UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

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ams AG, AMS-TAOS USA INC.,
SAMSUNG ELECTRONICS AMERICA, INC., and
SAMSUNG ELECTRONICS CO. LTD.,
Petitioners

v.

JJL TECHNOLOGIES LLC and 511 INNOVATIONS, INC.,
Patent Owner

Case IPR2016-01819
U.S. Patent No. 6,915,955

PETITION FOR *INTER PARTES* REVIEW

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I. MANDATORY NOTICES

A. Real Parties-in-Interest

ams AG, AMS-TAOS USA Inc., Samsung Electronics America, Inc., and Samsung Electronics Co., Ltd. (collectively "Petitioners") are the real parties-in-interest to this proceeding.

U.S. Patent No. 6,915,955 (the "'955 Patent") was assigned to JJL Technologies LLC by an assignment dated July 26, 2007 and recorded on the same date at reel/frame 019597/0461. However, in the various court proceedings identified below, 511 Innovations, Inc. claims to be "the current owner by assignment of all rights, title, and interest in and under the '955 Patent."

B. Related Matters

The '955 Patent and other patents in the same patent family are currently asserted against Petitioners in *511 Innovations, Inc. v. Samsung Telecommunications America, LLC*, No. 2:15-cv-01526 (E.D. Tex.). Other patents in the same patent family are also currently asserted in: *511 Innovations, Inc. v. HTC America, Inc.*, No. 2:15-cv-01524 (E.D. Tex.); *511 Innovations, Inc. v. Microsoft Mobility Inc.*, No. 2:15-cv-01525 (E.D. Tex.); and *511 Innovations, Inc. v. Apple, Inc.*, No. 2:16-cv-00868 (E.D. Tex.).

In addition to this Petition, Petitioners are seeking *inter partes* review of related U.S. Patents Nos. 6,307,629, 6,490,038, 7,113,283, 7,110,096, 7,397,541, 8,472,012, and 8,786,844.

C. Counsel

Lead Counsel: Daniel E. Venglarik (Registration No. 39,409);

Backup Counsel: Jamil N. Alibhai (*pro hac vice* to be filed), Kelly P. Chen (*pro hac vice* to be filed), and Jacob L. LaCombe (Registration No. 63,036).

D. Service Information

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E. Certification of Standing

Petitioners certify that the '955 Patent is available for *inter partes* review and that Petitioners are not barred or estopped from requesting *inter partes* review on the grounds identified herein.

II. OVERVIEW OF CHALLENGE AND RELIEF REQUESTED

Petitioners challenge claims 1, 5, 7, 10-11, and 18-19 of the ’955 Patent as indicated below:

Ground 1: Claims 1, 5, 7, 10, and 18 are anticipated by Jung.

Ground 2: Claims 1, 11, and 19 are obvious over Farrar in view of Hassler.

Ground 3: Claim 1 is obvious over Mills.

The above grounds create a reasonable likelihood that Petitioners will prevail with respect to at least one of the challenged claims. The arguments, charts, and evidence demonstrate that the challenged claims are unpatentable as anticipated under 35 U.S.C. § 102 and/or obvious under 35 U.S.C. § 103. Petitioners request cancellation of the challenged claims.

III. THE ’955 PATENT

A. Overview of the ‘955 Patent

The challenged claims are directed to the well-known idea of using optical sensors to measure the intensity of light reflected from the object, and then using the intensity measurements to determine information about the object. The patent generally discusses measuring the intensity of reflected light and using the measured intensity in an algorithm (run on the microprocessor) to determine the optical characteristics of the object. Ex. 1001, 4:43-58. The ’955 Patent describes a probe that measures the intensity of reflected light to determine optical characteristics (e.g., color) of teeth. Ex. 1001, 5:6-12. As shown in Figure 1, light emitted by a light source 11 is carried by fiber optic 5 to probe body 2 and probe tip 1 to illuminate a patient's teeth 20:

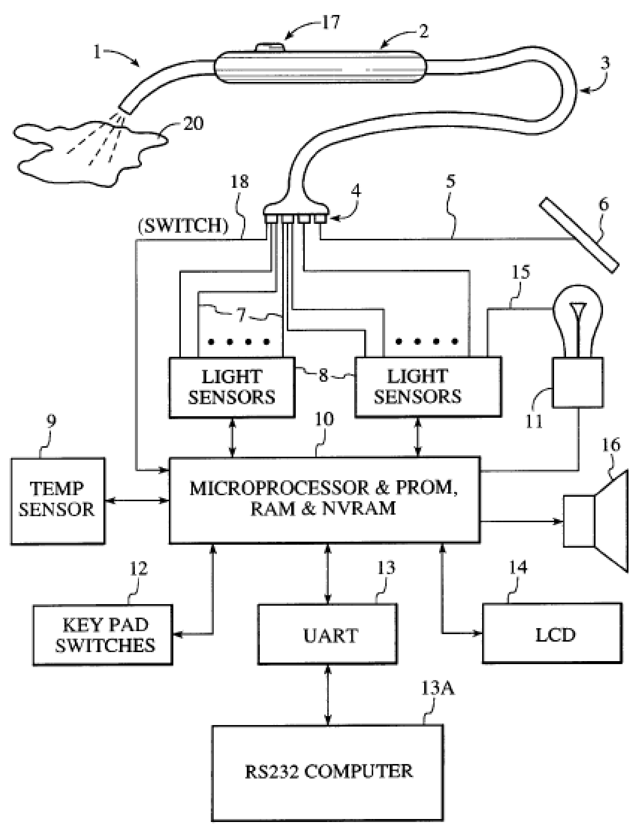


FIG. 1

Ex. 1001, Figure 1, 9:1-66; 10:9-17. "Light reflected from the object 20 passes through the receiver fiber optics in probe tip 1 to light sensors 8 (through probe body 2, fiber optic cable 3 and fibers 7)." Ex. 1001, 11:37-40. "Based on the information produced by light sensors [8], microprocessor 10 produces a color measurement result or other information to the operator." Ex. 1001, 11:40-42.

The patent discloses using the sensing elements 24 to convert the light received via the fibers 7 into an AC signal with a frequency proportional to the intensity of the incident light. Ex. 1001, 12:61-13:5. The processor measures the frequencies of the signals output from sensing elements 24 using a software timing loop and produces bits that are determinative of the period of the signals. Ex. 1001, 13:21-56. The patent discloses that "[f]rom such calculated periods, a measure of the received light intensities may be calculated." Ex. 1001, 13:56-67.

B. Admitted Prior Art

The '955 Patent admits prior art knowledge that color is dependent on the wavelength(s) of reflected light and that light incident on an object will, when reflected, "vary in intensity and wavelength dependent upon the color of the surface of the object." Ex. 1001, 1:54-61. Admitted prior art color measurement devices ("colorimeters") shine "white" light on the object and measure the intensity of reflected light received through filters passing only bands of wavelengths, such as red, green, and blue color filters. Ex. 1001, 2:16-35. The intensity measurements from the three (red/green/blue) "color sensors" represent the color. Ex. 1001, 2:16-37. Admitted prior art light sensors such as the commercially available TSL230 or TSL213 and admitted prior art filter materials such as Kodak filters are all that are disclosed for such system components. Ex. 1001, Figs. 1, 3, 12:63-13:20, 14:13-41.

