

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TESTO, INC., a/k/a TESTO NORTH AMERICA, AND TESTO SE & CO. KGaA

Petitioners

v.

PARKER INTANGIBLES LLC,

Patent Owner

U.S. Patent No. 10,739,051
Filing Date March 19, 2019
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Inter Partes Review No. IPR2023-00691

TABLE OF CONTENTS

EXHIBITS	12
I. INTRODUCTION	14
A. Real Parties-in-Interest Under 37 C.F.R. § 42.8(b)(1).....	14
B. Related Matters Under 37 C.F.R. § 42.8(b)(2)	14
C. Designation of Lead and Backup Counsel Under 37 C.F.R. § 42.8(b)(3)..	
.....	
15	
D. Service Information Under 37 C.F.R. § 42.8(b)(4).....	15
E. Power of Attorney	15
F. Standing.....	16
G. Fees.....	16
II. Statement Relief Requested	16
A. Claims for Which Relief is Requested.....	16
B. Statutory Grounds	17
III. The '051 Patent	18
IV. Level of Ordinary Skill in the Art.....	20
V. Claim Construction	21
VI. The Board Should Not Exercise Discretion to Deny Institution	21
A. The Fintiv Factors Favor Institution	21
B. The Becton Dickson Factors Favor Institution	22
1. Kane.....	23
a. Relevant Prosecution History.....	23
b. The USPTO's Material Error in Considering Kane.....	24
2. The Becton Dickinson Factors Favor Instituting on the Kane Grounds.	25
3. The BD Factors Favor Instituting on Grounds 1-3	26
4. Peirs	26

VII.	The Prior Art Is Analogous and Relevant to the Field of the '051 Patent..	27
VIII.	The Challenged Claims Are Unpatentable Over the Prior Art	29
A.	Ground 1: Fieldpiece-B In Combination With Fieldpiece-M Renders Claims 1, 10, 15, 20, And 21 Unpatentable Under 35 U.S.C. § 103.....	31
1.	Independent Claim 1	31
a.	Claim 1[preamble] “A sensor system for a refrigerant unit comprising:”	31
b.	1[a]: “a plurality of sensors for sensing system parameters of the refrigerant unit, wherein:”	32
c.	1[b]: “the plurality of sensors comprises a first pressure sensor and a second pressure sensor, and a first temperature sensor and a second temperature sensor”	32
d.	1[c]: “the first and second pressure sensors each comprises a connector that connects to a tube of the refrigerant unit”	33
e.	1[d]: “the first and second temperature sensors each comprises a temperature sensor clamp having a clamping portion configured to clamp on a tube of the refrigerant unit, the clamping portion including a sensor element to measure temperature about the tube;”	34
f.	1[e]: “each of the first temperature sensor clamp and the second temperature sensor clamp further comprises a handle and integrated electronics”	36
g.	1[f’]: “the integrated electronics are incorporated into the handle and in electrical connection with the sensor element; and”	37
h.	1[g]: “there are no external physical electrical connections that extend from the first and second temperature sensors, and there are no external physical fluidic connections that extend from the first and second pressure sensors oppositely from the connectors.”	38
i.	Claim 1 Summary.....	41
2.	Independent Claim 10	42

a.	Claim 10[preamble] “A temperature sensor clamp for sensing temperature in a refrigerant unit, the temperature sensor clamp comprising:”	42
b.	10[d’]: “a clamping portion configured to clamp on a tube of the refrigerant unit, the clamping portion including a sensor element to measure temperature about the tube, and.....	42
c.	10[e’]: “a handle and integrated electronics, and”	42
d.	10[f]: the integrated electronics are incorporated into a portion of the temperature sensor clamp and are in signal communication with the sensor element;.....	43
e.	10[g’] “wherein the temperature sensor clamp has no external physical electrical connections.”	44
f.	Claim 10 Summary.....	44
3.	Independent Claim 15	44
a.	15[f]: “the integrated electronics are incorporated into a portion of the temperature sensor clamp and are in signal communication with the sensor element; and”	45
b.	Claim 15 Summary.....	45
4.	Independent Claim 20	45
a.	20[a’] “a plurality of sensors for sensing system parameters of the refrigerant unit; and a receiving unit that gathers and combines data from at least two of the plurality of sensors; wherein:”	46
b.	Claim 20 Summary.....	48
5.	Dependent Claim 21.....	48
a.	21[1]: “the receiving unit comprises a portable electronic device”	48
b.	21[2] “the first pressure sensor senses pressure on a high side of the refrigerant system and the second pressure sensor senses pressure on a low side of the refrigerant system, wherein the first pressure sensor and the second pressure sensor are configured for wirelessly communicating pressure sensor data to the portable electronic device”	49

c.	21[3]: “the first temperature sensor clamp has a clamping portion with a temperature sensor to measure temperature about a tube located on the high side of the refrigerant system and the second temperature sensor clamp has a clamping portion with a temperature sensor to measure temperature about a tube located on the low side of the refrigerant system; and”	51
d.	21 [4]: “at least one of the first temperature sensor clamp and the second temperature sensor clamp includes integrated electronics that are configured for wirelessly communicating temperature sensor data to the portable electronic device.”	52
e.	Claim 21 Summary.....	54
B.	Ground 2: Fieldpiece-B In Combination With Fieldpiece-M, CN '078 And Staniforth Renders Claims 1, 10, 15, 20, And 21 Unpatentable Under 35 U.S.C. § 103.....	54
1.	Independent Claim 1	56
a.	1[e]: each of the first temperature sensor clamp and the second temperature sensor clamp further comprises a handle and integrated electronics, and”	56
b.	1[f’]: “the integrated electronics are incorporated into the handle and in electrical connection with the sensor element; and”	58
c.	1[g]: “there are no external physical electrical connections that extend from the first and second temperature sensors, and there are no external physical fluidic connections that extend from the first and second pressure sensors oppositely from the connectors”	60
d.	Claim 1 Summary.....	60
2.	Independent Claim 10	61
a.	10[e’]: “a handle and integrated electronics, and”	61
b.	10[f]: “the integrated electronics are incorporated into a portion of the temperature sensor clamp and are in signal communication with the sensor element;”	61

c.	10[g']: "wherein the temperature sensor clamp has no external physical electrical connections."	61
d.	Claim 10 Summary	62
3.	Independent Claim 15	62
a.	15[f]: "the integrated electronics are incorporated into a portion of the temperature sensor clamp and are in signal communication with the sensor element; and"	62
b.	Claim 15 Summary	62
4.	Independent Claim 20	63
a.	20 [e]: "each of the first temperature sensor clamp and the second temperature sensor clamp further comprises a handle and integrated electronics, and"	63
b.	Claim 20, [f] "the integrated electronics are incorporated into a portion of the temperature sensor clamp and are in signal communication with the sensor element"	63
c.	Claim 20 Summary	63
5.	Dependent Claim 21	64
a.	21[4]: "at least one of the first temperature sensor clamp and the second temperature sensor clamp includes integrated electronics that are configured for wirelessly communicating temperature sensor data to the portable electronic device."	64
b.	Claim 21 Summary	64
C.	Ground 3: Fieldpiece-B In Combination With Fieldpiece-M, CN '332 And Staniforth Renders Claims 1, 10, 15, 20, And 21 Unpatentable Under 35 U.S.C. § 103	65
1.	Independent Claim 1	66
a.	1[e] "each of the first temperature sensor clamp and the second temperature sensor clamp further comprises a handle and integrated electronics, and"	66

b.	1[f]': "the integrated electronics are incorporated into the handle and in electrical connection with the sensor element; and"	67
c.	1[g]: "there are no external physical electrical connections that extend from the first and second temperature sensors, and there are no external physical fluidic connections that extend from the first and second pressure sensors oppositely from the connectors"	68
d.	Claim 1 Summary.....	69
2.	Independent Claim 10	69
a.	10[e'] "a handle and integrated electronics, and"	69
b.	Claim 10, [f] "the integrated electronics are incorporated into a portion of the temperature sensor clamp and are in signal communication with the sensor element;"	69
c.	10,[g'] "wherein the temperature sensor clamp has no external physical electrical connections."	70
d.	Claim 10 Summary.....	70
3.	Independent Claim 15	71
a.	15[f]: "the integrated electronics are incorporated into a portion of the temperature sensor clamp and are in signal communication with the sensor element; and"	71
b.	Claim 15 Summary.....	71
4.	Independent Claim 20	71
c.	Claim 20 Summary.....	72
5.	Dependent Claim 21.....	72
a.	21[4]: "at least one of the first temperature sensor clamp and the second temperature sensor clamp includes integrated electronics that are configured for wirelessly communicating temperature sensor data to the portable electronic device."	72
b.	Claim 21 Summary.....	73

D.	Ground 4: Fieldpiece-B In Combination With Fieldpiece-M, Peirs And Staniforth Renders Claims 1, 10, 15, 20, And 21 Unpatentable Under 35 U.S.C. § 103	73
1.	Independent Claim 1	74
a.	1[d]: “the first and second temperature sensors each comprises a temperature sensor clamp having a clamping portion configured to clamp on a tube of the refrigerant unit, the clamping portion including a sensor element to measure temperature about the tube;”	74
b.	1,[e]: “each of the first temperature sensor clamp and the second temperature sensor clamp further comprises a handle and integrated electronics”	75
c.	1[f’]: “the integrated electronics are incorporated into the handle and in electrical connection with the sensor element; and”	77
d.	1[g]: “there are no external physical electrical connections that extend from the first and second temperature sensors, and there are no external physical fluidic connections that extend from the first and second pressure sensors oppositely from the connectors.”	77
e.	Claim 1 Summary.....	78
2.	Independent Claim 10	78
a.	10[e’]: “a handle and integrated electronics, and”	79
b.	10[f]: “the integrated electronics are incorporated into a portion of the temperature sensor clamp and are in signal communication with the sensor element;”	79
c.	10[g’]: “wherein the temperature sensor clamp has no external physical electrical connections.”	79
d.	Claim 10 Summary.....	80
3.	Independent Claim 15	80
a.	15[f] “the integrated electronics are incorporated into a portion of the temperature sensor clamp and are in signal communication with the sensor element; and”	80

b.	Claim 15 Summary.....	80
4.	Independent Claim 20	81
a.	20[e]: “each of the first temperature sensor clamp and the second temperature sensor clamp further comprises a handle and integrated electronics, and”	81
b.	Claim 20, [f] “the integrated electronics are incorporated into a portion of the temperature sensor clamp and are in signal communication with the sensor element”	81
c.	Claim 20 Summary.....	81
5.	Dependent Claim 21.....	81
a.	20[4] “at least one of the first temperature sensor clamp and the second temperature sensor clamp includes integrated electronics that are configured for wirelessly communicating temperature sensor data to the portable electronic device.”	82
b.	Claim 21 Summary.....	82
E.	Ground 5: Kane In Combination With CN ’078 And Staniforth Renders Claims 1, 10, 15, 20, And 21 Unpatentable Under 35 U.S.C. § 103.....	83
1.	Independent Claim 1	83
a.	1[Preamble]: “A sensor system for a refrigerant unit comprising:”	84
b.	1[a]: “a plurality of sensors for sensing system parameters of the refrigerant unit, wherein:”	84
c.	1[c]: “the first and second pressure sensors each comprises a connector that connects to a tube of the refrigerant unit;”	84
d.	1[d]: “the first and second temperature sensors each comprises a temperature sensor clamp having a clamping portion configured to clamp on a tube of the refrigerant unit, the clamping portion including a sensor element to measure temperature about the tube;”	85
e.	[e] “each of the first temperature sensor clamp and the second temperature sensor clamp further comprises a handle and integrated electronics, and”	88

f.	1[f']:	“the integrated electronics are incorporated into the handle and in electrical connection with the sensor element; and”	88
g.	1[g]:	“there are no external physical electrical connections that extend from the first and second temperature sensors, and there are no external physical fluidic connections that extend from the first and second pressure sensors oppositely from the connectors.”	90
h.	Claim 1 Summary.....		91
2.	Independent Claim 10		91
a.	10[Preamble]	“A temperature sensor clamp for sensing temperature in a refrigerant unit, the temperature sensor clamp comprising:”	91
b.	Claim 10, [d']	“a clamping portion configured to clamp on a tube of the refrigerant unit, the clamping portion including a sensor element to measure temperature about the tube, and”	91
c.	10[e']:	“a handle and integrated electronics, and”	92
d.	Claim 10, [f]	“the integrated electronics are incorporated into a portion of the temperature sensor clamp and are in signal communication with the sensor element;”	92
e.	10[g']:	wherein the temperature sensor clamp has no external physical electrical connections.”	92
f.	Claim 10 Conclusion.....		93
3.	Independent Claim 15		93
a.	15[f]:	“the integrated electronics are incorporated into a portion of the temperature sensor clamp and are in signal communication with the sensor element; and”	93
b.	Claim 15 Summary.....		93
4.	Independent Claim 20		93
a.	Claim 20, [a']	“a plurality of sensors for sensing system parameters of the refrigerant unit; and a receiving unit that gathers and combines data from at least two of the plurality of sensors; wherein:”	94
b.	Claim 20 Conclusion.....		95

5.	Dependent Claim 21.....	95
a.	Claim 21, [1] “the receiving unit comprises a portable electronic device”	95
b.	Claim 21, [2] “the first pressure sensor senses pressure on a high side of the refrigerant system and the second pressure sensor senses pressure on a low side of the refrigerant system, wherein the first pressure sensor and the second pressure sensor are configured for wirelessly communicating pressure sensor data to the portable electronic device;”	95
c.	Claim 21, [3] “the first temperature sensor clamp has a clamping portion with a temperature sensor to measure temperature about a tube located on the high side of the refrigerant system and the second temperature sensor clamp has a clamping portion with a temperature sensor to measure temperature about a tube located on the low side of the refrigerant system; and”	95
d.	Claim 21, [4] “at least one of the first temperature sensor clamp and the second temperature sensor clamp includes integrated electronics that are configured for wirelessly communicating temperature sensor data to the portable electronic device.”	96
e.	Claim 21 Summary.....	96
IX.	CONCLUSION	96

EXHIBITS

Exhibit	Description
Ex. 1001	U.S. Patent No. 10,739,051 to Parker <i>et al.</i> (the '051 Patent)
Ex. 1002	Declaration of James Parker
Ex. 1003	<i>Curriculum vitae</i> of James Parker
Ex. 1004	Prosecution History of U.S. Patent No. 10,281,183
Ex. 1005	Prosecution History of U.S. Patent No. 10,739,051
Ex. 1006	"Wireless Full System Analysis in Real Time" brochure for "Fieldpiece HG3" (Fieldpiece-B)
Ex. 1007	CN 101339078 (CN '078)
Ex. 1008	English Translation of CN 101339078
Ex. 1009	U.S. Patent No. 6,779,919 (Staniforth)
Ex. 1010	CN 102435332 (CN '332)
Ex. 1011	English Translation of CN 102435332
Ex. 1012	EP 2 309 212 (Peirs)
Ex. 1013	"HVAC Guide System Analyzer Model HG3 Field Manual" ("Fieldpiece-M")
Ex. 1014	U.S. Pre-Grant Publication No. 2013/0245965 (Kane)
Ex. 1015	International Search Report and Written Opinion of PCT/US2015/011900

Exhibit	Description
Ex. 1016	Affidavit of Nathaniel E Frank White
Ex. 1017	Declaration of Lee Hsu
Ex. 1018	Screenshots of the Internet Archive’s Wayback Machine Archive for Fieldpiece-B HTML: https://web.archive.org/web/20110619232109/http://fieldpiece.com/PDF/Flyers/HG3_Brochure_v11.pdf
Ex. 1019	Screenshots of the Internet Archive’s Wayback Machine Archive for Fieldpiece-M HTML: https://web.archive.org/web/20110619232012/http://fieldpiece.com/PDF/Manuals/HVAC-Guide3-manual-v17.pdf
Ex. 1020	Screenshots of the Internet Archive’s Wayback Machine Archive for Fieldpiece Instruments, Inc. website for “Wireless HVAC Guide System Analyzer - HG3” HTML: https://web.archive.org/web/20110619205521/http://fieldpiece.com/hvac-guide-system-analyzer/hg3
Ex. 1021	Screenshots of the Internet Archive’s Wayback Machine Archive for Fieldpiece Instruments, Inc. website for “HVAC Guide® System Analyzer” HTML: https://web.archive.org/web/20110619183944/http://fieldpiece.com/hvac-guide-system-analyzer

I. INTRODUCTION

Petitioners Testo, Inc., a/k/a Testo North America, and Testo SE & CO. KGaA (“Petitioners”) hereby request *inter partes* review of claims 1, 10, 15, 20 and 21 (the “Challenged Claims”) of U.S. Patent No. 10,739,051 (the “’051 Patent”), purportedly assigned to Parker Intangibles LLC (“Patent Owner”).

The alleged invention relates to turning a system for sensing temperature and pressure in a refrigeration unit from a system using a “hose” to a wireless system. *See* Ex. 1001, 2:37–44. However, the Challenged Claims do nothing more than combine known HVAC technology with known wireless technology, and are therefore unpatentable.

A. Real Parties-in-Interest Under 37 C.F.R. § 42.8(b)(1)

The real parties-in-interest are Testo, Inc., a/k/a Testo North America, and Testo SE & Co. KGaA. No other entity is controlling, directing, or funding the submission of this petition and any proceeding initiated as a result therefrom.

