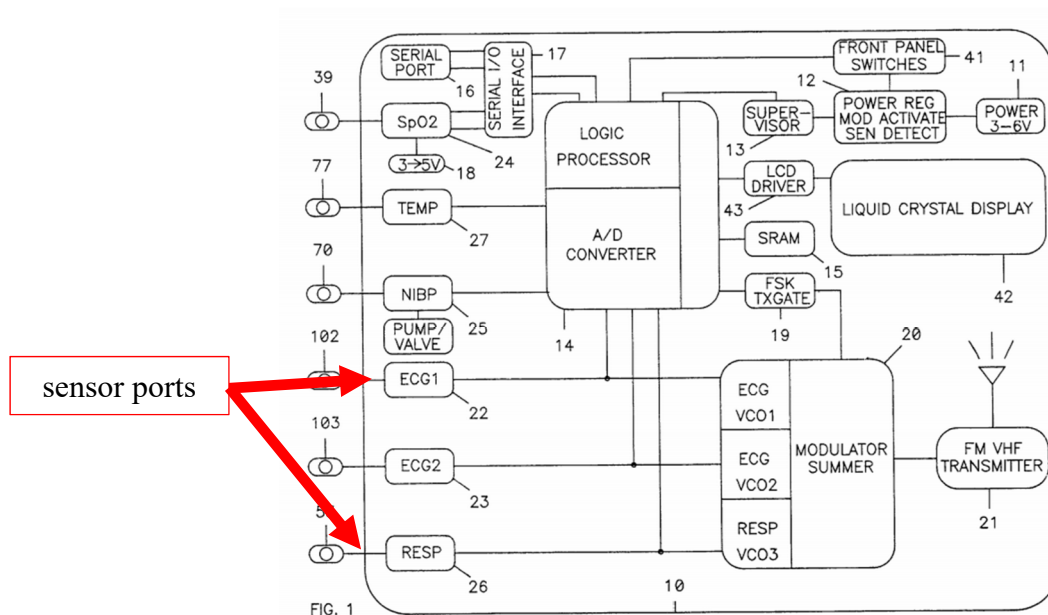


215. Lastly, the claim seems to suggest that the port is the reason for the extending direction of this wire. Such a suggestion runs contrary to both physics and common sense. The extending direction of the wire results from a force pulling the wire toward the pulse oximetry sensor 112, not from the configuration of the port itself. If the wire was not also tied to the pulse oximetry sensor, then the extending direction of the wire would simply fall as a result of the pull of gravity. So, a PHOSITA would understand this claim to be claiming the wire's extending direction due to the relationship of the port's placement on a wearable device and where a pulse oximetry sensor attaches to a patient. In Akai, exactly as claimed and shown in the '735 Patent, that wire extends along a direct line from the housing 113 strapped on a patient's wrist to the pulse oximetry sensor 112 positioned on the patient's finger. There is nothing different about Akai and claim 1 in terms of housing configuration.

216. As I explained above in paragraphs 192-196, it would have been obvious to modify Money's housing configuration to better accommodate the light-based pulse oximetry sensor 112 of Akai.

h. “a plurality of additional sensor communications ports positioned on the housing and configured to provide wired communication with a plurality of additional physiological sensors at least partly in the digital domain; and”

217. Money teaches that five sensors, including pulse oximetry sensor 39, blood pressure sensor 70, temperature sensor 77, respiration rate sensor 53, and ECG sensor 102/103, communicate with the processor 14 via wired connections. EX1008, 5:23-51, FIG. 1. As shown, the sensor ports are positioned on the housing 10. EX1008, FIG. 1.



218. Again, Kiani shows that sensor input ports 550 were a known vehicle for wired communication. EX1006, 3:21-27, 8:31-9:2. Like I said before, Kiani expressly teaches something that a PHOSITA would assume reading Money. Nevertheless, it would have been obvious to combine Money and Kiani to include a ports on the housing 10 as part of the wired connections with the five sensors taught by Money. Like above, modifying Money with Kiani would have been a combination of known concepts (wired electrical communication and wired electrical communication using ports) to yield predictable results. EX1008, 5:23-51; EX1006, 3:21-27, 8:31-9:2. Particularly, including ports on Money's housing would have predictably enabled wired communication with the sensors while allowing easy removal and replacement of the sensors and providing a secure, wired connection between the sensors 53, 70, 77, 102, 103 and the housing 10. EX1006, 2:34-3:4.

219. Additionally, Money teaches a system that receives analog signals from some sensors and digital signals from others. EX1008, 5:48-51, 7:4-8, 7:16-20, 7:58-62, 12:4-7, 13:24-32. Specifically, in the example taught by Money, Money receives digital signals from the pulse oximetry sensor cuff 39 through a RS232 serial port. EX1008, 7:58-62, 12:4-7, 13:24-32. Money teaches that the pulse oximetry sensor transmits packets of data, and a PHOSITA would understand that a packet is a digital construct. EX1008, 13:24-32. Thus, by teaching that the

monitor 10 receives data packets from the pulse oximetry sensor 39, Money teaches a system that receives digital data from one sensor and analog data from another. EX1008, 5:48-51, 7:4-8, 13:24-32. As such, Money teaches a system capable of receiving digital data from some sensors (e.g., sensors connected to an RS232 port) and analog signals from other sensors.

220. Money teaches that the RS232 port provides additional versatility to handle occasional software and hardware issues with the device 10. EX1008, 6:11-20. Thus, substituting the pulse oximetry cuff transducer 39 of Money with the analog-outputting SpO₂ sensor 112 of Akai would have additional implications, namely that the SpO₂ sensor would no longer plug into the RS232 port because the RS232 port only receives digital data. EX1008, 6:11-20, 12:4-7, 13:24-31. However, a PHOSITA would have been motivated to continue using the RS232 serial port for dual purposes (debug and receiving digital data from a sensor) because of limited space on the monitor 10 or Money's power requirements. EX1008, 5:4-8, FIG. 17A-B, 7:4-22. The most obvious solution would be modifying the temperature sensor 77 to output digital data through the RS232 port.

221. Money teaches that a temperature interface circuit and an analog-to-digital converter allow the processor to display a digital value of the patient's temperature. EX1008, 10:59-11:5, FIG. 1, 7:49-52. That is, Money specifically teaches that the end result of the temperature interface is to display a digital value

for the patient's temperature. EX1008, 11:2-5. While Money teaches that the temperature detection circuit interface 27 and the A2D converter are within the monitor 10, Money fully teaches the requisite circuitry 27 to output a digital signal representative of patient. EX1008, 10:59-11:5, FIG. 1, 7:49-52. Money also teaches the value of having a dual input RS232 serial port for communicating with an external terminal and receiving data from a sensor. EX1008, 6:11-20, 11:51-53. Lastly, Money teaches how to send digital packets via the RS232 protocol to be received by the serial port. EX1008, 6:11-20.