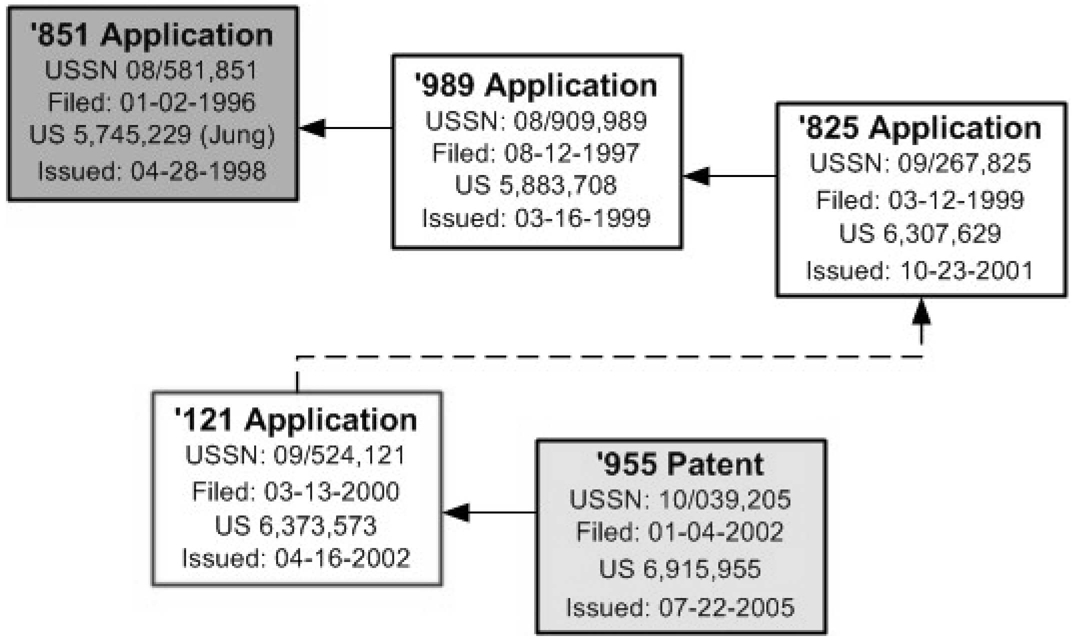
C. Effective Filing Date

The ’955 Patent purports to claim the benefit of a January 2, 1996 filing date—over six years before its actual filing date. Specifically, the ’955 Patent contains a priority claim to Jung. However, this priority claim is defective because the parent application contains no priority claim to Jung, breaking the chain of priority and rendering the priority claim in the ’955 Patent ineffective.

The ’955 Patent was filed on January 4, 2002 with a preliminary amendment containing a priority claim to four earlier filed patent applications. Ex. 1002, page 78. In the ’955 Patent, this priority claim recites:

> This is a continuation of application Ser. No. 09/524,121, filed Mar. 13, 2000, U.S. Pat. No. 6,373,573 which is a continuation-in-part of Ser. No. 09/267,825, filed Mar. 12, 1999, now U.S. Pat. No. 6,307,629; which is a continuation of Ser. No. 08/909,989, filed Aug. 12, 1997, now U.S. Pat. No. 5,883,708; which is a continuation of Ser. No. 08/581,851, filed Jan. 2, 1996, now U.S. Pat. No. 5,745,229.

Ex. 1001, 1:7-13. This priority claim is visually depicted below:



The '955 Patent (shown in yellow above) is a continuation of U.S. Application No. 09/524,121 ("the '121 application") and also claims priority to each of the other above identified patent applications—U.S. Application No. 09/267,825 ("the '825 application"), U.S. Application No. 08/909,989 ("the '989 application"), and U.S. Application No. 08/581,851 ("the '851 application," which matured into Jung). Ex. 1001, 1:7-13.

35 U.S.C. § 120 allows patent applicants to obtain the benefit of an earlier filed application if their application is:

> *filed before the patenting or abandonment of or termination of proceedings on* [i.e., during the pendency of] the first application or on an application similarly entitled to the benefit of the filing date of the first application ***and*** *if it contains or is*

> *amended to contain a specific reference to the earlier filed application*. No application shall be entitled to the benefit of an earlier filed application under this section *unless an amendment containing the specific reference to the earlier filed application is submitted at such time during the pendency of the application* as required by the Director.

35 U.S.C. § 120 (1999) (emphases added). For a multiple application priority chain, this specific reference must be made to "each application in the chain of priority to refer to the prior applications." *Encyclopaedia Britannica, Inc. v. Alpine Elecs. of America, Inc*, 609 F.3d 1345, 1352 (Fed. Cir. 2010). This "specific reference" to an application in a priority claim requires precise details, including those details recited in 37 C.F.R. § 1.78(a)(2)(i)(pre-AIA), the implementing regulation for 35 U.S.C. § 120. *Medtronic Corevalue, LLC v. Edwards Lifesciences Corp.*, 741 F.3d 1359, 1366 (Fed. Cir. 2014)

The '955 Patent is not entitled to the benefit of the filing date of any of the '825, '989, and '851 applications for several reasons. First, it was not filed during the pendency of "an application similarly entitled to the benefit of the filing date of the ['825, '989, and '851 applications]" as required under 35 U.S.C. § 120. *See* 35 U.S.C. § 120 (1999). The '825 application, the last pending application among the '825, '989, and '851 applications, was no longer pending when the '955 Patent was filed as an application. The ’955 Patent was filed on January 4, 2002—over two months after the ’825 application issued as a patent on October 23, 2001. *See* Ex. 1003.

Second, the Patent Owner cannot rely on the ’955 Patent’s priority claim to the ’121 application as an “application similarly entitled to the benefit of the filing date of the [’825, ’989, and ’851 applications]” to meet the requirements of 35 U.S.C. § 120. *See* 35 U.S.C. § 120 (1999). The ’121 application neither “contained [nor was] amended to contain a specific reference to the earlier filed application[s]” as required by 35 U.S.C. § 120. *See* Ex. 1004, Ex. 1005; 35 U.S.C. § 120 (1999). Thus, the ’955 Patent was only co-pending with the ’121 application, an application that contained no priority claim, which breaks the priority chain to the earlier filed applications. The ’955 Patent cannot obtain the benefit of the filing date of any application except that of the ’121 application. *See Encyclopaedia Britannica, Inc. v. Alpine Electronics of Am., Inc.*, 609 F.3d. 1345 at 1351 (Fed. Cir. 2010) (“[l]ater applications cannot amend the [parent] application and restore its entitlement to priority”); *see also Medtronic CoreValve, LLC v. Edwards Lifesciences Corp.*, 741 F.3d 1359, 1363 (Fed. Cir. 2014) (“because intermediate U.S. Applications 6 and 8 failed to specifically reference the earlier filed applications in the priority chain, the ‘281 patent is not entitled to claim the priority date of International Application 2b under § 120.”).

Third, the ’955 Patent’s priority claim to the ’825, ’989, and ’851 applications is also defective because the priority chain does not correctly “indicat[e] the relationship of the applications” in the priority chain as required by § 1.78(a)(2)(i) (pre-AIA);. *See* C.F.R. § 1.78(a)(2)(i) (pre-AIA); IPR2015-00414, *Apple, Inc. v. E-Watch, Inc.*, Paper 13 at 10-13 (finding priority claim defective under C.F.R. § 1.78(a)(2)(i) (pre-AIA) for not correctly identifying the *relationship* of applications within the priority chain). The ’955 Patent states that the ’121 application “is a continuation-in-part of [the ’825 application].” The ’121 application is required to “contain [or be] amended to contain a specific reference to the [’825] application” during its pendency to be a continuation-in-part of the ’825 application. *See* 35 U.S.C. § 120 (1999). As discussed above, the ’121 application never contained such a “specific reference” to the ’825 application and, therefore, is not a continuation-in-part of the ’825 application. *See* Ex 1004; Ex 1004; 35 U.S.C. § 120 (1999). Thus, the ’955 Patent’s priority claim is defective for failing to correctly indicate the relationship of the ’121 application to the other applications in the priority chain. *See* 37 C.F.R. § 1.78(a)(2)(i) (pre-AIA).

Because of the defective priority claim and failure to meet the co-pendency requirement, the earliest effective filing date of the ’955 Patent is March 13, 2000, the filing date of the ’121 application. Ex. 1005, face plate.

IV. ORDINARY SKILL IN THE ART

A person of ordinary skill in the art at the time of the claimed inventions would have had a bachelor's degree in electrical engineering, physics, or a closely related field, along with at least 2-3 years of experience in the design and development of optoelectronic measurement systems. An individual with an advanced degree in a relevant field, such as physics or electrical engineering, would require less experience in the design and development of optoelectronic measurement systems.

