

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

Petitioner

v.

PARKER INTANGIBLES LLC,
Patent Owner

IPR2023-00691
U.S. Patent No. 10,739,051

DECLARATION OF JAMES PARKER

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I. INTRODUCTION

1. I, James Parker, submit this declaration to state my opinions on the matter described below.

2. I have been retained by Petitioner TESTO, INC., a/k/a TESTO NORTH AMERICA, AND TESTO SE & CO. KGaA (“Petitioner”), as an independent expert in this proceeding before the United States Patent and Trademark Office (USPTO). Although I am being compensated at my usual and customary rate of \$325.00 (USD) per hour, no part of my compensation depends on the outcome of this proceeding, and I have no other interest in this proceeding. I am not related or affiliated with Patent Owner, Parker-Hannifin Corporation, or Christian D. Parker.

3. I understand that this proceeding involves U.S. Patent No. 10,739,051 (the “’051 Patent” (Ex. 1001)), and I have been asked to provide my opinions as to the patentability of the claims of the ’051 Patent. I understand that the application for the ’051 Patent was U.S. Application No. 16/357,511 (the “’511 Application”), which was filed March 19, 2019 and was a continuation application of U.S. Application No. 14/913,834 (the “’834 Application”), which was a U.S. national stage application of international application PCT/US2015/011900, filed January 19, 2015. I also understand that PCT/US2015/011900 claimed the benefit of U.S. Provisional Application No. 61/929,363, which was filed on January 20, 2014.

4. I have been advised that the '051 Patent claims may or may not be entitled to the benefit of U.S. Provisional Application No. 61/929,363, and if they are not then the effective filing date would not be the filing date of U.S. Provisional Application No. 61/929,363. Likewise, the '051 Patent claims may or may not be entitled to the benefit of PCT/US2015/011900 filing date. Nonetheless, I have been instructed to assume that the effective filing date is January 20, 2014 for purposes of forming my opinions in this matter.

5. I have been asked to consider the validity of certain claims of the '051 Patent based on certain prior art references. I have also been asked to consider the state of the art and prior art available as of January 20, 2014. Based on the prior art discussed in this declaration, it is my opinion that claims 1, 10, 15, 20, and 21 the "Challenged Claims," of the '051 patent are unpatentable for the reasons provided below.

II. QUALIFICATIONS AND BACKGROUND

6. I believe that I am well qualified to serve as a technical expert in this matter based upon my educational and work experience, and specifically, wireless sensors, systems, and devices. My *curriculum vitae* ("CV") is submitted as Exhibit 1003.

7. I earned a diploma in Electronic Engineering Technology from the Radio College of Canada, now RCC Institute of Technology, a Division of Yorkville University, in Toronto, Ontario, Canada in 1982.

8. I was an Engineering Technologist with Thermetic Controls Limited in 1983, a Technical Sales Representative at Har-Tech Electronics Ltd. in 1984, and Vice President of Engineering at Swinemaster Inc. from 1984 to 1985.

9. I was the Head of Engineering at Digital Security Controls (DSC) Limited starting in 1985. Tyco Security Products (TYCO) then acquired DSC. I was then Vice President of Engineering at TYCO until December 2003.

10. I was the co-founder and President of EE-Systems Group Inc. (EE-SGI) Canada (R&D) from 2004–2014. I was responsible for new product development.

11. I am currently a consultant at Parker Security Consulting Inc. (PARSEC), which I founded to provide technical consulting and expert witness services in electronics research and development, new product development, electronic security systems and sensors, and other areas.

12. While at EE-SGI, I developed several new technologies such as ePIR for motion detection, eLEDing for high efficiency LED illumination and eFAR for significant false alarm reduction.

13. While at DSC/Tyco, I was the principal architect and driving force behind most of DSC's major commercial product successes. These include the

industry benchmark setting “Power” and “Maxsys” families, and the PC1550, which is one of the most prolific alarm control panels in the world with an installed base in the millions.

14. I developed the KEYBUS and COMBUS protocols for interconnecting components. These protocols have a proven track record and have been widely imitated and copied. I also developed DSC’s wireless protocols for both 924 Mhz DSSS (Direct Sequence Spread Spectrum) and Mhz tight narrow band.

15. I conceived and drove the development of over twelve mixed mode ASIC’s (Application Specific Integrated Circuits). Mixed mode ASIC’s combine analog and digital circuitry on a single chip. They offer superior capabilities and performance to “off the shelf” solutions while dramatically reducing cost and improving product reliability.

III. MATERIALS CONSIDERED

16. In forming my opinions, I reviewed the following documents:

Exhibit	Description
Ex. 1001	U.S. Patent No. 10,739,051 to Parker et al. (the ’051 Patent)
Ex. 1004	Prosecution History of U.S. Patent No. 10,739,051
Ex. 1005	Prosecution History of U.S. Patent No. 10,281,183

Exhibit	Description
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 Field Manual Model HG3” (Fieldpiece-M)
Ex. 1014	U.S. Pre-Grant Publication No. 2013/0245965 (Kane)

IV. LEGAL STANDARDS

17. In forming my opinions and considering the subject matter of the '051 patent and its claims in light of the prior art, I am relying on certain legal principles

that counsel for the Petitioner in this case explained to me. My understanding of these concepts is summarized below.

18. I understand that the claims of a patent define the invention.

19. I understand that an unpatentability analysis is a two-step process. First, the claims of the patent are construed to determine their meaning and scope. Second, the content of the prior art is compared to the construed claims.

20. I understand that a patent claim is only patentable over “prior art” when it is new and non-obvious in light of the prior art. That is, the invention as defined in the claims of the patent must not be anticipated by or rendered obvious by the prior art.

A. Claim Construction

21. I have been advised that the USPTO interprets claim terms in *inter-partes* review proceedings under the same claim construction standards used in the United States federal courts, and that under these standards, the meaning of claim terms is considered from the viewpoint of one of ordinary skill in the art at the time of the invention.

22. I have been further advised that claim terms are generally given their plain and ordinary meaning in light of the specification and prosecution history pertaining to the patent. I understand, however, that claim terms are not generally limited to specific embodiments described in the specification.

B. Anticipation Under 35 U.S.C. § 102

23. I have been advised that 35 U.S.C. § 102 lists the standard for when a patent claim is anticipated and is, thus, unpatentable as follows:

(1) the claimed invention was patented, described in a printed publication, or in public use, on sale, or otherwise available to the public before the effective filing date of the claimed invention; or

(2) the claimed invention was described in a patent issued under section 151, or in an application for patent published or deemed published under section 122(b), in which the patent or application, as the case may be, names another inventor and was effectively filed before the effective filing date of the claimed invention.

24. I have been advised that this means that a patent claim is unpatentable under 35 U.S.C. § 102 if its subject matter was patented or described in a printed publication before the effective filing date of the claimed invention, and this grounds for unpatentability is referred to as “anticipation.” I have also been advised that a patent claim is anticipated, or lacks novelty, if a single prior art reference discloses every element of the claim.

25. I have been advised that a reference may inherently disclose an element of an invention if the element is necessarily present in the technology disclosed even though it may not have been explicitly stated in the reference.

C. Obviousness Under 35 U.S.C. § 103

26. I have been advised that that that 35 U.S.C. § 103 lists the statutory standard for obviousness, and states:

A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

27. I understand that obviousness can be established over one prior art reference or a combination of references that teach the invention.

28. I understand that a patent claim is unpatentable as obvious if the claimed invention would have been obvious to a person of ordinary skill in the art at the time the claimed invention was made. This, I have been advised, means that even if all of the elements of the claim cannot be found in a single prior art reference such that the single prior art reference would anticipate the claim, a person of ordinary skill in the art who knew about the prior art would have come up with the claimed invention. I understand that in an obviousness determination, the person of ordinary skill in the art is presumed to have knowledge of all material prior art. I also

understand that whether a claim is obvious is based upon the determination of several factual issues.

29. I have been advised that obviousness is a determination of law based on underlying determination of fact.

30. I understand that this underlying determination of fact includes determining (i) the scope and content of the prior art; (ii) differences between the prior art and the claims at issue; and (iii) the level of ordinary skill in the pertinent art. With these determinations, I have been advised, the obviousness or non-obviousness of the subject matter is determined – whether one prior art reference or a combination of references teach the claimed invention. I have also been advised, that secondary considerations of non-obviousness must be determined.

31. I understand that one must determine what differences, if any, existed between the claimed invention and the prior art.

32. I understand that a patent claim composed of several elements is not proved obvious merely by demonstrating that each of its elements was independently known in the prior art. In evaluating whether such a claim would have been obvious, one may consider whether a reason has been identified that would have prompted a person of ordinary skill in the art to combine the elements or concepts from the prior art in the same way as in the claimed invention. There is no single way to define the line between true inventiveness on the one hand (which is patentable) and the

application of common sense and ordinary skill to solve a problem on the other hand (which is not patentable). For example, market forces or other design incentives may be what produced a change, rather than true inventiveness.

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

34. I understand that one may consider, for example, whether (1) the change was merely the predictable result of using prior art elements according to their known functions, or whether it was the result of true inventiveness; (2) there is some teaching or suggestion in the prior art to make the modification or combination of elements claimed in the patent; (3) the claimed innovation applies a known technique that had been used to improve a similar device or method in a similar way; (4) the claimed invention would have been obvious to try, meaning that the claimed innovation was one of a relatively small number of possible approaches to the problem with a reasonable expectation of success by those skilled in the art; (5) the

invention merely substituted one known element for another known element in order to obtain predictable results; (6) the invention merely applies a known technique to a known device, method, or product to yield predictable results; or (7) known work in the field may have prompted variations of use of the same inventions in the same or different fields due to market forces or design incentives that would have been predictable to a person of ordinary skill in the art.

35. I understand that any assertion of secondary considerations of non-obviousness must be accompanied by a nexus between the merits of the invention and the evidence offered.

36. I have been advised that the motivation to combine teachings in prior art references may be found explicitly or implicitly in market forces; design incentives; the interrelated teachings of multiple patents; any need or problem known in the field of endeavor at the time of invention and addressed by the patent; and the background knowledge, creativity, and common sense of the person of ordinary skill in the art.

37. I understand that a reference that is (1) from the same field of endeavor as the claimed invention (even if it addresses a different problem); or (2) reasonably pertinent to the problem faced by the inventor (even if it is not in the same field of endeavor as the claimed invention) may be used to establish claims are obvious.

V. The '051 Patent

A. Overview of the '051 Patent

38. The '051 Patent relates to a sensor system for refrigeration units: “The present invention 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. Refrigeration units are equipment that is broadly used in “heating, ventilation, air conditioning and refrigeration (HVACR) systems.” *Id.*, 1:21–24.

39. The '051 Patent describes certain sensor systems that existed prior to the effective filing date in the “BACKGROUND OF THE INVENTION,” and states “FIG. 1 depicts a conventional gauge set used for monitoring and collecting system conditions of a refrigerant unit such as pressure, which may then be used to calculate system parameters such as superheat and subcooling.” Ex. 1001, 1:26–30. The prior art sensors for a refrigerant unit included two pressure sensors: “There is a set of analog pressure gauges 14, typically a high side pressure gauge . . . and a low side pressure gauge . . .” (*Id.*, 1:35–38), and two temperature sensors: “FIGS. 2 and 3 (FIG. 3 being a more close-up view) depict the installation of the conventional gauge set 10 and temperature sensors 16 within an air conditioning unit 18.” *Id.*, 1:51–53, underline added. A technician would use the temperature and pressure readings from these sensors to then “manually calculate superheat and supercooling.” *Id.*, 1:53–55.

40. The '051 Patent points out problems in the prior art pressure gauges, which would have a “length of the hoses to the analog or digital gauges at the manifold to display pressure.” Ex. 1001, 1:60–62. The problems included the following. The refrigerant in conventional gauge hoses had to be collected and reclaimed, rather than released to the environment. *Id.*, 1:64–66. Refrigerant trapped in the hoses required reservation of one set of hoses for only those HVAC systems using the same one type of refrigerant. *Id.*, 2:1–20. This deficiency required a technician to carry multiple gauge sets – one for each type of refrigerant that might be encountered. *Id.* Otherwise, cross-contamination would lead to gauge damage and reduced HVACR system performance. *Id.* The lengthy hoses were bulky, and inconvenient to transport, weighty and difficult to manage — especially on ladders and roofs. *Id.*, 2:21–27. Also, conventional gauge sets required a technician to stand next to the gauges to read them, or a first technician to stand next to and read a gauge, and a second technician in radio communication with the first and receiving reports from the first via radio. *Id.*, 2:27–33. Finally, the “close distance requirements of conventional analog gauge sets” provided another deficiency in the prior art. *Id.*

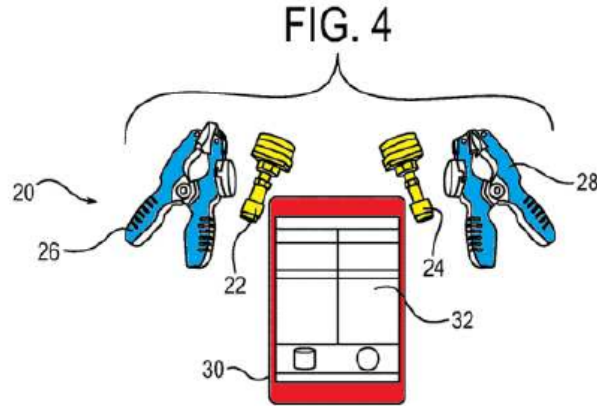
41. The '051 Patent describes the solution to these problems in the prior art: wireless communication from sensors to a remote device that can calculate system conditions:

The described invention is a hoseless system of individual hose-free sensors that are installed on a refrigeration or air conditioning system. Sensor information may be transmitted wirelessly to a remote device, such as a portable electronic device (e.g., tablet computer, laptop computer, smartphone, or the like). The portable electronic device may have installed a software or program application that receives the sensor information and calculates automatically system conditions, such as for example superheat and subcooling.

Ex. 1001, 2:39–48, underline emphasis added.

42. In comparison to the conventional systems described in the “BACKGROUND OF THE INVENTION” section, all that is added by the ’051 Patent claims is “hoseless” or “wireless” communication between sensors and a portable electronic device.

43. At FIG. 4, the ’051 Patent illustrates “an exemplary hoseless sensor system for use in sensing parameters and determining system conditions” (Ex. 1001, 3:58–60), and a color-coded copy of FIG. 4 follows.



Ex. 1001, FIG. 4

44. FIG. 4 of the '051 Patent includes two temperature sensors 26, 28 (Blue), two pressure sensors 22, 24 (Yellow), and a portable electronic device 30 (Red). Ex. 1001, 4:59–5:13.

45. The '051 Patent refers to both the temperature sensors and both the pressure sensors as “hoseless,” states that they “transmit pressure and temperature data to the portable electronic device preferably by a wireless communication.” sensors. Ex. 1001, 4:59–64;6:9–11.

46. According to the '051 Patent, the portable electronic device “may calculate system conditions based on sensor parameters measured by the plurality of hoseless sensors.” Ex. 1001, 5:3–5.

B. Person of Ordinary Skill in the Art

47. I was advised that patentability must be analyzed from the perspective of “one of ordinary skill in the art” in the same field as the '051 patent at the time of the invention. I was also advised that several factors are considered in assessing the

level of ordinary skill in the art, including (1) the types of problems encountered in the art; (2) the prior art solutions to those problems; (3) the rapidity with which innovations are made; (4) the sophistication of the technology; and (5) the education level of active workers in the field.