B. Related Matters Under 37 C.F.R. § 42.8(b)(2)

The ’051 Patent is asserted against Petitioners in Parker-Hannifin Corp., And Parker Intangibles LLC v. TESTO, INC., a/k/a TESTO NORTH AMERICA, AND TESTO SE & CO. KGaA, Civil Action No.:22-cv-00135 (the “Litigation”). Parker-Hannifin Corp. and Patent Owner also assert U.S. Patent No. 10,281,183 against Petitioners in the Litigation. The Litigation was stayed pending mediation.

Petitioners are unaware of any other proceedings involving the ’051 Patent.

C. Designation of Lead and Backup Counsel Under 37 C.F.R. § 42.8(b)(3)

Lead Counsel	Back-Up Counsel
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D. Service Information Under 37 C.F.R. § 42.8(b)(4)

Please address all correspondence to counsel at the addresses above.

Petitioners consent to service by email.

E. Power of Attorney

Powers of Attorney with designations of counsel are filed herewith per 37 C.F.R. § 42.10(b).

F. Standing

Petitioners certify that the '051 Patent is available for *inter partes* review and that Petitioners are not barred or estopped from requesting *inter partes* review challenging the claims of the '051 Patent on the grounds identified herein.

G. Fees

This Petition is accompanied by a fee payment of \$41,500, which includes the \$19,000 *inter partes* review request fee, and the \$22,500 *inter partes* review post-institution fee. Please charge any additional fees to Volpe Koenig's Deposit Account 22-0493.

II. Statement Relief Requested

A. Claims for Which Relief is Requested

Petitioners request *inter partes* review under 35 U.S.C. § 311 and 37 C.F.R. § 42.104(b) of claims 1, 10, 15, 20, and 21 of the '051 patent, and the cancellation of those claims as unpatentable due to being obvious under 35 U.S.C. §103 over one or more of the following prior art references, each published or publicly available more than one year prior to the earliest possible effective filing date for the '051 Patent, January 20, 2014.

Prior Art References
“Wireless Full System Analysis in Real Time” brochure for “Fieldpiece HG3” (“Fieldpiece-B”) (Ex. 1005), publicly available June 19, 2011 (Ex. 1006)
CN 101339078 (CN ’078) (Ex. 1007; English Translation, Ex. 1008), published January 7, 2009
U.S. Patent No. 6,779,919 (Staniforth) (Ex. 1009), published
CN 102435332 (CN ’332) (Ex. 1009, English Translation, Ex. 1010), published May 2, 2012
EP 2 309 212 (Peirs) (Ex. 1011), published April 13, 2011
“HVAC Guide System Analyzer Model HG3 Field Manual” (hereinafter referred to as “Fieldpiece-M”) (Ex. 1013), publicly available June 19, 2011
U.S. Pre-Grant Publication No. 2013/0245965 (Kane) (Ex. 1014), published September 19, 2013

B. Statutory Grounds

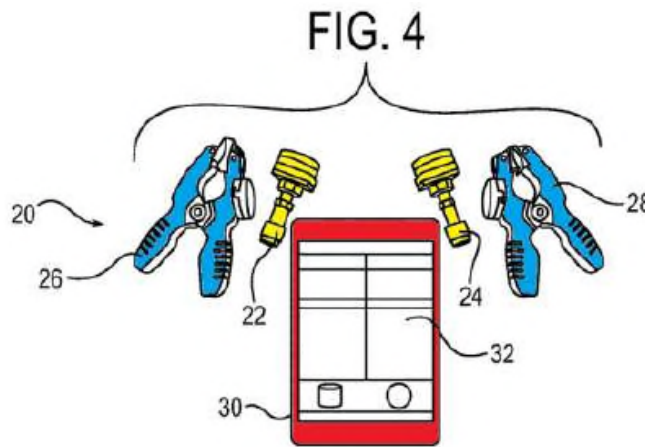
Claims 1, 10, 15, 20, and 21 are unpatentable based on the following grounds:

Grounds of Unpatentability	
1	Fieldpiece-B in combination with Fieldpiece-M renders claims 1, 10, 15, 20, and 21 unpatentable under 35 U.S.C. § 103
2	Fieldpiece-B in combination with Fieldpiece-M, CN '078 and Staniforth renders claims 1, 10, 15, 20, and 21 unpatentable under 35 U.S.C. § 103
3	Fieldpiece-B in combination with Fieldpiece-M, CN '332 and Staniforth renders claims 1, 10, 15, 20, and 21 unpatentable under 35 U.S.C. § 103
4	Fieldpiece-B in combination with Fieldpiece-M, Peirs and Staniforth renders claims 1, 10, 15, 20, and 21 unpatentable under 35 U.S.C. § 103
5	Kane in combination with CN '078 and Staniforth renders claims 1, 10, 15, 20, and 21 unpatentable under 35 U.S.C. § 103

III. The '051 Patent

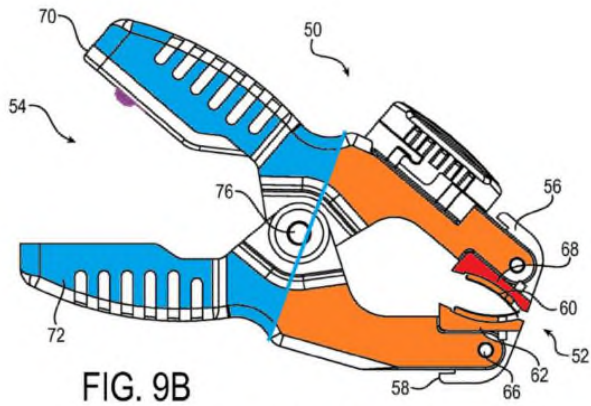
The earliest possible effective filing date for the '051 Patent is January 20, 2014. Ex. 1001, Pgs. 1–2. The '051 Patent is directed to “enhanced sensor systems for refrigeration units for monitoring and collecting system conditions, such as superheat and subcooling.” Ex. 1001, 1:15–17.

The '051 Patent identifies problems in the prior systems, using two pressure gauges and two temperatures sensors and manual calculation of superheat and subcool, such as the hose lengths on the pressure gauges. Ex. 1001, 1:21–2:33. A technician would carry multiple sets of gauges with bulky, inconvenient hoses to avoid cross-contamination and damage to HVACR systems. *Id.*, 2:4–20, 2:21–27. The prior system required close proximity to gauges, or technicians needed radios to report measurements. *Id.*, 2:27–33. FIG. 4 illustrates the alleged solution:

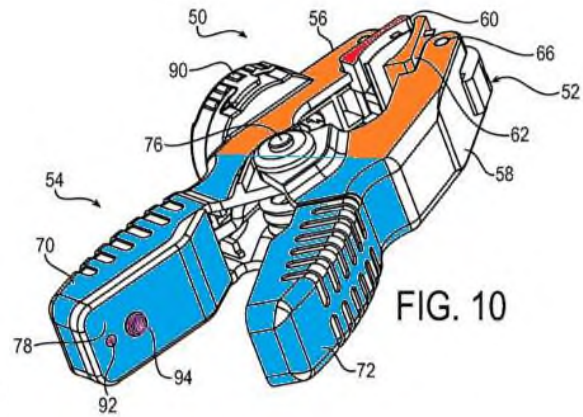


Ex. 1001, FIG. 4

The '051 Patent proposed two temperature sensors 26, 28 (Blue), two pressure sensors 22, 24 (Yellow), referred to as “hoseless” sensors, and a portable electronic device 30 (Red). Ex. 1001, 4:59–5:13. “The pressure and temperature sensors transmit pressure and temperature data to the portable electronic device preferably by a wireless communication.” *Id.*, 6:9–11. Ex. 1001, 5:3–5. FIGS. 9B and 10 illustrate preferred temperature sensors:



Ex. 1001, FIG. 9B



Ex. 1001, FIG. 10

Essentially, all the '051 Patent accomplished was moving a sensor to a handle of a device, and making the device wireless. This proposed solution was well known in the prior art at the time of the '051 Patent.

IV. Level of Ordinary Skill in the Art

A person of ordinary skill in the art (PHOSITA) of the '051 Patent would have (A) a bachelor's or equivalent degree in electrical or electronic engineering, industrial engineering, or mechanical engineering, or (B) at least a two (2) year associate's degree in electrical or electronic engineering, industrial engineering, or mechanical engineering, or an equivalent field, and two (2) years of practical experience in an industry relating to HVAC service and repair. Declaration of James Parker, ¶48 (Ex. 1002, "Parker").

V. Claim Construction

The Board construes claims in accordance with 37 C.F.R. § 42.200(b) and *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (*en banc*). 37 C.F.R. § 42.200(b).

Claims 10, 15, and 20 recite “integrated electronics” that are “in signal communication” with a “sensor element.” Ex. 1001, 12:59–62; 13:29–32; 14:18–21. “Signal” only appears in ’051 Patent claims 10, 15, and 20. The only connection between the “integrated electronics” and the “sensor element” in the ’051 Patent is “in electrical connection.” Ex. 1001, 8:1–2; 9:50–52; 11:1–3; 11:50–53. Accordingly, “in signal communication” must be read in light of the specification to encompass “in electrical connection.” Ex. 1002, ¶¶54.

Otherwise, no terms need construction because the claims read on the prior art identified below under any construction consistent with *Phillips*.

VI. The Board Should Not Exercise Discretion to Deny Institution

A. The *Fintiv* Factors Favor Institution

The ’051 Patent is asserted against Petitioners in the Litigation, to which Patent Owner is a party on. The most relevant *Fintiv* factors demonstrate that the Board should *not* deny institution of this Petition under 35 U.S.C. §315(b) and *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 (PTAB Mar. 20, 2020) (precedential).

There has been little activity in the Litigation. The case was referred to private mediation on August 1, 2022, effectively staying the case. The last activity in the

case was the filing of a Stipulated Protective Order on September 9, 2022 to facilitate the mediation. *See Parker-Hannifin*, No. 2-22-cv-00135, Dkt. 22 (Sept. 9, 2022).

The Litigation is in the pleadings stage, as the Court has not ruled on a motion dismiss Petitioners' counterclaims. No Scheduling Order has issued. Discovery has not commenced, although the parties did informally exchange some information during mediation. No trial date has been set. No infringement contentions have been served. In such circumstances, it is submitted that the Board should not exercise its discretion and deny institution under 35 U.S.C. § 315(b). *See Interim Procedure for Discretionary Denials in AIA Post-Grant Proceedings with Parallel District Court Litigation*, June 21, 2022.

Further, the merits of this Petition are compelling. Fieldpice show nearly every element of the Challenged Claims. In combination with the secondary references, as outlined herein, the invalidity of the Challenged Claims is apparent. *See Commscope Techs. LLC v. Dali Wireless, Inc.*, IPR2022-01242, Paper 23 at 4-5 (PTAB Feb. 27, 2023).

The *Fintiv* factors favor institution of this IPR.

B. The *Becton Dickson* Factors Favor Institution

The factors in *Becton, Dickinson & Co. v. B. Braun Melsungen AG*, IPR2017-01586, 2017 WL 6405100, Paper 8 at 17-18 (PTAB Dec. 15, 2017) (precedential as to § III.C.5, first para) (the "BD Factors"), favor institution.

1. Kane

a. Relevant Prosecution History

Kane was cited in an Information Disclosure Statement during prosecution of the '051 Patent and listed in Notice of References cited with a Notice of Allowance. (Ex. 1005, 03/19/19 Information Disclosure Statement, 05/20/20 Notice of Allowance). It was not otherwise relied upon in any Office Actions. *See* Ex. 1005. Kane was considered during the prosecution of the parent '183 Patent. However, the Examiner failed to consider critical disclosure from Kane, committing a manifest error.

During prosecution of the '183 Patent, Kane was raised in a May 25, 2018 Final Office Action in rejecting certain pending claims. Ex. 1004, 05/25/18 Action, at 3-4. The Examiner stated there were “no physical connections” between Kane’s sensors and Kane’s portable electronic device 120. *Id.* Elements 220, 222, 232 and 234 were “connections” to sensors, which include two temperature sensors and two pressure sensors. Ex. 1014, ¶¶[0037].

An Examiner Interview was conducted on July 26, 2018. Applicant argued that the connections between the Kane “sensor” and “sender unit” were wired, while the Examiner disagreed citing FIGS. 2 and 3 of Kane. Ex. 1004, 08/02/14 Interview Summary. The Examiner stated that “[i]n figure 2, Kane discloses the sensors and

sender units 204 wirelessly connected to the main unit 120 without any physical connection.” *Id.*

Applicant filed a July 31, 2018 Reply citing FIG. 2 stating “the sensors 202 are wired to sender units 212-218, which in turn may be wirelessly connected to a main measuring unit 120.” Ex. 1004, 07/31/18 Reply, at 6. Applicant argued that the alleged wireless connection from sensors to sender units “still requires some wired connections among the sensors, particularly between the sensors and the sending units.” *Id.* at 7. Applicant argued that FIG. 3 did not show “sensors 202” so there was no way to conclude they did not include wired connections to “sender units 302,” rather than being integrally combined with them. *Id.*, at 7-8.

The rejection was overcome and Kane became a *secondary* reference in a subsequent Final Office Action. Ex. 1004, 09/06/18 Final Office Action, at 4. That rejection was also overcome, and the application was allowed. Ex. 1004, 02/13/19, Notice of Allowance.

b. The USPTO’s Material Error in Considering Kane

Kane embodiments described in connection with FIGS. 4 and 9 were neither raised nor discussed during prosecution. As set forth in Section VIII.E and its sub-parts, these embodiments *explicitly* disclose wireless temperature and pressure sensors that send data wirelessly to a portable electronic device. Ex. 1014, ¶¶[0043],

[0063]–[0065]. The Examiner erred in consideration of Kane, and Applicant did not correct the error.

The fact that Kane discloses wireless temperature and pressure sensors that send data wirelessly to a portable electronic device (which it does) is critical and material to the patentability of the '051 Patent. The Examiner materially erred in overlooking FIGS. 4-9 of Kane and their related disclosure. See Ex. 1014, ¶¶[0041]–[0072].

2. The *Becton Dickinson* Factors Favor Instituting on the Kane Grounds

BD Factors (c), (e), and (f) (related to whether the petitioners have demonstrated that the Patent Office erred in a manner material to the patentability of the challenged claims) and weigh heavily against exercising the Board's discretion to deny institution of this IPR Petition under 35 U.S.C. § 325(d). The Examiner erred, assisted by Applicant's arguments, by failing to appreciate the explicit disclosure in Kane of wireless temperature and pressure sensors that send data wirelessly to a portable electronic device. Thus, BD Factors (c) and (e) are satisfied. Further, Petitioners' expert has interpreted Kane and readily identified the wireless disclosure of Kane. Ex. 1002, ¶¶397–400. Under BD Factor (f), the Examiner's misinterpretation of Kane and withdrawal of reliance on Kane was without the benefit of expert testimony interpreting FIGS. 4-9. Finally, Kane is applied herein

in combination with prior art that was not considered during prosecution of the '051 Patent or its parent application, namely, CN '078 and Staniforth. This situation is therefore similar to *Medacta USA, Inc. v. RSB Spine, LLC*, IPR Case No. 2020-00264, Paper 24 (PTAB May 22, 2020).

The Board should not exercise discretion as to any of the Kane grounds under § 325(d). In addition, the Kane grounds should be instituted at least because the Grounds 1-3 are “not affected by § 325(d).” *See, Dril-Quip, Inc. v. FMC Techs., Inc.*, PGR2021-00049, 2021 WL 3413510, Paper 10 at 12 (PTAB Aug. 4, 2021).

3. The BD Factors Favor Instituting on Grounds 1-3

None of the references in Grounds 1-3 were submitted or considered during prosecution of the '183 Patent or any of its related applications. Accordingly, the art and arguments in Grounds 1-3, including Mr. Parkers' expert testimony, are materially different, non-cumulative, and do not overlap with any arguments made during prosecution.

Accordingly, the Board should not exercise discretion as to the Grounds 1-3 under § 325(d).

4. Peirs

Peirs was cited in an information disclosure statement (IDS) filed with the application (Ex. 1005, May 19, 2019, Information Disclosure Statement, and copy of foreign reference), and in the international search report and written opinion of

PCT/US2015/011900 (Ex. 1015). The written opinion did not discuss Peirs, and the U.S. examiner signed the IDS without comment. Peirs was not the subject of a rejection.

Simply signing an IDS, with no indication of whether or how the Examiner considered or applied it, does not favor denial of institution. *See Roku, Inc. v. Universal Electronics, Inc.*, IPR2019-01615, 2020 WL 1903093, Paper 12, at 12-13 (PTAB April 17, 2020) (declining to exercise discretion under section 325(d) after “determin[ing] that the Examiner erred by overlooking the specific teachings” of a reference cited in an IDS); *Intex Recreation Corp. v. Team Worldwide Corp.*, IPR2018-00871, 2018 WL 4404107, Paper 14 at 13 (PTAB Sept. 14, 2018) (“Cursory consideration of later-relied-upon prior art,” by simply initialing an IDS, “weighs against exercising discretion to deny under § 325(d)”).

VII. The Prior Art Is Analogous and Relevant to the Field of the '051 Patent

The prior art references relied upon in this IPR Petition is analogous and relevant to the technology and problems identified in the '051 Patent, for at least the reasons noted below:

Fieldpiece-B and Fieldpiece-M (collectively referred to herein as “Fieldpiece”) relate to sensor systems that remotely and wirelessly transmit temperature and pressure data for refrigeration units, and are directed to solving the

same need for “improved sensors systems” as the ’051 Patent. *See* Ex. 1001, 1:15–24, 1:15–17, 2:37–39; Ex. 1006, Pg. 4; Ex. 1013, Pg. 2; Ex. 1002, ¶¶38, 57, 58.