V. CLAIM CONSTRUCTION

Because of its defective priority claim, the '955 Patent has not expired. In an *inter partes* review of a non-expired patent, the Board gives a claim "its broadest reasonable construction in light of the specification of the patent in which it appears." 37 C.F.R. § 42.100(b); *Cuozzo Speed Techs., LLC v. Lee*, 136 S.Ct. 2131, 2142-46 (2016). In reviewing a patent that has expired or will expire before the final decision, the Board applies the "district court" or *Phillips* claim construction standard. 37 C.F.R. § 42.100(b). Under that standard, the "correct" construction—that most accurately delineating the scope of the invention—is identified. *PPC Broadband, Inc. v. Corning Optical Communications RF, LLC*, 815 F.3d 734, 740 (Fed. Cir. 2016).

As shown below, the prior art anticipates or renders obvious claims 1, 5, 7, 10-11 and 18-19 of the ’955 Patent; accordingly, the Board need not consider any claim terms for purposes of invalidity.

VI. GROUND 1: Claims 1, 5, 7, 10, and 18 are anticipated by Jung.

A. Jung is Prior Art to the ’955 Patent

Because the earliest effective filing date of the ’955 Patent is March 13, 2000 (the filing date of the ’121 application), Jung is prior art under 35 U.S.C. § 102(b) to the ’955 Patent. Jung issued as a patent on April 28, 1998, nearly two years before the ’955 Patent’s earliest effective filing date of March 13, 2000. Ex 1006. Jung is prior art to the ’955 Patent at least under § 102(b). *See* 35 U.S.C. § 102(b).

B. Jung Contains Identical Disclosure to Much of That in the ’955 Patent

The disclosures of Jung and the ’955 Patent contain substantial overlap. For example, FIGS. 1-15 in the ’955 Patent are the same as those in Jung and the corresponding descriptions thereof in the first 28 columns of the ’955 Patent are substantially similar. *Compare* Ex. 1001 *with* Ex. 1006. Similarly, the discussion of the “System Described” in section B of the Overview of the ’955 Patent provided above is also attributable to that of Jung. Jung’s substantial overlap in disclosure anticipates claims 1, 5, 7, 10, and 18 of the ’955 Patent.

C. Jung Anticipates Claims 1, 5, 7, 10, and 18

1. *Claim 1*

[1a] "*An apparatus for measuring spectral characteristics of received light, comprising:*"

Jung discloses an apparatus for measuring spectral characteristics of an object using received light. Ex. 1006, Figure 1, Title, Abstract, 5:6-25, 5:38-6:4.

[1b] "*one or more light receivers, wherein the received light is received by the one or more lights [sic] receivers;*"

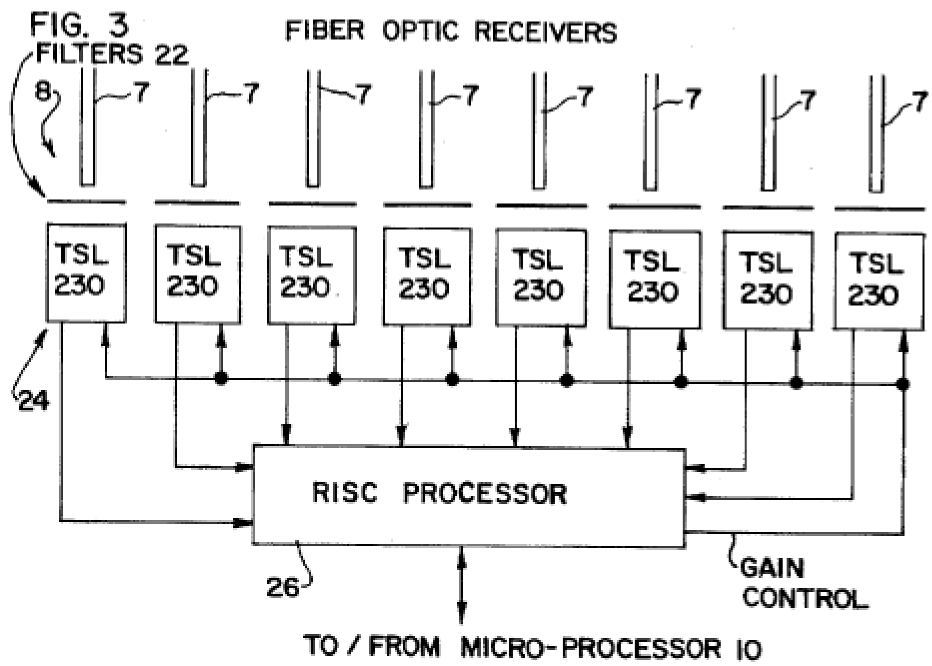
Jung describes using light receivers (e.g., optical fibers 7) that extend from probe tip 1 through probe body 2 and fiber optic cable 3 that receive light from an object 20. Ex. 1006, Figs. 1, 3, 5:9-25, 5:38-6:4.

[1c] "*one or more spectral sensors coupled to receive at least a portion of the received light,*"

Jung describes light from sixteen light receivers (e.g., optical fibers 7) passing to sensors 8 ("spectral sensors") through filters. Ex. 1006, Figure 1, 5:38-6:4, 9:56-10:1.

[1d] "*wherein the one or more spectral sensors measure the intensity of the received light in one or more predetermined spectral bands;*"

Jung depicts and describes sensors 8 as each including a sensing element 24 (each comprising a TSL230 photodiode array and light to frequency converter integrated circuit) receiving light from an optical fiber 7 through a corresponding filter 22 and outputting signals based on the intensity of the received light. Ex. 1006, 8:43-9:2.



Ex. 1006, Figure 3. The filters 22 between at least some of the optical fibers 7 and the corresponding sensors 8 each pass different bands of wavelengths from the 300 nm band forming the visible, optical spectrum. Ex. 1006, 8:45-59, 9:56-10:26. The spectral bands are "predetermined" based on the type of the filter 22 selected to be placed in front of the sensors 8.

[1e] "*a processor, wherein the processor receives data corresponding to one or more light intensities measured by the one or more spectral sensors;*"

Jung describes a processor 26 coupled to and receiving measurement data from sensors 8. Ex. 1006, Figure 3, 9:3-48. As the output of the sensing element 24 is based on the light intensities measured by the one or more spectral sensors and sent to the processor 26, the processor 26 receives data corresponding to one or more light intensities measured by the one or more spectral sensors. Ex. 1006, 8:43-9:10.

[1f] "*wherein the processor determines a data value of at least two bits based on the received light measured in each of the one or more predetermined spectral bands;*"

Jung describes processor 26 as reading the digital inputs from the sensing elements 24 at periodic intervals using a software timing loop determined by the processor's "crystal oscillator time base" and incrementing an internal counter each pass through the software timing loop. Ex. 1001, 8:67-9:2; 9:11-17. When any of the read digital inputs change (e.g., go from low to high or high to low), the processor saves (i.e., determines) a value of the internal counter (i.e., a data value) at the time of the detected change and continues this process until all inputs have changed at least twice to measure "a full 1/2 period of each input." Ex. 1001, 9:20-48. Thus, these counter values are determined based on the frequency of the digital input which is proportional to the light intensity. Ex. 1001, 8:43-9:10, 9:32-48. A counter inherently requires more information than two pieces of information (i.e. a single bit of data). Ex. 1012, ¶¶28-29. The counter of the PIC16C55 Microprocessor, disclosed by Jung as his preferred embodiment for the processor 26, is an 8-bit counter (i.e., 256 pieces of information). Ex. 1001, 9:6-10; Ex. 1007, page 1; Ex. 1012, ¶¶28-29. The counter values necessarily have two or more bits, since otherwise the different measurements would all have equal measured representations corresponding to a single time interval value—that is, one bit (0 = no time interval, 1 = one time interval). Ex. 1012, ¶¶28-29. In order to accurately measure "a full 1/2 period of each input" and therefore accurately derive light intensity, the periodicity of the counter would need to be quicker than the 1/2 period of each input; otherwise input changes would be missed and the intensity calculation would be incorrect. *Id.*

[1g] "*wherein the data value for each spectral band is determined based on the measured light intensity level of the received light in each spectral band.*"

As discussed in [1f] above, Jung discloses determining two counter values for each of the inputs received from the sensing elements 24, which are based on the measured light intensity level. Ex. 1006, 8:67-9:48; Ex. 1012, ¶¶28-29.