48. In my opinion, one of ordinary skill in the art, that is, a person of ordinary skill in the art (POSITA), 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.

49. Although my training and experience surpassed the above definition of a POSITA at the effective filing date of the '051 patent, January 20, 2014, my analysis was from the perspective of a POSITA as of January 20, 2014.

50. I am also familiar with the knowledge of the POSITA as of January 20, 2014. I am able to opine on how a POSITA would have understood the disclosure and claims of the '051 Patent, the disclosures of the prior art, the motivation to combine the prior art, and what combinations would have been obvious to a POSITA prior to the priority date of the '051 Patent, January 20, 2014.

VI. CLAIM CONSTRUCTION AND OVERVIEW OF GROUNDS

51. I understand that the United States Patent and Trademark Office interprets claim terms in an *inter partes* review proceeding under the same claim construction standard that is used in a United States federal court. I understand that under this standard, the meaning of claim terms is considered from the viewpoint of one of ordinary skill in the art at the time of the alleged invention.

52. I have been informed that claim terms are generally given their ordinary and customary meaning as understood by one of ordinary skill in the art in light of the specification and the prosecution history pertaining to the patent. I understand that in addition to the claims, specification, and prosecution history, other evidence may be considered to ascertain the meaning of claim terms, including textbooks, encyclopedias, articles, and dictionaries, although this evidence is secondary to the claims, specification, and prosecution history.

53. I have been asked to assume that the claim terms have their plain and ordinary meaning to a POSITA in light of the specification and the prosecution history at the time of the invention. I expect to respond in the event that the Patent Owner proposes or the Board adopts a different construction. As of this point in the proceedings, I am not aware of anything in the prosecution history of the '051 Patent that would change my opinions in this declaration.

54. Each of claims 10, 15, and 20 recites a connection between integrated electronics in a temperature sensor clamp and a sensor element: “integrated electronics . . . *in signal communication* with the sensor element.” Ex. 1001, 12:59–62; 13:29–32; and 14:18–21. The term “in signal communication” does not appear anywhere else in the ’051 Patent. The word “signal” appears only three times in the ’051 Patent, in claims 10, 15, and 20. The only connection between the “integrated electronics” and the “sensor element” described in the ’051 Patent is “in electrical connection.” Ex. 1001, 8:1–2;9:50–52;11:1–3;11:50–53. In light of the specification, it is my opinion that the phrase “in signal communication” must include the concept of and encompass “in electrical connection.”

55. ***Grounds of Unpatentability:***

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

Grounds of Unpatentability	
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

56. The Challenged Claims share certain claim language verbatim, as noted below. The following bracketed designations are used uniformly throughout my Declaration to indicate and track the shared identical claim language:

- i. Claims 1, 15, and 20, **[Preamble]** “A sensor system for a refrigerant unit comprising:”
- ii. Claims 1 and 15, **[a]** “a plurality of sensors for sensing system parameters of the refrigerant unit, wherein:”
- iii. Claims 1, 15, and 20 **[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;”
- iv. Claims 1 and 15, **[c]** “the first and second pressure sensors each comprises a connector that connects to a tube of the refrigerant unit;”
- v. Claims 1, 15, and 20, **[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;”

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

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

viii. Claims 1 and 15, [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.”

VII. GROUND 1: FIELDPIECE-B IN COMBINATION WITH FIELDPIECE-M RENDERS CLAIMS 1, 10, 15, 20, AND 21 UNPATENTABLE UNDER 35 U.S.C. § 103

57. Fieldpiece-B is from the same field of endeavor as the '051 Patent, namely sensor systems for HVACR. For example, Fieldpiece-B discloses “FULL SYSTEM ANALYSIS IN REAL TIME,” a variety of sensors, and a “WIRELESS HG3 System Analyzer [that] walks you step-by-step through critical HVAC tests.” Ex. 1006, Pgs. 1–2. Further, both Fieldpiece-B and the '051 Patent are directed to solving problems similar to the problems addressed by the '051 Patent, namely, a

“need in the art for an improved sensor system for refrigeration units for monitoring and collecting system conditions such as superheat and subcooling.” Ex. 1001, 2:37–39.

58. Fieldpiece-M is also from the same field of endeavor as the ‘051 Patent, namely sensor systems for HVACR. For example, Fieldpiece-M relates to an “HVAC Guide® System Analyzer” and wireless sensors that transmit data to it for, among other purposes, testing “Superheat” and “Subcooling” in an HVAC system. Ex. 1013, Pg. 2. Further, both Fieldpiece-M and the ‘051 Patent are directed to solving problems similar to the problems addressed by the ‘051 Patent, namely, a “need in the art for an improved sensor system for refrigeration units for monitoring and collecting system conditions such as superheat and subcooling.” Ex. 1001, 2:37–39.

59. Fieldpiece-B and Fieldpiece-M disclose and both are related to the HG3 System Analyzer, and sensors that wirelessly communicate with it, for HVAC system analysis. Ex. 1003, Pg. 1; Ex. 1013, Pg. 2. A POSITA would have looked to both Fieldpiece-B and Fieldpiece-M, which are complementary references, when considering solving a “need in the art for an improved sensor system for refrigeration units for monitoring and collecting system conditions such as superheat and subcooling.” Ex. 1001, 2:37–39.

A. Independent Claim 1

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

60. Fieldpiece-B discloses a sensor system for a refrigerant unit in at least with its “Full A/C Diagnostic Kit.” Ex. 1006, Pg. 4. The text describing this sensor system states “Full A/C Diagnostic Kit — THE most accurate way to do a full system diagnosis, the HG3K18AC uses all wireless measurements to get real-time data for the CheckMe!® Test. Includes nine ET2W wireless transmitters and nine accessory heads.” *Id.*

61. Likewise, Fieldpiece-M discloses a sensor system for a refrigerant unit. Ex. 1013, Pgs. 12-13.

62. It is my opinion that both Fieldpiece-B and Fieldpiece-M disclose a “sensor system for a refrigerant unit,” as recited in claim 1 of the ‘051 Patent.

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

63. An image of the Full A/C Diagnostic Kit is reproduced below from Exhibit 1006, Pg. 4:



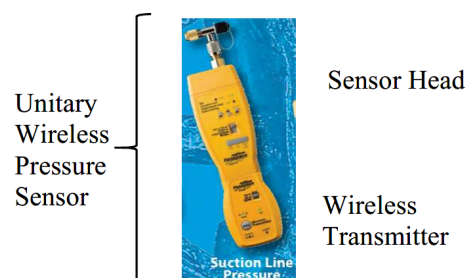
Ex. 1006, Pg. 4 – Full A/C Diagnostics Kit

64. Fieldpiece-B explains that a “ET2W wireless transmitter” and “any” accessory head are combined into a single unit to provide a wireless sensor:

Simply slide any Fieldpiece Accessory Head onto the ET2W wireless transmitter to make any head a wireless measuring device.

Ex. 1006, Pg. 3.

65. The result of combining a pressures sensor head with the wireless transmitters is pictured at Pg. 1 of Fieldpiece-B as a unitary, wireless pressure sensor combining a pressure sensor head with a ET2W wireless transmitter:



Ex. 1006, Pg. 1

66. In view of the disclosure of a wireless pressure sensor in Fieldpiece-B, a POSITA would understand that all of the nine ET2W wireless transmitters and nine accessory heads of the Full A/C Diagnostic Kit are respectively combined into a plurality of wireless sensors.

67. Fieldpiece-M also discloses recording 13 system parameters “at the same time,” and, thus, discloses at least 13 sensors: “Attach any Fieldpiece Accessory Head to the ET2W or EH4W to view or log measurements on your HG3 in real-time. The HG3 has the capability to wirelessly and simultaneously read up to 12 signals. A 13th accessory head can be attached directly to the HG3 and gives you the ability to record 13 parameters at the same time.” Ex. 1013, Pg. 12. Further, Fieldpiece-M discloses “Set up the Fieldpiece Accessory Heads at multiple locations on the system with the wireless transmitters. . . .” Ex. 1013, Pg. 2.

68. It is my opinion that Fieldpiece-B and Fieldpiece-M disclose [a] “a plurality of sensors for sensing system parameters of the refrigerant unit,” as recited in claim 1 of the ‘051 Patent.

3. Claim 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”

69. An image of the Full A/C Diagnostics Kit from Fieldpiece-B is reproduced below, with annotations, showing the Full A/C Diagnostics Kit with two temperature sensors (Blue) and two pressure sensors (Yellow):



Ex. 1006, Pg. 4

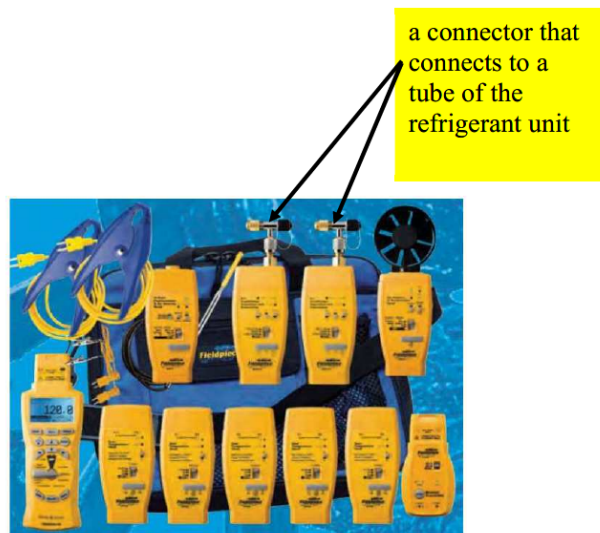
70. It is my opinion that Fieldpiece-B discloses **[b]** “the plurality of sensors comprises a first pressure sensor and a second pressure sensor, and a first temperature sensor and a second temperature sensor,” as recited in claim 1 of the ‘051 Patent.

71. Further, Fieldpiece-M discloses that the HG3 can receive 13 system parameters, 12 of them wirelessly, at the same time. Fieldpiece-M also discloses detecting suction line pressure and temperature with a first pressure sensor and a first temperature sensor for obtaining the system parameters for superheat analysis. Ex. 1013, Pg. 23. Fieldpiece-M also 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. 29. Fieldpiece-M also suggests that use of the discloses system makes the job “easier, faster and better.” Ex. 1013, Pg. 1.

72. It is my opinion that the combined disclosures in Fieldpiece-M of (1) faster results, (2) receiving 12 wirelessly transmitted system parameters, (3) a first and second temperature sensor, and (4) a first and second pressure sensor teach element [b].

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

73. An image of the Full A/C Diagnostics Kit from Fieldpiece-B is reproduced below, with annotations, showing pressure sensors having connectors:



Ex. 1006, Pg. 4

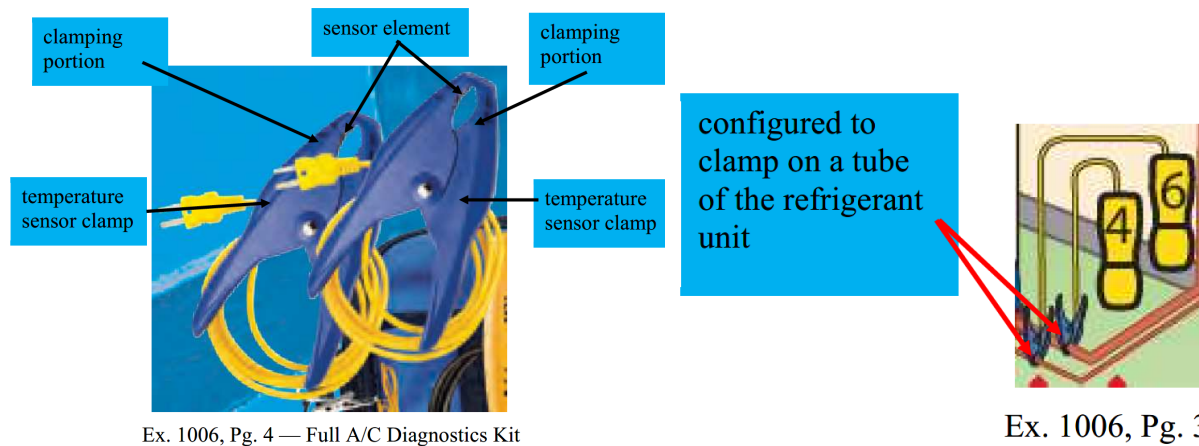
74. In my opinion, Fieldpiece-B discloses [c] “the first and second pressure sensors each comprises a connector that connects to a tube of the refrigerant unit,” as recited in claim 1 of the ‘051 Patent.

75. 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. It is my opinion that Fieldpiece-M disclose element [c].

5. ***Claim 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;”***

76. An image from Fieldpiece-B showing the Full A/C Diagnostics Kit alongside an image of the temperature sensor claims clamped on a tube of the refrigerant unit is copied below with annotations:



77. In my opinion, Fieldpiece-B discloses [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,” as recited in claim 1 of the ‘051 Patent.

78. Fieldpiece-M also discloses this element as follows.

79. Fieldpiece-M also illustrates temperature sensor clamps having a clamping portion:



Ex. 1013, Pg. 15

Ex. 1013, Pg. 23

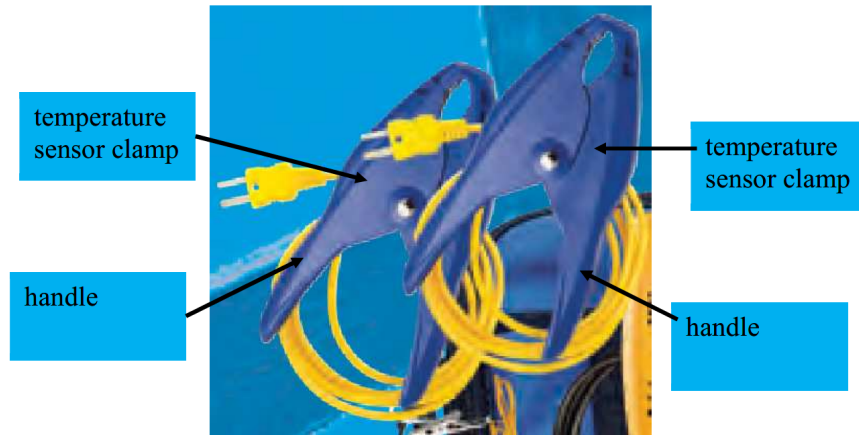
Ex. 1013, Pg. 29

80. As shown above, 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. The “sensor element to measure temperature about the tube” may not be explicitly written, but it is necessarily present in each clamping portion.

81. It is my opinion that Fieldpiece-M disclose element [d].

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

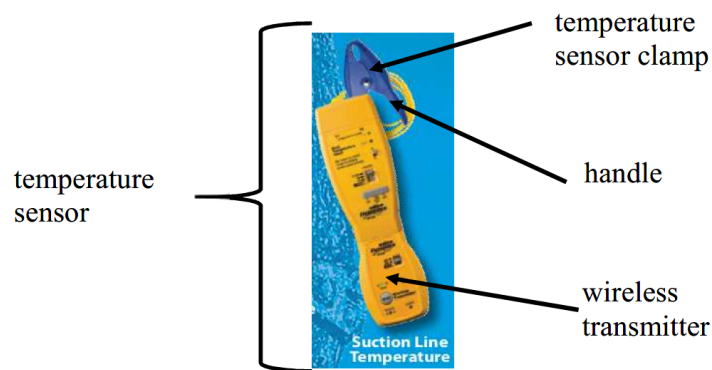
82. The same image of Full A/C Diagnostics Kit is copied below with different annotations to highlight that each clamp includes a handle:



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

83. It is my opinion that each of the above illustrated temperature sensor clamps necessarily include integrated electronics to convert sensed temperatures to a signal carried by the cable, and deliver the signal to the wireless transmitter.