222. A PHOSITA would easily move the temperature determining circuitry and the analog-to-digital conversion to the temperature sensor 77 such that the temperature sensor 77 outputted the digital temperature value. EX1008, 10:59-11:5. Such a modification would have been a use of a known technique (using an RS232 port to receive digital data from a sensor and connect to an external terminal) to improve similar devices (Money's monitor 10) in the same way (Money's RS232 port would continue to serve a dual function even after upgraded with a modern SpO₂ sensor). The digital temperature determining circuitry would output digital values regardless of its location in an electronic system (inside the monitor or outside the monitor). Thus, this claim is not claiming novel components, it's simply claiming *where* in the circuit a known component is

located (inside the patient monitor or outside). Also, a PHOSITA would know how to transmit data according to RS232.

223. The motivation to move this temperature digitization circuitry either inside or outside of the monitor 10 is simply a design choice because this basic circuitry would predictably function exactly the same way regardless of its location in the electronic circuit (inside or outside the monitor). But more specifically, a PHOSITA would have been motivated to cause the temperature sensor 77 to output digital data so that the monitor 10 of Money would communicate with a modern, light-based, analog, pulse oximetry sensor, as explained above in paragraphs 194-196, and still use the RS232 serial port for receiving data from a sensor (and maintain the debug versatility provided by the RS232 serial port). In other words, a PHOSITA would not want to add more ports than necessary to the monitor 10 of Money, and would be motivated to use all available ports, including the RS232 port that would be unoccupied when modified by Akai's SpO₂ sensor.

224. So, it would have been further obvious to include the digital temperature determining circuitry to be part of the temperature sensor 77 so that the monitor received a digital signal from the temperature sensor 77. EX1008, 10:60-11:5, 13:26-32. Transmitting a digital value of a patient's temperature via a digital packet would have been particularly obvious because the temperature sensor 77 only measures one discrete value (exactly like oxygen saturation), as

opposed to providing a waveform (like those provided by the ECG sensors), which would be better represented by analog data. EX1008, 5:65-6:10 (noting that ECG and respiration waveforms should not be digitized). Indeed, digitizing a waveform runs the risk of losing important health data. *Id.* That said, some ECG data can be represented digitally, such as a patient's heart rate.

225. Alternatively, it would have been obvious to output a digital signal indicative of any discrete parameter, including temperature, so that the monitor could receive data according to conventional, and standardized digital connection ports, such as the RS232 serial port. EX1008, 7:4-8, 6:11-20, 7:58-62, 13:24-32. Use of standardized ports and cables would allow for easier to purchase equipment, like cabling to connect sensors to the monitor 10.

226. Thus, Money teaches a system that receiving analog data from some sensors and digital data from others. EX1008, 5:48-51, 7:4-8, 7:16-20, 7:58-62, 12:4-7, 13:24-32. Also, for the purposes of Ground 5, it would have been obvious to continue receiving digital data from a sensor, preferably the temperature sensor, via the RS232 port so that the monitor 10 of Money did not need additional ports positioned on its housing.

i. “one or more processors and a transmitter configured to:”

227. Money teaches a processor 14 that receives and processes signals from the sensors 104. EX1008, 5:23-28, 7:53-57.

- j. **“display, on the display, physiological measurements derived from the pulse oximetry sensor and the plurality of additional physiological sensors; and”**

228. Money teaches that the processor 14 displays oxygen saturation (from pulse oximetry sensor), pulse rate, temperature, respiration rate, blood pressure, and ECG (plurality of additional physiological sensors) on the display 42. EX1008, 5:23-28, 6:21-37, 7:53-57, FIG. 10.

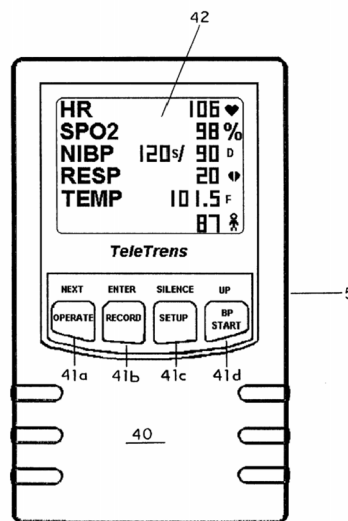


FIG. 10

- k. **“wirelessly transmit information indicative of the physiological measurements to a remote computing device.”**

229. Money teaches that an RF transmitter 21 wirelessly transmits all measured parameters, which can include oxygen saturation, blood pressure, temperature, respiration rate, and ECG (physiological measurements) to a central

monitoring station. EX1008, Abstract, 3:24-26, 5:10-13, 5:23-28, 6:8-10, 10:12-35, 14:42-45.

2. **Dependent Claim 2: “The mobile medical monitoring device of claim 1, wherein the wired communication with the pulse oximetry sensor is provided via a tail extending from the pulse oximetry sensor.”**

230. A PHOSITA would not understand how a tail is any different than a wire. Nor does the specification of the '735 patent explain the difference between a tail and a wire in its single, passing mention of a tail. EX1001, 5:45-47. Thus, while likely indefinite, a PHOSITA would at best understand this term to be equivalent to a wire.

231. Akai teaches a pulse oximetry sensor 104a that includes a wire that connects the pulse oximetry sensor 104a to the controller 102, so Akai teaches a “tail.” EX1007, 5:14-19.

3. **Dependent Claim 7: “The mobile medical monitoring device of claim 1, wherein the face of the housing comprises a single user interface.”**

232. Money teaches a single display for displaying data to a user on the front side of the housing. EX1008, 6:21-48. A PHOSITA would understand that the display 42 is a user interface.

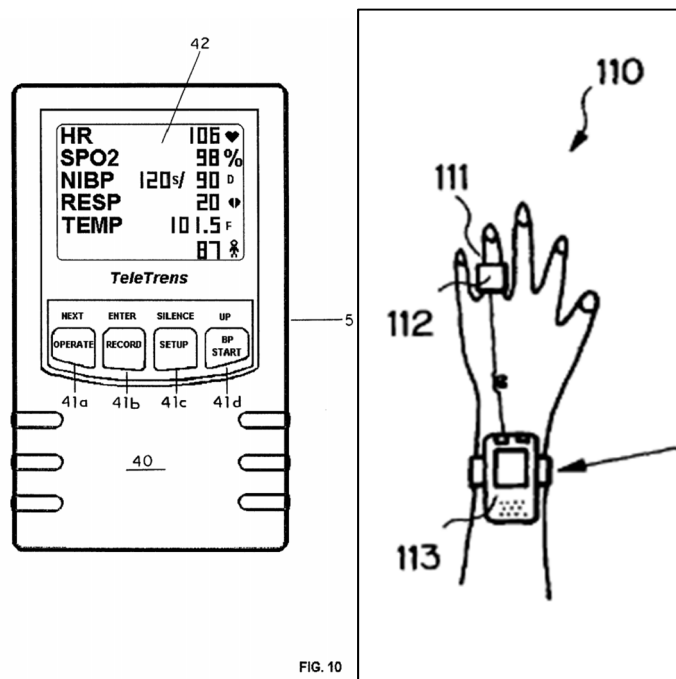
4. **Dependent Claim 8: “The mobile medical monitoring device of claim 7, wherein the single user interface comprises the display.”**

233. The user interface of Money is the display 42. *Id.*

5. Dependent Claim 9:

- a. “The mobile medical monitoring device of claim 8, wherein: the housing comprises a back side that is opposite the face of the housing,”**

234. Money and Akai teach a three-dimensional, box-shaped housings 10 and 113 having six sides. EX1008, FIG. 10; EX1007, FIG. 1. The illustrated front side (face) shown in FIG. 10 of Money (and in FIG. 1 of Akai) is equivalent to the claimed “face of the housing”. Because the housing 10 is three dimensional, the housing 10 would also include a back side, opposite the face of the housing. *Id.* A PHOSITA would understand that the back side, while not illustrated, would face into the patient’s arm while the portable device (10 or 113) is being worn. Thus, both Money and Akai teach “a back side opposite the face of the housing”.