2. *Claim 5*

[5a] "*The apparatus of claim 1:*"

See the discussion of claim 1 above.

[5b] "*wherein at least one spectral band comprises a reference band.*"

Jung describes one of the optical fibers 7 as measuring the light source 11. Ex. 1006, 9:56-57. The measured intensity of the light source is used as a reference band in order to maintain the intensity in the range of the other received light intensities. Ex. 1006, 9:58-61.

3. *Claim 7*

[7a] "*The apparatus of claim 5:*"

See the discussion of claim 5 above.

[7b] "*wherein the one or more light receivers is/are moved relative to an object or material,*"

Jung describes the probe of Figure 1 and its light receiver as being moved relative an object. Ex. 1006, 13:19-14:12.

[7c] "*wherein a plurality of data values are determined as the one or more light receivers is/are moved relative to the object or material.*"

Jung describes measuring light intensity and determining height data values as the probe and its light receiver are moved relative to the object. Ex. 1006, 14:4-12.

4. *Claim 10*

[10a] "*The apparatus of claim 1:*"

See the discussion of claim 1 above.

[10b] "*wherein the one or more light receivers is/are moved relative to an object or material,*"

See the discussion of element [7b].

[10c] "*wherein a plurality of data values are determined as the one or more light receivers is/are moved relative to the object or material.*"

See the discussion of element [7c].

5. *Claim 18*

[18a] "*The apparatus of claim 1:*"

See the discussion of claim 1 above.

[18b] "*wherein the one or more spectral sensors comprise one or more light to frequency converter sensing elements.*"

Jung describes each of sensors 8 as including a sensing element 24 comprising a TSL230 photodiode array with at least one light to frequency converter. Ex. 1006, 8:55-67 & Figure 3.

D. Charts:

Limitation		Jung
1a	An apparatus for measuring spectral characteristics of received light, comprising:	Jung discloses apparatus for measuring spectral characteristics of an object using received light. Ex. 1006, Figure 1, Title, Abstract, 5:6-25, 5:38-6:4.
1b	one or more light receivers, wherein the received light is received by the one or more lights receivers;	Jung describes light receivers (e.g., optical fibers 7) that receive light from an object 20. Ex. 1006, Figs. 1, 3, 5:9-25, 5:38-6:4.
1c	one or more spectral sensors coupled to receive at least a portion of the received light,	Jung describes light from sixteen optical fibers 7 passing to sensors 8 ("spectral sensors") through filters. Ex. 1006, Figure 1, 5:38-6:4, 9:56-10:1.
1d	wherein the one or more spectral sensors measure the intensity of the received light in one or more predetermined spectral bands; and	Jung depicts and describes sensors 8 as each including a sensing element 24 (including a TSL230 photodiode array and light to frequency converter integrated circuit) receiving light from an optical fiber 7 through a corresponding filter 22 and outputting signals based on the intensity of the received light. Ex. 1006, 8:43-9:2. The spectral bands are "predetermined" based on the type of the

Limitation		Jung
		filter 22 selected to be placed in front of the sensors 8. Ex. 1006, 8:45-59, 9:56-10:26.
1e	a processor, wherein the processor receives data corresponding to one or more light intensities measured by the one or more spectral sensors;	Jung describes a processor 26 coupled to and receiving measurement data from sensors 8 based on the light intensities measured by the sensing elements 24. Ex. 1006, Figure 3, 8:43-9:48.
1f	wherein the processor determines a data value of at least two bits based on the received light measured in each of the one or more predetermined spectral bands,	Jung describes processor 26 saving (i.e., determining) a value of the internal counter (i.e., a data value) at a time of a change in sensing element output with two saved counter values per sensing element output. Ex. 1006, 8:67-9:2; 9:11-48. These counter values are determined based on the frequency of the digital output which is proportional to the light intensity. Ex. 1006, 8:43-9:10, 9:32-48. A counter inherently requires more information than two pieces of information (i.e. a single bit of data). Ex. 1012, ¶¶28-29. The counter of the PIC16C55 Microprocessor, disclosed by Jung as his preferred embodiment for the processor 26, is an 8-bit counter (i.e., 256 pieces of information). Ex. 1001, 9:6-10; Ex. 1007, page 1; Ex. 1012, ¶¶28-29. The counter values necessarily have two or more bits, since otherwise the different measurements would all have equal measured representations corresponding to a single time interval value—that is, one bit (0 = no time interval, 1 = one time interval). Ex. 1012, ¶¶28-29. At least the second of these two determined counter values (per sensing element output) must be at least two bits to accurately measure the ½ period of the sensing element output. *Id.*

Limitation		Jung
1g	wherein the data value for each spectral band is determined based on the measured light intensity level of the received light in each spectral band.	As discussed in [1e] above, Jung discloses to determine two counter values for each of inputs received from the sensing elements 24, which are based on the measured light intensity level, and at least one of which is a minimum of two bits. Ex. 1006, 8:67-9:48; Ex. 1012, ¶¶28-29.
5a	The apparatus of claim 1,	See [1a]-[1g].
5b	wherein at least one spectral band comprises a reference band.	Jung describes one of the optical fibers 7 as measuring the light source 11. Ex. 1006, 9:56-57. The measured intensity of the light source is used as a reference band in order to maintain the intensity in the range of the other received light intensities. Ex. 1006, 9:58-61.
7a	The apparatus of claim 5,	See [5a]-[5b].
7b	wherein the one or more light receivers is/are moved relative to an object or material,	Jung describes the probe of Figure 1 and the optical fibers therein as being moved relative an object. Ex. 1006, 13:19-14:12.
7c	wherein a plurality of data values are determined as the one or more light receivers is/are moved relative to the object or material.	Jung describes measuring light intensity and determining height data values as the probe is moved relative to the object. Ex. 1006, 14:4-12.
10a	The apparatus of claim 1,	See [1a]-[1g].
10b	wherein the one or more light receivers is/are moved relative to an object or material,	See [7b].
10c	wherein a plurality of data values are determined as the one or more light receivers is/are moved relative to the object or material.	See [7c].
18a	The apparatus of claim 1,	See [1a]-[1g].
18b	wherein the one or more spectral sensors comprise one or more light to	Jung describes each of sensors 8 as including a sensing element 24 comprising a TSL230 photodiode array with at least one light to

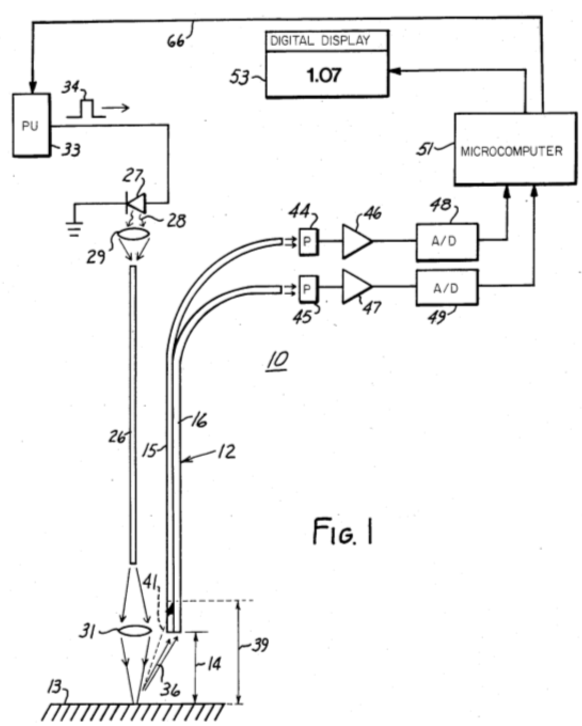
Limitation		Jung
	frequency converter sensing elements.	frequency converter. Ex. 1006, 8:55-67.