84. Further, the below image reproduced from Fieldpiece-B showing an isolated, wireless temperature sensor from Fieldpiece-B. It is my opinion the temperature sensor clamp necessarily includes integrated electronics, including the headpiece integrated with the wireless transmitter, that carry the sensed temperature data to the wireless transmitter:



Ex. 1006, Pg. 1

85. It is my opinion that Fieldpiece-B discloses [e] “each of the first temperature sensor clamp and the second temperature sensor clamp further comprises a handle and integrated electronics,” as recited in claim 1 of the ‘051 Patent.

86. Each of the temperature sensor clamps illustrated Fieldpiece-M, as copied above, for element [d], also has a handle.

87. Also at “Accessory Head Descriptions,” Fieldpiece-M discloses “ATH4: Temperature with thermocouples (includes wet bulb and dry bulb thermocouples). Accepts an K-Type thermocouples. Ex. 1013, Pg. 72.

88. In the next section Fieldpiece-M states “K-Type Thermocouples,” Fieldpiece-M discloses “ATC1: Pipe Clamp thermocouple” and “ATC1R: Pep clamp thermocouples.” Ex. 1013, Pg. 73.

89. It is my opinion that a thermocouple is a form of “integrated electronics” as it not only acts as a sensor element but also transforms sensed temperature to electrical signal. Further the electrical signal must be transmitted. The temperatures sensor clamps of Fieldpiece-M include integrated electronics. It is my opinion that Fieldpiece-M discloses element [e].

7. ***Claim 1, [f'] “the integrated electronics are incorporated into the handle and in electrical connection with the sensor element; and”***

90. This claim 1 element is noted as [f'] because it varies from the above noted element [f], which appears in claims 10, 15, and 20. In particular, claim 1 recites “in electrical connection,” where claims 10, 15, and 20 recite “in signal communication.”

91. Fieldpiece-B discloses “Wireless Signal from 100' Away,” “12 Wireless Measurements at the Same Time,” and obtaining a “complete live system snapshot.” Ex. 1006, Pg. 3. Any assembly of sensors disclosed in Fieldpiece-B including 12 sensors to take “12 Wireless Measurements at the Same Time” could be bulky and more difficult to work with in practice. 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.

92. It is my opinion that a POSITA would have understood as of January 20, 2014 that wireless technology capable of being received 100 feet away was commonplace and could have been incorporated in the temperature sensor clamps successfully. For example, Bluetooth was easily capable of reaching beyond 100 feet (up to 300 feet as per the standard in place at the time). Bluetooth technology was

also sufficiently miniaturized as to be in popular use in a myriad of small electronic devices, including smartphones, wireless headphones and hands-free headsets such as those types that fit on or over the ear.

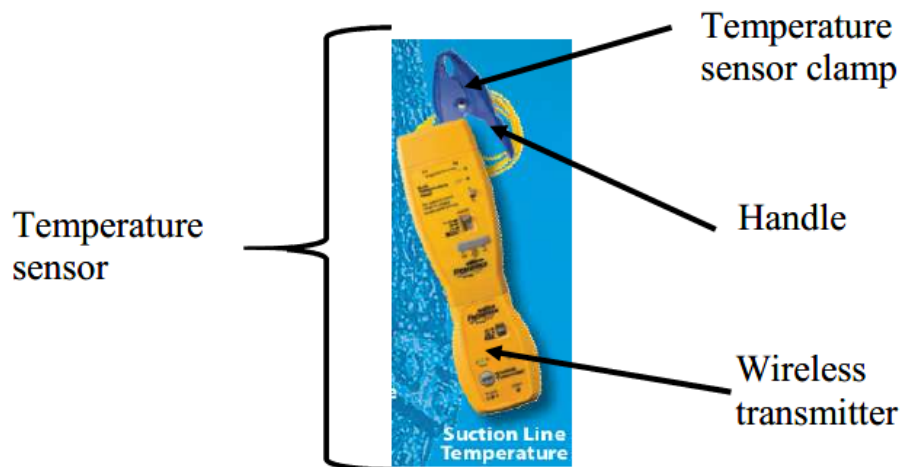
93. Still further, as noted above, Fieldpiece-B teaches that one can “simply slide any Fieldpiece Accessory Head onto” a wireless transmitter. It is my opinion that, based on Fieldpiece-B, a POSITA would have been motivated by these teachings to place suitably configured wireless transmitters, a form of integrated electronics, into the temperature sensor handles, and in electrical connection with the sensor elements without necessarily having a wire extending from the clamp.

94. With respect to Fieldpiece-M, it is my opinion that the portion of the temperature sensor clamps engaging either the refrigerant line (suction line or liquid line, above) necessarily includes a sensor element to measure temperature about the tube illustrated. It is further my opinion that the integrated electronics are necessarily connected to the integrated wireless transmitter taught in the handle in order to transmit temperature data.

95. It is my opinion that both Fieldpiece-B and Fieldpiece-M teach **[f’]** “the integrated electronics are incorporated into the handle and in electrical connection with the sensor element” as recited in claim 1 of the ‘051 Patent.

8. ***Claim 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.”***

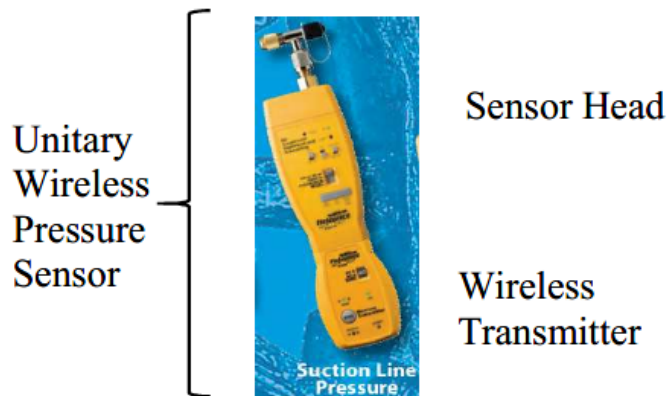
96. The first part of element [g] only recites “no external physical electrical connections that extend from the first and second temperature sensors.” Fieldpiece-B discloses temperature sensors that are wireless and, thus, have no external physical electrical connection. Reproduced below is an annotated image from Fieldpiece-B, showing a temperature sensor with no external electrical connections:



Ex. 1006, Pg. 1

97. It is my opinion that Fieldpiece-B discloses “there are no external physical electrical connections that extend from the first and second temperature sensor.”

98. The second part of element [g], regarding the “pressure sensors,” reproduced below is an annotated image from Fieldpiece-B, showing the wireless pressure sensor from Pg. 1 of Exhibit 1006:



Ex. 1006, Pg. 1

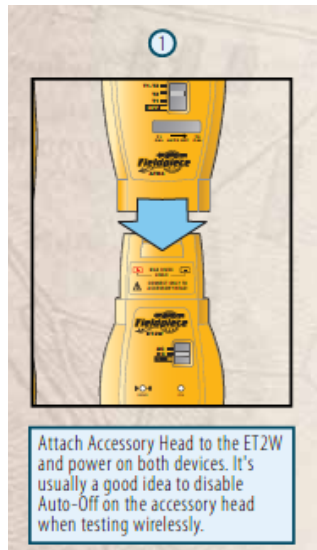
99. As can be seen from the image, there are no physical fluidic connections that extend from the first and second pressure sensor and oppositely from the connector.

100. The “Full A/C Diagnostics Kit . . . Includes nine ET2W wireless transmitters and nine accessory heads.” Ex. 1006, Pg. 4. A POSITA would have understood that every one of the nine accessory heads, including the two pressure and the two temperature sensor heads, can each be modified by attaching its own ET2W wireless transmitter. Further the modification is not through an external wire or hose leading from the sensor toward the portable electronic device.

101. The two wireless pressure sensors of the Full A/C Diagnostics Kit have connectors, but no physical fluidic connections oppositely from the connectors.

102. It is my opinion that Fieldpiece-B discloses [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,” as recited in claim 1 of the ‘051 Patent.

103. Likewise, Fieldpiece-M teaches the option of “Wirelessly Using a Fieldpiece Transmitter” and that for this option “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. 32. The “Wireless Testing” section of Fieldpiece-M repeats the suggestion to “simultaneously read up to 12 signals” wirelessly, and details combining any accessory head to a “ET2W” to make a wireless sensor. See Ex. 1013, Pg. 12:



104. As shown, the combination of accessory head and wireless transmitter creates an integrated, unitary wireless sensor.

105. With a selection of 12, simultaneous signals, Fieldpiece-M suggest combining 12 accessory heads with 12 ET2W. (Ex. 1013, Pgs. 10 and 12)

106. Further, the teaching to perform tests “fast” suggests modifying the superheat and subcool arrangements illustrated therein (Ex. 1013, Pgs. 23 and 29) 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).

107. It is my opinion that as taught and suggested, none of the wireless temperature sensors would have an external physical electrical connection, none of the wireless pressure sensors would have external physical fluidic connections that

extend from them oppositely the connectors, nor would the HG3 have an external physical connection of any type.

108. It is my opinion that Fieldpiece-M teaches element [g].

9. *Claim 1 Summary and Conclusion*

109. A POSITA would have combined the teachings of Fieldpiece-B in combination with Fieldpiece-M to provide for wireless sensors in combination for HVACR analysis as taught in Fieldpiece-B in combination with Fieldpiece-M.

110. Based on the foregoing analysis, it is my opinion that a POSITA would appreciate that the complementary disclosures in Fieldpiece-B and Fieldpiece-M teach incorporation of wireless technology in HVACR sensors configured to transmit data to a remote, portable electronic device used for analysis of HVACR systems. A POSITA would recognize that the temperature sensors therein could be improved by placing wireless technology and integrated electronics into the temperature sensor clamp handles of Fieldpiece-B or Fieldpiece-M, including the two temperature sensor clamp handles in the Full A/C Diagnostic Kit, in order to enhance usability of the assembled sensor system components. A POSITA would have found it obvious to make such a modification and would have predicted success of this combination.

111. A POSITA would have been motivated to combine HVACR sensors and wireless technology in order to reduce the bulk, number, and arrangement of

components required in the field. Instead of two temperature sensor clamps, and their respective tethered headpiece-wireless transmitter units of Fieldpiece-B or Fieldpiece-M, the modification 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. A POSITA would also have been motivated to make the combination of wireless sensors and a wireless remote computer in order to eliminate distance constraints imposed by cables or hoses connecting sensors to each other, or to the remote device collecting sensed data. A POSITA would have understood that without such distance constraints, 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, and without the need for a technician to physically approach, read, and record data from each sensor. A POSITA would also have known based on the state of the art at the time that wireless communication was predictably effective, and would have expected success at the combination of wireless technology in HVACR sensors and remote devices.

112. Accordingly, it is my opinion that Fieldpiece-B in combination with Fieldpiece-M renders claim 1 of the '051 Patent obvious.

B. Independent Claim 10

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

113. Fieldpiece-B discloses a temperature clamp in its Full A/C Diagnostics Kit. Ex. 1006, Pg. 4. It is my opinion that Fieldpiece-B discloses this preamble.

114. Likewise, Fieldpiece-M discloses a temperature clamp. Ex. 1013, Pg. 23. Fieldpiece-M discloses this preamble.

2. ***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”***

115. This element is similar to claim 1, element **[d]**. Claim 10 is, however, directed to one “temperature sensor clamp,” while claim 1 recites “the first and second temperature sensors each comprises a temperature sensor clamp. . . .” The single temperature sensor clamp recited in claim 10 includes the same features as recited for each of the temperature sensor clamps in claim 1. The previous discussion of claim 1, element **[d]** in Section VII.A.5. is incorporated herein and applied to claim 10. It is my opinion that both Fieldpiece-B and Fieldpiece-M discloses claim 10, element **[d’]** for at least the same reasons as discussed for claim 1, element **[d]**.

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

116. This element is similar to claim 1, element [e]. Claim 10 is, however, directed to one "temperature sensor clamp," while claim 1 recites "the first and second temperature sensors each comprises a temperature sensor clamp. . . ." The discussion of claim 1, element [e] in Section VII.A.6. is incorporated herein and applied to claim 10. It is my opinion that both Fieldpiece-B and Fieldpiece-M disclose claim 10, element [e'] of the '051 Patent for at least the same reasons as discussed for claim 1, element [e].

4. 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"

117. The discussion of claim 1, element [f'] in Section VII.A.7. is incorporated herein and applied to claim 10. As outlined therein, a POSITA would have placed suitably configured wireless transmitters; a form of integrated electronics, into the temperature sensor handles, and in electrical connection with the sensor elements.

118. Claim 10, element [f] differs from claim 1 element [f'] in reciting that the integrated electronics "incorporated into a portion of the temperature sensor clamp," rather than "into the handle" as in claim 1. A "portion" includes the "handle." For at least the same reasons as set forth for claim 1, element [f'] of the

‘051 Patent, Fieldpiece-B teaches [f] “the integrated electronics are incorporated into a portion of the temperature sensor clamp.”

119. Further, “a portion of the temperature sensor clamp” includes the junction between the sensor element and electronics. That is, the thermocouple transforms temperature into an electrical signal, which is necessarily present in Fieldpiece-B temperature sensor clamps and in electrical connection to the sensor element. Taking this into considering, it is my opinion that Fieldpiece-B discloses “the integrated electronics are incorporated into a portion of the temperature sensor clamp” of claim 10, element [f].

120. Still further, Fieldpiece-M discloses the thermocouple: “Accessory Head Descriptions,” Fieldpiece-M discloses “ATH4: Temperature with thermocouples (includes wet bulb and dry bulb thermocouples). Accepts any K-Type thermocouples. Ex. 1013, Pg. 72.” Also, “K-Type Thermocouples,” Fieldpiece-M discloses “ATC1: Pipe Clamp thermocouple” and “ATC1R: Pipe clamp thermocouples.” Ex. 1013, Pg. 73.

121. Fieldpiece-B in combination with Fieldpiece-M disclose ““the integrated electronics are incorporated into a portion of the temperature sensor clamp.”

122. Claim 10, element **[f]** also differs from claim 1, element **[f']** in reciting that the “integrated electronics . . . are in signal communication with the sensor element.”

123. As set forth in the Claim Construction and Overview of Grounds Section VI, “in signal communication” must include “in electrical connection” as outlined in the '051 Patent. In addition, element **[f']** in claim 1 recites “integrated electronics are . . . in electrical connection with the sensor element.” For at least the same reasons as discussed for claim 1, element **[f']** (Section VII.A.7), it is my opinion that both Fieldpiece-B and Fieldpiece-M disclose **[f]** “integrated electronics . . . are in signal communication with the sensor element.”

124. It is my opinion that both Fieldpiece-B and Fieldpiece-M disclose **[f]** “the integrated electronics are incorporated into a portion of the temperature sensor clamp and are in signal communication with the sensor element,” as recited in claim 10 of the '051 Patent. In addition, to the extent that “a portion” also includes the junction between the sensor element and electronics, it is my opinion that both Fieldpiece-B and Fieldpiece-M discloses element **[f]** of claim 10 of the '051 Patent.