CN ’078 discloses a temperature sensing device with an attachment clamp, a handle and wireless transmitter, and is reasonably pertinent to a problem described in the ’051 Patent, “an improved sensor system”, and the proposed solution of wireless transmission of temperature sensor data to a remote device. Ex. 1001, 2:37–44; Ex. 1008, p. 5; Ex. 1002, ¶¶187, 191.

Staniforth discloses as a device for measuring the surface temperature of a pipe, including a handle and clamp, and is reasonably pertinent to the problem providing improved sensor systems with clamps, as it provides “[a] probe for measuring a surface temperature of a pipe [that] includes an active clamp assembly and a passive clamp assembly...” Ex. 1009, Abstract; Ex. 1002, ¶¶188, 191.

CN ’332 discloses a temperature measuring device for a pipe with a wireless temperature sensor, including a clamp and handle with integrated electronics and wireless data transmission. Ex. 1011, ¶[0009]–[0010]; Ex. 1002, ¶¶251, 255. It is reasonably pertinent to a problem described in the ’051 Patent, for example, “an improved sensor system for refrigeration units for monitoring and collecting system conditions,” and the proposed solution of wireless transmission of sensor data to a remote device. Ex. 1001, 2:37–44.

Peirs discloses as pressure sensor for measuring a pressure value of a fluid present in the heat pump or refrigerating system, including a pressure sensor communicating with a receiving unit via a wireless connection, and is in the same field of endeavor as the '051 Patent, namely “enhanced sensor systems for refrigeration units for monitoring and collecting system conditions, such as superheat and subcooling.” Ex. 1001, 1:15–17; Ex. 1002, ¶321.

Kane discloses a plurality of HVAC test and measurement sensors configured for wireless transmission for refrigeration units, is in the same field of endeavor as the '051 Patent, and is reasonably pertinent to a problem described in the '051 Patent, for example, “an improved sensor system for refrigeration units for monitoring and collecting system conditions,” and the proposed solution of wireless transmission of sensor data to a remote device. See Ex. 1013, ¶[0002] and Ex. 1001, 1:15–17. Ex. 1002, ¶¶384, 387.

VIII. The Challenged Claims Are Unpatentable Over the Prior Art

The Challenged Claims share certain claim language verbatim, referred to herein by the claim element designations as follows:

[Preamble]: Claims 1, 15, and 20, “A sensor system for a refrigerant unit comprising:”

[a]: Claims 1 and 15, “a plurality of sensors for sensing system parameters of the refrigerant unit, wherein:”

[b]: Claims 1, 15, and 20, “the plurality of sensors comprises a first pressure sensor and a second pressure sensor, and a first temperature sensor and a second temperature sensor;”

[c]: Claims 1 and 15, “the first and second pressure sensors each comprises a connector that connects to a tube of the refrigerant unit;”

[d]: Claims 1, 15, and 20, “the first and second temperature sensors each comprises a temperature sensor clamp having a clamping portion configured to clamp on a tube of the refrigerant unit, the clamping portion including a sensor element to measure temperature about the tube;”

[e]: Claims 1, 15, and 20, “each of the first temperature sensor clamp and the second temperature sensor clamp further comprises a handle and integrated electronics,”

[f]: Claims 10, 15, and 20, “the integrated electronics are incorporated into a portion of the temperature sensor clamp and are in signal communication with the sensor element...”

[g]: Claims 1 and 15, “there are no external physical electrical connections that extend from the first and second temperature sensors, and there are no external physical fluidic connections that extend from the first and second pressure sensors oppositely from the connectors.”

**A. Ground 1: Fieldpiece-B In Combination With Fieldpiece-M
Renders Claims 1, 10, 15, 20, And 21 Unpatentable Under 35
U.S.C. § 103**

Fieldpiece-B and Fieldpiece-M were downloaded from active links at the Internet Archive “Wayback Machine,” from web pages captured June 19, 2011. *See* Exs. 1016-1021. Fieldpiece-B and Fieldpiece-M were publicly available at least as of that date at the links indicated. The authenticity of the records relied on herein is established by the Affidavit of Nathaniel E. Frank-Wright, dated February 19, 2023 (Ex. 1016).

1. Independent Claim 1

Fieldpiece-B and Fieldpiece-M are related publications, each describing aspects of the HG3 System Analyzer used in the field of HVACR monitoring. Ex. 1006, Pg. 1; Ex. 1013, Pg. 2. A POSITA would have looked to both Fieldpiece in combination, as they are corresponding or complementary references describing technology similar to the '051 Patent. Ex. 1001, 2:37-39; Ex. 1006, Pg. 2; Ex. 1013, Pgs. 14–15, 28–29; Ex. 1002, ¶¶57–59.

a. Claim 1[preamble] “A sensor system for a refrigerant unit comprising:”

Fieldpiece-B discloses a “Full A/C Diagnostic Kit” (or “Kit”) including a sensor system for a refrigerant unit, as does Fieldpiece-M. Ex. 1006, Pg. 4; Ex. 1013, Pgs. 12–13; Ex. 1002, ¶¶60-62.

b. 1[a]: “a plurality of sensors for sensing system parameters of the refrigerant unit, wherein:”

The Fieldpiece-B Kit for HVACR monitoring includes nine accessory heads and nine wireless transmitters, integrally attached to an accessory head to create a unitary wireless transmitter. Ex. 1006, Pg. 4; Ex. 1006, Pg. 3. Ex. 1002, ¶¶63–66. The Kit’s collection of wireless sensors are a “plurality of sensors for sensing system parameters of the refrigerant unit.” Ex. 1002, ¶¶66, 68.

Fieldpiece-M discloses recording 13 HVACR system parameters “at the same time,” and therefore discloses a plurality of sensors, and setting up devices at multiple locations on the system with the wireless transmitters. Ex. 1013, Pg. 2, 12; Ex. 1002, ¶67.

In combination, Fieldpiece disclose 1[a]. Ex. 1002, ¶¶60–68.

c. 1[b]: “the plurality of sensors comprises a first pressure sensor and a second pressure sensor, and a first temperature sensor and a second temperature sensor”

Fieldpiece-B illustrates the Kit for HVACR monitoring with its two temperature sensors and two pressure sensors. Ex. 1002, ¶¶69, 70:



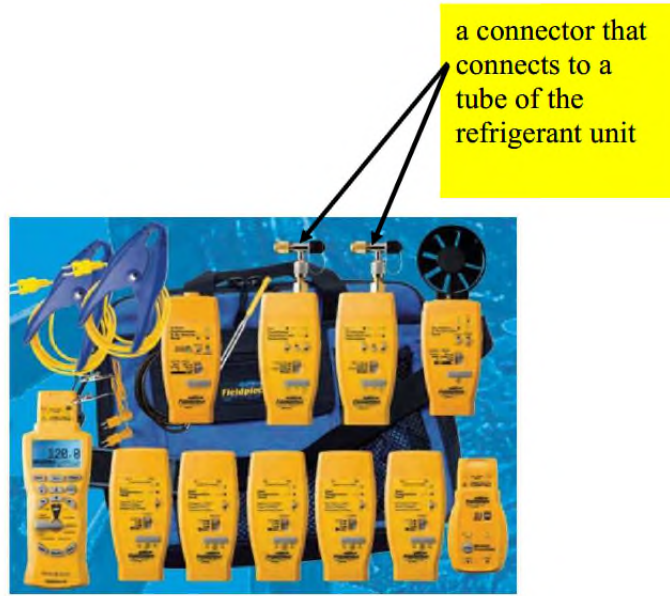
Ex. 1006, Pg. 4

Fieldpiece-M discloses that the HG3 device for HVACR monitoring can receive 13 system parameters, 12 of them wirelessly, simultaneously. Ex. 1013, Pg. 12. Fieldpiece-M discloses a first pressure sensor and a first temperature sensor for obtaining the system parameters for superheat analysis. *Id.*, Pg. 23. Fieldpiece-M discloses detecting liquid line pressure and temperature with a second pressure sensor and a second temperature sensor for obtaining the system parameters for subcooling analysis. Ex. 1013, Pg. 1, 29.

In combination, Fieldpiece disclose 1**[b]**. Ex. 1002, ¶¶69–72.

- d. 1[c]: “the first and second pressure sensors each comprises a connector that connects to a tube of the refrigerant unit”**

The Fieldpiece-B Kit shows connectors that connect to a tube of a refrigerant unit on each of its two pressure sensors. Ex. 1002, ¶¶73, 74.



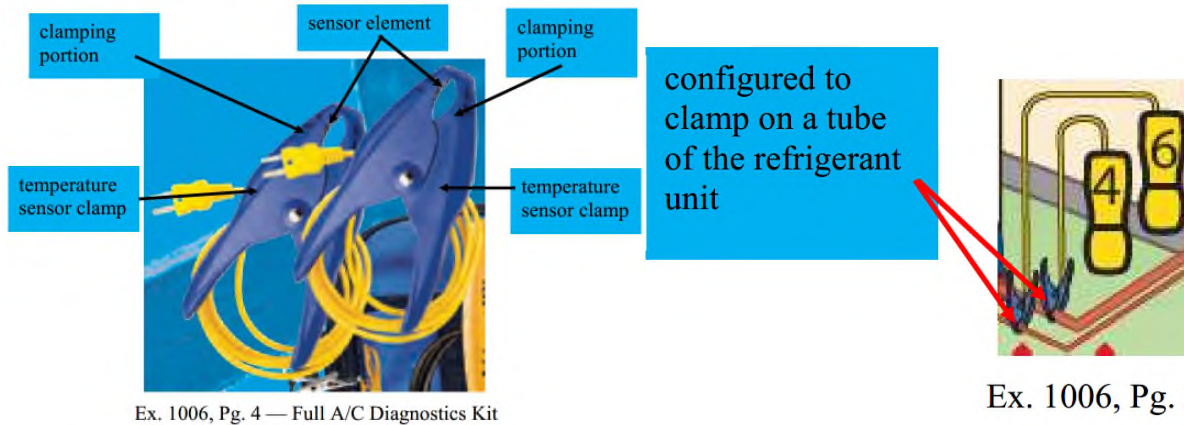
Ex. 1006, Pg. 4

Fieldpiece-M also discloses a first pressure sensor with a connector that connects it to a tube of the suction line of a refrigerant unit, and a second pressure sensor with a connector that connects it to a tube of the liquid line of a refrigerant unit. Ex. 1013, Pgs. 12 and 15; Ex. 1002, ¶75.

In combination, Fieldpiece disclose 1[c]. Ex. 1002, ¶¶73–75.

- e. 1[d]: “the first and second temperature sensors each comprises a temperature sensor clamp having a clamping portion configured to clamp on a tube of the refrigerant unit, the clamping portion including a sensor element to measure temperature about the tube;”*

The below, left image of the Kit from Fieldpiece-B shows the temperature sensors have clamps having a clamping portion and a sensor element. The right image from Pg. 3 of Fieldpiece-B show that each clamping portion is configured to clamp on a tube of the refrigerant unit. *Id.*, ¶76.



Under “Accessory Head Descriptions,” Fieldpiece-M discloses “ATH4: Temperature with thermocouples (includes wet bulb and dry bulb thermocouples). Ex. 1002, ¶187. K-Type thermocouples are accepted. Ex. 1013, Pg. 72. In the next section, “K-Type Thermocouples,” Fieldpiece-M discloses “ATC1: Pipe Clamp thermocouple” and “ATC1R: Pep clamp thermocouples.” Ex. 1002, ¶188.

Fieldpiece-M discloses temperature sensor clamps having a clamping portion configured to clamp on a tube of the refrigerant unit, the clamping portion including a sensor element to measure temperature about the tube. Ex. 1013, Pgs. 23, 29. A “sensor element to measure temperature about the tube” is necessarily present in each clamping portion. Ex. 1002, ¶180:



Ex. 1013, Pg. 15

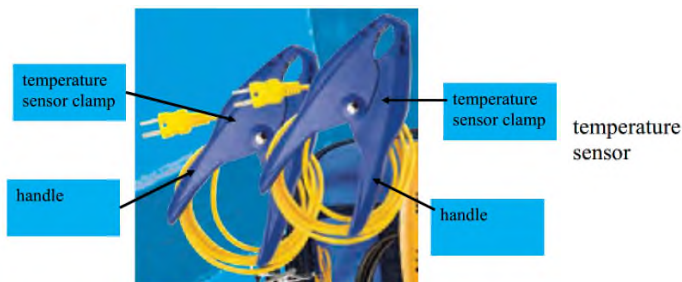
Ex. 1013, Pg. 23

Ex. 1013, Pg. 29

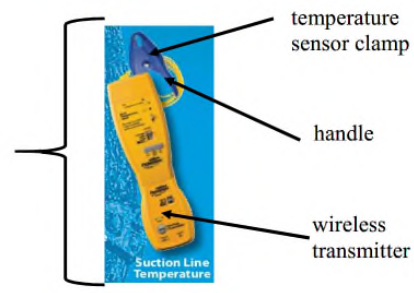
In combination, Fieldpiece disclose 1[d]. Ex. 1002, ¶¶76–81.

- f. 1[e]: “each of the first temperature sensor clamp and the second temperature sensor clamp further comprises a handle and integrated electronics”*

The below left image of the Kit from Fieldpiece-B shows temperature sensors clamps each having a handle. The below right image is of an isolated temperature sensor from Fieldpiece-B with a wireless transmitter:



Ex. 1006, Pg. 4 — Full A/C Diagnostics Kit



Ex. 1006, Pg. 1

Both temperature sensor clamps in the Fieldpiece-B Kit necessarily include integrated electronics to convert sensed temperature to signal, and to carry the signal to the wireless sensor. Ex. 1002, ¶¶83–84.

The Fieldpiece temperature sensor clamps have handles. Ex. 1002, ¶86. The handles therefore necessarily include integrated electronics in order to transmit sensed temperature data. *Id.*, ¶89.

In combination, Fieldpiece disclose 1[e]. Ex. 1002, ¶¶82–89.

g. 1[f]: “the integrated electronics are incorporated into the handle and in electrical connection with the sensor element; and”

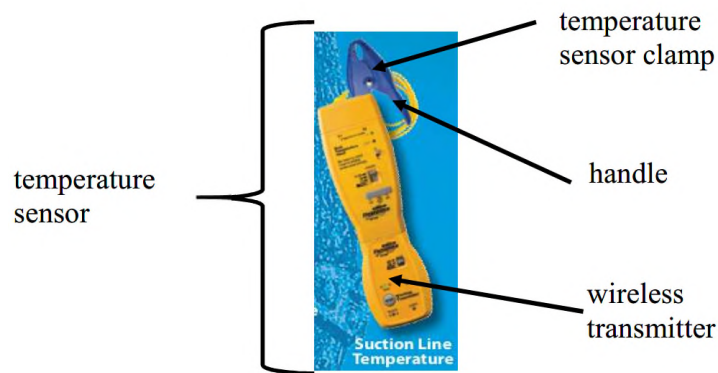
The integrated electronics of Fieldpiece-B are necessarily in electrical connection with the sensor element. *Id.*, ¶¶94. Fieldpiece-B describes a “Wireless Signal from 100’ Away,” “12 Wireless Measurements at the Same Time,” and obtaining a “complete live system snapshot.” Ex. 1006, Pg. 3; Ex. 1002, ¶91. Any assembly of sensors disclosed in Fieldpiece-B including 12 sensors to take “12 Wireless Measurements at the Same Time” would be bulky and more difficult to work with in practice. Ex. 1002, ¶91. A POSITA would have been motivated to move a wireless transmitter into the handle of each temperature sensor to reduce the number of components a technician would have to carry, and minimize bulkiness of the Kit, while still being able to obtain “Wireless Signal from 100’ Away” from each temperature sensor.” *Id.* A POSITA would have had a reasonable expectation that the modification would succeed given the maturity of wireless technology, such as Bluetooth, prior to January 14, 2014. *Id.*, ¶92.

In Fieldpiece-M, the portion of the temperature sensor clamps engaging either the refrigerant line (suction line or liquid line) necessarily includes a sensor element to measure temperature about the tube. Ex. 1002, ¶94. The sensor element is necessarily connected to the integrated electronics in the handle in order to transmit temperature data. *Id.*

In combination, Fieldpiece disclose 1[f']. Ex. 1002, ¶¶90–95.