VII. GROUND 2: Claims 1, 11, and 19 of the '955 Patent are obvious over Farrar in view of Hassler.

This ground is not redundant with Ground 1 because Farrar and Hassler are both prior art under at least § 102(b) regardless of the determination of the '955 Patent's priority claim.

A. Overview of Farrar

Farrar relates to a fiber optic range finder determining a range 14 to the surface of an object 13. Ex. 1008, Title, 2:58-66. Figure 1 is representative of most embodiments described in Farrar:



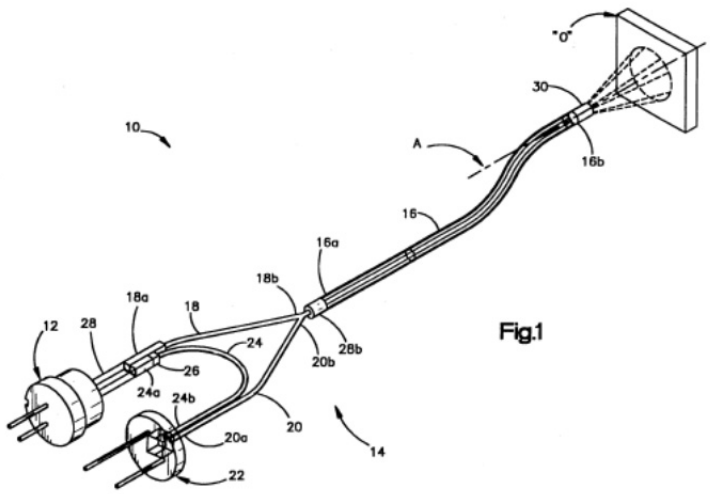
Ex. 1008, Figure 1. The range finder (or "proximity sensor") 10 includes a light transmitting optical fiber 26 together with light receiving optical fibers 15 and 16. Ex. 1008, 2:58-66, 3:49-51, 5:18-20. The light transmitting optical fiber 26 projects light from a light source 27 onto the object surface. Ex. 1008, 3:52-56. At least part of that light will reflect off the object surface (reflected light 36 or 41) and be received by the light receiving optical fibers 15 and 16. Ex. 1008, 3:64-4:6.

Photodetectors 44 and 45 receive light from the light receiving fibers 15 and 16, respectively, measure the intensity and generate corresponding electrical signals amplified by amplifiers 46, 47 and digitized by A/D converters 48, 49. Ex. 1008, 4:59-65. A microprocessor 51 calculates a range 14 to the object surface based on a mathematical combination of the light intensities measured by the two photodetectors 44 and 45. Ex. 1008, 5:3-7. By mathematically manipulating both measured light intensities received at different angles through light receiving fibers 15 and 16 having different numerical apertures, the range calculated by micro-processor 51 accounts for variations in light intensity as a whole and variations caused by surface texture, reflectivity, etc. of a specific object surface 13. Ex. 1008, 4:32-42, 5:67-6:10.

B. Overview of Hassler

Like Farrar, Hassler relates to a fiber optic position sensor. Ex. 1009, Abstract. Hassler is analogous to Farrar based on the use of similar means (optical fibers) to achieve a similar result (a measure of light intensity), based on the numerous structural similarities identified below. Both Hassler and Farrar are analogous to the challenged claims of the ’955 Patent for the same reasons.

Hassler discloses a first illumination fiber optic bundle 18 between a light source 12 and an object O and a second measurement fiber optic bundle 20 between the object O and a one region 22b of a bi-cell light detector 22:



Ex. 1009, Figure 1, 2:46-3:1. The light detector 22 converts incident light from the measurement fiber optic bundle 20 into electrical signals proportional to an intensity of the incident light. Ex. 1009, 3:4-8. Hassler discloses the electrical signals from the light detector 22 are processed by a microcontroller 58 that includes an 8-bit microprocessor 60 and the analog to digital converter 56 on-chip. Ex. 1009, Figure 4, 6:58-60.

C. Farrar in view of Hassler Renders Claims 1, 11 and 19 Obvious

1. *Claim 1*

[1a] "*An apparatus for measuring spectral characteristics of received light, comprising:*"

Farrar discloses fiber optic range finder systems. Ex. 1008, Figures 1, 4, 6, Title, Abstract. Fiber optic range finder 10 includes photodetectors 44 and 45 each measuring an intensity of light reflected from an object surface 13. Ex. 1008, Figs. 1, 4, 6, 4:46-49, 4:59-62, 7:51-54.

[1b] "*one or more light receivers, wherein the received light is received by the one or more lights receivers;*"

Farrar discloses a light receiver (e.g., light receiving fiber 15) positioned so that light 36 reflected off the object surface 13 is received by light receiving fiber 15. Ex. 1008, Figs. 1, 4, 6, 3:49-56, 3:64-4:6, 7:51-54.

[1c] "*one or more spectral sensors coupled to receive at least a portion of the received light,*"

The embodiment of Figure 6 in Farrar includes photodetectors 44 and 45 measuring an intensity of light received from light receiving fiber 15. Ex. 1008, Figs. 1, 4, 6, 4:63-65, 7:47-54.

[1d] "*wherein the one or more spectral sensors measure the intensity of the received light in one or more predetermined spectral bands; and*"

Different narrowband optical input filters 67 and 68 are placed in front of the photodetectors 44 and 45, respectively. Ex. 1008, Figs. 5, 6, 7:18-26. The different transmission bands of the optical filters 67 and 68 correspond to the different wavelengths or spectral bands. *Id*. The spectral bands are "predetermined" because of the selection of the optical filters 67 and 68 placed in the proximity sensor 10. Additionally, in the embodiment of Figure 4, Farrar teaches the fiber 15 being wavelength dependent, thus receiving light, the intensity of which is measured by photodetector 44 in a predetermined spectral band. Ex. 1008, Figure 4, 6:36-44.

[1e] "*a processor, wherein the processor receives data corresponding to one or more light intensities measured by the one or more spectral sensors;*"

Farrar discloses a microprocessor 51. Ex. 1008, Figure 1, 2:58, 4:63-65. An electrical signal from photodetector 44 corresponding to the measured light intensity is amplified by amplifier 46 and digitized by A/D converter 48, with the digital value for the measured light intensity provided to the microprocessor 51. Ex. 1008, 4:59-65.

[1f] "*wherein the processor determines a data value of at least two bits based on the received light measured in each of the one or more predetermined spectral bands,*"

Farrar discloses that the microprocessor 51 performs a mathematical combination of the digital sensor outputs to provide display of distances of at least three decimal digits. Ex. 1008, Figs. 1, 4, 8, 9, 4:59-5:10, 6:34-15. Farrar does not explicitly describe the number of bits for the digital values output by the A/D converters 48, 49 based upon the light intensities detected by photodetectors 44, 45. However, Farrar depicts display of ranges having three decimal digits ("0.44" inches, millimeters, etc.) on digital display 53. Ex. 1008, Figure 6, 5:8-10, 7:27-32, 7:51-54. To fully utilize three decimal digits, at least 1,000 different distances must be measurable. Ex. 1012, ¶41.

In an analogous reference, Hassler depicts A/D converter 56 as generating 10-bit values (corresponding to 2^{10}=1024 different measurements) for light intensity measurements by a photodiode 22. Ex. 1008, Figure 4; Ex. 1012, ¶42.

One skilled in the art would be motivated to implement the A/D converters 48, 49 of Farrar to generate 10 bit digital values (i.e., at least two bits) as disclosed by Hassler, to fully utilize the three decimal digits of the digital display 53 in Farrar. Ex. 1012, ¶42. No more than ordinary skill would be required for this modification, which would produce the predictable result of the A/D converters 48, 49 outputting 10-bit digital values for the detected light intensities. *Id*.