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

125. Claim 1, element **[g]** recites “there are no external physical electrical connections that extend from the first and second temperature sensors,” while claim 10, element **[g']** recites “wherein the temperature sensor clamp has no external

physical electrical connections.” For at least the same reasons as set forth with respect to claim 1, element [g] in Section VII.A.8., which is incorporated here, both Fieldpiece-B and Fieldpiece-M teach “wherein the temperature sensor clamp has no external physical electrical connections,” as recited in claim 10 of the ‘051 Patent. In addition, see Section VII.A.6.–7.; a POSITA would have moved wireless technology into temperature sensor handles, and, as such, the temperature sensor clamps would have no external physical connections.

6. *Claim 10 Summary and Conclusion*

126. A POSITA would have combined the teachings of Fieldpiece-B in combination with Fieldpiece-M to provide for a wireless sensor clamp for HVACR analysis as taught in Fieldpiece-B in combination with Fieldpiece-M.

127. Based on the foregoing analysis, it is my opinion that a POSITA would appreciate that the complementary disclosures in Fieldpiece-B and Fieldpiece-M teach incorporation of wireless technology in HVACR sensors for use in HVACR sensor systems. A POSITA would recognize that Fieldpiece-B temperature sensor could be improved by placing wireless technology in a portion of the temperature sensor clamps of Fieldpiece-B or Fieldpiece-M in order to enhance the usability of the assembled sensor system components. A POSITA would have found it obvious to make such a modification and would have predicted success at the combination.

128. A POSITA would have been motivated to combine HVACR sensors and wireless technology in order to reduce the bulk, number, and arrangement of components required in the field. Instead of a temperature sensor clamp, and its tethered headpiece-wireless transmitter unit, the modification would result in a wireless temperature sensor clamp requiring less bulk and weight, and being more convenient to simply clamp in place and remove at will. A POSITA would also have known based on the state of the art at the time that wireless communication was predictably effective, and would have expected success at the combination of wireless technology in temperature sensor clamps.

129. It is my opinion that Fieldpiece-B in combination with Fieldpiece-M renders claim 10 of the '051 Patent obvious.

C. Independent Claim 15

130. Several elements of claim 15 are identical to the claim 1 of the '051 Patent. The discussion of the claim 1 **[preamble]** and elements **[a]**, **[b]**, **[c]**, **[d]**, **[e]**, **[f']** and **[g]**, in Sections VII.A.1–8., is incorporated herein and applied to claim 15. The only difference between claim 1 and claim 15 of the '051 Patent is that at element **[f']**, claim 1 recites “the integrated electronics are incorporated into the handle and in electrical connection with the sensor element,” while at element **[f]**, claim 15 recites “the integrated electronics are incorporated into a portion of the temperature sensor clamp and are in signal communication with the sensor element.”

However, Fieldpiece-B in combination with Fieldpiece-M still renders claim 15 of the '051 Patent obvious.

131. Both Fieldpiece-B and Fieldpiece-M apply to the claim 15 **[preamble]** and elements **[a]**, **[b]**, **[c]**, **[d]**, **[e]**, and **[g]** in the same way as it applies to the claim 1 preamble and elements **[a]**, **[b]**, **[c]**, **[d]**, **[e]**, and **[g]** as set forth in Sections VII.A.1.–6. and 7., which are incorporated by reference and the same analysis is applied here. As set forth regarding claim 1, Sections VII.A.1.–6. and 7., it is my opinion that Fieldpiece-B discloses elements **[a]**, **[b]**, **[c]**, **[d]**, **[e]**, and **[g]**.

1. Claim 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”

132. Claim 10, element **[f]** is identical to claim 10, element **[f]**. The discussion of claim 10, element **[f]** in Section VII.B.4. is incorporated herein. Fieldpiece-B applies to claim 15, element **[f]** the same was as it applies to claim 10, element **[f]**. It is my opinion that both Fieldpiece-B and Fieldpiece-M disclose element **[f]** “the integrated electronics are incorporated into a portion of the temperature sensor clamp and are in signal communication with the sensor element.”

2. Claim 15 Summary and Conclusion

133. A POSITA would have combined the teachings of Fieldpiece-B in combination with Fieldpiece-M to provide for wireless sensors in combination for HVACR analysis as taught in Fieldpiece-B in combination with Fieldpiece-M.

134. Based on the foregoing analysis, it is my opinion that a POSITA would appreciate that the complementary disclosures of Fieldpiece-B and Fieldpiece-M teach incorporation of wireless technology in HVACR sensors and remote, portable electronic devices used for analysis of HVACR systems. A POSITA would recognize that a Fieldpiece-B or Fieldpiece-M temperature sensor could be improved by placing wireless technology and integrated electronics in a portion of the temperature sensor clamps of Fieldpiece-B or Fieldpiece-M in order to enhance usability of the assembled sensor system components. A POSITA would have found it obvious to make such a modification and would have predicted success at the combination.

135. A POSITA would have been motivated to combine HVACR sensors and wireless technology in order to reduce the bulk, number, and arrangement of components required in the field. Instead of two temperature sensor clamps, and their respective tethered headpiece-wireless transmitter units of Fieldpiece-B or Fieldpiece-M, the modification would result in the two wireless temperature sensor clamps of Full A/C Diagnostic Kit requiring less bulk and weight, and being more convenient to simply clamp in place and remove at will. A POSITA would also have been motivated to make the combination of wireless sensors and a wireless remote device in order to eliminate distance constraints imposed by cables or hoses connecting sensors to each other, or to the remote device collecting sensed data. A

POSITA would have understood that without such distance constraints, 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, and without the need for a technician to physically approach, read, and record data from each sensor. A POSITA would also have known based on the state of the art at the time that wireless communication was predictably effective, and would have expected success at the combination of wireless technology in HVACR sensors and remote devices.

136. It is my opinion that Fieldpiece-B in combination with Fieldpiece-M renders claim 15 of the '051 Patent obvious.

D. Independent Claim 20

1. Claim 20, [Preamble] “A sensor system for a refrigerant unit comprising:”

137. This preamble is identical to the preamble in claims 1 and 15. The discussion of the preamble in connection with claim 1, Section VII.A.1., is incorporated herein and applied to claim 20. Both Fieldpiece-B and Fieldpiece-M disclose the preamble of claim 20 for the same reasons set forth regarding claim 1.

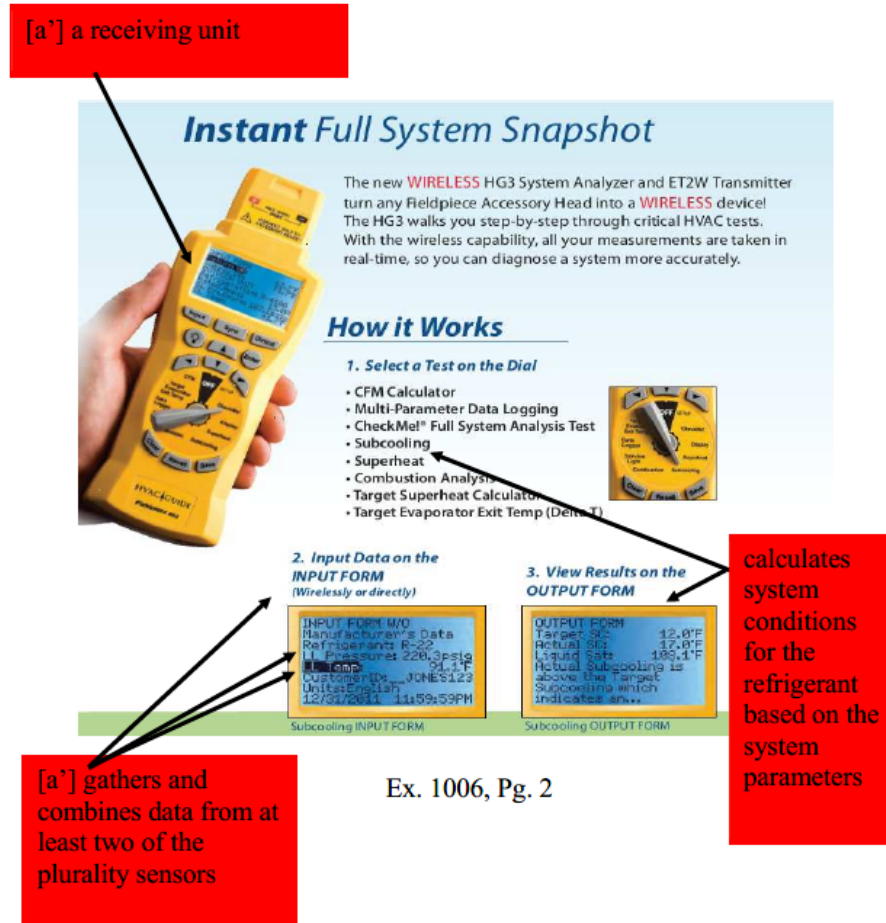
2. Claim 20, [a'] “a plurality of sensors for sensing system parameters of the refrigerant unit; and a receiving unit that gathers and combines data from at least two of the plurality of sensors; wherein:”

138. The first part of claim 20, element [a'], “a plurality of sensors for sensing system parameters of the refrigerant unit,” is identical to claim 1, element

[a], discussed at Section VII.A.2, which is incorporated here. Both Fieldpiece-B and Fieldpiece-M disclose this portion of claim 20, element [a'] for the same reasons set forth regarding claim 1, element [a], which are incorporated herein.

139. The second part of claim 20, element [a'] reads “a receiving unit that gathers and combines data from at least two of the plurality of sensors.”

140. Fieldpiece-B discloses the “WIRELESS HG3 System Analyzer,” that “walks you through step-by-step through critical HVAC tests. With wireless capability, all your measurements are taken in real-time, so you can diagnose a system more accurately.” Ex. 1006, Pg. 2. An image from Fieldpiece-B as annotated is reproduced below:



141. As shown in the “INPUT FORM” of Fieldpiece-B, the WIRELESS HG3 System Analyzer “gathers” data from at least a pressure sensor and a temperature sensor; that is, from at least two of the plurality of sensors in, for example, the Full A/C Diagnostics Kit. See Ex. 1006, Pg. 4.

142. The '051 Patent establishes that a POSITA knew 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. Further, to “calculate” from multiple data points necessarily includes “combining” them.

143. As illustrated in the “OUTPUT FORM” of Fieldpiece-B, the WIRELESS HG3 System Analyzer calculates subcooling and superheat.

144. It is my opinion that the WIRELESS HG3 System Analyzer shown in Fieldpiece-B and illustrated above is a receiving unit that receives parameters from a plurality of sensors, combines them, and outputs calculated results.

145. It is my opinion that Fieldpiece-B discloses claim 20, element [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.”

146. Likewise, Fieldpiece-M discloses the “HVAC GUIDE System Analyzer,” also referred to as the “New HG3 model” or “HG3.” Ex. 1013, Pgs. 2, 4, and 5.

147. The HG3 is configured to wirelessly receive as many as 12 system parameters at one time. Ex. 1013, Pg. 10. It is my opinion that to receive 12 system parameters “at one time” requires a “plurality of sensors” transmitting the parameters, and the HG3 is a receiving unit that gathers data from a plurality of sensors.

148. The HG3 calculates system conditions based the receive system parameters. See, for example, Ex. 1013 at Pgs. 12-15, 22-33. The system conditions calculated include superheat and subcool. *Id.*, Pgs. 22-33.

149. The '051 Patent establishes that a POSITA knew 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. Further, to “calculate” from multiple data points necessarily includes combining them.

150. For the above reasons, it also is my opinion that Fieldpiece-M discloses element **[a']**.

3. Claim 20, [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;”

151. Claim 20, element **[b]** is identical to claim 1, element **[b]**, and the discussion of Section VII.A.3. is incorporated by reference and the same analysis is applied here to claim 20. Both Fieldpiece-B and Fieldpiece-M disclose claim 20, element **[b]** for the same reasons set forth regarding claim 1, element **[b]**, which are incorporated herein and applied to claim 20.

4. Claim 20, [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;”

152. Claim 20, element **[d]** is identical to claim 1, element **[d]**. Both Fieldpiece-B and Fieldpiece-M disclose claim 20, element **[d]** for the same reasons set forth regarding claim 1, element **[d]**, as outlined in Section VII.A.5., which are incorporated herein and applied to claim 20.

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

153. Claim 20, element [e] is identical to claim 1, element [e]. Both Fieldpiece-B and Fieldpiece-M disclose claim 20, element [e] for the same reasons set forth regarding claim 1, element [e], outlined in Section VII.A.6., which are incorporated herein and applied to claim 20.

6. 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”

154. Claim 20, element [f] is identical to claim 10 element [f] and claim 15 element [f]. Both Fieldpiece-B and Fieldpiece-M disclose claim 20, element [f] for the same reasons set forth regarding claims 10 and 15, element [f], as outlined in Sections VII.B.4 and VII.C.1., which are incorporated herein and applied to claim 20.

7. Claim 20 Summary and Conclusion

155. A POSITA would have combined the teachings of Fieldpiece-B in combination with Fieldpiece-M to provide for wireless sensors in combination with a wireless receiving unit for HVACR analysis as taught in Fieldpiece-B in combination with Fieldpiece-M.

156. Based on the foregoing analysis, it is my opinion that a POSITA would appreciate that complementary disclosures of Fieldpiece-B and Fieldpiece-M teach

incorporation of wireless technology in HVACR sensors and remote devices used for analysis of HVACR systems. A POSITA would recognize that Fieldpiece-B or Fieldpiece-M temperature sensors could be improved by placing wireless technology and integrated electronics in a portion of each temperature sensor clamp of the Full A/C Diagnostic Kit in order to enhance usability of the assembled sensor system components. A POSITA would have found it obvious to make such a modification and would have predicted success at the combination.

157. A POSITA would have been motivated to combine HVACR sensors and wireless technology in order to reduce the bulk, number, and arrangement of components required in the field. Instead of two temperature sensor clamps, and their respective tethered headpiece-wireless transmitter units of Fieldpiece-B or Fieldpiece-M, the modification in the Full A/C 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. A POSITA would also have been motivated to make the combination of wireless sensors and a wireless remote device in order to eliminate distance constraints imposed by cables or hoses connecting sensors to each other, or to the remote computer collecting sensed data. A POSITA would have understood that without such distance constraints, 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, and without the

need for a technician to physically approach, read, and record data from each sensor. A POSITA would also have known based on the state of the art at the time that wireless communication was predictably effective, and would have expected success at the combination of wireless technology in HVACR sensors and remote devices.

158. It is my opinion that Fieldpiece-B in combination with Fieldpiece-M renders claim 20 of the '051 Patent obvious.

E. Dependent Claim 21

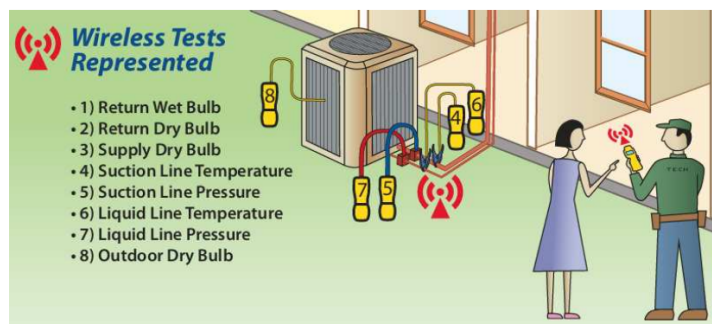
1. Claim 21

159. Dependent claim 21 reads: **[Preamble]** The sensor system of claim 20, wherein: **[1]** the receiving unit comprises a portable electronic device; **[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; **[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 **[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.