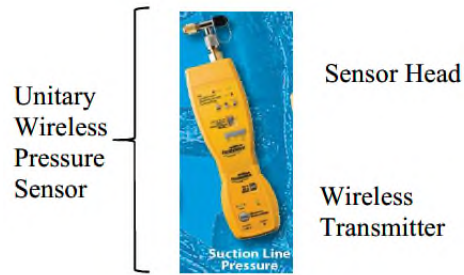
- h. 1[g]: “there are no external physical electrical connections that extend from the first and second temperature sensors, and there are no external physical fluidic connections that extend from the first and second pressure sensors oppositely from the connectors.”***

Fieldpiece-B shows the following temperature sensor, as annotated:



Ex. 1006, Pg. 1

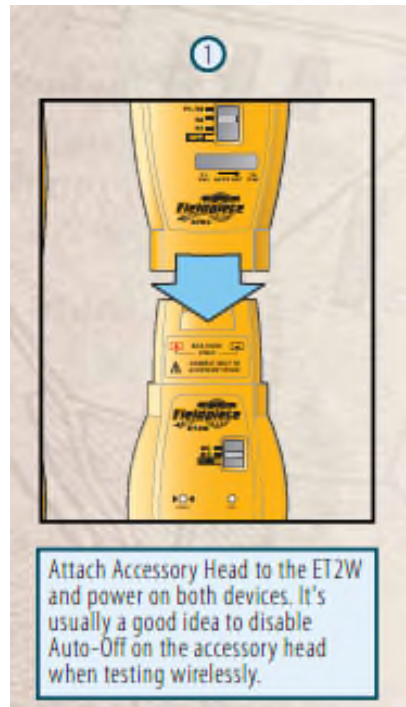
The temperature sensor is wireless, and thus has “no external physical electrical connection” Ex. 1002, 96; *Id.*, ¶97. Fieldpiece-B shows a pressure sensor with integrated wireless transmitter:



Ex. 1005, Pg. 1

The pressure sensors of the Kit would have no “external physical fluidic connections that extend... oppositely from the connector.” Ex. 1002, ¶99. Fieldpiece-B discloses “there are no external physical fluidic connections that extend from the first and second pressure sensors oppositely from the connectors.” *Id.*, ¶102.

Fieldpiece-M teaches the option of “Wirelessly Using a Fieldpiece Transmitter” and “Measurements are taken by the Accessory head and sent wirelessly to the HG3 The HG3 can receive up to 12 wireless signals at one time. See Wireless Testing Section (Pages 12-13).” Ex. 1013, Pg. 10; Ex. 1002, ¶103. The Fieldpiece-M details “combining and accessory head to “ET2W” to make a wireless sensor. See Ex. 1013, Pg. 12:



The combination of accessory head and wireless transmitter creates an integrated, unitary wireless sensor. Ex. 1002, ¶104. With a selection of 12 simultaneous signals, Fieldpiece-M suggests combining 12 accessory heads with 12 ET2W. *Id.*, ¶105. Performing tests “fast” suggests modifying the superheat and subcool arrangements to assemble a kit to attach two wireless temperature sensors (one on the suction line and one on the liquid line), and two wireless pressure sensors (one at the suction line and one at the liquid line). *Id.*, ¶106. None of the wireless temperature sensors, the wireless pressure sensors, or the HG3 would have an external, physical, electronic connection. *Id.*, ¶107.

In combination, Fieldpiece disclose 1 [g]. Ex. 1002, ¶¶96–108.

i. Claim 1 Summary

A POSITA would appreciate Fieldpiece in combination teach incorporation of wireless technology in HVACR sensors configured to transmit data to a remote, portable electronic device used for analysis of HVACR systems, and the improvement of temperature sensors by placing wireless technology and integrated electronics in the temperature sensor clamps in order to enhance usability of the assembled sensor system components. Ex. 1002, ¶180.

A POSITA would have been motivated to combine HVACR sensors and wireless technology in order to reduce the components required in the field. Ex. 1002, ¶¶109, 111. The modification would result in two wireless temperature sensor clamps minimizing bulk and weight and being more convenient to clamp in place and remove. *Id.* A POSITA would have been motivated to make the combination of wireless sensors and a wireless remote computer to eliminate distance constraints imposed by cables or hoses. *Id.* A greater number of sensors could be deployed at remote locations, while facilitating rapid and efficient data collection from every sensor at the same time, without the need for a technician to physically approach, read, and record data from each sensor. *Id.* Based on the state of the art at the time that wireless communication was predictably effective, success would have been expected by the combination of wireless technology in HVACR sensors and remote

computers. *Id.* A POSITA would have found it obvious to make such a modification and would have predicted success of this combination. *Id.* 110.

The Fieldpiece combination renders claim 1 obvious. Ex. 1002, ¶112.

2. Independent Claim 10

Claim 10 includes similar elements to elements [d], [e], [f], and [g], designated as [d'], [e'], [f], and [g'].

a. Claim 10[preamble] “A temperature sensor clamp for sensing temperature in a refrigerant unit, the temperature sensor clamp comprising:”

The temperature clamps of Fieldpiece are for sensing temperature in a refrigerant unit. Ex. 1006, Pg. 4. Ex. 1002, ¶113; Ex. 1013, Pg. 23.

b. 10[d']: “a clamping portion configured to clamp on a tube of the refrigerant unit, the clamping portion including a sensor element to measure temperature about the tube, and

The claim language “...a clamping portion configured to clamp on a tube of the refrigerant unit, the clamping portion including a sensor element to measure temperature about the tube...” of element [d] is identical to claim 10, element [d'].

The discussion of 1[d] at Section VIII.A.1.e. is incorporated by reference.

In combination, Fieldpiece disclose 10[d']. Ex. 1002, ¶¶115.

c. 10[e']: “a handle and integrated electronics, and”

The claim language “a handle and integrated electronics” of claim 1, element [e’] is identical to claim 10, element [e]. The discussion of claim 1, element [e] at Section VIII.A.1.f. is incorporated by reference.

In combination, Fieldpiece disclose 10[e’]. Ex. 1002, ¶¶116.

- d. 10[f]: the integrated electronics are incorporated into a portion of the temperature sensor clamp and are in signal communication with the sensor element;***

Element 10[f] recites “into a portion of the temperature sensor clamp and are in signal communication with the sensor element,” where element [f’] recites “into the handle and in electrical connection with the sensor element.” The discussion of 1[f’] at Section VIII.A.1.g is incorporated by reference.

The sensor element necessarily present in each Fieldpiece-B temperature sensor clamp includes a thermocouple, which is an integrated electronic residing in the “portion” of the temperature sensor clamp and necessarily electrically connected to the sensor element. Ex. 1002, ¶119.

In “signal communication” encompasses “in electrical connection.” See Section VI; Ex. 1002, ¶¶54, 123. The wireless transmitter taught by Fieldpiece-M would necessarily be in signal communication with the sensor element. Ex. 1002, ¶¶91, 117, 123.

In combination, Fieldpiece disclose 10[f]. Ex. 1002, ¶¶117–124.

e. 10[g'] “wherein the temperature sensor clamp has no external physical electrical connections.”

Sections VIII.A.1.g. and VIII.A.1.h., incorporated by reference, demonstrate that Fieldpiece teach incorporating a wireless transmitter in a temperature sensor clamp, is incorporated by reference. The temperature sensor clamps have no external physical electrical connections. Ex. 1002, ¶125.

In combination, Fieldpiece disclose 10[g']. Ex. 1002, ¶¶125.

f. Claim 10 Summary

A POSITA would have relied upon Fieldpiece combination for at least the same reasons as outline in Sections VII and VIII.A.i. with respect to claim 1, which is incorporated by reference. *See* Ex. 1002, ¶¶109–111; 126–128. A POSITA would recognize that Fieldpiece temperature sensors could be improved by placing the temperature sensor clamp wireless technology in a portion of the clamp to enhance the usability of the assembled sensor system components. *Id.*, ¶¶ 126–128.

The Fieldpiece combination renders claim 10 obvious. Ex. 1002, ¶129.

3. Independent Claim 15

Fieldpiece disclose [preamble] and elements [a], [b], [c], [d], [e], and [g] for the reasons set forth in Sections VIII.A.1.a.–f. and h, incorporated by reference. Ex. 1002, ¶¶130–131.

- a. 15[f]: “the integrated electronics are incorporated into a portion of the temperature sensor clamp and are in signal communication with the sensor element; and”**

Section VIII.A.2.d as it applies to element [f] is incorporated by reference.

The sensor element necessarily present in each temperature sensor clamp of Fieldpiece include a thermocouple, which is an “integrated electronic” in the “portion” of the temperature sensor clamp and necessarily electrically connected to the sensor element. Ex. 1002, ¶¶117–124; 132. Fieldpiece also teach integrating wireless technology in the handle of temperature sensor clamps, and thereby teach element [f]. Ex. 1002, ¶¶90–93.

b. Claim 15 Summary

A POSITA would have relied upon the combination of Fieldpiece for at least the reasons as outline in Sections VII and VIII.A.i. with respect to claim 1, which is incorporated by reference. *See* Ex. 1002, ¶¶109–111; 133 –135.

In combination, Fieldpiece render claim 15 obvious under 35 U.S.C. § 103. Ex. 1002, ¶136.

4. Independent Claim 20

Fieldpiece disclose [preamble] and elements [b], [d], and [e] for the reasons set forth in Sections VIII.A.1.a., c., e, and f, incorporated by reference. *See* Ex. 1002, ¶137.

- a. 20[a'] "a plurality of sensors for sensing system parameters of the refrigerant unit; and a receiving unit that gathers and combines data from at least two of the plurality of sensors; wherein:"

The language "a plurality of sensors for sensing system parameters of the refrigerant unit," is identical to element [a]. The discussion of 1[a] at Section VIII.A.1.b is incorporated by reference.

Fieldpiece-B states "WIRELESS HG3 System Analyzer," "[W]ith wireless capability, all your measurements are taken in real-time, so you can diagnose a system more accurately." Ex. 1006, Pg. 2:



“INPUT FORM” shows that WIRELESS HG3 System Analyzer “gathers” data from at least a pressure sensor and a temperature sensor from at least two of the plurality of sensors in the Kit. *See* Ex. 1006, Pg. 4; Ex. 1002, ¶141. The “OUTPUT FORM” shows that the WIRELESS HG3 System Analyzer calculates subcooling and superheat. Ex. 1002, ¶142.

Fieldpiece-M discloses the “HVAC GUIDE System Analyzer,” (also called “New HG3 model” or “HG3”). Ex. 1013, Pgs. 2, 4, and 5. HG3 is configured to wirelessly receive as many as 12 system parameters at one time, thereby requiring a “plurality of sensors” transmitting the parameters, and HG3 is a receiving unit that gathers data from a plurality of sensors. Ex. 1013, Pgs. 10, 12–15, 22–33; Ex. 1002, ¶¶146–147. The calculated system conditions include superheat and subcool. *Id.*, Pgs. 22–33. HG3 calculates system conditions based the receive system parameters. Ex. 1002, ¶148.

A POSITA was aware before January 20, 2014 that superheat and subcooling are calculated by combining measured temperature and pressure data from multiple sensors. Ex. 1001, 1:45-58; Ex. 1002, ¶142. Further, to “calculate” multiple data points necessarily includes “combining.” Ex. 1002, ¶142.

Fieldpiece disclose a receiving unit that receives parameters from a plurality of sensors, combines them, and outputs calculated results, meeting 20[a’]. Ex. 1002, ¶¶140–150.

b. Claim 20 Summary

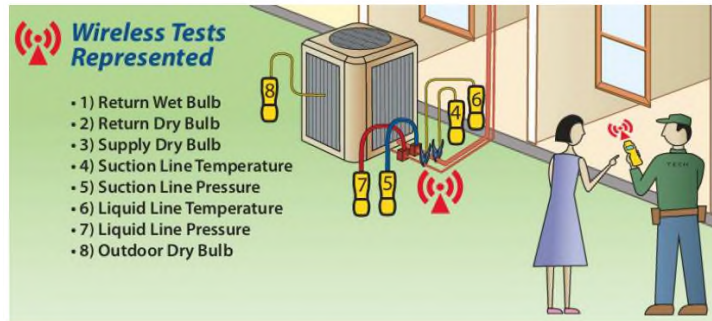
A POSITA would have relied upon the Fieldpiece combination for at least the reasons as outlined in Sections VII and VIII.A.1. with respect to claim 1, which are incorporate by reference. *See* Ex. 1002, ¶¶109–111; ¶¶155-157. The modifications made by a POSITA would result in two wireless temperature sensor clamps requiring less bulk and weight, and being more convenient to simply clamp in place and remove at will. *Id.* A POSITA would have been motivated to make the combination of wireless sensors and a wireless remote computer to eliminate distance constraints imposed by cables or hoses connecting sensors or a remote computer. *Id.*, ¶157. Without distance constraints, a greater number of sensors could be deployed at remote locations, facilitating rapid and efficient data collection from every sensor at the same time, without the need for a technician to physically approach, read, and record data from each sensor. *Id.*, ¶157.

Fieldpiece in combination render claim 20 obvious. Ex. 1002, ¶158.

5. Dependent Claim 21

a. 21[1]: “the receiving unit comprises a portable electronic device”

Fieldpiece-B states “view the measurement from anywhere on the job site” (Ex. 1006, Pg. 3), and shows a technician carrying the WIRELESS HG3 System Analyzer (a “receiving unit” that is portable and electronic) on a job site, Ex. 1002, ¶¶160–161:



Ex. 1006, Pg. 3

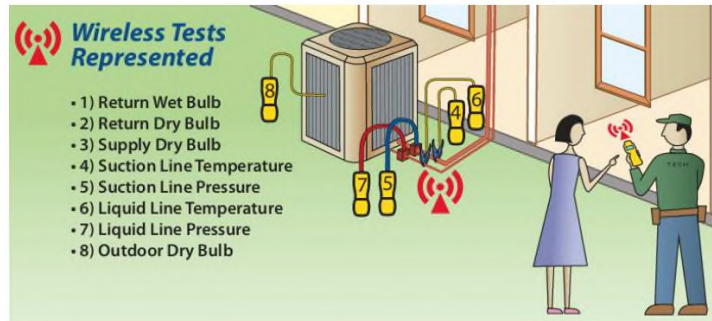
The receiving unit disclosed in Fieldpiece-M is a portable electronic device, and discloses this element. Fieldpiece-M, Ex. 1013, Pgs. 4–5; Ex. 1002, ¶162.

In combination, Fieldpiece disclose [1]. Ex. 1002, ¶162.

- b. 21[2] “the first pressure sensor senses pressure on a high side of the refrigerant system and the second pressure sensor senses pressure on a low side of the refrigerant system, wherein the first pressure sensor and the second pressure sensor are configured for wirelessly communicating pressure sensor data to the portable electronic device”**

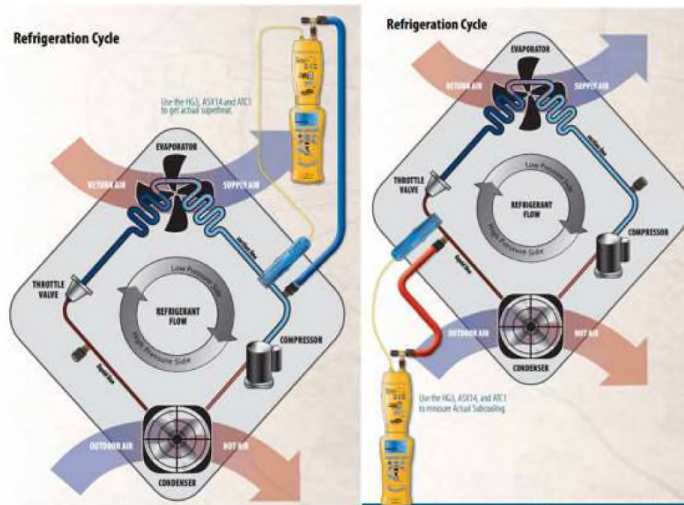
A POSITA at the time of the '051 Patent would have known that the “liquid line” was on the “high side” of a refrigerant system, and the “suction line” was on the “low side.” See Kane, Ex. 1014, ¶¶[0004] and [0026]; Ex. 1002, ¶163.

Fieldpiece-B discloses pressure sensor 7 measuring high side (liquid line) pressure, pressure sensor 5 measure low side (suction line) pressure, and each wirelessly communicating with the portable electronic device, as shown in the image below reproduced from Fieldpiece-B. Ex. 1002, ¶¶164, 165.



Ex. 1006, Pg. 3

The below images from Fieldpiece-M show a pressure sensor on the high and low sides of a refrigerant unit:



Ex. 1013, Pg. 23

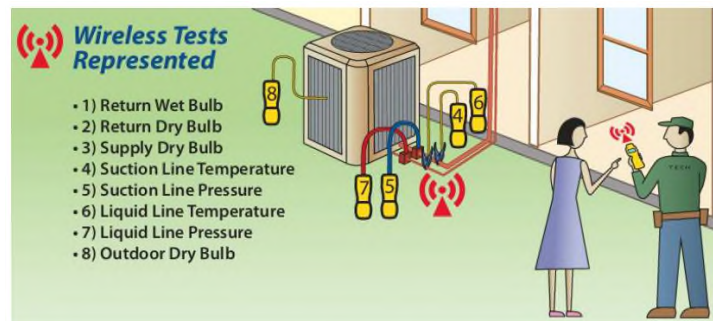
Ex. 1013, Pg. 29

Ex. 1002, ¶166. Fieldpiece-M states “Measurements are taken by the Accessory head and sent wirelessly to the HG3, The HG3 can receive up to 12 wireless signals at one time.” Ex. 1013, Pg. 10; *Id.*, ¶167. A POSITA would have recognized that the pressure sensor illustrated could be modified to include the Fieldpiece-M option of sending the pressure measurements wirelessly to the HG3, portable electronic device. *Id.*, ¶168.

In combination, Fieldpiece disclose [2]. Ex. 1002, ¶169.