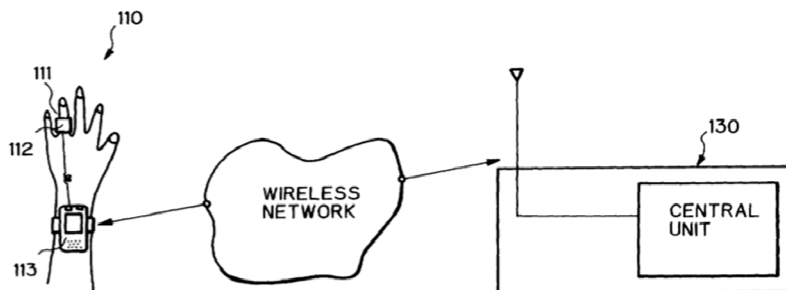
b. “the strap is mountable to the back side of the housing, and”

235. Akai teaches that the measurement unit 113/213 attaches to a person’s wrist via a strap. EX1007, 7:44-46, FIG. 1. Thus, Akai teaches a strap mountable to the housing and configured to secure the housing to the arm of the patient.

EX1007, FIG. 1

236. By reviewing FIG. 1, a PHOSITA would understand that the strap of Akai must mount to the back of the measurement unit 113. *Id.* A PHOSITA would assume that the strap is mounted to the back side of the measurement unit 113 because the measurement unit 113 is illustrated over the strap. EX1007, FIG. 1. Additionally, a PHOSITA would look at FIG. 1 and instantly recognize that the strap is not covering the display illustrated on the front side of the measurement unit 113. *Id.*

Fig. 1



237. Additionally, it would have been particularly obvious for a PHOSITA to mount the strap to the back side of the measurement unit 113/213. There are only two places where the strap could mount: either to the back of the measurement unit 113 or to the left and right sides of the measurement unit 113. Obviously, the strap can't mount to the front side of the measurement unit 113, lest the strap block the display. Either mounting option would predictably secure the measurement unit 113 to the patient's arm, so both options would be equally effective in securing the measurement unit 113 to the patient's arm, and a PHOSITA would instantly recognize this fact. Thus, Akai teaches that the strap is mounted to the back side of the measurement unit 113 or it would have been obvious to mount the strap to the back side of the measurement unit 113.

238. Therefore, this limitation is obvious in view of Money and Akai.

- c. “the face of the housing is raised from the strap and the lower arm of the patient to enable positioning of the first sensor communication port on the side of the housing between the lower arm of the patient and the face of the housing.”**

239. As I explained in paragraph 234, the housing 113 is three-dimensional. The wire's extension into the housing 113 proves that there is a vertical side where the wire extends into the housing 113. EX1007, FIG. 1. The existence of this vertical side and the inherent three-dimensional nature of the housing 113 means that the face of Akai's housing 113 (front side) is raised from

the strap and the lower arm to enable positioning of the first sensor communication port on the side of the housing 113. *Id.* FIG. 1 of Akai clearly illustrates this meaningless claim limitation.

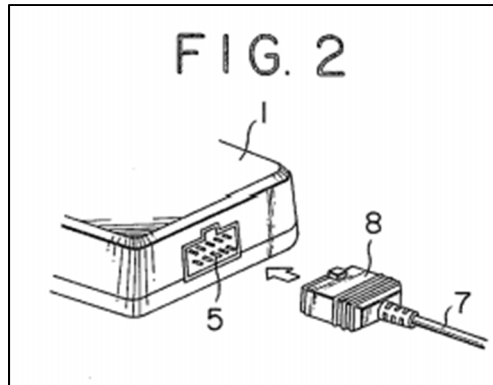
G. Ground 6: Claims 3-6 and 13-19 are unpatentable under 35 U.S.C. § 103(a) in view of Goldberg, Kiani, Money, and Fujisaki

240. In my opinion, claims 3-6 and 13-19 would have been obvious to a PHOSITA in view of Money along with Akai, Kiani, and Fujisaki. This is because I believe that a PHOSITA, having knowledge of these four sources, would have found it obvious to combine the references to create the technology at issue in this case.

1. Dependent Claim 3: “The mobile medical monitoring device of claim 2, wherein the tail comprises a cable that is configured to be removably attachable to the first sensor communication port.”

241. Money and Akai teach a wired connection between a wearable housing and a pulse oximetry sensor. EX1008, FIG. 1; EX1007, 5:14-19. A PHOSITA reading Money would assume that the wired connection is removable. EX1008, 12:36-40.

242. Regardless, Fujisaki teaches removable wired connections with ports. EX1016, 5:37-44, FIGs. 2, 6. Specifically, Fujisaki shows a wearable device having cable removably connected with a connector plug (i.e., port). *Id.*



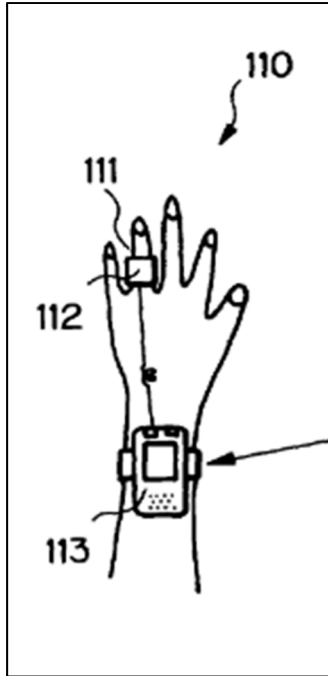
243. Fujisaki teaches that a removable cable allows for replacement of a sensor with another sensor. *Id.* Such interchangeability is important because not all patients have the same ailments, meaning that a set of monitored physiological parameters can change from patient-to-patient. So, a caregiver would mix-and-match sensors with a wearable unit depending on which physiological parameters matter for a given patient. For example, a patient with an irregular heartbeat might need a pulse oximetry sensor and an ECG sensor, whereas, a patient suffering from a diabetes might need a glucose sensor. Having removable cables would allow a caregiver to connect the appropriate set of sensors to a wearable device and allow the wearable device to monitor patients having different ailments. Money teaches that the medical monitor 10 can communicate with numerous sensors. EX1008, 5:23-28. Thus, one having ordinary skill would combine the teachings of Money and Fujisaki to allow a caregiver to build a set of medical sensors appropriate for a patient's condition. *Id.*

244. Also, medical sensors can sometimes fail or malfunction. If an individual sensor fails, medical personnel would not want to remove and replace all sensors connected to a patient (which can be numerous); they only want to remove and replace the malfunctioning or broken sensor. A removable cable allows for replacement of a sensor without replacement of the monitoring device, such as the medical device of Money. Plug-and-play wired connections eliminate the need to commission and set up a new portable device.