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

160. Fieldpiece-B states “view the measurement from anywhere on the job site” (Ex. 1006, Pg. 3), and illustrates a technician carrying the WIRELESS HG3 System Analyzer on a job site, as shown in the image from Fieldpiece-B reproduced below:



Ex. 1006, Pg. 3

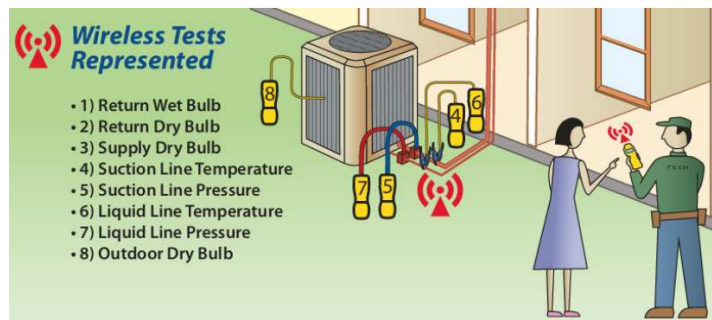
161. As shown in the image from Fieldpiece-B above, the technician is carrying the “receiving unit,” and it is electronic. It is my opinion that Fieldpiece-B discloses **[1]** “the receiving unit comprises a portable electronic device,” as recited in claim 21, element **[1]**.

162. Likewise, see Fieldpiece-M, Ex. 1013, at Pgs. 4–5. The receiving unit disclosed in Fieldpiece-M is a portable electronic device, and it is my opinion that Fieldpiece-M discloses this element.

3. ***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”***

163. As evidenced by, for example, Kane, 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.” Kane, Ex. 1014, ¶¶[0004] and [0026].

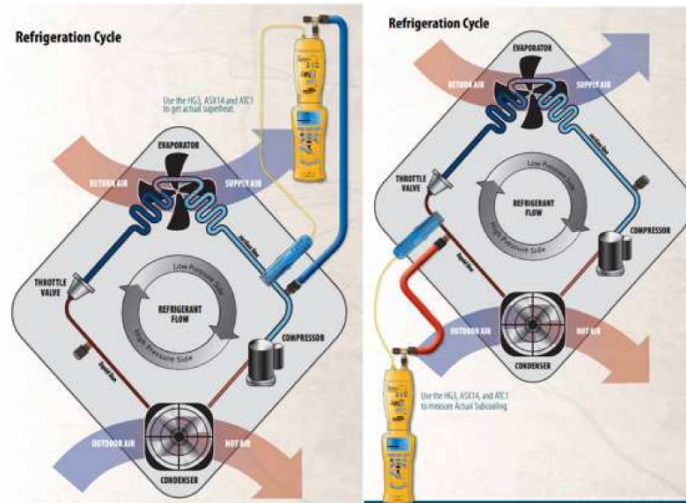
164. Fieldpiece-B discloses pressure sensor 7 measuring high side (liquid line) pressure, pressure sensor 5 measure low side (suction line) pressure, and each wirelessly communicating with the portable electronic device, as shown in the image below reproduced from Fieldpiece-B:



Ex. 1006, Pg. 3

165. Fieldpiece-B discloses claim 21, element [2].

166. Likewise, the below copied 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

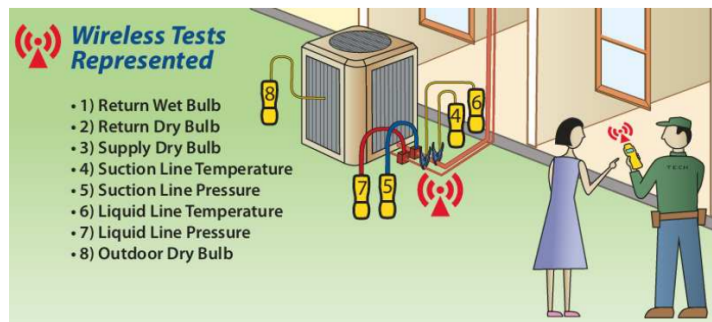
167. Fieldpiece-M teaches the option of “Wirelessly Using a Fieldpiece Transmitter” and that for this option “Measurements are taken by the Accessory head and sent wirelessly to the HG3, The HG3 can receive up to 12 wireless signals at one time.” Ex. 1013, Pg. 10.

168. A POSITA would have recognized that the pressure sensor illustrated above could be modified to include Fieldpiece-M option of sending the pressure measurements wirelessly to the HG3, portable electronic device.

169. It is my opinion that Fieldpiece-M teaches element [2]

4. ***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”***

170. Fieldpiece-B discloses a temperature sensor clamp 6 measuring high side (liquid line) temperature, temperature sensor clamp 4 measuring low side (suction line) temperature, as shown in the image below reproduced from Fieldpiece-B:



Ex. 1006, Pg. 3

171. Both 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, as shown in the image below reproduced from Fieldpiece-B:

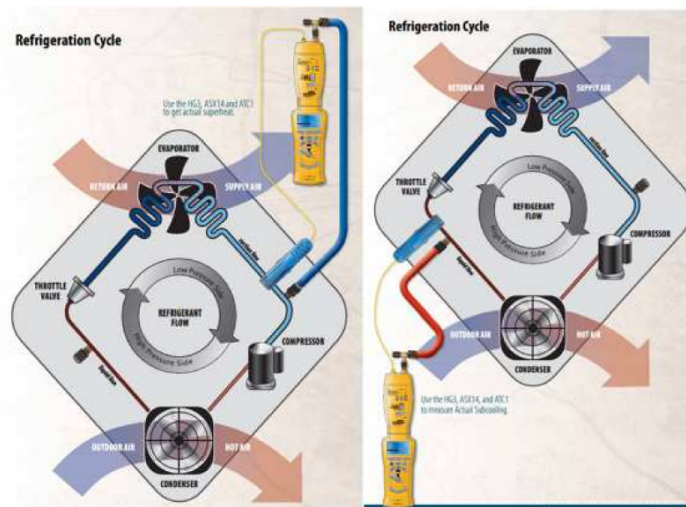


Ex. 1006, Pg. 3

172. The clamping portion of each temperature sensor illustrated in the above reproduced image from Fieldpiece-B necessarily includes “a temperature sensor to measure temperature about a tube.”

173. Fieldpiece-B discloses claim 21, element [3].

174. Likewise, the below copied images 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

175. The temperature sensor clamp on the right, above, includes “a clamping portion with a temperature sensor to measure temperature about a tube located on the high side of the refrigerant system,” and the temperature sensor clamp on the left

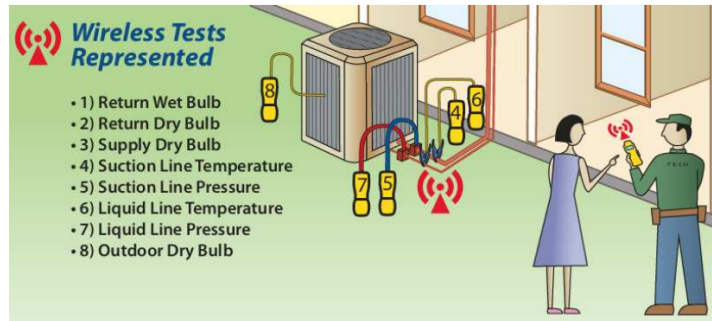
includes “a clamping portion with a temperature sensor to measure temperature about a tube located on the low side of the refrigerant system.”

176. It is my opinion that Fieldpiece-M discloses element [3].

5. ***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.”***

177. Section VII.A.6., incorporated herein, discusses claim 20, element [e], which recites “each of the first temperature sensor clamp and the second temperature sensor clamp further comprises a handle and integrated electronics.” For at least the same reasons as for claim 20, element [e] outlined in Section VII.A.6., it is my opinion that both Fieldpiece-B and Fieldpiece-M disclose “at least one of the first temperature sensor clamp and the second temperature sensor clamp includes integrated electronics,” as recited in claim 21, element [4].

178. A “Wireless Tests Represented” graphic shown in Fieldpiece-B, including wireless temperature tests, illustrates that the temperatures sensor integrated electronics are “configured for wirelessly communicating temperature sensor data to the portable electronic device,” as shown in the image reproduced below from Fieldpiece-B:



Ex. 1006, Pg. 3

179. Fieldpiece-B discloses claim 21, element **[4]**.

180. See also Fieldpiece-M 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.

181. Fieldpiece-M teaches temperature sensor clamps having “integrated electronics that are configured for wirelessly communicating temperature sensor data to the portable electronic device.”

182. It is my opinion that Fieldpiece-M teaches element [4].

6. Claim 21 Summary and Conclusion

183. A POSITA would have combined the teachings of Fieldpiece-B in combination with Fieldpiece-M to provide for wireless sensors in combination with a wireless portable electronic device for HVACR analysis as taught in Fieldpiece-B in combination with Fieldpiece-M.

184. Claim 21 depends from claim 20. The discussion of claim 20 in Section VII.D. is incorporated by reference and the same analysis is applied here to claim 21.

185. Based on the foregoing analysis, it is my opinion that a POSITA would appreciate that the complementary disclosures of Fieldpiece-B and Fieldpiece-M disclose a portable electronic device and both pressure and temperature sensors configured for high side and low side HVAC measurements. A POSITA would recognize that from the various instruments disclosed in Fieldpiece-B or Fieldpiece-M, 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. See, for example, the Full A/C Diagnostic Kit in Fieldpiece-B. Further, both Fieldpiece-B and Fieldpiece-M suggests tests for calculating superheat and subcool. 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, and would have expected success at the combination given the suggestion in both Fieldpiece-B and Fieldpiece-M to conduct superheat and subcool tests with wireless sensors.

186. It my opinion that Fieldpiece-B in combination with Fieldpiece-M renders claim 21 of the '051 Patent obvious.

VIII. 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

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

188. Staniforth relates to “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 further has electronics incorporated in its handle that connect a thermistor to a display panel, and the display has integrated control buttons. *Id.*, 4:30–49.

189. In my opinion, Fieldpiece-B is analogous art to and in the same field of endeavor as the '051 Patent since both relate to sensor systems that remotely transmit temperature and pressure data for refrigeration units. See Ex. 1006, Pg. 1 and Ex. 1001, 1:15–17.

190. Also, Fieldpiece-M is analogous to and in the same field of endeavor as the '051 Patent, namely sensor systems for HVACR. For example, Fieldpiece-M relates to an “HVAC Guide® System Analyzer” and wireless sensors that transmit data to it for, among other purposes, testing “Superheat” and “Subcooling” in an HVAC system. Ex. 1013, Pg. 2. Further, both Fieldpiece-M and the '051 Patent are directed to solving problems similar to the problems addressed by the '051 Patent, namely, a “need in the art for an improved sensor system for refrigeration units for monitoring and collecting system conditions such as superheat and subcooling.” Ex. 1001, 2:37-39.

191. Fieldpiece-B and Fieldpiece-M disclose and both are related to the HG3 System Analyzer, and sensors that wirelessly communicate with it, for HVAC system analysis. Ex. 1003, Pg. 1; Ex. 1013, Pg. 2. A POSITA would have looked to both Fieldpiece-B and Fieldpiece-M, which are complementary references, when considering solving a “need in the art for an improved sensor system for refrigeration units for monitoring and collecting system conditions such as superheat and subcooling.” Ex. 1001, 2:37-39. It is also my opinion that CN '078 is analogous art to Fieldpiece-B and the '051 Patent, since 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 temperature sensor data to a remote

device. Ex. 1001, 2:37–44. Still further, it is my opinion that Staniforth is analogous since it is reasonably pertinent to the problem providing improved sensor systems, in particular, improved temperature sensor 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.

192. Based on the foregoing, it is my opinion that a POSITA would have consulted and combined Fieldpiece-B, Fieldpiece-M, CN ’078, and Staniforth when considering “an improved sensor system for refrigeration units for monitoring and collecting system conditions.”

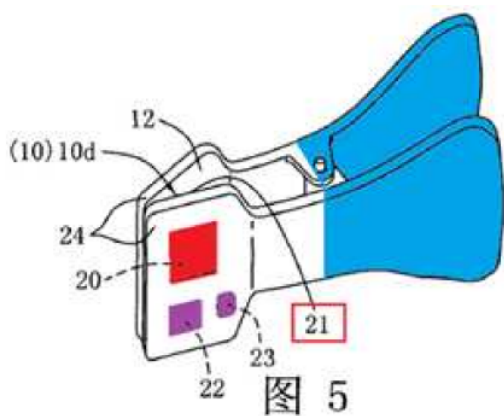
A. Independent Claim 1

193. The claim language of the claim **[preamble]** and elements **[a]**, **[b]**, **[c]**, **[d]**, **[e]**, and **[g]** are discussed in Sections VII.A.1, 2, 3, 4, 5, 6, and 8, which are incorporated by reference and the same analysis is applied here. As shown in those Sections, Fieldpiece-B discloses the claim 1 **[preamble]** and elements **[preamble]** and elements **[a]**, **[b]**, **[c]**, **[d]**, **[e]**, and **[g]**.

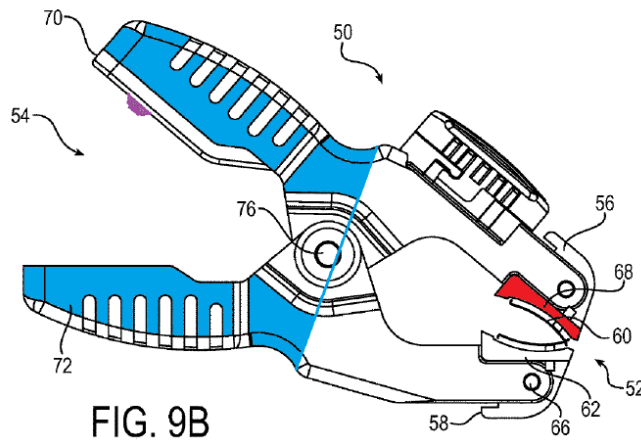
194. To the extent that it is asserted that Fieldpiece-B in combination with Fieldpiece-M does not disclose elements **[e]**, **[f’]**, or **[g]**, CN ’078 and Staniforth discloses those elements.

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

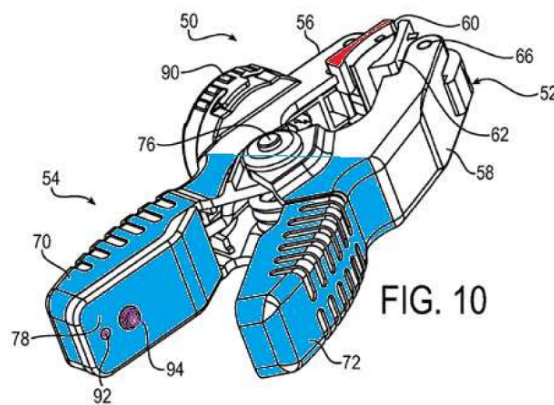
195. Below is a color-coded comparison of the temperature sensor clamp of CN '078 at FIG. 5 to the temperatures sensor clamp of the '051 Patent at FIGS. 9B and 10:



Ex. 1007, FIG. 5



Ex. 1001, FIG. 9B



Ex. 1001, FIG. 10

196. With reference to the annotated FIGS. 9B and 10 of the '051 Patent, above, the '051 Patent describes integrated electronics (Purple). Ex. 1001, 9:56–63. 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.*

197. 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.