- c. 21[3]: *“the first temperature sensor clamp has a clamping portion with a temperature sensor to measure temperature about a tube located on the high side of the refrigerant system and the second temperature sensor clamp has a clamping portion with a temperature sensor to measure temperature about a tube located on the low side of the refrigerant system; and”*

Fieldpiece-B discloses a temperature sensor clamp 6 measuring high side (liquid line) temperature, temperature sensor clamp 4 measuring low side (suction line) temperature. Ex. 1002, ¶170:



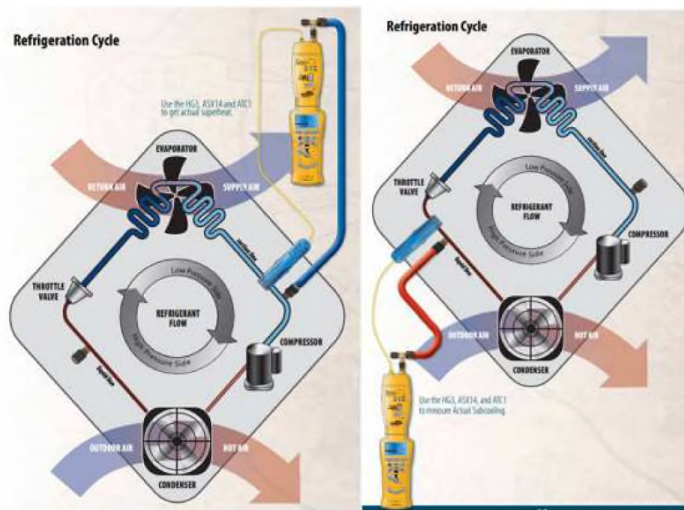
Ex. 1006, Pg. 3

Temperature sensors 6 and 4 have a clamping portion having a temperature sensor to measure temperature about a tube on the high side and low side of the refrigerant system, respectively, that necessarily includes “a temperature sensor to measure temperature about a tube.”. Ex. 1002, ¶¶171–172:



Ex. 1006, Pg. 3

The images reproduced from Fieldpiece-M show a temperature sensor on the high and low sides of a refrigerant unit:



Ex. 1013, Pg. 23

Ex. 1013, Pg. 29

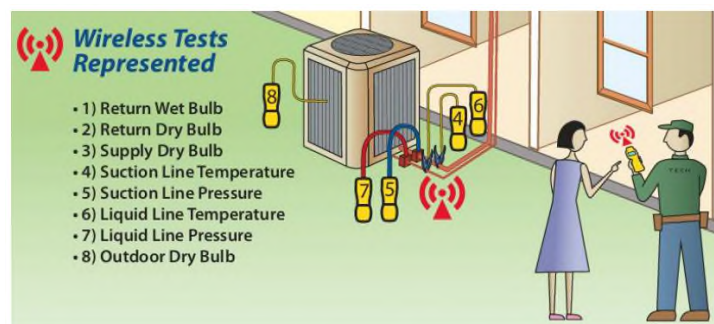
Ex. 1002, ¶174. The temperature sensor clamps measure temperature of a tube located on the high side of the refrigerant system and on the low side of the refrigerant system.” *Id.*, ¶175.

In combination, Fieldpiece disclose 21[3]. Ex. 1002, ¶173, 176.

- d. 21 [4]: “at least one of the first temperature sensor clamp and the second temperature sensor clamp includes integrated electronics that are configured for wirelessly communicating temperature sensor data to the portable electronic device.”

For at least the reasons as for claim 1, element [e] outlined in Section VIII.A.1.f, incorporated by reference, Fieldpiece disclose “at least one of the first temperature sensor clamp and the second temperature sensor clamp includes integrated electronics,” as recited in 21[4].

Further, the integrated electronics are “configured for wirelessly communicating temperature sensor data to the portable electronic device,” as shown in the below copied “Wireless Tests Represented” graphic from Fieldpiece-B Ex. 1002, ¶¶177, 178.



Ex. 1006, Pg. 3

Fieldpiece-M discloses an option of “Wirelessly Using a Fieldpiece Transmitter” where “Measurements are taken by the Accessory head and sent wirelessly to the HG3. The HG3 can receive up to 12 wireless signals at one time.” Ex. 1013, Pg. 10. Ex. 1002, ¶180. Fieldpiece-M teaches temperature sensor clamps having “integrated electronics that are configured for wirelessly communicating temperature sensor data to the portable electronic device.” *Id.*, ¶181.

In combination, Fieldpiece disclose 21[4]. Ex. 1002, ¶¶179, 182.

e. Claim 21 Summary

A POSITA would appreciate that the Fieldpiece combination discloses a portable electronic device and both pressure and temperature sensors configured for high side and low side HVAC measurements. Ex. 1002, ¶185. A POSITA would recognize that from the various instruments disclosed in Fieldpiece, two temperature sensors, two pressure sensors, and the WIRELESS HG3 System Analyzer, could be selected to simultaneously measure the high side and low side temperature and pressure. Ex. 1006, Pgs. 2–3; Ex. 1013, Pgs. 2, 22–23. Further, Fieldpiece suggests tests for calculating superheat and subcool. *Id.* A POSITA would have found it obvious to assemble the combination of the WIRELESS HG3 System Analyzer, two temperature sensors, and two pressure sensors for gathering the data necessary for the WIRELESS HG3 System Analyzer to combine and calculate superheat and subcool. Ex. 1002, 183, 185.

In combination, Fieldpiece teaches every element of claim 21 of the '051 Patent, rendering claim 21 obvious under 35 U.S.C. § 103; Ex. 1002, ¶186.

B. Ground 2: Fieldpiece-B In Combination With Fieldpiece-M, CN '078 And Staniforth Renders Claims 1, 10, 15, 20, And 21 Unpatentable Under 35 U.S.C. § 103

Fieldpiece are described in detail and applied to each of the Challenged Claims in Section VIII.A. and the sub-parts thereof, incorporated by reference into this Ground.

CN '078 discloses a device comprising a temperature sensor that wirelessly transmits temperature data to a computer, which then analyzes the temperature data. Exs. 1007, 1008, Abstract. The wireless temperature sensor can be a temperature sensor clamp. Ex. 1007, FIG. 5.

Staniforth teaches “a probe for measuring the surface temperature of a pipe which comprises an active clamp assembly and a passive clamp assembly.” Ex. 1009, 1:44–46. The probe includes a “clamp temperature sensor assembly . . . in the upper jaw and an electronics module is carried in the lower handle. The electronics module is in communication with the clamp temperature sensor assembly and has a display panel.” *Id.*, 1:50–55. The probe has electronics incorporated in its handle that connect a thermistor to a display panel with integrated control buttons. *Id.*, 4:30–49.

A POSITA would have relied upon the teachings of Fieldpiece for at least the reasons as outline in Sections VII and VIII.A.i. with respect to claim 1, incorporated by reference. Ex. 1002, ¶¶57–59, 109–111, 187–192. A POSITA would have relied upon and combined the teachings of Fieldpiece, CN '078 and Staniforth based on the relatedness of the technology, the motivation to have improved functionality and usability, to reduce size and/or components, and due to a reasonable expectation of success in such a combination. Ex. 1002, ¶¶187–192; *see also Id.*, ¶¶215–217 (claim 1); ¶¶224–226 (claim 10); ¶¶ 231–233 (claim 15); ¶¶239–241 (claim 20); ¶¶246–249 (claim 21).

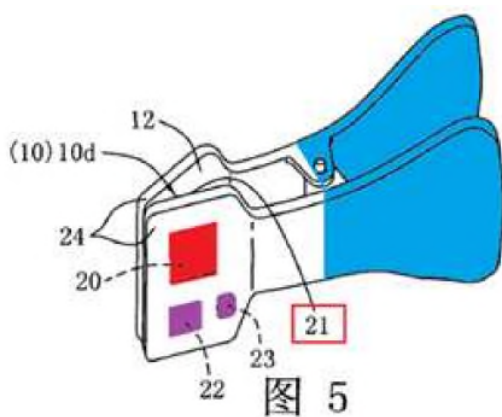
1. Independent Claim 1

Fieldpiece disclose **[preamble]** and elements **[a]**, **[b]**, **[c]**, **[d]**, **[e]**, **[f']** and **[g]** for the reasons set forth in Sections VIII.A.1.a.-h., incorporated by reference. Ex. 1002, ¶¶193.

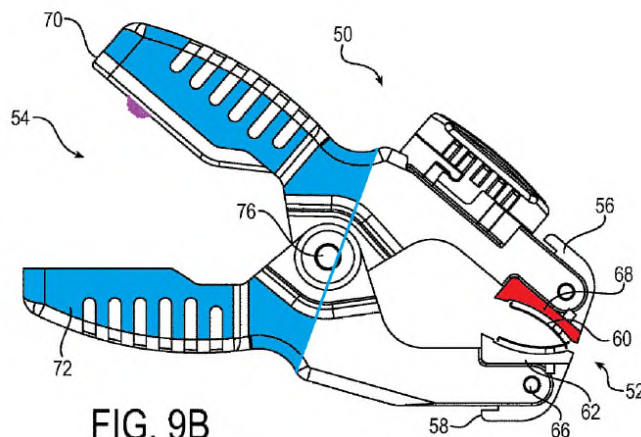
Although disclosed by Fieldpiece, if suggested that the combination of Fieldpiece does not disclose elements **[e]**, **[f']** and **[g]**, CN '078 and/or Staniforth disclose these elements. Ex. 1002, ¶¶183–185; 194.

- a. 1[e]: each of the first temperature sensor clamp and the second temperature sensor clamp further comprises a handle and integrated electronics, and”*

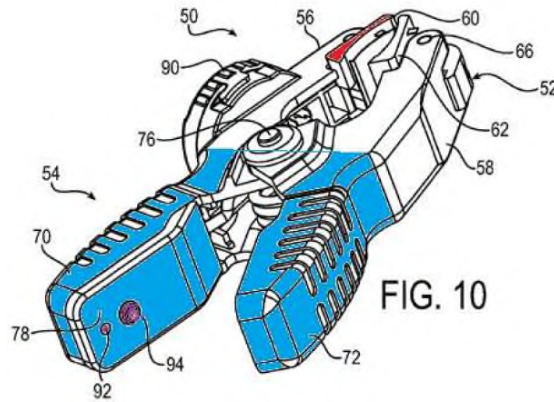
Below is a comparison (similar parts = matching colors) of the temperature sensor clamp of CN '078, FIG. 5 and the temperatures sensor clamp of the '051 Patent, FIGS. 9B and 10.



Ex. 1007, FIG. 5



Ex. 1001, FIG. 9B



Ex. 1001, FIG. 10

The '051 Patent describes integrated electronics (Purple). Ex. 1001, 9:55–61. Further, the integrated electronics are described in “electrical connection” to the sensor 68 (Red). *Id.* The '051 Patent also states that the “integrated electronics may include . . . wireless interface pair button.” *Id.*, 9:59–63. Similarly, CN '078 discloses a temperature sensing device having integrated electronics including a “wireless transmitter 22” (Purple) and an “alarm 23” (Purple). Ex. 1008, Pg. 6. 147.

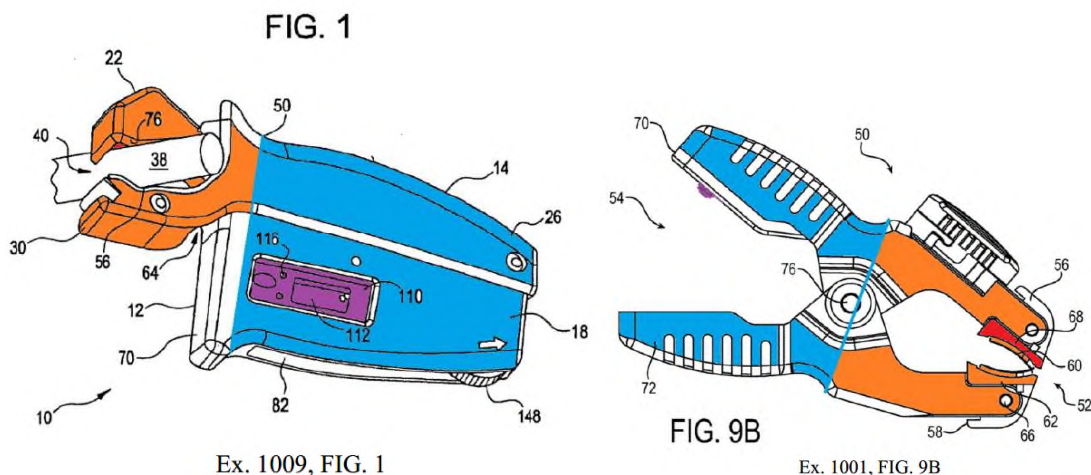
CN '078 also includes a handle (Blue) and “a clamping portion 24, as shown in Fig. 5, directly clamps and is fixed on” the item being monitored. Ex. 1008, Pg. 6. CN '078 discloses temperature sensing device having a “handle” and “integrated electronics. Ex. 1002, ¶¶195–200.

The combination of Fieldpiece and CN '078 teach first and second temperature sensor clamps, each having a “handle” and “integrated electronics,” disclosing element [e]. *Id.*, ¶¶195–200.

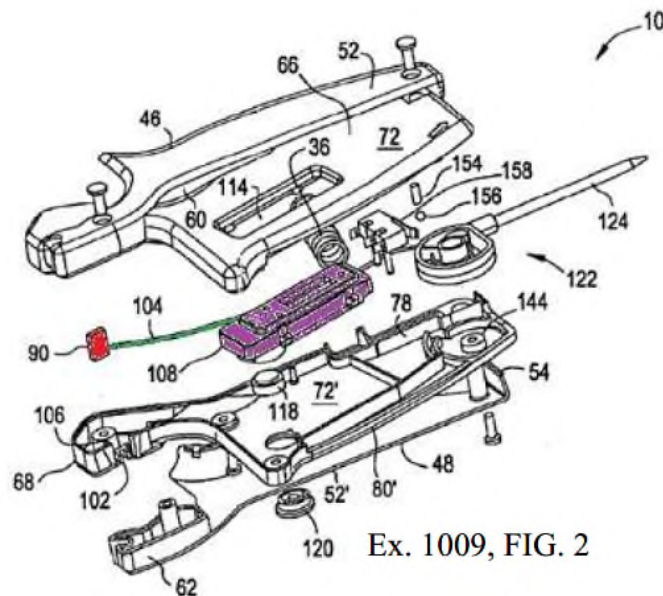
b. 1[f]: “the integrated electronics are incorporated into the handle and in electrical connection with the sensor element; and”

CN '078 discloses temperature sensor 20 (Red) having a sensing surface 21. CN '078 FIG. 5, Ex. 1008, Pg. 6. The temperature sensor 20 converts measured sensed values into electrical signals transmitted through a wireless transmitter 22 to a wireless receiver 31. Ex. 1008, Pg. 5. The wireless receiver 31 transmits the electrical signals to a computer device 30 that analyzes and determines the electrical signals received. *Id.* The wireless transmitter 22 comprises integrated electronics in electrical connection with the sensor element. Ex. 1002, ¶201. Moving the integrated electronics closer or a farther away from the sensor element in the same clamp arm part, as illustrated in CN '078, has no effect on function and is an obvious design choice a POSITA would have readily adopted. *Id.*, ¶202.

FIG. 1 of Staniforth and FIG. 9B of the '051 Patent and shown below (similar parts = matching colors):



Staniforth discloses upper and lower jaws 22, 30 (Orange) that clamp a pipe 38, the same configuration as '051 Patent, FIG. 9B. Ex. 1009, 3:15–17. Staniforth FIG. 1 and FIG. 2 disclose a temperature sensor assembly 90 (Red) in recess 102 in the clamping surface 76 of the upper jaw 22, with the signal-carrying conductor 104 [Green] extending through opening 106 in clamping surface 76. See Ex. 1009, 4:8–11. 19:



The clamping surface 76 (Red) is visible in FIG. 1 and shows the location of the temperature sensor assembly 90 in the assembled temperature probe of Staniforth.

Staniforth discloses electronics module 108 (display panel 110, LCD display 112, and control buttons 116) as “integrated electronics” (Purple) within lower handle 18 and within display panel 110. Ex. 1009, 3:5–24, 4:30–49. The temperature

sensor assembly 90 is connected via signal-carrying conductor 104 (Green) with the electronics module 108 (Purple) within lower handle 18. Ex. 1009, 4:30–34.

Staniforth in combination with Fieldpiece and CN '078 teaches moving integrated electronics to the handle of the temperature sensor, disclosing 1[f']. Ex. 1002, ¶¶201–211.

- c. ***1[g]: “there are no external physical electrical connections that extend from the first and second temperature sensors, and there are no external physical fluidic connections that extend from the first and second pressure sensors oppositely from the connectors”***

Modification of Fieldpiece temperature sensor clamps as taught by CN '078 would result in wireless temperature sensor clamps having “no external physical electrical connections that extend from the first and second temperature sensors.” Ex. 1002, ¶¶96–108, 212–214.

The discussion related to pressure sensors in Section VIII.A.1.h. is incorporated by reference. Fieldpiece disclose that “there are no external physical fluidic connections that extend from the first and second pressure sensors oppositely from the connectors,” as recited in claim 1. Ex. 1002, ¶¶96–108, 212–214.

d. *Claim 1 Summary*

Fieldpiece in combination with CN '078 and Staniforth renders claim 1 obvious. Ex. 1002, ¶¶215–218.

2. Independent Claim 10

Fieldpiece disclose **[preamble]** and elements **[d']**, **[e']**, **[f]**, and **[g']** for the reasons set forth in Sections VIII.A.2.a.–e., incorporated by reference. Ex. 1002, ¶¶219.