245. For either reason, it would have been obvious to modify Money as modified by Akai to include a removable wire (if it didn't already have one) in view of Fujisaki to predictably yield a portable device that removably communicates with a sensor.

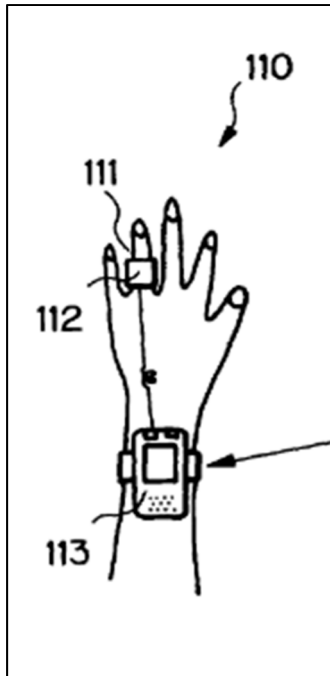
2. Dependent Claim 4: “The mobile medical monitoring device of claim 3, wherein a length of the cable corresponds to the path from the sensor communication port on the side of the housing to the digit of the patient.”

246. FIG. 1 of Akai shows the wire between the pulse oximetry sensor 112 and the housing 113 running from the first sensor port to a finger where the pulse oximetry sensor is attached. EX1007, FIG. 1. As shown, the length of the wire corresponds to the path between the housing and the patient's finger. *Id.*



3. **Dependent Claim 5: “The mobile medical monitoring device of claim 3, wherein the cable is appropriately sized based on the path from the sensor communication port on the side of the housing to the digit of the patient.”**

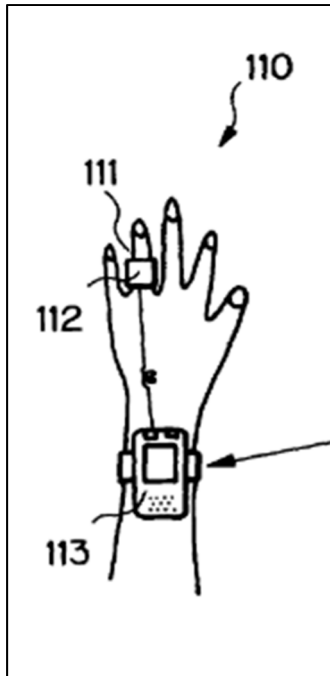
247. FIG. 1 of Akai shows the wire between the pulse oximetry sensor 112 and the housing 113 running from the first sensor port to a finger where the pulse oximetry sensor is attached. EX1007, FIG. 1. As shown, the length of the cable is appropriately sized based on the length between the housing and the patient’s finger. *Id.*



4. **Dependent Claim 6: “The mobile medical monitoring device of claim 3, wherein the path from the sensor communication port on the side of the housing to the digit of the patient runs at least partly along a backside of the hand of the patient.”**

248. FIG. 1 of Akai shows the wire between the pulse oximetry sensor 112 and the housing 113 running from the first sensor port part way along a backside of the hand of the patient and to a finger where the pulse oximetry sensor is attached.

EX1007, FIG. 1.



5. Independent Claim 13:

- a. “A body worn, battery-powered medical monitoring device configured to provide on-patient and remote monitoring of patient physiological parameters, the medical monitoring device comprising:”**

249. I fully explained above in paragraphs 191-192 how Money in view of Kiani and Akai teaches a body worn medical monitoring device to provide on-patient monitoring of physiological parameters.

250. Money also teaches that measured parameters are transmitted to a central monitoring station. EX1008, Abstract, 3:24-26, 5:10-13, 5:23-28, 6:8-10, 10:12-35, 14:42-45. Thus, Money teaches on-patient and remote monitoring of patient physiological parameters.

251. Lastly, Money teaches that the medical monitor 10 includes batteries. EX1008, 5:52-55, 7:4-23, FIG. 17A-B.

252. Therefore, even though the preamble should not be limiting, Money in view of Akai and Kiani renders obvious the entire preamble.

- b. “a battery configured to provide power to the medical monitoring device such that the medical monitoring device may operate without a wired power connection;”**

253. Money teaches that the medical monitor 10 includes batteries. EX1008, 5:52-55, 7:4-23, FIGs. 17A-B.

- c. “a case configured to house the battery;”**

254. Money teaches a housing 10 that houses the battery. EX1008, 5:52-55, 7:4-23, FIGs. 17A-B.

- d. “a strap configured to attach the case to an arm of a patient and be mountable to the case;”**

255. Akai teaches that the measurement unit 113 attaches to a person’s wrist via a strap. EX1007, 7:44-46, FIG. 1. Thus, Akai teaches a strap mountable to the housing and configured to secure the housing to the arm of the patient. EX1007, FIG. 1. As I explained above in paragraphs 197-199, it would have been obvious to include a strap on Money’s housing to render the monitoring device 10 wearable on a patient’s wrist.

- e. “a first communications port positioned on a face of a side of the case configured to be nearest to a hand of**

the arm of the patient when the case is mounted to the arm of the patient,”

256. I fully explained how Money in view of Kiani and Akai teaches this limitation above in paragraphs 204-210.

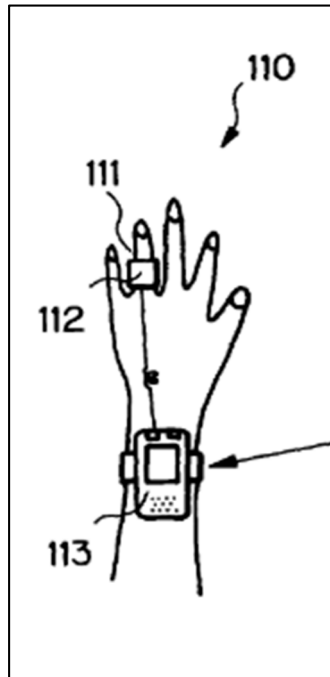
f. “the first communications port configured to removably couple with a cable of a finger- or thumb-type pulse oximetry sensor and positioned on the face of the side of the case to provide a path from the first communications port to a digit of the hand of the patient that avoids tangling of the cable,”

257. I fully explained how Money in view of Kiani and Akai teaches that a first communication port couples with a cable of a pulse oximetry sensor, and that the first communication port is positioned on a side of the housing 113 above in paragraphs 204-210.