198. The device of CN '078 also discloses a clamp: “a clamping portion 24, as shown in Fig. 5, [that] directly clamps and is fixed on” the item being monitored. Ex. 1008, Pg. 6 and FIG. 5, copied above.

199. The device of CN '078 also comprises a “handle.” See Ex. 1007, FIG. 5, as reproduced above.

200. It is therefore my opinion that Fieldpiece-B in combination with Fieldpiece-M and CN '078 teaches claim 1, element [e], namely, “each of the first temperature sensor clamp and the second temperature sensor clamp further comprises a handle and integrated electronics.”

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

201. Referring to the annotated image of the CN '078 FIG. 5 of the temperature sensor clamp presented above in the discussion of claim 1, element [e], CN '078 also discloses temperature sensor 20 (Red) having a sensing surface 21. Ex. 1008, Pg. 6. Further, “a temperature sensor 20 starts sensing and converts the

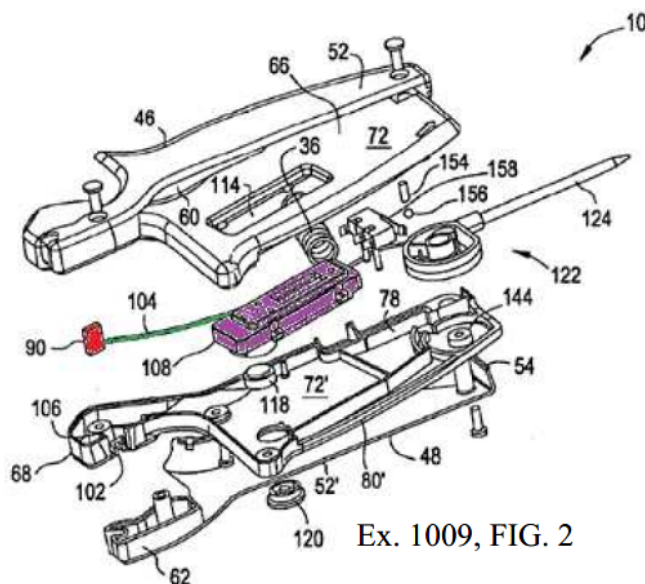
measured sensed values into electrical signals, the electrical signals are transmitted through a wireless transmitter 22 to a wireless receiver 31, the wireless receiver 31 transmits the electrical signals received to a computer device 30, and the computer device 30 analyzes and determines the electrical signals received.” Ex. 1008, Pg. 5. In my opinion, a POSITA would have understood that the “wireless transmitter 22” would be considered integrated electronics and would be in electrical connection with the sensor element.

202. Claim 1 recites that the integrated electronics are incorporated into the “handle.” However, it is my opinion that 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.

203. Nonetheless, Staniforth discloses integrated electronics incorporated in the handle of a temperature sensor clamp, and in electrical connection with the sensor element as follows:

204. FIG. 1 of Staniforth as compared to FIG. 9B of the '051 Patent are annotated and reproduced below for reference:

206. Referring both the FIG.1 above and FIG. 2, below, a temperature sensor assembly 90 (Red) is “in recess 102 in the clamping surface 76 of the upper jaw 22, with the signal-carrying conductor104 [green] extending through opening 106 in clamping surface 76.” See Ex. 1009, 4:8–11, and FIGS. 1 (above) and 2 (below):



Ex. 1009, FIG. 2

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

208. Staniforth also discloses an upper handle 26 and lower handle 18 (Blue), and an electronics module 108, that is “integrated electronics” (Purple) within lower handle 18 and within display panel 110. Ex. 1009, 3:5–24. The electronics module includes display panel 110, LCD display 112, and control buttons 116. *Id.*, 4:30–49.

209. Further, 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.

210. It is my opinion that the further combination with Staniforth specifically teaches moving integrated electronics to the handle of the temperature sensor taught by Fieldpiece-B in combination with Fieldpiece-M and CN '078.

211. It is my opinion that Fieldpiece-B in combination with Fieldpiece-M, CN '078, and Staniforth teaches element [f'].

3. Claim 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”

212. To the extent that the “first and second temperature sensors” of element [g] are interpreted to be only “first and second temperature sensor clamps,” modification of Fieldpiece-B 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.”

213. Regarding “the first and second pressure sensors,” the discussion of claim 1 elements **[g]** in Section VII.A.8 is incorporated and applied here. It is my opinion that both Fieldpiece-B and Fieldpiece-M disclose “there are no external physical fluidic connections that extend from the first and second pressure sensors oppositely from the connectors.”

214. It is my opinion that Fieldpiece-B in combination with Fieldpiece-M and CN '078 teaches element **[g]**.

4. Claim 1 Summary and Conclusion

215. A POSITA would have combined the teachings of Fieldpiece-B in combination with Fieldpiece-M, CN '078, and Staniforth to provide for wireless pressure sensors and wireless temperatures sensor clamps as disclosed in Fieldpiece-B in combination with Fieldpiece-M, with modification of the temperature sensor clamps therein with the CN '078 wireless temperature sensor and Staniforth integrated electronics to arrive at a combination of improved wireless sensors for HVACR analysis.

216. Based on the foregoing analysis, it is my opinion that a POSITA would appreciate that the complementary disclosures of Fieldpiece-B and Fieldpiece-M teach incorporation of wireless technology in HVACR sensors configured to

transmit data to a remote, portable electronic device used for analysis of HVACR systems. A POSITA would recognize that Fieldpiece-B or Fieldpiece-M temperature sensors, like those in the Full A/C Diagnostic Kit of Fieldpiece-B, could be improved by placing wireless technology and integrated electronics in the temperature sensor clamp handles in order to enhance usability of the assembled sensor system components, and based on this understanding, a POSITA would have been motivated to combine Fieldpiece-B, Fieldpiece-M, and CN '078 to arrive at improved, wireless temperature clamps. Further, the POSITA would have expected success at the combination since both Fieldpiece-B and CN '078 teach success at incorporation of wireless technology in the elements of a sensor system. Further, a POSITA would have been motivated to apply the modifications of Staniforth to connect the temperature sensor with integrated electronics incorporated in the handle, and to provide control buttons for the temperature sensor clamp. Further, the POSITA would have expected success at the combination since Staniforth teaches successful incorporation of electronics, including control buttons, in the handle of a temperature sensor clamp.

217. A POSITA would have been motivated to combine the HVACR sensors of Fieldpiece-B or Fieldpiece-M with the wireless temperature sensor clamp of CN '078 in order to reduce the bulk, number, and arrangement of components required in the field. Instead of two temperature sensor clamps, and their respective

headpiece-wireless transmitter units of Fieldpiece-B or Fieldpiece-M, the modification with the integrated electronics, including a wireless transmitter, from CN '078 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. A POSITA would also have been motivated to make the combination in order to eliminate distance constraints imposed by cables or hoses connecting sensors to each other, or to the remote computer collecting sensed data. A POSITA would have understood that without such distance constraints, 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, and without the need for a technician to physically approach, read, and record data from each sensor. A POSITA would also have known based on the state of the art at the time, as demonstrated by Fieldpiece-B and CN '078, that wireless communication was predictably effective, and would have expected success at the combination of wireless technology in HVACR sensors and remote computers. Moreover, A POSITA would have been further motivated to modify the temperature sensor clamps taught by Fieldpiece-B, Fieldpiece-M, and CN '078 under the teachings of Staniforth with integrated electronics, including control buttons, in the handle for enhanced usability as well as a reduced number of parts.

218. It is my opinion that Fieldpiece-B in combination with Fieldpiece-M, CN '078, and Staniforth renders claim 1 of the '051 Patent obvious.

B. Independent claim 10

219. The claim language of claim 10 **[preamble]** and elements **[d']**, **[e']**, **[f]**, and **[g']** are discussed in Sections VII.B.1, 2, 3, 4, and 5, which are incorporated by reference and the same analysis is applied here. As shown in those Sections, Fieldpiece-B discloses the preamble and elements **[d']**, **[e']**, **[f]**, and **[g']**.

220. To the extent that it is asserted that Fieldpiece-B does not disclose elements **[e']**, **[f]**, and **[g']**, CN '078 and Staniforth disclose those claim elements.

1. Claim 10, [e'] “a handle and integrated electronics, and”

221. CN '078 discloses a temperature sensor clamp having “a handle and integrated electronics.” CN '078, FIG. 5. The discussion of element **[e]** in Sections VIII.A.1 is incorporated herein and the same analysis applies here. Fieldpiece-B in view of CN '078 teaches element **[e']**.

2. 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;”

222. The discussion of element **[f']** in Section VIII.A.2. is incorporated herein and the same analysis applies here to claim 10. CN '078 includes “integrated electronics” in a “portion” of its temperature sensor clamp that are “in signal communication” with “the sensor element.” CN '078, FIG. 5. Further, Staniforth

discloses a temperature sensor clamp having integrated electronics incorporated in its handle, a portion of the device, and in electrical connection with its sensor element. Element **[f']** recites “in electrical connection” where element **[f]** recites “in signal communication.” The meaning of “in signal communication,” as discussed in Section VI, includes “in electrical connection.” Therefore, in my opinion, Fieldpiece-B in combination with Fieldpiece-M, CN '078, and Staniforth teach element **[f]**.

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

223. The temperature sensor clamp of CN '078 has no external physical electrical connection. CN '078, FIG. 5. The discussion of element **[g]** in Section III.A.3. is incorporated herein and the same analysis applies here to claim 10. Fieldpiece-B in combination with Fieldpiece-M and CN '078 teaches element **[g']**.

4. Claim 10 Summary and Conclusion

224. A POSITA would have combined the teachings of Fieldpiece-B in combination with Fieldpiece-M, CN '078, and Staniforth to provide for wireless temperatures sensor clamps as disclosed in Fieldpiece-B in combination with Fieldpiece-M, with modification of the temperature sensor clamp with the CN '078 wireless temperature sensor and Staniforth integrated electronics to arrive at an improved temperature sensor clamp for HVACR analysis.

225. Based on the foregoing analysis, it is my opinion that a POSITA would appreciate that the complementary disclosures of Fieldpiece-B and Fieldpiece-M teach incorporation of wireless technology in HVACR sensors for use in HVACR sensor systems. A POSITA would recognize that the temperature sensors of either Fieldpiece-B and Fieldpiece-M could be improved by placing wireless technology in a portion of the temperature sensor clamps therein in order to enhance usability of the assembled sensor system components. A POSITA have been motivated to combine teachings of a temperatures sensor clamp in CN '078 with Fieldpiece-B temperature sensor clamps for these reasons, would have found it obvious to make such a modification, and would have predicted success at the combination. Further, a POSITA would have been motivated to apply the modifications of Staniforth to connect the temperature sensor with integrated electronics incorporated in the handle, and to provide control buttons for the temperature sensor clamp. Further, the POSITA would have expected success at the combination since Staniforth teaches successful incorporation of electronics, including control buttons, in the handle of a temperature sensor clamp.

226. A POSITA would have been motivated to combine HVACR sensors and wireless technology in order to reduce the bulk, number, and arrangement of components required in the field. Instead of a temperature sensor clamps, and its tethered headpiece-wireless transmitter unit of Fieldpiece-B or Fieldpiece-M, the

modification with the integrated electronics, including a wireless transmitter, from CN '078 would result in a wireless temperature sensor clamp requiring less bulk and weight, and being more convenient to simply clamp in place and remove at will. A POSITA would also have known based on the state of the art at the time that wireless communication was predictably effective, as shown by Fieldpiece-B, Fieldpiece-M, and CN '078, and would have expected success at the combination of wireless technology in sensors. Further, CN '078 taught the success of integrating wireless transmitters in a temperature sensor clamp, and a POSITA would have, thus, predicted success at integrating wireless sensors into the temperature sensor clamps of Fieldpiece-B or Fieldpiece-M. Moreover, A POSITA would have been further motivated to modify the temperature sensor clamps taught by Fieldpiece-B in combination with Fieldpiece-M and CN '078 under the teachings of Staniforth with integrated electronics, including control buttons, in the handle portion for enhanced usability as well as a reduced number of parts.

227. It is my opinion that Fieldpiece-B in combination Fieldpiece-M, CN '078, and Staniforth renders claim 10 of the '051 Patent obvious.

C. Independent Claim 15

228. The claim language of claim 15 **[preamble]** and elements **[a]**, **[b]**, **[c]**, **[d]**, **[e]**, and **[g]** are discussed in Sections VII.A.1, 2, 3, 4, 5, 6, and 8, which are incorporated by reference and the same analysis is applied here. The discussions in

Sections VIII.A.1. and VIII.A.3 apply Fieldpiece-B in combination with Fieldpiece-M and CN '078 to elements [e] and [g], and are incorporated by reference and the same analysis applies here. The only difference between claim 1 and claim 15 is that at element [f'], claim 1 recites “the integrated electronics are incorporated into the handle and in electrical connection with the sensor element,” while at element [f], claim 15 recites “the integrated electronics are incorporated into a portion of the temperature sensor clamp and are in signal communication with the sensor element.”

1. Claim 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”

229. CN '078 includes “integrated electronics” in a “portion” of its temperature sensor clamp that are “in signal communication” with “the sensor element.” CN '078, FIG. 5. The discussions of element [f'] in Section VIII.A.2. and of element [f] in Section VIII.B.2. are incorporated herein and the same analysis applies here to claim 15. CN '078 discloses integrated electronics incorporated in a portion of a temperature sensor clamp in signal communication with the sensor element, and it is my opinion that Fieldpiece-B in view of CN '078 teach claim 15, element [f].

230. In addition, Staniforth discloses “integrated electronics are incorporated into a portion of the temperature sensor clamp and are in signal

communication with the sensor element.” See Section VIII.B.2., which is incorporated by reference and the same analysis is applied here.

2. *Claim 15 Summary and Conclusion*

231. A POSITA would have combined the teachings of Fieldpiece-B in combination with Fieldpiece-M, CN '078, and Staniforth to provide for wireless pressure sensors and wireless temperatures sensor clamps as disclosed in Fieldpiece-B in combination with Fieldpiece-M, with modification of the temperature sensor clamps therein with the CN '078 wireless temperature sensor and Staniforth integrated electronics to arrive at a combination of improved wireless sensors for HVACR analysis.

232. Based on the foregoing analysis, it is my opinion that a POSITA would appreciate that the complementary disclosures of Fieldpiece-B and Fieldpiece-M teach incorporation of wireless technology in HVACR sensors configured to transmit data to a remote, portable electronic device used for analysis of HVACR systems. A POSITA would recognize that Fieldpiece-B or Fieldpiece-M temperature sensors, like those in the Full A/C Diagnostic Kit of Fieldpiece-B, could be improved by placing wireless technology and integrated electronics in the temperature sensor clamp handles in order to enhance usability of the assembled sensor system components, and based on this understanding, a POSITA would have been motivated to combine Fieldpiece-B, Fieldpiece-M, and CN '078 to arrive at

improved, wireless temperature clamps. Further, the POSITA would have expected success at the combination since both Fieldpiece-B and CN '078 teach success at incorporation of wireless technology in the elements of a sensor system. Further, a POSITA would have been motivated to apply the modifications of Staniforth to connect the temperature sensor with integrated electronics incorporated in the handle, and to provide control buttons for the temperature sensor clamp. Further, the POSITA would have expected success at the combination since Staniforth teaches successful incorporation of electronics, including control buttons, in the handle of a temperature sensor clamp.