If suggested that Fieldpiece do not disclose elements **[e']**, **[f']**, or **[g']**, CN '078 and/or Staniforth do. Ex. 1002, ¶222.

a. 10[e']: "a handle and integrated electronics, and"

The discussion of Section VIII.B.1.a. (identical claim language in element **[e]**) is incorporated by reference.

b. 10[f]: "the integrated electronics are incorporated into a portion of the temperature sensor clamp and are in signal communication with the sensor element;"

Section VIII.A.2.d. (applying the Fieldpiece combination to claim element **[f]**) is incorporated by reference. Section VIII.B.1.b. (this Ground, discussing claim 1, element **[f']**) is incorporated by reference. Fieldpiece, CN '078 and Staniforth in combination disclose 10**[f]**. Ex. 1002, ¶222.

c. 10[g']: "wherein the temperature sensor clamp has no external physical electrical connections."

The discussion regarding temperature sensors in this Ground, Section VIII.B.1.c. (element **[g]**) is incorporated by reference. Filedpiece in combination with CN '078 disclose 10**[g']**. Ex. 1002, ¶223.

d. Claim 10 Summary

Fieldpiece in combination with CN '078 and Staniforth renders claim 10 obvious. Ex. 1002, ¶¶219-227.

3. Independent Claim 15

Fieldpiece disclose **[preamble]** and elements **[a]**, **[b]**, **[c]**, **[d]**, **[e]**, and **[g]** for the reasons set forth in Sections VIII.A.1.a.-f. and h., incorporated by reference. Ex. 1002, ¶228.

Sections VIII.B.1.a. and VIII.B.1.c. of this Ground (discussing elements **[e]** and **[g]**), and are incorporated by reference. Ex. 1002, ¶¶229.

If suggested that the Fieldpiece combination does not disclose element **[f]**, CN '078 and/or Staniforth do. Ex. 1002, ¶¶229–230.

a. 15[f]: “the integrated electronics are incorporated into a portion of the temperature sensor clamp and are in signal communication with the sensor element; and”

Fieldpiece in combination with CN '078 and Staniforth teach element **[f]** for at least the reasons set forth in the discussion of element **[f]** in this Ground at Section VIII.B.2.b, incorporated by reference. Ex. 1002, ¶¶229-230. *See also* Section VIII.B.1.b (element **[f']**), incorporated by reference.

b. Claim 15 Summary

Fieldpiece in combination with CN '078 and Staniforth renders claim 15 obvious. Ex. 1002, ¶¶228–234.

4. Independent Claim 20

Fieldpiece disclose **[preamble]**, and elements **[b]**, **[d]**, and **[e]** for the reasons set forth in Sections VIII.A.1a., c., e–f., incorporated by reference. Ex. 1002, ¶¶235.

Section VIII.B.2.b of this Ground (discussing element **[f]**) is incorporated by reference.

If suggested that Fieldpiece do not disclose element **[e]** or **[f]**, CN ‘078 and/or Staniforth disclose that element.

- a. **20 [e]: “each of the first temperature sensor clamp and the second temperature sensor clamp further comprises a handle and integrated electronics, and”**

Section VIII.B.1.a of this Ground (element **[e]**) is incorporated by reference. Ex. 1002, ¶ 237.

- b. **Claim 20, [f] “the integrated electronics are incorporated into a portion of the temperature sensor clamp and are in signal communication with the sensor element”**

Sections VIII.B.1.b. and VIII.B.2.b. of this Ground (discussing elements **[f’]** and **[f]**) are incorporated by reference. Ex. 1002, 238.

- c. **Claim 20 Summary**

Fieldpiece-B in combination with CN ‘078 and Staniforth renders claim 20 obvious. Ex. 1002, ¶¶235–242.

5. Dependent Claim 21

Fieldpiece disclose **[preamble]** and elements **[1]**, **[2]**, **[3]**, and **[4]** for the reasons set forth in Sections VIII.A.5.a.–e., incorporated by reference. Ex. 1002, ¶¶243.

If suggested that Fieldpiece do not disclose claim 21, element **[4]**, CN '078 does.

- a. 21[4]: “at least one of the first temperature sensor clamp and the second temperature sensor clamp includes integrated electronics that are configured for wirelessly communicating temperature sensor data to the portable electronic device.”*

Sections VIII.B.1.a.–b. (Fieldpiece, CN '078, and Staniforth applied to elements **[e]** and **[f']**) are incorporated by reference. Ex. 1002, ¶245.

CN '078 discloses a temperature sensor clamp including integrated electronics for wirelessly communicating temperature sensor data to a computer. Ex. 1007, FIG. 5 and 1008, Pg. 6.; ¶Ex. 1002, ¶245.

b. Claim 21 Summary

Fieldpiece in combination with CN '078 and Staniforth renders claim 21 obvious. Ex. 1002, ¶¶243–250.

**C. Ground 3: Fieldpiece-B In Combination With Fieldpiece-M,
CN '332 And Staniforth Renders Claims 1, 10, 15, 20, And 21
Unpatentable Under 35 U.S.C. § 103**

The Fieldpiece combination as applied to these Challenged Claims is outlined in detail in Section VIII.A and its sub-parts, incorporated by reference herein.

Staniforth is discussed at Sections VII and VIII.B, incorporated by reference herein.

CN '332 is directed to “pipe temperature [measurement] device,” with a temperature transducer.” Ex. 1011, ¶¶[0003] and [0009]. The temperature transducer includes a temperature-sensing probe in a clamping portion, connected to a data processing device that “may be a digital display and may also have a wireless transmission function.” *Id.*, ¶¶[0009]-[0010].

A POSITA would have relied upon and combined the teachings of Fieldpiece, CN '332 and Staniforth based on the relatedness of the technology, the motivation to have improved functionality and usability, to reduce size and/or components, and due to a reasonable expectation of success in such a combination. Ex. 1002, ¶¶251–256; *see also Id.*, ¶¶286–288 (claim 1); ¶¶296–298 (claim 10); ¶¶ 303–305 (claim 15); ¶¶310–312 (claim 20); ¶¶316–319 (claim 21).

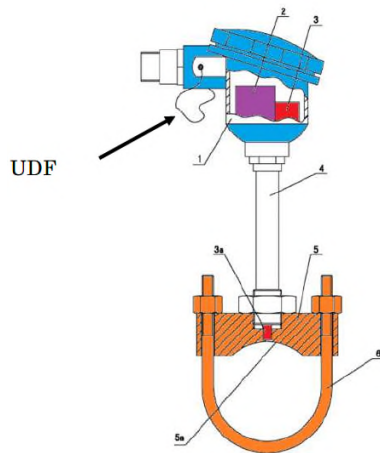
1. Independent Claim 1

Fieldpiece disclose **[preamble]** and elements **[a]**, **[b]**, **[c]**, **[d]**, **[e]**, and **[g]** for the reasons set forth in Sections VIII.A.1.a.-f. and h., incorporated by reference. Ex. 1002, ¶¶257.

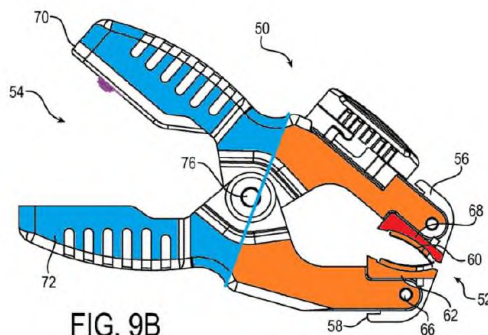
If suggested that the Fieldpiece combination does not disclose elements **[e]**, **[f’]** or **[g]**, CN ‘332 and/or Staniforth do.

- a. ***1[e] “each of the first temperature sensor clamp and the second temperature sensor clamp further comprises a handle and integrated electronics, and”***

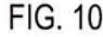
An annotated version of CN ‘332 FIG. 1, showing a pipe temperature device (Ex. 1011, ¶[0009]), is color-coded to show elements similar to the ‘051 Patent FIGS. 9B and 10.



Ex 1010, FIG. 1



Ex. 1001, FIG. 9B



Ex. 1001, FIG. 10

The pipe temperature device is a temperature sensor. Ex. 1002, ¶259. The CN '332 temperature clamp has the same features as the '051 Patent at FIGS. 9B. Ex. 1002, ¶¶260–262. The temperature sensor has a clamp 6 (Orange) and heat conduction base 5 (Orange) having cylindrical surface 5a, linked to the clamp 6, configured to clamp around a pipe. Ex. 1011, ¶¶[0009], [0012]. Above support pole 4, shell 1 (Blue) contains temperature transducer 3 (Red) and temperature data processing device 2 (Purple), which are connected to each other. Ex. 1011, ¶[0009]. The temperature transducer 3 and the temperature data processing device 2 are “integrated electronics.” Ex. 1002, ¶¶260–263.

b. 1[f']: “the integrated electronics are incorporated into the handle and in electrical connection with the sensor element; and”

A POSITA would have used upper shell 1 of CN '332 FIG. 1 to grasp the device during installation. Ex. 1002, ¶264. Fieldpiece include a handle, and a POSITA would have incorporated the CN '332 integrated electronics into the temperature sensor clamp handles of Fieldpiece. *Id.*

The CN '332 temperature sensor also includes a temperature-sensing probe 3a. Ex. 1011, ¶[0009]. The temperature-sensing probe 3a “obtains the temperature of the outer surface of the pipe.” *Id.*, [0012]. The temperature-sensing probe 3a is connected, as part of temperature-sensing probe 3, to the temperature data processing device 2, which may include a digital display and a wireless transmission function. *Id.*, ¶[0009]. Ex. 1002, ¶¶265–266.

Staniforth discloses integrated electronics incorporated into the handle of a temperature sensor clamp and in electrical connection with a sensor element. Ex. 1009, 4:30–49; Ex. 1002, ¶¶267–274.

The combination of Fieldpiece, CN '332 and Staniforth disclose element [f']. Ex. 1002, ¶275.

- c. ***1[g]: “there are no external physical electrical connections that extend from the first and second temperature sensors, and there are no external physical fluidic connections that extend from the first and second pressure sensors oppositely from the connectors”***

CN '332 discloses that the “temperature data processing device in the example may be a digital display and may also have a wireless transmission function.” Ex. 1011, ¶[0010]. Modification of the two temperature sensor clamps of Fieldpiece as taught by CN '332 would include wireless function in the handle of each temperature sensor clamp. Ex. 1002, ¶276–277. Thus, Fieldpiece in combination with CN '332

teaches “there are no external physical electrical connections that extend from the first and second temperature sensors.” *Id.* Ex. 1002, ¶285.

Fieldpiece disclose “there are no external physical fluidic connections that extend from the first and second pressure sensors oppositely from the connectors.” Section VIII.A.1.h. (incorporated by reference); Ex. 1002, ¶278.

d. Claim 1 Summary

Fieldpiece in combination with CN ’332 and Staniforth renders claim 1 obvious. Ex. 1002, ¶289.

2. Independent Claim 10

Fieldpiece disclose **[preamble]** and elements **[d’]**, **[e’]**, **[f]**, and **[g’]** for the reasons set forth in Sections VIII.A.2.a.–e., incorporated by reference. Ex. 1002, ¶290.

If suggested that Fieldpiece-B does not disclose elements **[e’]**, **[f]**, or **[g’]**, CN ’332 and/or Staniforth disclose these elements.

a. 10[e’] “a handle and integrated electronics, and”

Both Fieldpiece and CN ’332 disclose these features. Ex. 1006, Pg. 4; Ex. 1011, ¶[0009]; Ex. 1002, ¶¶292–293.

b. Claim 10, [f] “the integrated electronics are incorporated into a portion of the temperature sensor clamp and are in signal communication with the sensor element;”

Section VIII.C.1.b. of this Ground (element [f']) is incorporated by reference, and shows that CN '332 discloses integrated electronics incorporated in a portion of a temperature sensor clamp. Ex. 1002, ¶294.

Staniforth discloses integrated electronics incorporated into the handle of a temperature sensor clamp and in electrical connection with a sensor element. Ex. 1009, 4:30–49; Ex. 1002, ¶¶267–274.

The combination of Fieldpiece, CN '332 and Staniforth disclose element [f]. Ex. 1002, ¶294.

c. 10,[g'] “wherein the temperature sensor clamp has no external physical electrical connections.”

Section VIII.D.1.c. this Ground, (discussing element [g]) is incorporated by reference. The wireless temperature sensor clamp taught by Fieldpiece in combination with CN '332 would have no external physical electrical connections. Ex. 1002, ¶295.

The combination of Fieldpiece, CN '332 and Staniforth disclose element [g].
Id.

d. Claim 10 Summary

Fieldpiece in combination with CN '332 and Staniforth renders claim 10 obvious. Ex. 1002, ¶299.

3. Independent Claim 15

Fieldpiece disclose **[preamble]** and elements **[a]**, **[b]**, **[c]**, **[d]**, **[e]**, and **[g]** for the reasons set forth in Sections VIII.A.1.a.-f and h., incorporated by reference. Ex. 1002, ¶¶300.

If suggested that the Fieldpiece combination do not disclose element **[f]**, CN '078 and/or Staniforth disclose that element.

- a. 15[f]: “the integrated electronics are incorporated into a portion of the temperature sensor clamp and are in signal communication with the sensor element; and”*

The discussions in this Ground of Section VIII.C.2.b. (element **[f]**) and Section VIII.C.1.b. (element **[f']**) are incorporated by reference.

Fieldpiece in combination with CN '332 and Staniforth teach claim 15, element **[f]**. Ex. 1002, ¶302.

- b. Claim 15 Summary*

Fieldpiece in combination with CN '332 and Staniforth renders claim 15 obvious. Ex. 1002, ¶306.

4. Independent Claim 20

Fieldpiece disclose **[preamble]** and elements **[a']**, **[b]**, **[d]**, **[e]**, and **[f]** for the reasons set forth in Sections VIII.A.1.a.c.e.f. and g. and VIII.A.4.a., incorporated by reference. Ex. 1002, ¶307.

Fieldpiece in combination with CN '332 and Staniforth disclose elements [e] and [f] for the reasons set forth in Sections VIII.C.1.a. and VIII.C.2.b. of this Ground, incorporated by reference. Ex. 1002, ¶¶308-309.

c. Claim 20 Summary

Fieldpiece in combination with CN '332 and Staniforth renders claim 20 obvious. Ex. 1002, ¶313.

5. Dependent Claim 21

Section VIII.C.4 and sub-parts (claim 20) is incorporated by reference.

Fieldpiece disclose elements [1], [2], [3], and [4] for the reasons set forth in Sections VIII.A.5.a.-d., incorporated by reference. Ex. 1002, ¶314.

If suggested that Fieldpiece does not disclose or teach element [4], CN '332 does.

a. 21[4]: “at least one of the first temperature sensor clamp and the second temperature sensor clamp includes integrated electronics that are configured for wirelessly communicating temperature sensor data to the portable electronic device.”

CN '332 discloses a temperature sensor clamp that includes integrated electronics that are configured for wirelessly communicating temperature sensor data. Ex. 1002, ¶315. In combination with the temperature sensor clamps of Fieldpiece, CN '332 teaches element [4]. *Id.*

b. Claim 21 Summary

Fieldpiece in combination with CN '332 and Staniforth renders claim 21 obvious. Ex. 1002, ¶319.

D. Ground 4: Fieldpiece-B In Combination With Fieldpiece-M, Peirs And Staniforth Renders Claims 1, 10, 15, 20, And 21 Unpatentable Under 35 U.S.C. § 103

Fieldpiece is discussed in detail in Sections VIII.A and sub-parts, incorporated by reference herein.

Staniforth is discussed at Sections VII and VIII.B, incorporated by reference herein.

Peirs relates to “improved monitoring equipment for heat pump or refrigerating systems.” Ex. 1012, ¶[0001]. Peirs describes “heat pumps and refrigerating systems” as including “refrigerators, freezers, coolers, air conditioners, etc.” *Id.*, ¶[0002].

A POSITA would have relied upon and combined the teachings of Fieldpiece, Peirs and Staniforth based on the relatedness of the technology, the motivation to have improved functionality and usability, to reduce size and/or components, and due to a reasonable expectation of success in such a combination. Ex. 1002, ¶¶332–327; *see also Id.*, ¶¶351–353 (as to claim 1); ¶¶360–363 (as to claim 10); ¶¶366–368 (as to claim 15); ¶¶373–375 (as to claim 20); ¶¶379–382 (as to claim 21).

1. Independent Claim 1

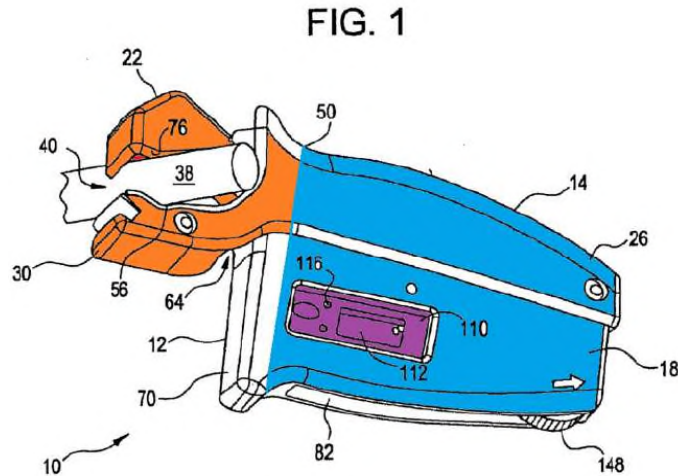
Fieldpiece disclose **[preamble]** and elements **[a]**, **[b]**, **[c]**, **[d]**, **[e]**, and **[g]** for the reasons set forth in Sections VIII.A.1.a.–f. and h., incorporated by reference. Ex. 1002, ¶328.