258. Furthermore, Akai teaches a “finger-type” pulse oximetry sensor, which a PHOSITA would assume is merely a pulse oximetry sensor that attaches to a patient’s finger. EX1007, 5:7-9. As I fully explained above in paragraphs 194-195, it would have been obvious to substitute Money’s pulse oximetry cuff for Akai’s light-based, finger-placed pulse oximetry sensor.

259. Also, the wire between the pulse oximetry sensor 112 and the housing 113 in Akai would avoid tangling because it is not long enough to tangle. EX1007, FIG. 1. Said differently, the wire is illustrated at taut, and a taut wire would not tangle. *Id.* As such, Akai teaches a wire that avoids tangling. Also, the direct path,

along which the cable runs, between the face of the housing 113 positioned closest to the hand and the sensor 112 further avoids tangling as there is nothing that the wire could tangle with.



260. Lastly, I fully explained how Money in view of Fujisaki renders obvious a removable wire in paragraphs 241-245.

- g. **“the first communications port configured such that the cable perpendicularly extends from the face of the side of the case when the cable is coupled to the first communications port;”**

261. I fully explained how Money in view of Kiani and Akai teaches this limitation above in paragraphs 214-216.

- h. “a second communications port configured to provide wired communications with a second physiological sensor arrangement at least partly via digital communications;”**

262. I fully explained how Money in view of Kiani and Akai teaches this limitation above in paragraphs 217-226.

- i. “a third communications port configured to provide wired communications with a third physiological sensor arrangement;”**

263. I fully explained how Money in view of Kiani and Akai teaches this limitation above in paragraphs 217-219.

- j. “a display configured to provide real time measurements of patient physiological parameters based at least in part on data obtained from at least the pulse oximetry sensor via the first communications port; and”**

264. I fully explained how Money in view of Kiani and Akai teaches this limitation above in paragraphs 200-203. More specifically, Money teaches that the display 42 displays real-time parameter measurements based on data obtained by the pulse oximetry sensor 39. EX1008, 5:23-38, 5:38-41, 6:21-55, 11:31-34, 1:26-30.

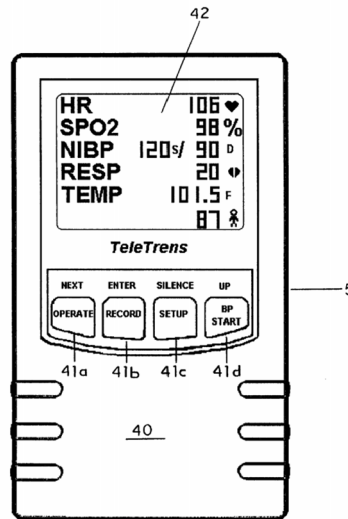


FIG. 10

- k. **“a transmitter configured to wirelessly transmit information indicative of real time measurements of patient physiological parameters based at least in part on data obtained from the pulse oximetry sensor via the first communications port.”**

265. Money teaches that the RF transmitter 21 wirelessly transmits physiological measurements, which can include oxygen saturation to a central monitoring station based at least in part on signals received from the pulse oximetry sensor. EX1008, 5:10-13, 5:23-28, 5:38-41, 3:24-29.

- 6. Dependent Claim 14: “The medical monitoring device of claim 13, wherein the path from the first communications port to a digit of the hand is shorter than any path from any communications port located on any other side of the case to the digit of the hand.”**

266. I fully explained how Money in view of Kiani and Akai teaches the limitation of claim 14 above in paragraphs 214-216.

7. Dependent Claim 15:

- a. “The medical monitoring device of claim 13 further comprising one or more hardware processors configured to:”**

267. I fully explained how Money in view of Kiani and Akai teaches this limitation above in paragraph 227.

- b. “process the data obtained from the pulse oximetry sensor; and”**

268. The processor 14 of Money processes data obtained from the pulse oximetry sensor. EX1008, 5:23-28, 7:49-52.

- c. “determine, based at least in part on the data, the real time measurements of patient physiological parameters.”**

269. The processor 14 of Money determines real time oxygen saturation data based on signals from the pulse oximetry sensor. EX1008, 5:23-28, 7:49-52, FIG. 10.

8. Dependent Claim 16:

- a. “The medical monitoring device of claim 15, wherein: the one or more hardware processors are further configured to receive additional data from at least the second physiological sensor arrangement and the third physiological sensor arrangement;”**

270. Money teaches a patient monitoring device 10 that communicates with five sensors (pulse oximetry, ECG, respiration rate, temperature, and blood

pressure. EX1008, 2:64-3:2, 5:23-28. Thus, the patient monitoring device 10 taught by Money teaches at least three sensors.

- b. **“determine, based at least in part on the additional data, real time measurements of additional patient physiological parameters; and”**

271. The processor 14 of Money determines real time blood pressure and ECG measurements data based on signals from the blood pressure and ECG sensors. EX1008, 5:23-28, 7:49-52, FIG. 10.

- c. **“cause to be displayed, on the display, the real time measurements of additional patient physiological parameters; and”**

272. Money teaches that the processor 14 displays real-time blood pressure and ECG measurements. EX1008, 6:21-55, 5:65-6:2, 13:3-7.

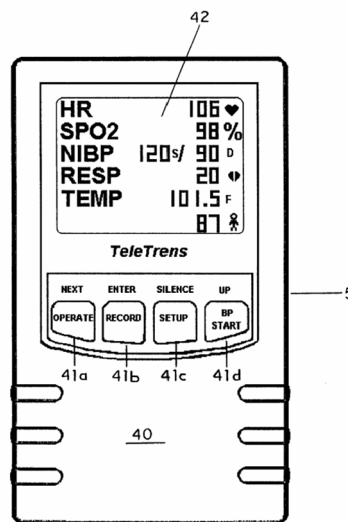


FIG. 10

- d. **“the transmitter is further configured to wirelessly transmit information indicative of real time**

measurements of additional patient physiological parameters based at least in part on the additional data.”

273. Money teaches that the processor 14 wirelessly transmits, via the RF transmitter 21, real-time blood pressure and ECG measurements. EX1008, 5:10-13, 5:23-28, 5:38-41, 3:24-29.

- 9. Dependent Claim 17: “The medical monitoring device of claim 16, wherein the display is positioned on a front, user-facing side of the case to enable a user to view the real time measurements of patient physiological parameters and the real time measurements of additional patient physiological parameters.”**

274. Money clearly teaches a display 42 positioned on the front, user-facing side of the housing 112, as seen in FIG. 10.

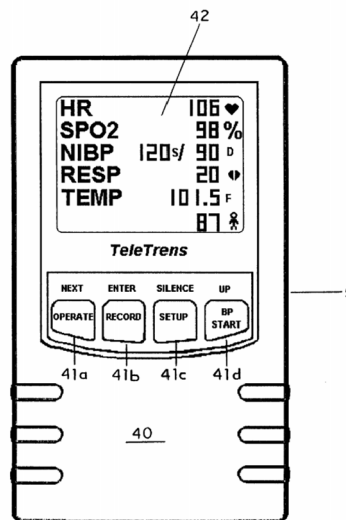


FIG. 10

275. Money further teaches that the display 42 displays real-time blood pressure and ECG measurements. EX1008, 6:21-55, 5:65-6:2, 13:3-7.