233. A POSITA would have been motivated to combine the HVACR sensors of Fieldpiece-B or Fieldpiece-M with the wireless temperature sensor clamp of CN '078 in order to reduce the bulk, number, and arrangement of components required in the field. Instead of two temperature sensor clamps, and their respective headpiece-wireless transmitter units of Fieldpiece-B or Fieldpiece-M, the modification with the integrated electronics, including a wireless transmitter, from CN '078 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. A POSITA would also have been motivated to make the combination in order to eliminate distance constraints imposed by cables or hoses connecting sensors to each other, or to the remote computer collecting sensed data. A POSITA would have

understood that without such distance constraints, 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, and without the need for a technician to physically approach, read, and record data from each sensor. A POSITA would also have known based on the state of the art at the time, as demonstrated by Fieldpiece-B and CN '078, that wireless communication was predictably effective, and would have expected success at the combination of wireless technology in HVACR sensors and remote computers. Moreover, A POSITA would have been further motivated to modify the temperature sensor clamps taught by Fieldpiece-B, Fieldpiece-M, and CN '078 under the teachings of Staniforth with integrated electronics, including control buttons, in the handle for enhanced usability as well as a reduced number of parts.

234. It is my opinion that Fieldpiece-B in combination with Fieldpiece-M, CN '078, and Staniforth renders claim 15 of the '051 Patent obvious.

D. Independent Claim 20

235. The claim language of element **[a']** is discussed in Section VII.D.2, which is incorporated by reference and the same analysis is applied here. The claim language of the claim 20 **[preamble]** and elements **[b]**, **[d]**, and **[e]** are discussed in Sections VII.A.1, 3, 5, and 6, which are incorporated by reference and the same analysis is applied here to claim 20. As shown in those Sections, Fieldpiece-B in

combination with Fieldpiece-M discloses claim 20 **[preamble]** and elements **[a']**, **[b]**, **[d]**, and **[e]**.

236. To the extent that it is asserted that Fieldpiece-B in combination with Fieldpiece-M does not disclose elements **[e]** and **[f]**, CN '078 and Staniforth discloses those claim elements.

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

237. CN '078 discloses a temperature sensor clamp having “a handle and integrated electronics.” CN '078, FIG. 5. The discussion of element [e] in Section VIII.A.1., which is incorporated herein and the same analysis applies here to claim 20. Fieldpiece-B in combination with Fieldpiece-M and CN '078 teach claim 20, element **[e]**.

2. ***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”***

238. The discussion of element **[f']** in Section VIII.A.2. and of element **[f]** in Section VIII.B.2. are incorporated herein and the same analysis applies here to claim 20. CN '078 includes “integrated electronics” in a “portion” of its temperature sensor clamp that are “in signal communication” with “the sensor element.” CN '078, FIG. 5. 223. In addition, Staniforth discloses “integrated electronics are incorporated into a portion of the temperature sensor clamp and are in signal

communication with the sensor element.” Fieldpiece-B in combination with Fieldpiece-M, CN ’078, and Staniforth teach claim 20, element [f].

3. Claim 20 Summary and Conclusion

239. A POSITA would have combined the teachings of Fieldpiece-B in combination with Fieldpiece-M, CN ’078, and Staniforth to provide for wireless pressure sensors, wireless temperatures sensor clamps, and a wireless receiving unit as disclosed in Fieldpiece-B in combination with Fieldpiece-M, with modification of the temperature sensor clamps therein with the CN ’078 wireless temperature sensor and Staniforth integrated electronics to arrive at a combination of improved wireless sensors and wireless receiving unit for HVACR analysis.

240. Based on the foregoing analysis, it is my opinion that a POSITA would appreciate that the complementary disclosures of Fieldpiece-B teach incorporation of wireless technology in HVACR sensors and remote devices used for analysis of HVACR systems. A POSITA would recognize from CN ’078 that Fieldpiece-B or Fieldpiece-M temperature sensors could be improved by placing wireless technology and integrated electronics in a portion of the temperature sensor clamps therein in order to enhance usability of the assembled sensor system components. A POSITA would have found it obvious to make such a modification and would have predicted success at the combination. Further, a POSITA would have been motivated to apply the modifications of Staniforth to connect the temperature sensor element

in each temperatures sensor clamp with integrated electronics incorporated in the handle of the clamp, and to provide control buttons for the temperature sensor clamp. Further, the POSITA would have expected success at the combination since Staniforth teaches successful incorporation of electronics, including control buttons, in the handle of a temperature sensor clamp.

241. A POSITA would have been motivated to integrate electronics including a wireless sensor as taught in CN '078 in a portion of Fieldpiece-B or Fieldpiece-M temperature sensor clamps in order to reduce the bulk, number, and arrangement of components required in the field. Instead of two temperature sensor clamps, and their respective tethered headpiece-wireless transmitter units, the modification with the integrated electronics, including a wireless transmitter, from CN '078 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. Further, a POSITA would also have been motivated to make the combination of wireless sensors and a wireless remote device in order to eliminate distance constraints imposed by cables or hoses connecting sensors to each other, or to the remote computer collecting sensed data. A POSITA would have understood that without such distance constraints, 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, and without the need for a technician to physically approach,

read, and record data from each sensor. A POSITA would also have known based on the state of the art at the time that wireless communication was predictably effective, and would have expected success at the combination of wireless technology in HVACR sensors and remote computers. Moreover, A POSITA would have been further motivated to modify the temperature sensor clamps taught by Fieldpiece-B and CN '078 under the teachings of Staniforth with integrated electronics, including control buttons, in the handle portion for enhanced usability as well as a reduced number of parts.

242. It is my opinion that Fieldpiece-B in combination with Fieldpiece-M, CN '078 and Staniforth renders claim 20 of the '051 Patent obvious.

E. Dependent Claim 21

243. The claim language of claim 21 **[preamble]** and elements **[1]**, **[2]**, **[3]**, and **[4]** is discussed in Sections VII.E.1–5., which are incorporated by reference and the same analysis is applied here to claim 21. Fieldpiece-B discloses the preamble and elements **[1]**, **[2]**, **[3]**, and **[4]** of claim 21.

244. To the extent that it is suggested that Fieldpiece-B in combination with Fieldpiece-M does not disclose claim 21, element **[4]**, CN '078 and Staniforth discloses that element.

1. ***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.”***

245. CN '078 discloses a temperature sensor clamp that includes integrated electronics that are configured for wirelessly communicating temperature sensor data to a computer. CN '078 FIG. 5. The discussion of elements [e] and [f'] in Sections VIII.A.1. and VIII.A.2. are incorporated herein and the same analysis applies here to claim 21. Fieldpiece-B in view of CN '078 teach claim 21, element [4].

2. Claim 21 Summary and Conclusion

246. A POSITA would have combined the teachings of Fieldpiece-B in combination with Fieldpiece-M, CN '078, and Staniforth to provide for wireless pressure sensors, wireless temperatures sensor clamps, and a wireless portable electronic device as disclosed in Fieldpiece-B in combination with Fieldpiece-M, with modification of the temperature sensor clamps therein with the CN '078 wireless temperature sensor and Staniforth integrated electronics to arrive at a combination of improved wireless sensors and wireless portable electronic device for HVACR analysis.

247. Claim 21 depends from claim 20. The discussion of claim 20 in Section VIII.D. is incorporated by reference and the same analysis is applied here to claim 21.

248. Based on the foregoing analysis, it is my opinion that a POSITA would appreciate that the complementary disclosures of Fieldpiece-B and Fieldpiece-M disclose a portable electronic device and both pressure and temperature sensors configured for high side and low side HVAC measurements. A POSITA would recognize that from the various instruments disclosed in Fieldpiece-B or Fieldpiece-M, 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. See, for example, the Full A/C Diagnostic Kit of Fieldpiece-B. Further, both Fieldpiece-B and Fieldpiece-M suggests tests for calculating superheat and subcool. 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. Still further, a POSITA would have been motivated to incorporate the integrated electronics of CN '078 in the temperature sensor clamps of Fieldpiece-B or Fieldpiece-M in order to enhance usability of the assembled sensor system components by decreasing the bulk, number, and arrangement of components.

Instead of two temperature sensor clamps, and their respective tethered headpiece-wireless transmitter units, the modification with the integrated electronics, including a wireless transmitter, from CN '078 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. The POSITA would also have predicted success given the state of the art in wireless technology, as shown by Fieldpiece-M, Fieldpiece-B, and CN '078.

249. Further, a POSITA would have been motivated to apply the modifications of Staniforth to connect the temperature sensor with integrated electronics incorporated in the handle, and to provide control buttons for the temperature sensor clamp. Still further, the POSITA would have expected success at the combination since Staniforth teaches successful incorporation of electronics, including control buttons, in the handle of a temperature sensor clamp. The POSITA would have recognized that the integrated electronics, including control buttons, in the handle portion would provide enhanced usability as well as a reduced number of parts.

250. It is my opinion that Fieldpiece-B in combination with Fieldpiece-M, CN '078, and Staniforth renders claim 21 of the '051 Patent obvious.

**IX. 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**

251. CN '332 is directed to “pipe temperature [measurement] device,” with a temperature transducer. . . .” Ex. 1011, ¶[0009]. The temperature transducer includes a temperature-sensing probe in a clamping portion of the device, and the temperature transducer is connected to a data processing device that “may be a digital display and may also have a wireless transmission function.” *Id.*, ¶¶[0009]-[0010]. In comparison to Ground 2, CN '332 replaces CN '078. Like 'CN '078, CN '332 is an analogous prior art reference disclosing a wireless temperature sensor clamp.

252. Staniforth relates to “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 further has electronics incorporated in its handle that connect a thermistor to a display panel, and the display has integrated control buttons. *Id.*, 4:30–49.

253. In my opinion, Fieldpiece-B is analogous art to and in the same field of endeavor as the '051 Patent since both relate to sensor systems that remotely transmit

temperature and pressure data for refrigeration units. See Ex. 1006, Pg. 1 and Ex. 1001, 1:15–17.

254. Also, Fieldpiece-M is analogous to and in the same field of endeavor as the '051 Patent, namely sensor systems for HVACR. For example, Fieldpiece-M relates to an “HVAC Guide® System Analyzer” and wireless sensors that transmit data to it for, among other purposes, testing “Superheat” and “Subcooling” in an HVAC system. Ex. 1013, Pg. 2. Further, both Fieldpiece-M and the '051 Patent are directed to solving problems similar to the problems addressed by the '051 Patent, namely, a “need in the art for an improved sensor system for refrigeration units for monitoring and collecting system conditions such as superheat and subcooling.” Ex. 1001, 2:37-39.

255. Fieldpiece-B and Fieldpiece-M disclose and both are related to the HG3 System Analyzer, and sensors that wirelessly communicate with it, for HVAC system analysis. Ex. 1003, Pg. 1; Ex. 1013, Pg. 2. A POSITA would have looked to both Fieldpiece-B and Fieldpiece-M, which are complementary references, when considering solving a “need in the art for an improved sensor system for refrigeration units for monitoring and collecting system conditions such as superheat and subcooling.” Ex. 1001, 2:37-39. It is also my opinion that CN '332 is analogous art to Fieldpiece-B and the '051 Patent, since 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. In particular, CN ’332 discloses a wireless temperatures sensor Ex. 1011, ¶[0009]–[0010]. For these reasons, it is my opinion that a POSITA would have consulted and combined Fieldpiece-B and CN ’332 when considering “an improved sensor system for refrigeration units for monitoring and collecting system conditions.” Still further, it is my opinion that Staniforth is analogous since it is reasonably pertinent to the problem providing improved sensor systems, in particular, improved temperature sensor 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.

256. Based on the foregoing, it is my opinion that a POSITA would have consulted and combined Fieldpiece-B, Fieldpiece-M, CN ’332, and Staniforth when considering “an improved sensor system for refrigeration units for monitoring and collecting system conditions.”

A. Independent Claim 1

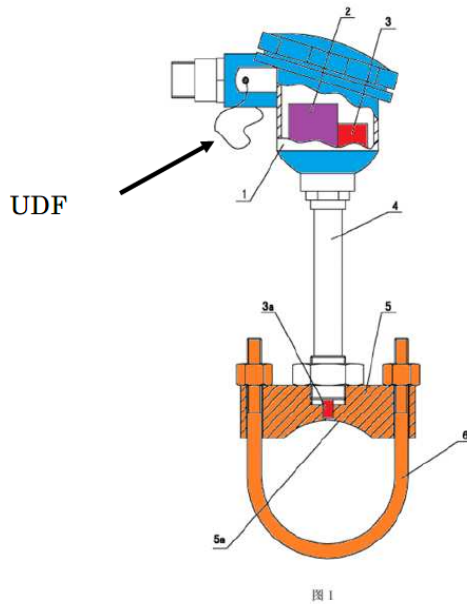
257. The claim language of the **[preamble]** and elements **[a]**, **[b]**, **[c]**, **[d]**, **[e]**, and **[g]** are discussed in Sections VII.A.1, 2, 3, 4, 5, 6, and 8, which are incorporated by reference and the same analysis is applied here to claim 1. As shown in those Sections, Fieldpiece-B in combination with Fieldpiece-M discloses the

preamble and elements [a], [b], [c], [d], [e]. Also, Fieldpiece-B discloses element [g] in view of the whole temperature sensor disclosed therein.

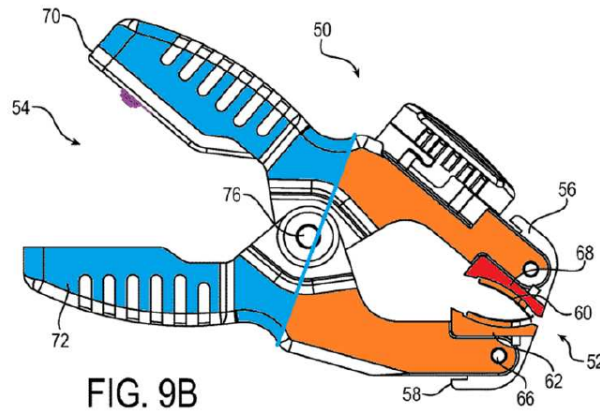
258. To the extent that it is asserted that Fieldpiece-B in combination with Fieldpiece-M does not disclose elements [e], [f'], and [g], CN '332 and Staniforth, discloses those claim elements.

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

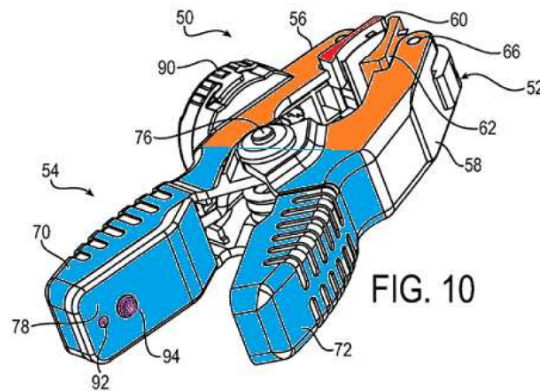
259. CN '332 discloses Example 1 of a pipe temperature measurement device; *i.e.*, a temperature sensor. Ex. 1011, ¶[0009] and Ex. 1010, FIG. 1. An annotated version of CN '332 FIG. 1 is reproduced below in comparison to the '051 Patent FIGS. 9B and 10:



Ex 1010, FIG. 1



Ex. 1001, FIG. 9B



Ex. 1001, FIG. 10

260. Compared to the '051 Patent, FIGS. 9B and 10, the CN '332 temperature clamp has the same features but a different shape: The temperature sensor has a clamp 6 (Orange), and heat conduction base 5 (Orange), having cylindrical surface 5a, linked to the clamp 6. Ex. 1011, ¶[0009]. These elements are configured to clamp around a pipe. *Id.*, ¶[0012].