If suggested that Fieldpiece do not disclose or teach elements **[d]**, **[e]**, **[f’]**, or **[g]**, Peirs and/or Staniforth do.

- a. *1[d]: “the first and second temperature sensors each comprises a temperature sensor clamp having a clamping portion configured to clamp on a tube of the refrigerant unit, the clamping portion including a sensor element to measure temperature about the tube;”*

Peirs discloses two wirelessly communicating temperature sensors. Ex. 1012, Abstract, ¶¶[0037] and [0038]. The wireless sensors are to be fixed on connectors provided on the heat pump or refrigerating system and communicate via an integrated transmitting unit to the receiving unit via wireless communication.” Ex. 1012, ¶[0040].

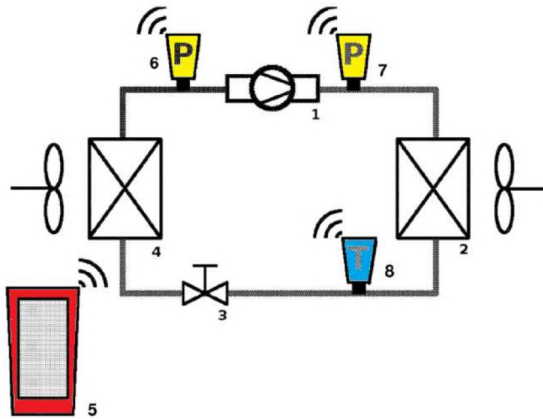
Staniforth discloses a temperature sensor clamp, with upper and lower jaws 22, 30 (Orange) that clamp a pipe 38, with a temperature sensor assembly 90 located on the clamping surface 76 of the upper jaw 22. Ex. 1009, 3:15–17. Ex. 1009, 4:30–34:



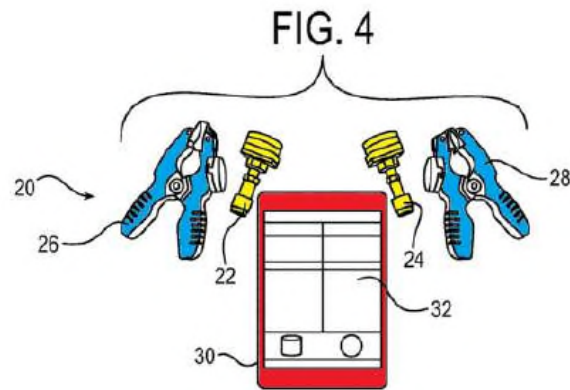
The combination of the two wirelessly communicating temperature sensors of Peirs with the teachings of Staniforth as to the clamping portion, as well as the previously discussed teachings of Fieldpiece, teach element **[d]**. Ex. 1002, ¶¶330–332.

b. 1,[e]: “each of the first temperature sensor clamp and the second temperature sensor clamp further comprises a handle and integrated electronics”

Peirs discloses two wirelessly communicating pressure sensors in an HVAC/R system, and two wirelessly communicating temperature sensors. Ex. 1012, Abstract, ¶¶[0037], [0038], and FIG. 1. Below, FIG. 1 from Peirs is compared to the '051 Patent FIG. 4, which is “an exemplary hoseless sensor system” in the '051 Patent (Ex. 1001, 3:58–60):



Ex. 1012, FIG. 1



Ex. 1001, FIG. 4

Each Figure above shows a portable electronic device (Red), two pressure sensors (Yellow), and a wireless temperature sensor (Blue). There is no difference between these two figures other than the artistic rendering and the absence of one wireless temperature sensor in Peirs FIG. 1. Ex. 1002, ¶334. That difference is accounted for in Peirs as “two wireless temperature sensors.” Ex. 1012, ¶[0039].

Having two wireless temperature sensors, as in Peirs (¶[0039]), would have led a POSITA to replace the cables in the handle and leading away from each temperature sensing clamp of the Fieldpiece Kit with wireless transceivers located in the handle of each clamp. Ex. 1002, ¶336. This combination would result in the “two wireless temperature sensors” of Peirs, but in the clamping configuration of Fieldpiece, with each having a handle and integrated electronics to establish the wireless communication. Ex. 1002, ¶336.

Staniforth discloses “integrated electronics” and a “handle.” Ex. 1009, 4:30–49; 3:5–24; Ex. 1002, ¶¶335, 340–345.

The combination of Fieldpiece, Peirs and Staniforth as to handles and integrated electronics, teach element [e]. Ex. 1002, ¶337.

- c. ***1[f]: “the integrated electronics are incorporated into the handle and in electrical connection with the sensor element; and”***

A POSITA would have connected the sensing element in both of the temperature sensor clamps of the Fieldpiece Kit temperature sensors to the “integrated transmitting unit” in the wireless temperature sensors taught by Peirs. See Ex. 1012 at ¶[0039] and [0040]; Ex. 1002, ¶338.

As outlined in Section VIII.B.1.b, incorporated by reference, Staniforth discloses integrated electronics, including control buttons, incorporated in the handle and in electrical connection with a sensor element. See also Ex. 1002, ¶¶339–347 (discussing Staniforth).

The combination of the clamps of Fieldpiece, the integrated electronics of Peirs, and the handle and integrated electronics of Staniforth, teach element [f']. Ex. 1002, ¶347.

- d. ***1[g]: “there are no external physical electrical connections that extend from the first and second temperature sensors, and there are no external physical fluidic connections that extend from the first and second pressure sensors oppositely from the connectors.”***

Modification of Fieldpiece sensor clamps as taught by Peirs and Staniforth would result in a wireless temperature sensor clamp having “no external physical

electrical connections that extend from the first and second temperature sensors.”

Ex. 1002, ¶348. These would have “no external physical electrical connections that extend from the first and second temperature sensors.” *Id.*

The discussion of Fieldpiece pressure sensors at Section VIII.A.1.h. is incorporated by reference. Fieldpiece discloses “there are no external physical fluidic connections that extend from the first and second pressure sensors oppositely from the connectors.” Ex. 1002, ¶349.

Fieldpiece, Peirs and Staniforth in combination teach element **[g]**. Ex. 1002, 350.

e. Claim 1 Summary

Fieldpiece in combination with Peirs and Staniforth renders claim 1 obvious. Ex. 1002, ¶354.

2. Independent Claim 10

Fieldpiece disclose **[preamble]** and elements **[d’]**, **[e’]**, **[f]**, and **[g’]** for the reasons set forth in Sections VIII.A.2.a.–f., incorporated by reference. Ex. 1002, ¶355.

If suggested that Fieldpiece do not disclose elements **[e’]**, **[f]**, or **[g’]**, Peirs and/or Staniforth do.

a. 10[e’]: “a handle and integrated electronics, and”

The discussion of Peirs in this Ground at Section VIII.D.1.b., is incorporated by reference. Fieldpiece in combination with Piers teaches this claim element. Ex. 1002, ¶357.

b. 10[f]: “the integrated electronics are incorporated into a portion of the temperature sensor clamp and are in signal communication with the sensor element;”

Piers teaches a POSITA modification of a Fieldpiece temperature sensor clamp to include “integrated electronics,” which could be incorporated in any “portion” of the temperature sensor clamp. Ex. 1002, ¶358. Further, the “integrated electronics” would necessarily be in “signal communication” with the sensor element.” *Id.*

If suggested that “integrated electronics are incorporated into a portion of the temperature sensor clamp and are in signal communication” is not taught by Fieldpiece in combination with Peirs, Staniforth discloses this feature. See the discussion of element [f’] in this Ground at Section VIII.D.1.c., incorporated by reference. This same analysis applies here to element [f]. Ex. 1002, ¶ 358.

c. 10[g’]: “wherein the temperature sensor clamp has no external physical electrical connections.”

The wireless temperature sensor clamp taught by Fieldpiece and Peirs would have no external physical connections. Ex. 1002, ¶359.

d. Claim 10 Summary

Fieldpiece in combination with Peirs and Staniforth renders claim 10 obvious.
Ex. 1002, ¶363.

3. Independent Claim 15

Fieldpiece disclose **[preamble]** and elements **[d’]**, **[e’]**, **[f]**, and **[g’]** for the reasons set forth in Sections VIII.A.2.a.–f., incorporated by reference. Ex. 1002, ¶364.

Fieldpiece in combination with Peirs disclose elements **[e]** and **[g]** for the reasons set forth in this Ground Sections VIII.D.1.b. and VIII.D.1.d, incorporated by reference. *Id.*

If suggested that Fieldpiece does not disclose or teach element **[f]**, Peirs and/or Staniforth do.

a. 15[f] “the integrated electronics are incorporated into a portion of the temperature sensor clamp and are in signal communication with the sensor element; and”

Fieldpiece in combination with Peirs, and Staniforth disclose elements **[f’]** and **[f]** or the reasons set forth in this Ground Sections VIII.D.1.c and VIII.D.2.a., incorporated by reference. Ex. 1002, ¶365.

b. Claim 15 Summary

Fieldpiece in combination with Peirs and Staniforth renders claim 15 obvious.
Ex. 1002, ¶369.

4. Independent Claim 20

Fieldpiece disclose **[preamble]** and elements **[a']**, **[b]**, **[d]**, **[e]** for the reasons set forth in Sections VIII.A.4.a. and VIII.A.1.a., c. e. and f., incorporated by reference. Ex. 1002, ¶370.

If suggested that Fieldpiece does not disclose elements **[e]** and **[f]**, Peirs does.

- a. *20[e]: “each of the first temperature sensor clamp and the second temperature sensor clamp further comprises a handle and integrated electronics, and”*

Section VIII.D.1.b of this Ground (Fieldpiece, Peirs, and Staniforth applied to element **[e]**), is incorporated by reference. Ex. 1002, ¶371.

- b. *Claim 20, [f] “the integrated electronics are incorporated into a portion of the temperature sensor clamp and are in signal communication with the sensor element”*

Sections VIII.D.1.c and VIII.D.2.a.of this Ground (Fieldpiece, Peirs, and Staniforth applied to elements **[f']** and **[f]**), are incorporated by reference. Ex. 1002, ¶372.

- c. *Claim 20 Summary*

Fieldpiece in combination with Peirs and Staniforth renders claim 20 obvious. Ex. 1002, ¶376.

5. Dependent Claim 21

Section VIII.C.4 and sub-parts (claim 20) is incorporated by reference.

Fieldpiece disclose [1], [2], [3], and [4] for the reasons set forth in Sections VIII.A.5.a.-d., incorporated by reference. Ex. 1002, ¶¶377.

If suggested that Fieldpiece does not disclose element [4], Peirs teaches it.

- a. 20[4] “at least one of the first temperature sensor clamp and the second temperature sensor clamp includes integrated electronics that are configured for wirelessly communicating temperature sensor data to the portable electronic device.”**

Fieldpiece in view of Peirs teach [e] “each of the first temperature sensor clamp and the second temperature sensor clamp further comprises a handle and integrated electronics,” and [f] “the integrated electronics are incorporated into the handle and in electrical connection with the sensor element.” Ex. 1002, ¶378. Further, Peirs teaches that the integrated electronics include an integrated wireless transmitter. Ex. 1012, ¶[0040]; Ex. 1002, ¶378. The wireless temperature sensor clamps taught by Fieldpiece in view of Peirs would be configured for wirelessly communicating temperature sensor data to the portable electronic device. *Id.* Fieldpiece in view of Peirs teach element [4]. *Id.*

b. Claim 21 Summary

Fieldpiece in combination with Peirs and Staniforth renders claim 21 obvious. Ex. 1002, ¶383.

**E. Ground 5: Kane In Combination With CN '078 And Staniforth
Renders Claims 1, 10, 15, 20, And 21 Unpatentable Under 35
U.S.C. § 103**

The discussion of CN '078 in Ground 3 is incorporated by reference herein.

The discussion of Staniforth in Grounds 2-4 is incorporated by reference herein.

Kane relates to “servicing and testing equipment used in the heating, ventilating, air conditioning, and refrigeration (HVAC/R) field,” including “hand-held test and measurement devices.” Ex. 1014, ¶[0001]. The equipment includes two temperature pressure sensors, two temperature sensors, and a portable electronic device. Ex. 1014, [0042], [0043], [0063]-[0067].

A POSITA would have relied upon and combined the teachings of Kane, CN '078 and Staniforth based on the relatedness of the technology, the motivation to have improved functionality and usability, to reduce size and/or components, and due to a reasonable expectation of success in such a combination. Ex. 1002, ¶¶384–387; *see also Id.*, ¶¶431–434 (claim 1); ¶¶441–444 (claim 10); ¶¶ 448–451 (claim 15); ¶¶463–466 (claim 20); ¶¶476–478 (claim 21).

1. Independent Claim 1

a. 1[Preamble]: “A sensor system for a refrigerant unit comprising:”

Kane discloses a sensor system for servicing and testing equipment used in the HVAC/R field.” Ex. 1014, ¶[0001]; Ex. 1002, ¶388.

b. 1[a]: “a plurality of sensors for sensing system parameters of the refrigerant unit, wherein:”

AND

1[b]: “the plurality of sensors comprises a first pressure sensor and a second pressure sensor, and a first temperature sensor and a second temperature sensor”

Kane discloses pressure sensors 416 and 426, and temperature sensors 418 and 428 in an “AC/R kit,” for sensing system parameters of a refrigeration unit. Ex. 1014, ¶¶[0042] and [0043]; Ex. 1002, ¶389–390.

c. 1[c]: “the first and second pressure sensors each comprises a connector that connects to a tube of the refrigerant unit;”

The Kane pressure sensors 416 and 426 may have “Schrader or other standard refrigerant line pressure test port fittings.” Ex. 1014, ¶¶[0042] and [0043]. A POSITA would have understood that a “Schrader or other standard” port fitting would be a connector that connect to a tube of the refrigerant unit. Ex. 1002, ¶391.

- d. 1[d]: “the first and second temperature sensors each comprises a temperature sensor clamp having a clamping portion configured to clamp on a tube of the refrigerant unit, the clamping portion including a sensor element to measure temperature about the tube;”**

Kane discloses temperature sensors 418 and 428. Ex. 1014, ¶¶[0042] and [0043]. These sensors may be in “The AC/R kit,” and are for sensing system parameters of the AC/R. Ex. 1014, [0042]–[0043]. Ex. 1002, ¶389. The temperature sensors are “equipped with... pipe engaging sensor clamps for quality transducer contact for measuring refrigerant (line) temperature...” *Id.*, ¶¶393–394. Temperature sensors 418 and 428 are “pipe engaging sensor clamps for quality transducer contact for measuring refrigerant (line) temperature.” Ex. 1002, ¶394.

Kane describes kit 404 as incorporating everything in kit 402, including the first temperature sensor, and “an additional temperature sensor 428 (which may be substantially similar to temperature sensor 418).” Ex. 1014, [0043]; Ex. 1002, ¶396.

According to Kane, “[t]he AC/R kit 404 may include a combination of wired and wireless sensors, sender units, and transceivers/receivers as described and shown in FIG. 3, to provide a combination of wired and wireless remote sensor test and measurement means using a central/main unit 120.” Ex. 1014, [0043] (emphasis added); Ex. 1002, ¶397. Wireless technology comprises “integrated electronics.” Ex. 1002, ¶399.

Referring to FIG. 9, Kane discloses “sensors 704 [that] comprise any one or more attachment heads 904, 906, 908, 910, 912, 914, 916, 918, or another sensor attachment head not shown, each of which preferably interconnects with the sensor interface 702.” Ex. 1014, ¶[0063]; Ex. 1002, ¶398. FIG. 9 from Kane (Ex. 1014) shows wireless sensors (Purple and Blue) wirelessly transmitting data to a portable electronic device (Red):

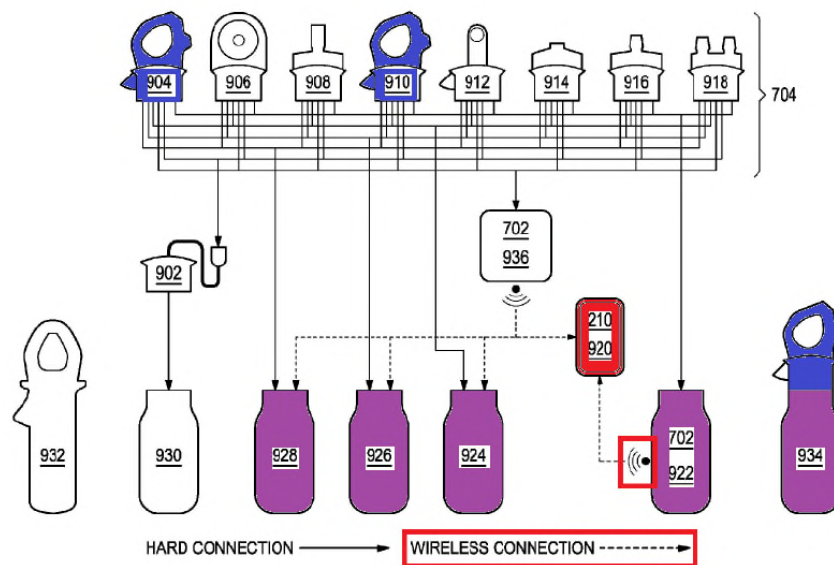
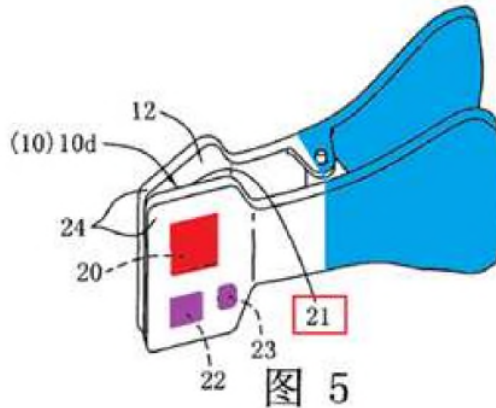


FIG. 9

Ex. 1014, FIG. 9

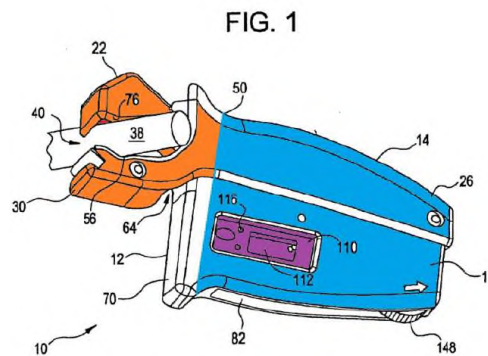
The meter 934 has a “clamp-on type head 904,” and is the integral combination of base unit 922 and sensor head 904. Ex. 1014, ¶[0065]; Ex. 1002, ¶399. A POSITA would appreciate each base unit 922, 924, 926, or 928 as a handle. Ex. 1002, ¶399. Base unit 922 includes wireless technology, considered to be integrated electronics. Ex. 1014, ¶[0065]; Ex. 1002, ¶399.