- 10. Dependent Claim 18: “The medical monitoring device of claim 17, wherein the second physiological sensor arrangement comprises an EKG sensor arrangement and the third physiological sensor arrangement comprises a blood pressure sensor arrangement.”**

276. Money communicates with both a blood pressure and ECG (same thing as EKG – just a different acronym based on the German language rather than English) sensors. EX1008, 5:20-37, 5:42-44.

- 11. Dependent Claim 19:**

- a. “The medical monitoring device of claim 18, wherein the first, second, and third communication ports are communicatively coupled to respective first, second, and third sensor interfaces; and”**

277. Money teaches that each connection with a physiological sensor includes sensor interface. EX1008, 3:14-24, 5:28-51. Money teaches a highly specific monitor where each sensor has its own unique sensor interface. EX1008, Abstract, 5:38-51.

- b. “the first, second, and third sensor interfaces are uniquely configured to receive signals from the respective pulse oximetry sensor, EKG sensor arrangement, and blood pressure sensor arrangement.”**

278. As I just said, Money teaches respective sensor interfaces for communicating with a pulse oximetry sensor, an ECG sensor, and a blood pressure sensor. EX1008, 5:28-44.

H. Ground 7: Claims 10-12 are unpatentable under 35 U.S.C. § 103(a) over Goldberg, Kiani, Money, and Estep

279. In my opinion, claims 10-12 would have been obvious to a PHOSITA in view of Money along with Akai, Kiani, and Estep. This is because I believe that a PHOSITA, having knowledge of these four sources, would have found it obvious to combine the references to create the technology at issue in this case.

1. Dependent Claim 10:

- a. “The mobile medical monitoring device of claim 9, wherein: the front side of the housing comprises a bezel and the display, and”**

280. Money teaches a display 42, and FIG. 10 illustrates a border of the housing 5 surrounding the display 42.

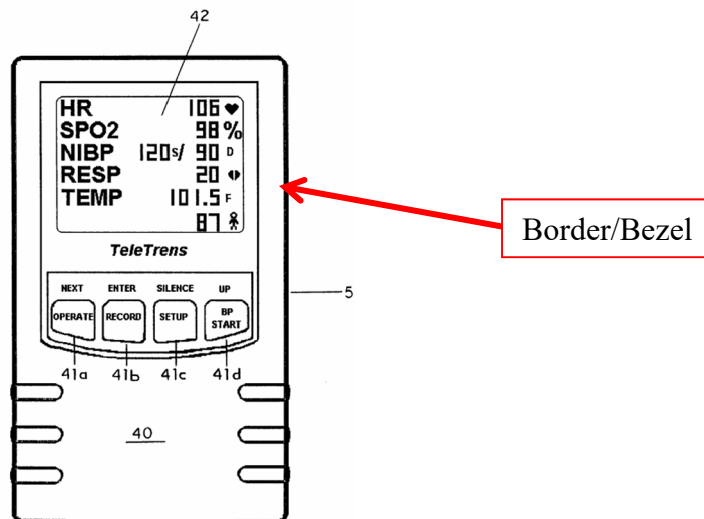


FIG. 10

A PHOSITA understands that a bezel is simply a border around a display. Thus, Money teaches a bezel.

281. As proof that those of skill in the art understand a bezel to simply be a border around a display, I offer Estep. Estep teaches a wearable device having a display with a bezel surrounding it. EX1009, 4:24-27, FIG. 3C. Estep expressly describes a bezel, but simply describes it as a border around a display. As such, Estep proves that Money teaches a bezel.

282. Alternatively, it would have been obvious to combine the bezel taught by Estep with the housing/display taught by Money. Bezels, in some situations (but not all), securely hold any display glass or screen in place. Thus, inclusion of a bezel around a display can securely hold the display in place, and combining Money and Estep represents a combination of prior art elements (displays and displays held in place by a bezel) according to known methods to yield predictable results.

b. “a top of the first sensor communication port is located below the face of the housing.”

283. I fully explained the three-dimensional nature of both Money’s and Akai’s respective housings above in paragraph 234. For the same reasons, FIG. 1 of Akai illustrates a sensor port located below the front face of Akai’s housing 113.

2. Dependent Claim 11: “The mobile medical monitoring device of claim 10, wherein the display is positioned centrally on the face of the housing.”

284. The display 42 of Money is positioned centrally on the front side of the housing 5.

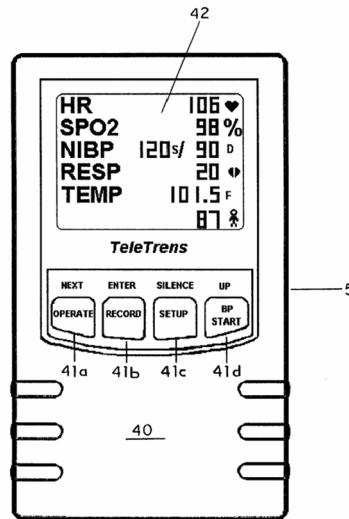


FIG. 10

3. **Dependent Claim 12: “The mobile medical monitoring device of claim 11, wherein the display positioned on the face of the housing is sized such that the display covers most of a length of a shortest dimension of the face of the housing.”**

285. Money also illustrates the display sized and positioned on the front side such that it covers most of the shortest dimension of the front side of the housing. EX1008, FIG. 10.

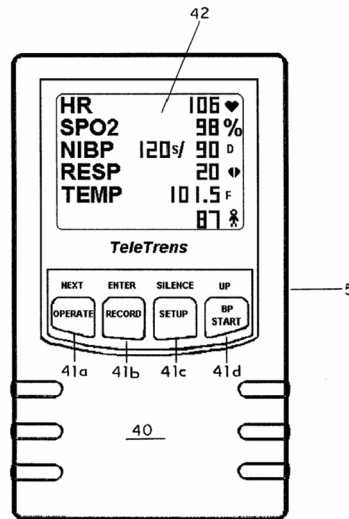


FIG. 10

I. Ground 8: Claim 20 is unpatentable under 35 U.S.C. § 103(a) over Goldberg, Kiani, Money, Fujisaki, and Estep

286. In my opinion, claim 20 would have been obvious to a PHOSITA in view of Money along with Akai, Kiani, Fujisaki, and Estep. This is because I believe that a PHOSITA, having knowledge of these five sources, would have found it obvious to combine the references to create the technology at issue in this case. Thus, claim 20 merely represents an omnibus claim including all the elements I described above. This omnibus combination is just as obvious as its sub-combinations.