[1g] "*wherein the data value for each spectral band is determined based on the measured light intensity level of the received light in each spectral band.*"

Claim 1 requires "one or more" spectral bands. Farrar teaches using the output of a single photo diode 44 (i.e., a light intensity measurement in a spectral band) to determine a distance that is expressed using three decimal digits. Ex. 1008, Figure 4, 6:34-15. Farrar does not explicitly describe the number of bits for the digital values output by the A/D converters 48, 49 based upon the light intensities detected by photodetectors 44, 45. However, Farrar depicts display of ranges having three decimal digits ("0.44" inches, millimeters, etc.) on digital display 53. Farrar, Figure 6, 5:8-10, 7:27-32, 7:51-54. To fully utilize three decimal digits, at least 1,000 different distances must be measurable. Ex. 1012, ¶41.

In an analogous reference, Hassler depicts A/D converter 56 as generating 10-bit values (corresponding to 2^{10}=1024 different measurements) for light intensity measurements by a photodiode 22. Ex. 1008, Figure 4; Ex. 1012, ¶42.

One skilled in the art would be motivated to implement the A/D converters 48, 49 of Farrar to generate 10 bit digital values as disclosed by Hassler, to fully utilize the three decimal digits of the digital display 53 in Farrar. Ex. 1012, ¶42. No more than ordinary skill would be required for this modification, which would produce the predictable result of the A/D converters 48, 49 outputting 10-bit digital values for the detected light intensities within each of the wavelength transmission bands for filter 67, 68. *Id*.

2. *Claim 11*

[11a] "*The apparatus of claim 1:*"

See the discussion of claim 1 above.

[11b] "*wherein at least one data value is determined as a function of a measured intensity in one spectral band and a measured intensity in a second spectral band.*"

Farrar discloses that the microprocessor 51 receives the digitized outputs of spectral intensity measurements in different spectral bands from each photodetector pair 44 and 45 and performs a mathematical combination (i.e., a function) of these digital outputs to determine a distance data value. Ex. 1008, 4:59-5:10.

3. *Claim 19.*

[19a] "*An apparatus for measuring spectral characteristics of received light, comprising:*"

See the discussion of element [1a].

[19b] "*one or more light receivers, wherein the received light is received by the one or more lights [sic] receivers;*"

See the discussion of element [1b].

[19c] "*wherein the received light comprises light in a plurality of predetermined spectral bands;*"

Different narrowband optical input filters 67 and 68 are placed in front of the photodetectors 44 and 45, respectively. Ex. 1008, Figs. 5, 6, 7:18-26. The different transmission bands of the optical filters 67 and 68 correspond to the different wavelengths or spectral bands. *Id*. The spectral bands are "predetermined" because of the selection of the optical filters 67 and 68 placed in the proximity sensor 10.

[19d] "*a plurality of spectral sensors coupled to receive at least a portion of the received light,*"

The embodiment of Figure 6 in Farrar includes photodetectors 44 and 45 receiving light from receiving fiber 15. Ex. 1008, Figure 6, 4:63-65, 7:47-54.

[19e] "*wherein the plurality of spectral sensors measure the intensity of the received light in the plurality of predetermined spectral bands;*"

The embodiment of Figure 6 in Farrar includes photodetectors 44 and 45 measuring an intensity of light in the different wavelengths or spectral bands passed by the optical filters 67 and 68. Ex. 1008, Figure 6, 4:63-65, 7:18-26, 7:47-54.

[19f] "*a processor, wherein the processor receives data corresponding to a plurality of light intensities measured by the plurality of spectral sensors;*"

See the discussion of element [1e].

[19g] "*wherein the processor determines at least one data value as a function of a measured intensity in one spectral band and a measured intensity in a second spectral band.*"

Farrar discloses that the microprocessor 51 receives the digitized outputs of spectral intensity measurements in different spectral bands from each photodetector pair 44 and 45 and performs a mathematical combination (i.e., a function) of these digital outputs to determine a distance data value. Ex. 1008, 4:59-5:10.

D. Charts:

Limitation		**Farrar+Hassler**
1a	An apparatus for measuring spectral characteristics of received light, comprising:	Farrar discloses fiber optic range finder systems. Ex. 1008, Figures 1, 4, 6, Title, Abstract. Fiber optic range finder 10 includes photodetectors 44 and 45 each measuring an intensity of light reflected from an object surface 13. Ex. 1008, Figs. 1, 4, 6, 4:46-49, 4:59-62, 7:51-54.
1b	one or more light receivers, wherein the received light is	A light receiver (e.g., light receiving fiber 15) is positioned so that light 36 reflected off the

Limitation		Farrar+Hassler
	received by the one or more lights receivers;	object surface 13 is received by light receiving fiber 15. Ex. 1008, Figs. 1, 4, 6, 3:49-56, 3:64-4:6, 7:51-54.
1c	one or more spectral sensors coupled to receive at least a portion of the received light,	Photodetectors 44 and 45 measure an intensity of light received from light receiving fiber 15. Ex. 1008, Figs. 1, 4, 6, 4:63-65, 7:47-54.
1d	wherein the one or more spectral sensors measure the intensity of the received light in one or more predetermined spectral bands; and	Placement of narrowband optical input filters 67 and 68 in front of the photodetectors 44 and 45, respectively predetermines the spectral band the photodetectors 44 and 45 measure light intensity. Ex. 1008, Figs. 5, 6, 7:18-26. In the embodiment of Figure 4, Farrar teaches the fiber 15 being wavelength dependent thus receiving light the intensity of which is measured by photodetector 44 in one predetermined spectral band. Ex. 1008, Figure 4, 6:36-44.
1e	a processor, wherein the processor receives data corresponding to one or more light intensities measured by the one or more spectral sensors;	An electrical signal from photodetector 44 corresponding to the measured light intensity is amplified by amplifier 46 and digitized by A/D converter 48, with the digital value for the measured light intensity provided to the microprocessor 51. Ex. 1008, Figure 1, 2:58, 4:59-65.
1f	wherein the processor determines a data value of at least two bits based on the received light measured in each of the one or more predetermined spectral bands,	Farrar discloses that the microprocessor 51 performs a mathematical combination of the digital sensor outputs to provide display of distances of at least three decimal digits. Ex. 1008, Figs. 1, 4, 8, 9, 4:59-5:10, 6:34-15. Farrar does not explicitly describe the number of bits for the digital values output by the A/D converters 48, 49 based upon the light intensities detected by photodetectors 44, 45. However, Farrar depicts display of ranges having three decimal digits ("0.44" inches, millimeters, etc.) on digital display 53. Farrar, Figure 6, 5:8-10, 7:27-32, 7:51-54. To fully

Limitation		Farrar+Hassler
		utilize three decimal digits, at least 1,000 different distances must be measurable. Ex. 1012, ¶41. Hassler depicts A/D converter 56 as generating 10-bit values (corresponding to 2^{10}=1024 different measurements) for light intensity measurements by a photodiode 22. Ex. 1009, Figure 4; Ex. 1012, ¶41. One skilled in the art would be motivated to implement the A/D converters 48, 49 of Farrar to generate 10 bit digital values (i.e., at least two bits) as disclosed by Hassler, to fully utilize the three decimal digits of the digital display 53 in Farrar. Ex. 1012, ¶42. No more than ordinary skill would be required for this modification, which would produce the predictable result of the A/D converters 48, 49 outputting 10-bit digital values for the detected light intensities. *Id*.
1g	wherein the data value for each spectral band is determined based on the measured light intensity level of the received light in each spectral band.	Claim 1 requires "one or more" spectral bands. Farrar teaches using the output of a single photo diode 44 (i.e., a light intensity measurement in a spectral band) to determine a distance that is expressed using three decimal digits. Ex. 1008, Figure 4, 6:34-15. Farrar does not explicitly describe the number of bits for the digital values output by the A/D converters 48, 49 based upon the light intensities detected by photodetectors 44, 45. However, Farrar depicts display of ranges having three decimal digits ("0.44" inches, millimeters, etc.) on digital display 53. Farrar, Figure 6, 5:8-10, 7:27-32, 7:51-54. To fully utilize three decimal digits, at least 1,000 different distances must be measurable. Ex. 1012, ¶41.