CN '078 discloses a clamp including “a clamping portion 24...[that] directly clamps and is fixed on” the item being monitored. Ex. 1008, Pg. 6 and Ex. 1007:



Ex. 1007, FIG. 5

Staniforth also discloses a temperature sensor clamp having upper and lower jaws 22, 30 (Orange) that clamp a pipe 38. Ex. 1009, 3:15-17. A temperature sensor assembly 90 is located on the clamping surface 76 of the upper jaw 22. Id., 4:30-34. Ex. 1002, ¶403:



Ex. 1009, FIG. 1

Kane in view of CN '078 and Staniforth disclose element **[d]**. Ex. 1002, ¶¶393-404.

- e. [e] “each of the first temperature sensor clamp and the second temperature sensor clamp further comprises a handle and integrated electronics, and”***

Section VIII.E.1.d of this Ground is incorporated by reference, including the discussion of CN ‘078 having a “handle” and “integrated electronics,” and clamping features. Ex. 1008, Pg. 6; Ex. 1002, ¶¶401, 405-409.

Staniforth discloses an upper handle 26 and lower handle 18, and an electronics module 108, that is “integrated electronics” within lower handle 18 and within display panel 110. Ex. 1009, 3:5-24, FIG.1 . The electronics module includes display panel 110, LCD display 112, and control buttons 116. *Id.*, 4:30-49. Ex. 1002, ¶¶410-411.

Kane, CN ‘078, and Staniforth teach two temperatures sensors with handles and integrated electronics. Ex. 1002, ¶412.

- f. 1[f]: “the integrated electronics are incorporated into the handle and in electrical connection with the sensor element; and”***

Section VIII.E.1.d of this Ground is incorporated by reference, including the discussion of CN ‘078 having a “handle” and “integrated electronics.” Ex. 1008, Pg. 6; Ex. 1002, ¶¶401, 405-409.

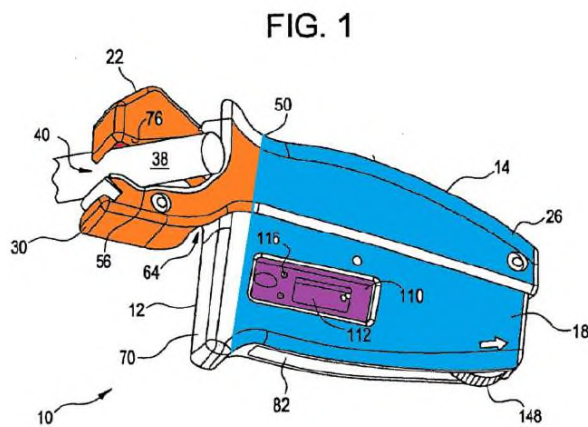
CN ‘078 discloses temperature sensor 20 having a sensing surface 21, as well as electrical signals transmitted through a wireless transmitter 22 to a wireless receiver 31. CN ‘078 FIG. 5, Ex. 1008, Pg. 5-6. The wireless transmitter 22

comprises integrated electronics in electrical connection with the sensor element.

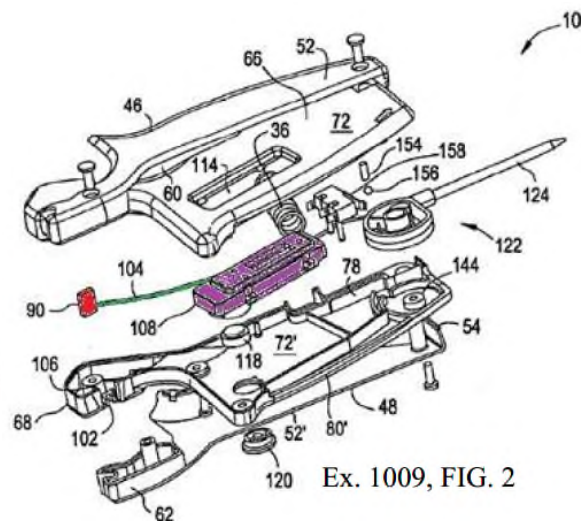
See Ex. 1002, ¶201.

Staniforth discloses an upper handle 26 and lower handle 18, and an electronics module 108, that is “integrated electronics” within lower handle 18 and within display panel 110. Ex. 1009, 3:5-24; ¶¶411, 414.

Staniforth FIG.1 and FIG. 2 show a temperature sensor assembly 90 (Red) is “in recess 102 in the clamping surface 76 of the upper jaw 22, with the signal-carrying conductor 104 [green] extending through opening 106 in clamping surface 76.” Ex. 1009, 4:8-11:



Ex. 1009, FIG. 1



Ex. 1009, FIG. 2

The electronics module 108 comprises “integrated electronics” (Purple) within lower handle 18 (Blue) are within display panel 110. Ex. 1009, 3:5-24. Ex. 1002, ¶417. The temperature sensor assembly 90 is connected via signal-carrying

conductor 104 (Green) with the electronics module 108 (Purple) within lower handle

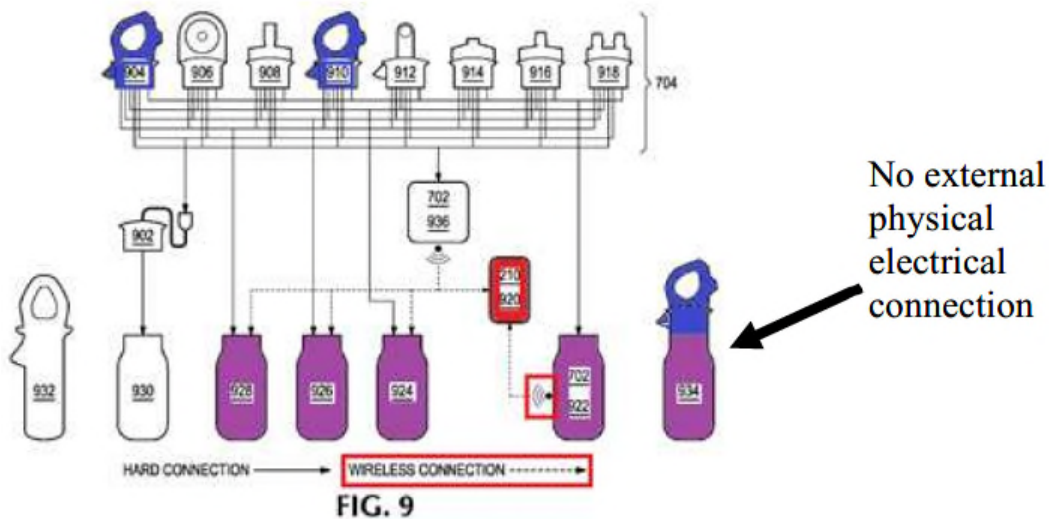
18. Ex. 1009, 4:30-34. Ex. 1002, ¶¶415-418.

Staniforth teaches moving the wireless transmitter, as in Kane or CN '078, to the handle. Ex. 1002, ¶¶419-420.

Kane in view of CN '078 and Staniforth disclose element [f']. Ex. 1002, ¶421.

- g. 1[g]: “there are no external physical electrical connections that extend from the first and second temperature sensors, and there are no external physical fluidic connections that extend from the first and second pressure sensors oppositely from the connectors.”***

Kane’s wireless temperature sensors have no external physical electrical connections, and the wireless pressure sensors, all shown disclosed over FIG. 4 or FIG. 9, have no external physical fluidic connections. Ex. 1014, ¶¶[0042]-[0043], [0063]-[0066]; Ex. 1002, ¶422-424:



Kane also shows assembling a wireless pressure sensor. Kane, ¶[0042], [0043], [0057], [0063]; Ex. 1002, ¶425. A wireless pressure sensor so assembled would have “no external physical fluidic connections that extend from the first and second pressure sensors oppositely from the connectors.” Ex. 1002., ¶425.

CN '078 discloses a wireless transmitter 22, and temperature sensor 20 having a sensing surface 21 with no external connections. Ex. 1008, CN '078, FIG. 5, Pg. 6; Ex. 1002, ¶¶426-427.

Kane suggests modification of its temperature and pressures sensors, and the wireless temperature sensors and wireless pressure sensors taught by the combination of Kane and CN '078 and Staniforth would have no external physical electrical connections that extend therefrom. Ex. 1002, ¶¶428-430.

h. Claim 1 Summary

Kane in combination with CN '078 and Staniforth renders claim 1 obvious. Ex. 1002, ¶435.

2. Independent Claim 10

- a. 10[Preamble] “A temperature sensor clamp for sensing temperature in a refrigerant unit, the temperature sensor clamp comprising:”***

Section VIII.E.1.d. of this Ground is incorporated by reference.

- b. Claim 10, [d'] “a clamping portion configured to clamp on a tube of the refrigerant unit, the clamping portion including a sensor element to measure temperature about the tube, and”***

Kane in combination with CN ‘078 and Staniforth disclose element **[d]** for the reasons set forth in Section VIII.E.1.d of this Ground, incorporated by reference. Ex. 1002, ¶437.

c. 10[e’]: “a handle and integrated electronics, and”

Kane in combination with CN ‘078 and Staniforth disclose element **[e’]** for the reasons set forth in Section VIII.E.1.e of this Ground, incorporated by reference. Ex. 1002, ¶438.

d. Claim 10, [f] “the integrated electronics are incorporated into a portion of the temperature sensor clamp and are in signal communication with the sensor element;”

Kane in combination with CN ‘078 and Staniforth disclose element **[f]** for the reasons set forth in Section VIII.E.1.f of this Ground as to **[f’]**, incorporated by reference. Ex. 1002, ¶439.

Kane, CN ‘078 and Staniforth disclose integrated electronics are incorporated into the handle and are in electrical connection with the sensor element. Ex. 1002, ¶421, 439. A “handle” is a portion, and “in electrical connection” is “in signal communication.” *Id.*, ¶439.

e. 10[g’]: wherein the temperature sensor clamp has no external physical electrical connections.”

Kane in combination with CN ‘078 and Staniforth disclose element **[g’]** for the reasons set forth in Section VIII.E.1.g of this Ground as to **[g]**, incorporated by

reference. Ex. 1002, ¶440. Kane in combination with CN '078 and Staniforth discloses element [g']. *Id.*

f. Claim 10 Conclusion

Kane in combination with CN '078 and Staniforth renders claim 10 obvious. Ex. 1002, ¶445.

3. Independent Claim 15

Kane in combination with CN '078 and Staniforth disclose [preamble] and elements [a], [b], [c], [d], [e], and [g] for the reasons set forth in Sections VIII.E.1.a.-e. and g. of this Ground, incorporated by reference.

a. 15[f]: “the integrated electronics are incorporated into a portion of the temperature sensor clamp and are in signal communication with the sensor element; and”

Kane in combination with CN '078 and Staniforth disclose elements [f'] and [f] for the reasons set forth in Sections VIII.E.1.f and VIII.E.2.d. of this Ground, incorporated by reference. Ex. 1002, ¶447.

b. Claim 15 Summary

Kane in combination with CN '078 and Staniforth renders claim 15 obvious. Ex. 1002, ¶452.

4. Independent Claim 20

Kane in combination with CN '078 and Staniforth disclose [preamble] and elements [preamble] and elements [b], [d], [e], [f'] for the reasons set forth in

Sections VIII.E.1.a., b., d., e., and f. of this Ground, incorporated by reference. See Ex. 1002, ¶¶459-462.

- a. Claim 20, [a'] "a plurality of sensors for sensing system parameters of the refrigerant unit; and a receiving unit that gathers and combines data from at least two of the plurality of sensors; wherein:"**

Kane in combination with CN '078 and Staniforth disclose elements [a'] for the reasons set forth in Sections VIII.E.1.b. of this Ground as to [a], incorporated by reference. Ex. 1002, ¶¶454.

Kane discloses "a handheld central or main field test and measurement instrument [and] comprises: a handheld-sized instrument with means for receiving a plurality of (ex. 1 through n) inputs 122 via wireless communications with sensor" Ex. 1014, ¶[0023]. The "the main unit 120 also provides the user/technician with real-time display of the (computed/calculated/estimated) output values (such as, for example, superheat, subcool, combustion efficiency, etc.)." The main unit functions are split between a handheld data interface unit 702 and user interface 708. Ex. 1014, ¶¶[0057], [0064]–[0066]; Ex. 1002, ¶¶456-457.

Through main unit 120, Kane discloses "a receiving unit that gathers and combines data from at least two of the plurality of sensors." Ex. 1002, ¶¶457-458.

b. Claim 20 Conclusion

Kane in combination with CN '078 and Staniforth renders claim 20 obvious.
Ex. 1002, ¶467.

5. Dependent Claim 21

Section VIII.E.4 and sub-parts (claim 20) are incorporated by reference.

a. Claim 21, [1] “the receiving unit comprises a portable electronic device”

Kane discloses that “main unit” 120 for receiving data is “handheld,” portable and electronic. Ex. 1014, ¶[0023], [0058]; Ex. 1014, ¶[0055]. Ex. 1002, ¶469.

b. Claim 21, [2] “the first pressure sensor senses pressure on a high side of the refrigerant system and the second pressure sensor senses pressure on a low side of the refrigerant system, wherein the first pressure sensor and the second pressure sensor are configured for wirelessly communicating pressure sensor data to the portable electronic device;”

Section VIII.E.1.g. is incorporated by reference. Kane discloses “the first pressure sensor senses pressure on a high side of the refrigerant system and the second pressure sensor senses pressure on a low side of the refrigerant system,” as recited. Ex. 1014 at ¶¶[0042]-[0043]; Ex. 1002, ¶¶471-472.

c. Claim 21, [3] “the first temperature sensor clamp has a clamping portion with a temperature sensor to measure temperature about a tube located on the high side of the refrigerant system and the second temperature sensor clamp has a clamping portion with a temperature sensor to measure

***temperature about a tube located on the low side
of the refrigerant system; and”***

Section VIII.E.1.d is incorporated by reference.

Kane disclose a temperature sensor on the high side, and another on the low side. Ex. 1014, ¶¶[0042]–[0043]; Ex. 1002, ¶¶473–474.

d. Claim 21, [4] “at least one of the first temperature sensor clamp and the second temperature sensor clamp includes integrated electronics that are configured for wirelessly communicating temperature sensor data to the portable electronic device.”

Clamping wireless temperatures sensors are taught by Kane in view of CN ‘078, teaching element [4]. Ex. 1002, ¶475.

e. Claim 21 Summary

Kane in combination with CN ‘078 and Staniforth renders claim 21 obvious. Ex. 1002, ¶479.

IX. CONCLUSION

In view of the foregoing, Petitioners submit that there is a reasonable likelihood that Petitioners will prevail with respect to claims 1, 10, 15, 20, and 21 of the ‘051 Patent. Accordingly, Petitioners request that the Board grant this petition and initiate an *inter partes* review.

Dated: March 6, 2023

By: Michael F. Snyder/
Michael F. Snyder
USPTO Reg. No. 58,347

CERTIFICATE OF WORD COUNT

Pursuant to 37 C.F.R. § 42.24(d), the undersigned hereby certifies that the foregoing Petition complies with the type-volume limits of 37 C.F.R. § 42.24(a)(1) because it contains 13,954 words, excluding parts of this Petition exempted under § 42.24(a), as measured by the word-processing system used to prepare this paper.

Dated: March 6, 2023

By: Michael F. Snyder/

Michael F. Snyder

USPTO Reg. No. 58,347

CERTIFICATE OF SERVICE

The undersigned certifies that the foregoing Petition for *Inter Partes* Review, the associated Powers of Attorney, and Exhibits 1001 through 1021 were served on March 6, 2023, on counsel of record for the subject patent and Litigation counsel via UPS Overnight delivery at the addresses below.

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Dated: March 6, 2023

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