1. Independent Claim 20:

- a. “A body worn portable patient monitoring device configured to provide on-patient and remote monitoring of patient physiological parameters, the portable patient monitoring device comprising:”**

287. I fully explained how Money in view of Kiani and Akai teaches this preamble above in paragraph 249-252.

- b. “a pulse oximetry sensor configured to be wrapped around a digit of a patient, the pulse oximetry sensor including at least:”**

288. Akai teaches and illustrates a pulse oximetry sensor wrapping around a patient’s finger. EX1007, 4:43-45, 5:7-9, FIG. 1. As I explained above in paragraphs 194-196, it would have been obvious to substitute the pulse oximetry cuff 39 of Money for the light-based SpO2 sensor 112 taught by Akai.

- c. “a light emitter configured to emit light into a tissue site of the digit of the patient;”**

289. Akai teaches a pulse oximetry sensor 113 that includes a light emitter configured to emit light into a finger’s tissue. EX1007, 5:20-26, 5:26-34, 11:19-21.

- d. “a light detector configured output a first signal responsive to at least a portion of the emitted light after attenuation by tissue of the tissue site; and”**

290. Akai teaches that light-based pulse oximetry sensors include light detectors that output a signal based on the amount of light that attenuated through a finger’s tissue. EX1007, 5:20-40, 5:26-34, 11:19-21.

- e. **“a cable extending from the pulse oximetry sensor and configured to electrically convey the first signal;”**

291. Akai teaches and illustrates a cable connecting the pulse oximetry sensor 112 and the housing 113. EX1007, 5:14-19.

- f. **“a blood pressure sensor configured to output a second signal responsive to at least a blood pressure parameter of the patient;”**

292. Money teaches a blood pressure sensor 70 configured to output a signal representative of a patient’s blood pressure. EX1008, 5:23-28.

- g. **“an additional sensor arrangement configured to output a third signal responsive to at least one additional physiological parameter of the patient other than blood pressure or oxygen saturation, the at least one additional physiological parameter including at least one of: temperature or respiration rate;”**

293. Money’s monitoring device 10 connects to and communicates with a respiration rate sensor that outputs a patient’s respiration rate (an additional parameter other than blood pressure and oxygen saturation). EX1008, 5:23-28.

- h. **“a housing configured to be secured to a lower arm of the patient, the housing having a size and shape configured to be secured to the lower arm of the patient;”**

294. Money teaches a wearable housing 5. EX1008, 5:4-8. Money teaches a 3” x 6” x 1” housing, which is a housing sized and shaped to secure to a patient’s lower arm. At worst, a PHOSITA would have been motivated to modify Money’s

housing in view of Akai so that the housing would secure to a patient's wrist, as I explained above in paragraphs 194-196 and 198-199.

- i. **“a strap mountable to the back side of the housing, the strap configured to secure the housing to the lower arm of the patient;”**

295. I fully explained how Money in view of Kiani and Akai teaches a strap mountable to the back side of the housing and configured to secure the housing to the patient's wrist above in paragraphs 235-238.

- j. **“a display positioned on a front side of the housing that is opposite a back side of the housing, the display configured to show a status of the portable patient monitoring device and one or more parameter measurements so as to be viewable by a user,”**

296. I fully explained how Money in view of Kiani and Akai teaches a display positioned on a front side of the housing that is opposite a back side of the housing and configured to shown one or more parameter measurements so as to be viewable by a user above in paragraphs 200-203 and 264.

297. Additionally, Money teaches that the display 42 displays status. More specifically, the display 42 indicates low battery and bad sensor connection messages. EX1008, 6:40-44. Low battery and bad connection status conditions merely display data about the monitor's 10 mode or status (e.g., whether its battery is low or whether a bad connection is detected). *Id.* Thus, the display 42 of Money displays status as well as physiological parameter measurements.

- k. “wherein the display is positioned centrally on the front side of the display and is sized such that the display spans most of a length of a shortest dimension of the front side of the housing, and”**

298. I fully explained how Money in view of Kiani and Akai teaches these limitations above in paragraphs 284-285.

- l. “wherein the front side of the housing comprises a single user interface and a bezel;”**

299. I fully explained how Money in view of Kiani, Akai, and Estep teaches these limitations above in paragraphs 232-233 and 280-282.

- m. “one or more user input mechanisms configured to control an operational mode of the portable patient monitoring device in response to inputs from a user;”**

300. The monitor 10 of Money includes switches 41a-d (input mechanisms) for controlling the monitor 10 in response to a user pressing the switches. EX1008, 8:1-9. Money provides a few examples as to how the buttons control the monitor 10. For example, the switches can put the monitor 10 into a calibrate mode or an alarm standby mode. *Id.*

- n. “a first sensor port positioned on a face of a first side of the housing, wherein: the face of the first side of the housing is configured to face toward a hand having the digit of the patient under measurement when the housing is secured to the lower arm of the patient,”**

301. I fully explained how Money in view of Kiani and Akai teaches these limitations above in paragraphs 204-210.

- o. “the first sensor port is configured to removably physically couple with the pulse oximetry sensor via the cable and to electrically receive the first signal from the pulse oximetry sensor,”**

302. I fully explained how Money in view of Kiani, Akai, and Fujisaki teaches these limitations above in paragraphs 241-245.

- p. “the cable is configured to run from the first sensor port, at least part way along a path substantially perpendicular to the face of the first side of the housing, down the arm of the patient, and to the digit of the patient to which the pulse oximetry sensor is configured to be wrapped around,”**

303. I fully explained how Money in view of Kiani and Akai teaches these limitations above in paragraphs 214-216, 248, and 261.

- q. “the front side of the housing is raised from the strap and the lower arm of the patient to enable positioning of the first sensor port on the first side of the housing between the lower arm of the patient and the front side of the housing, and”**

304. I fully explained how Money in view of Kiani and Akai teaches this limitation above in paragraph 239.

- r. “a top of the first sensor port is located below the front of the housing;”**

305. I fully explained how Money in view of Kiani and Akai teaches this limitation above in paragraph 283.

- s. “a second sensor port positioned on the housing and configured to provide wired electrical communication with the blood pressure sensor arrangement and to**

electrically receive second signal from the blood pressure sensor arrangement;”

306. I fully explained how Money in view of Kiani and Akai teaches this limitation above in paragraphs 217-219 and 262. Also, Kiani teaches how to position sensor ports 530, 540, 550 on a housing 500. EX1006, FIG. 5.

t. “a third sensor port positioned on the housing and configured to provide electrical wired communication with the additional sensor arrangement and to electrically receive the third signal from the additional sensor arrangement;”

307. I fully explained how Money in view of Kiani and Akai teaches this limitation above in paragraph 217-219 and 263. Also, Kiani teaches how to position sensor ports 530, 540, 550 on a housing 500. EX1006, FIG. 5.

u. “a rechargeable battery positioned within the housing and configured to power the portable patient monitoring device such that the portable patient monitoring device is portable and wearable by the patient;”

308. I fully explained how Money in view of Kiani and Akai teaches a battery positioned in the housing and configured to power the monitor 10 of Money above in paragraph 253. Also, Kiani specifically teaches a rechargeable battery. EX1006, 5:21-22. It would have been obvious to replace the AAA batteries taught by Money with the rechargeable batteries of Kiani to have a rechargeable device. This is another simple substitution of equivalent elements to yield predictable results.