Limitation		Farrar+Hassler
		Hassler depicts A/D converter 56 as generating 10-bit values (corresponding to 210=1024 different measurements) for light intensity measurements by a photodiode 22. Ex. 1008, Figure 4; Ex. 1012, ¶41. One skilled in the art would be motivated to implement the A/D converters 48, 49 of Farrar to generate 10 bit digital values as disclosed by Hassler, to fully utilize the three decimal digits of the digital display 53 in Farrar. Ex. 1012, ¶42. No more than ordinary skill would be required for this modification, which would produce the predictable result of the A/D converters 48, 49 outputting 10-bit digital values for the detected light intensities within each of the wavelength transmission bands for filter 67, 68. *Id.*
11a	The apparatus of claim 1,	See [1a]-[1g].
11b	wherein at least one data value is determined as a function of a measured intensity in one spectral band and a measured intensity in a second spectral band.	The microprocessor 51 receives the digitized outputs of spectral intensity measurements in different spectral bands from each photodetector pair 44 and 45 and performs a mathematical combination (*i.e.*, a function) of these digital outputs to determine a distance data value. Ex. 1008, 4:59-5:10.
19a	An apparatus for measuring spectral characteristics of received light, comprising:	See [1a].
19b	one or more light receivers, wherein the received light is received by the one or more lights [*sic*] receivers;	See [1b].
19c	wherein the received light comprises light in a plurality of predetermined spectral bands;	Different narrowband optical input filters 67 and 68 are placed in front of the photodetectors 44 and 45, respectively, predetermining the received spectral bands. Ex. 1008, Figs. 5, 6, 7:18-26.

Limitation		Farrar+Hassler
19d	a plurality of spectral sensors coupled to receive at least a portion of the received light,	Photodetectors 44 and 45 receive light from receiving fiber 15. Ex. 1008, Figure 6, 4:63-65, 7:47-54.
19e	wherein the plurality of spectral sensors measure the intensity of the received light in the plurality of predetermined spectral bands; and	Photodetectors 44 and 45 measure intensity of light in the different wavelengths or spectral bands passed by the optical filters 67 and 68. Ex. 1008, Figure 6, 4:63-65, 7:18-26, 7:47-54.
19f	a processor, wherein the processor receives data corresponding to a plurality of light intensities measured by the plurality of spectral sensors;	See [1e].
19g	wherein the processor determines at least one data value as a function of a measured intensity in one spectral band and a measured intensity in a second spectral band.	The microprocessor 51 receives the digitized outputs of spectral intensity measurements in different spectral bands from each photodetector pair 44 and 45 and performs a mathematical combination (i.e., a function) of these digital outputs to determine a distance data value. Ex. 1008, 4:59-5:10.

VIII. GROUND 3: Claim 1 of the '955 Patent is obvious over Mills.

This ground is not redundant with Grounds 1 and 2 because Mills explicitly discloses detector outputs digitized into an 8-bit digital byte of data by a processor.

A. Overview of Mills

Mills discloses an optical scanning unit 18 with a detector subsystem 22 for determining characteristics of fruit 10 (e.g., a lemon), including color, surface blemishes, size, and shape based on light reflected off the surface of the fruit:

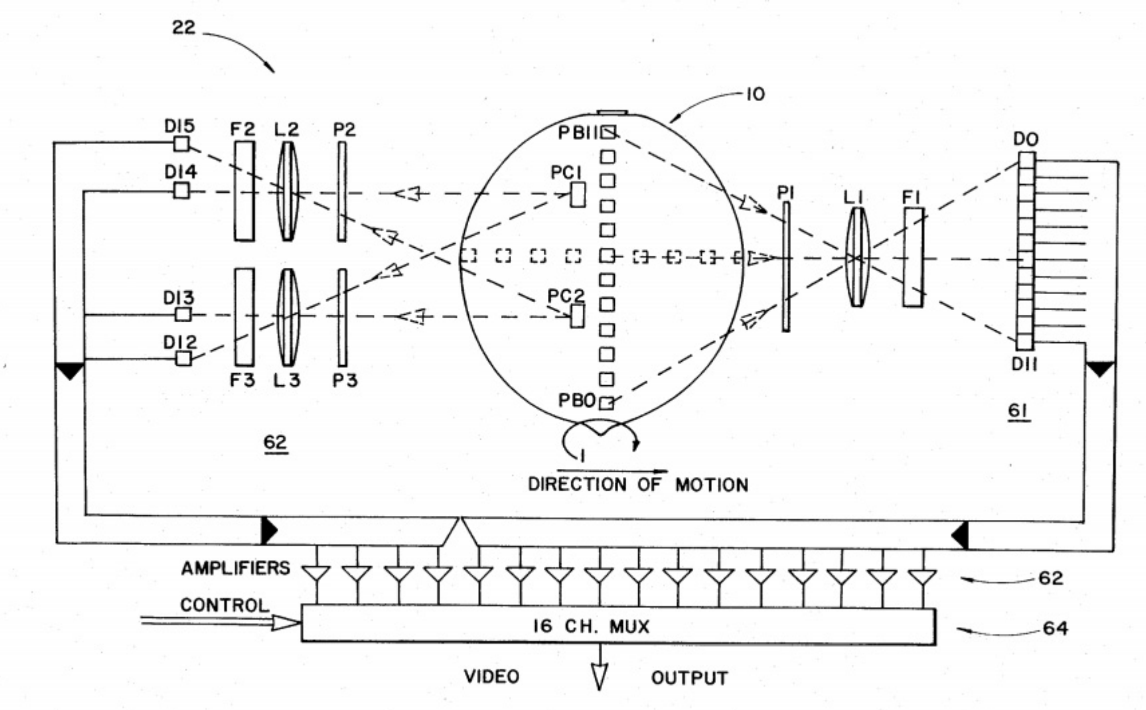


Fig. 3

Ex. 1010, Figure 3, 1:5-9, 2:17-22; 2:45-64, 3:47 to 4:26, 7:4-39; *see also* Figs. 1, 2, 4, 5.

B. Mills Renders Claim 1 Obvious

1. *Claim 1*

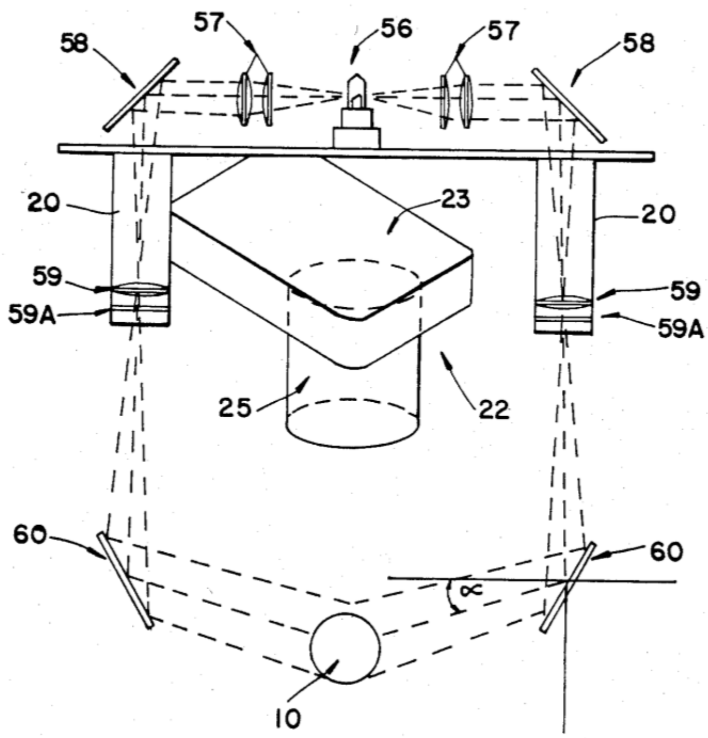
[1a] "*An apparatus for measuring spectral characteristics of received light, comprising:*"

Mills describes an apparatus operable for sorting fruit "as a function of variables including color." Ex. 1010, Abstract. Color is a spectral characteristic of an object. Mills also discloses that the digital data generated from the detector subsystem 22 is intensity of the detected light. Ex. 1010, 6:20-28.