- v. **“one or more signal processing arrangements positioned within the housing and configured to:”**

309. Money teaches a processor 14 within the housing 5 that receives and processes signals from the sensors. EX1008, 5:20-28, FIG. 1.

- w. **“receive the first signal from the pulse oximetry sensor via one or more sensor interfaces,”**

310. Money teaches that the processor 14 receives signals from the pulse oximetry sensor 39 via sensor interface 24. EX1008, 5:23-28, 5:38-41, 8:20-27, FIG. 1.

- x. **“wherein the first signal is provided at least partly as an analog signal;”**

311. Akai teaches that the pulse oximetry sensor 112 outputs an analog signal. EX1007, 5:30-34.

- y. **“process the first signal from the pulse oximetry sensor to determine measurements of oxygen saturation and pulse rate;”**

312. Money teaches that the processor 14 processes signals from all connected sensors including the pulse oximetry sensor 104a. EX1008, 5:23-28, 7:49-52. Money teaches that the processor 14 determines both pulse rate and oxygen saturation. EX1008, 5:23-28, 5:61-65. Money does not teach a separate pulse rate sensor, so a PHOSITA would assume that the pulse rate was determined using pulse oximetry data.

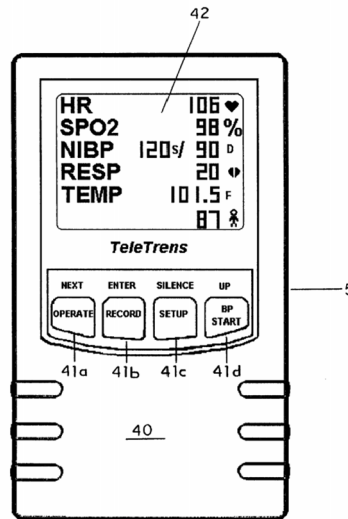


FIG. 10

313. A PHOSITA would understand that the heart rate value (HR) and the oxygen saturation (SpO2) both come from the pulse oximetry sensor because a PHOSITA knows that pulse oximetry sensors measure both pulse rate and oxygen saturation together. Kiani explicitly teaches this implicitly understood fact. Kiani explains that a pulse oximeter measures both pulse rate and oxygen saturation. EX1006, 6:7-9. A PHOSITA would assume that the pulse oximetry sensor 39 taught by Money also measures both pulse rate and oxygen saturation because Money teaches that values for both are displayed on the display 108. EX1008, FIG. 10.

314. Technically, a sensor doesn't determine both pulse rate and oxygen saturation. Instead, the pulse oximetry sensor transmits signals, and a processor can determine a pulse rate by noticing peaks in the signal emitted. So, because Money

teaches that pulse and oxygen saturation both sensed, derived, and displayed by display 42, Money teaches that the processor 14 determines the pulse rate and the oxygen saturation from signals received from the pulse oximetry sensor. EX1005, 4:34-36, 4:50-56, FIGs. 6A-C. Of note, Money seems to equate pulse rate and heart rate, but one skilled in the art would know that pulse oximetry sensors only calculate pulse rate by detecting pulses through blood vessels/

315. Even if the pulse oximetry sensor 104a wasn't able to measure both pulse rate and oxygen saturation, it would have been obvious to determine pulse rate from pulse oximetry sensors in view of Kiani. Kiani teaches that conventional pulse oximetry sensors can detect pulse rate and oxygen saturation simultaneously. EX1006, 6:7-9. It would have been obvious to modify the pulse oximetry sensor 104a to detect both parameters in view of Kiani to minimize the number of sensors attached to the patient. A PHOSITA would know that attaching numerous sensors to a patient increases patient discomfort and increases the chances that one of the sensors falls off or becomes disconnected.

316. Modifying Money with Kiani substitutes one known sensor (Goldberg's pulse oximetry sensor 104a) for another (Kiani's pulse oximetry sensor) to predictably detect both oxygen saturation and pulse rate by the same sensor. EX1005, 4:60-64; EX1006, 6:7-9.

z. “receive the second signal from the blood pressure sensor arrangement via the one or more sensor

interfaces, the second signal responsive to at least a blood pressure parameter of the patient;”

317. Money teaches that the processor 14 receives signals from the blood pressure sensor via sensor interface 25. EX1008, 2:64-3:2, 5:23-28, 5:42-44, 8:20-27.

aa. “receive the third signal from the additional sensor arrangement via the one or more sensor interfaces, the third signal responsive to the at least one additional physiological parameter of the patient including at least one of: temperature or respiration rate,”

318. Money teaches that the processor 14 receives signals from temperature sensor via interface 27. EX1008, 2:64-3:2, 5:23-28, 5:48-51, 10:60-11:5.

bb. “wherein the third signal is provided at least partly as a digital signal; and”

319. As explained above in paragraphs 219-226, Money as modified by Akai would result in a temperature sensor that outputted digital data packets via the RS232 port.

cc. “cause the measurements of oxygen saturation, pulse rate, blood pressure, and the at least one additional physiological parameter to all be displayed on the display of the portable patient monitoring device; and”

320. I fully explained how Money in view of Kiani and Akai teaches this limitation above in paragraphs 200-203, 264, and 272.

dd. “a transmitter positioned within the housing and configured to:”

321. Money teaches an RF transmitter 21 positioned within the housing 5.

EX1008, 6:8-10.

ee. “wirelessly transmit a transmit signal including the information indicating the measurements of oxygen saturation, pulse rate, blood pressure, and the at least one additional physiological parameter to a separate computing device configured to display, on a remote display, the measurements of oxygen saturation, pulse rate, blood pressure, and the at least one additional physiological parameter.”

322. I fully explained how Money in view of Kiani and Akai teaches this limitation above in paragraphs 265 and 273. Additionally, Akai teaches that the remote computer is configured to display received physiological parameters, including oxygen saturation, pulse rate, blood pressure, and respiration rate.

EX1007, 9:47-50. Thus, Goldberg in view of Kiani, Money, Fujisaki, and Estep teaches and renders obvious claim 20.

323. Money also teaches that the central monitoring station receives the data. I would assume that the central monitoring station displays the data, but Akai unequivocally teaches that the central terminal displays collected data to doctor workstations. EX1007, 9:37-39, 9:45-50. There’s nothing unique about displaying collected data – that is a natural offshoot as humans cannot understand binary data.

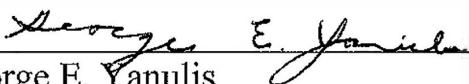
IX. CONCLUSION

324. For these reasons, it is my opinion that all claims of the '735 patent are unpatentable.

* * *

Pursuant to 28 U.S.C. § 1746, I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

Executed on this 18th day of May, 2020.



George E. Yanulis