[1b] "*one or more light receivers, wherein the received light is received by the one or more lights [sic] receivers;*"

Mills discloses a scanning unit 18 that includes a lamp 56 providing illumination reflected by four illuminators 20 onto the upper fruit surface:

Fig. 2B



Ex. 1010, Figure 3, 4:27-66. The detector 22 in each scanning unit 18 receives light reflected from fruit 10 via a cylindrical housing of lens portion 25. Ex. 1010, Figure 2B & 3, 4:67-68, 5:5-18, 5:68-6:8.

[1c] "*one or more spectral sensors coupled to receive at least a portion of the received light,*"

Diodes D0-D15 in detector subsystem 22 receive light reflected off the fruit 10 and received and propagated by the cylindrical housing. Ex. 1010, Figs. 3, 4, 5:61-6:19. Light reflected from the fruit passes through filters F1-F3 before impinging on diodes D0-D15, making each of diodes D0-D15 a "spectral sensor." Ex. 1012, ¶35.

[1d] "*wherein the one or more spectral sensors measure the intensity of the received light in one or more predetermined spectral bands; and*"

Diodes D12-D15 in color detector 62 measure an intensity of light reflected off the fruit 10 received and propagated by the cylindrical housing in a color determined based on the filters F2 and F3. Ex. 1010, Figs. 3, 4, 5:61-6:19. The filters F2 and F3 predetermine two measured spectral bands. Diodes D0-D11 in line scanning diode array 61 measure intensity of light reflected off the fruit 10 and received and propagated by the cylindrical housing in a wavelength band determined based on the filter F1. Ex. 1010, Figs. 3, 4, 5:23-28. The filter F1 predetermines a spectral band of light for which the intensity is measured by diodes D0-D11.

[1e] "*a processor, wherein the processor receives data corresponding to one or more light intensities measured by the one or more spectral sensors;*"

Mills discloses microcomputers 66 that include analog-to-digital converters 36 that receive an analog output of the diodes D0-D15 that correspond to the measured light intensities. Ex. 1010, Figs. 3, 5, 7:10-26.

[1f] "*wherein the processor determines a data value of at least two bits based on the received light measured in each of the one or more predetermined spectral bands;*"

The analog-to-digital converters 36 in the microcomputers 66 convert the analog output of each of the diodes D0-D15 into an 8-bit digital byte of data. Ex. 1010, Figs. 4, 5, 5:61-6:42. Figure 4 shows this 8-bit data value (i.e., 256 possible values) per diode output over the course of 100 scans:

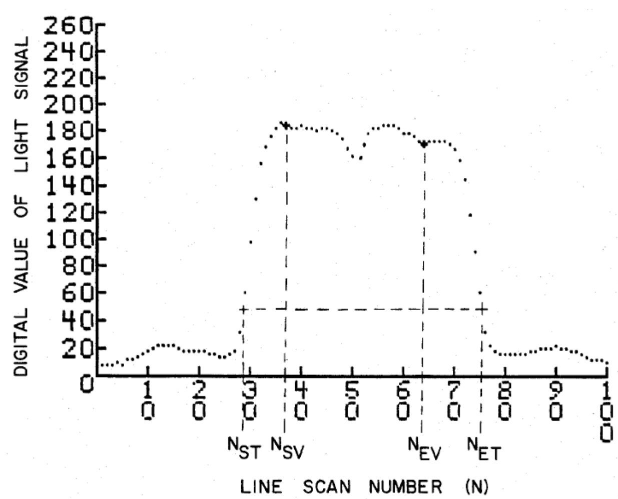


Fig. 4

Ex. 1010, Figure 4, 6:20-28.

[1g] "*wherein the data value for each spectral band is determined based on the measured light intensity level of the received light in each spectral band.*"

As discussed in [1f] above, the data value of 8 bits is determined based on the measured light intensity for each of the diodes D0-D15. Ex. 1010, Figs. 3-5, 5:61-6:42.

C. Chart:

Limitation		Mills
1a	An apparatus for measuring spectral characteristics of received light, comprising:	Mills describes an apparatus operable for sorting fruit "as a function of variables including color." Ex. 1010, Abstract. Color is a spectral characteristic of an object. Mills also discloses that the digital data generated from the detector subsystem 22 is intensity of the detected light. Ex. 1010, 6:20-28.
1b	one or more light receivers, wherein the received light is received by the one or more lights receivers;	Mills discloses a scanning unit 18 that includes a lamp 56 providing illumination reflected by four illuminators 20 onto the upper fruit surface. Ex. 1010, Figure 3, 4:27-66. The detector 22 in each scanning unit 18 receives light reflected from fruit via a cylindrical housing of lens portion 25. Ex. 1010, Figure 2B & 3, 4:67-68, 5:5-18, 5:68-6:8.
1c	one or more spectral sensors coupled to receive at least a portion of the received light,	Diodes D0-D15 in detector subsystem 22 receive light reflected off the fruit 10 and received and propagated by the cylindrical housing. Ex. 1010, Figs. 3, 4, 5:61-6:19.
1d	wherein the one or more spectral sensors measure the intensity of the received light	Diodes D12-D15 in color detector 62 measure an intensity of light reflected off the fruit 10 and received and propagated by the

Limitation		Mills
	in one or more predetermined spectral bands; and	cylindrical housing in a color determined based on the filters F2 and F3. Ex. 1010, Figs. 3, 4, 5:61-6:19. The filters F2 and F3 predetermine two measured spectral bands. Diodes D0-D11 in line scanning diode array 61measure and intensity of light reflected off the fruit 10 and received and propagated by the cylindrical housing in a wavelength determined based on the filter F1. Ex. 1010, Figs. 3, 4, 5:23-28. The filter F1 predetermines a spectral band the intensity of which is measured by diodes D0-D11.
1e	a processor, wherein the processor receives data corresponding to one or more light intensities measured by the one or more spectral sensors;	Mills discloses microcomputers 66 that include analog-to-digital converters 36 that receive an analog output of the diodes D0-D15 that correspond to the measured light intensities. Ex. 1010, Figs. 3, 5, 7:10-26.
1f	wherein the processor determines a data value of at least two bits based on the received light measured in each of the one or more predetermined spectral bands,	The analog-to-digital converters 36 in the microcomputers 66 that covert the analog output of each of the diodes D0-D15 into an 8-bit digital byte of data. Ex. 1010, Figs. 4, 5, 5:61-6:42. Figure 4 shows the 8-bit data value (i.e., 256 possible values) per diode output over the course of 100 scans. Ex. 1010, Figure 4, 6:20-28.
1g	wherein the data value for each spectral band is determined based on the measured light intensity level of the received light in each spectral band.	As discussed in 1f above, the data value of 8 bits is determined based on the measured light intensity for each of the diodes D0-D15. Ex. 1010, Figs. 3-5, 5:61-6:42.

IX. CONCLUSION

Claims 1, 5, 7, 10-11, and 18-19 of the ’955 Patent are unpatentable as anticipated or obvious. Petitioners therefore request *inter partes* review on Grounds 1-3 as well as cancellation of claims 1, 5, 7, 10-11 and 18-19.

Dated: September 14, 2016   Respectfully submitted,

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CERTIFICATE OF SERVICE UNDER 37 C.F.R. §§ 42.6(e)(4) and 42.105

The undersigned certifies that a copy of the foregoing PETITION FOR INTER PARTES REVIEW and all exhibits identified herein are being served via Priority Mail Express on September 14, 2016 on:

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CERTIFICATE OF WORD COUNT UNDER 37 C.F.R. §§ 42.24(d)

The undersigned certifies that the word count of the foregoing PETITION FOR INTER PARTES REVIEW, starting with the "OVERVIEW OF CHALLENGE AND RELIEF REQUESTED" up to and including the last word of the "CONCLUSION," is 8,045.

Dated: September 14, 2016

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