261. The temperature sensor also includes a temperature-sensing probe 3a (Red). Ex. 1011, ¶[0009]. The temperature-sensing probe 3a “obtains the temperature of the outer surface of the pipe.” *Id.*, [0012].

262. 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]. In my opinion, the temperature transducer 3 and the temperature data processing device 2 are “integrated electronics.”

263. In my opinion, A POSITA considering improvements to Fieldpiece-B temperature sensor clamps would have learned from CN '332 to incorporate the integrated electronics in electrical connection with a temperature sensor. The POSITA would have been motivated to incorporate Fieldpiece-B temperature sensor clamps to place the CN '332 temperature processing device, including wireless transmitter, in Fieldpiece-B handles and in electrical connection with the sensor element. The modification of the two temperature sensor clamps of Fieldpiece-B by the temperature sensor clamp of CN '332 teaches element [e].

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

264. Referring to the annotated CN '332 FIG. 1 above, it is my opinion that a POSITA would have recognized that upper shell 1 of the temperature sensor clamp in CN '332 (Blue) may be grasped as a handle when installing the clamping portion

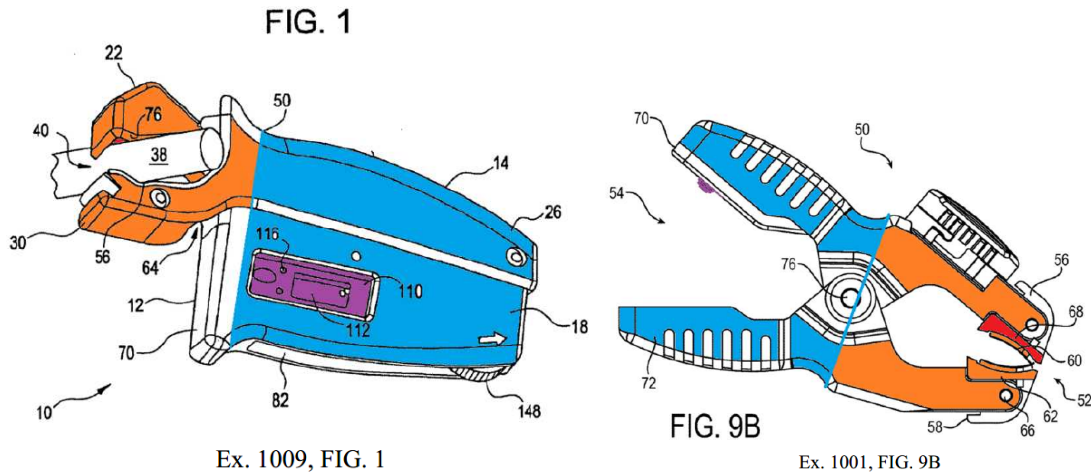
about a pipe. To the extent that it is argued that the “shell” of CN ’332 is not a handle, Fieldpiece-B discloses temperature sensor clamps having a handle, and it is my opinion that a POSITA would have incorporated the CN ’332 integrated electronics in Fieldpiece-B temperature sensor clamp handles.

265. The CN ’332 temperature sensor also includes a temperature-sensing probe 3a (Red). Ex. 1011, ¶[0009]. The temperature-sensing probe 3a “obtains the temperature of the outer surface of the pipe.” *Id.*, [0012].

266. CN ’332 discloses that the temperature-sensing probe 3a (Red) is connected, via its integration as part of temperature-sensing probe 3, to the temperature data processing device 2 (Purple), which may include a digital display and a wireless transmission function.” Ex. 1011, ¶[0009].

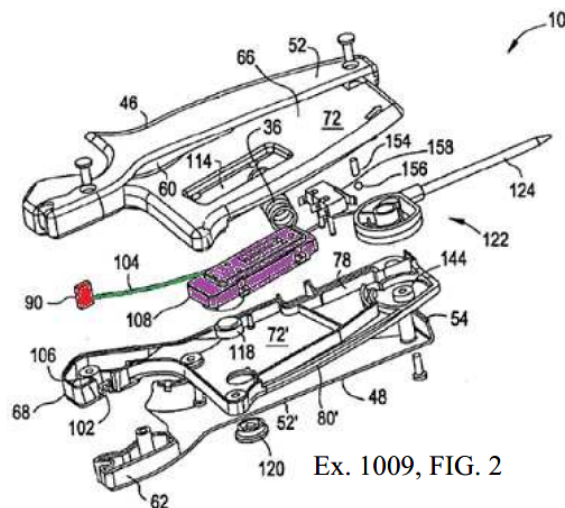
267. In addition, Staniforth discloses integrated electronics incorporated in the handle of a temperature sensor clamp, and in electrical connection with the sensor element as follows:

268. FIG. 1 of Staniforth as compared to FIG. 9B of the '051 Patent are annotated and reproduced below for reference:



269. Staniforth discloses upper and lower jaws 22, 30 (Orange) that clamp a pipe 38. Ex. 1009, 3:15-17. This is the same configuration shown in the '051 Patent at FIG. 9B.

270. Referring both the FIG.1 above and FIG. 2, below, 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.” See Ex. 1009, 4:8-11, and FIGS. 1 (above) and 2 (below):



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

272. Staniforth also discloses an upper handle 26 and lower handle 18 (Blue), and an electronics module 108, that is “integrated electronics” (Purple) within lower handle 18 and within display panel 110. Ex. 1009, 3:5-24. The electronics module includes display panel 110, LCD display 112, and control buttons 116. *Id.*, 4:30-49.

273. Further, 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.

274. It is my opinion that the further combination with Staniforth specifically teaches integrated electronics to the handle of the temperature sensor taught by Fieldpiece-B in combination with Fieldpiece-M and CN '332.

275. It is my opinion that Fieldpiece-B in combination with Fieldpiece-M, CN '332, and Staniforth teaches element [f].

3. Claim 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”

276. 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].

277. As set forth in Ground 1, it is my opinion that Fieldpiece-B in combination with Fieldpiece-M discloses element [g]. To the extent that “temperature sensors” in element [f] are interpreted to be “temperature sensor clamps,” modification of the two temperature sensor clamps of Fieldpiece-B, or those in Fieldpiece-M, as taught by CN ’332 would include wireless function in the handle of each temperature sensor clamp. In my opinion, the combination of Fieldpiece-B with CN ’332 teaches “there are no external physical electrical connections that extend from the first and second temperature sensors.”

278. As also outlined in Ground 1, Fieldpiece-B discloses “there are no external physical fluidic connections that extend from the first and second pressure sensors oppositely from the connectors.”

279. FIG. 1 of CN ’332 includes an undescribed feature, indicated by “UDF,” as shown above.

280. The UDF appears to be illustrated tethering one side of the shell 1 to the other. It is my opinion that the UDF is not an external physical connection since it appears to be anchored at both ends to shell 1. It is, however, unclear what the purpose of the UDF is.

281. To the extent that the UDF is suggested to be an “external physical electrical connection,” the embodiment of Example 2, FIG. 2, includes an integrated

solar means and is, thus, clearly self-sustaining without external physical electrical connections.

282. According to CN '332, the FIG. 2 embodiment includes all of the following features of the FIG.1 embodiment: “the structure of the supporting pole 4, heat conduction base 5, clamp 6, and temperature-sensing probe in the temperature transducer disposed in the heat conduction base 5 is the same as that in Example 1.” Ex. 1011, ¶[0011]. FIG. 2 adds a “solar wireless temperature testing device 7.” Ex. 1011, ¶[0011].

283. For either device FIG. 1 or FIG. 2 “the temperature measurement device is fixed on the pipe, the temperature-sensing probe 3a obtains the temperature of the outer surface of the pipe, the temperature transducer obtains temperature data of the outer surface of the pipe, and the actual temperature value of liquid and gas in the pipe is accurately obtained after the temperature data processing device 2 acquires, compensates, and processes the temperature data.” Ex. 1011, ¶[0012].

284. In my opinion, each of the CN '332 FIG. 2 embodiment features apply equally to element [g], in the same manner explained above for the CN '332 FIG. 1 embodiment.

285. It is my opinion that Fieldpiece-B in view of CN '332 teaches element [g].

4. Claim 1 Summary and Conclusion

286. A POSITA would have combined the teachings of Fieldpiece-B in combination with Fieldpiece-M, CN '332, and Staniforth to provide for wireless pressure sensors and wireless temperatures sensor clamps as disclosed in Fieldpiece-B in combination with Fieldpiece-M, with modification of the temperature sensor clamps therein with the CN '332 wireless temperature sensor and Staniforth temperature sensor clamp and integrated electronics to arrive at a combination of improve wireless sensors for HVACR analysis.

287. Based on the foregoing analysis, it is my opinion that a POSITA would appreciate that the complementary disclosures of Fieldpiece-B and Fieldpiece-M teach incorporation of wireless technology in HVACR sensors configured to transmit data to a remote, portable electronic device used for analysis of HVACR systems. A POSITA would recognize that Fieldpiece-B or Fieldpiece-M temperature sensor clamps could be improved by placing wireless technology and integrated electronics in the temperature sensor clamp handles in order to enhance usability of the assembled sensor system components, and based on this understanding, a POSITA would have been motivated to combine Fieldpiece-B, Fieldpiece-M, and CN '332 to arrive at improved, wireless temperature clamps. Further, the POSITA would have expected success at the combination since Fieldpiece-B, Fieldpiece-M, and CN '332 teach success at incorporation of wireless technology in sensors.

Further, a POSITA would have been motivated to apply the modifications of Staniforth to connect the temperature sensor with integrated electronics incorporated in the handle, and to provide control buttons for the temperature sensor clamp. Further, the POSITA would have expected success at the combination since Staniforth teaches successful incorporation of electronics, including control buttons, in the handle of a temperature sensor clamp.

288. A POSITA would have been motivated to combine the HVACR sensors of Fieldpiece-B in combination with Fieldpiece-M with the wireless temperature sensor clamp of CN '332 in order to reduce the bulk, number, and arrangement of components required in the field. Instead of two temperature sensor clamps, and their respective tethered headpiece-wireless transmitter units, the modification with the integrated electronics, including a wireless transmitter, from CN '332 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. A POSITA would also have been motivated to make the combination in order to eliminate distance constraints imposed by cables or hoses connecting sensors to each other, or to the remote computer collecting sensed data. A POSITA would have understood that without such distance constraints, 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, and without the need for a technician to physically approach,

read, and record data from each sensor. A POSITA would also have known based on the state of the art at the time, as demonstrated by Fieldpiece-B, Fieldpiece-M and CN '332, that wireless communication was predictably effective, and would have expected success at the combination of wireless technology in HVACR sensors and remote computers. Moreover, A POSITA would have been further motivated to modify the temperature sensor clamps taught by Fieldpiece-B in combination with Fieldpiece-M and CN '332 under the teachings of Staniforth with integrated electronics, including control buttons, in the handle for enhanced usability as well as a reduced number of parts.

289. It is my opinion that Fieldpiece-B in combination with Fieldpiece-M, CN '332, and Staniforth renders claim 1 of the '051 Patent obvious.

B. Independent claim 10

290. The claim language of the **[preamble]** and elements **[d']**, **[e']**, **[f]**, and **[g']** are discussed in Sections VII.B.1, 2, 3, 4, and 5, which are incorporated by reference and the same analysis is applied here to claim 10. As shown in those Sections, Fieldpiece-B discloses the preamble and elements **[d']** and **[e']**. Also, Fieldpiece-B discloses element **[f]** under the interpretation that “a portion” also includes the junction between the sensor element and electronics; *i.e.*, the thermocouple necessarily present and in contact with the sensor element.

291. To the extent that it is asserted that Fieldpiece-B does not disclose elements [e'], [f], and [g'], CN '332 and Staniforth disclose those claim elements.

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

292. It is my opinion that CN '332 discloses and "handle" and "integrated electronics." See FIGS. 1 and 2 of CN '332 and the discussion of CN '332 in this Ground, in Section IX.A.1, which is incorporated by reference and the same analysis is applied here to claim 10. To the extent that it is suggested that CN '332 does not disclose a handle, Fieldpiece-B in combination with Fieldpiece-M does. Ex. 1006, Pg. 4; Ex. 1013, Pg. 23.

293. It is my opinion that Fieldpiece-B in view of CN '332 teaches element [e'].

2. 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;"

294. The discussion at Section IX.A.2, which is incorporated by reference and the same analysis is applied here to claim 10, shows that Fieldpiece-B in combination with Fieldpiece-M, CN '332, and Staniforth teaches element [f']. The integrated electronics in either CN '332 or in the handle of Staniforth are in "a portion" of either. Section VI, incorporated herein, shows that "in signal communication" encompasses "in electrical connection." For at least the same

reasons as at Section IX.A.2, Fieldpiece-B in combination with Fieldpiece-M, CN '332, and Staniforth also teaches element [f].

3. Claim 10, [g'] "wherein the temperature sensor clamp has no external physical electrical connections."

295. See FIGS. 1 and 2 of CN '332 and the discussion of CN '332 regarding [g] in this Ground, at Section IX.A.3, which is incorporated by reference and the same analysis is applied here to claim 10. It is my opinion that the wireless temperature sensor clamp taught by Fieldpiece-B in combination with Fieldpiece-M and CN '332 would have no external physical electrical connections, as recited in claim 10 of the '051 Patent, element [g'].

4. Claim 10 Summary and Conclusion

296. A POSITA would have combined the teachings of Fieldpiece-B in combination with Fieldpiece-M, CN '332, and Staniforth to provide for a wireless temperatures sensor clamp as disclosed in Fieldpiece-B in combination with Fieldpiece-M, with modification of the temperature sensor clamp with the CN '332 wireless temperature sensor and Staniforth temperature sensor clamp and integrated electronics to arrive at an improved temperature sensor clamp for HVACR analysis.

297. Based on the foregoing analysis, it is my opinion that a POSITA would appreciate that the complementary disclosures of Fieldpiece-B and Fieldpiece-M teach incorporation of wireless technology in HVACR sensors for use in HVACR sensor systems. A POSITA would recognize that a Fieldpiece-B or Fieldpiece-M

temperature sensor clamp could be improved by placing wireless technology in a portion of the temperature sensor clamps in order to enhance usability of the assembled sensor system components. A POSITA have been motivated to combine teachings of a temperatures sensor clamp in CN '332 with Fieldpiece-B in combination with Fieldpiece-M temperature sensor clamps for these reasons, would have found it obvious to make such a modification, and would have predicted success at the combination.

298. A POSITA would have been motivated to combine HVACR sensors and wireless technology in order to reduce the bulk, number, and arrangement of components required in the field. Instead of a temperature sensor clamp, and its tethered headpiece-wireless transmitter unit of Fieldpiece-B, the modification with the integrated electronics, including a wireless transmitter, from CN '332 would result in a wireless temperature sensor clamp requiring less bulk and weight, and being more convenient to simply clamp in place and remove at will. A POSITA would also have known based on the state of the art at the time that wireless communication was predictably effective, as shown by both Fieldpiece-B and CN '332, and would have expected success at the combination of wireless technology in sensors. Further, CN '332 taught the success of integrating wireless transmitters in a temperature sensor clamp, and a POSITA would have, thus, predicted success at integrating wireless sensors into the temperature sensor clamp of Fieldpiece-B.

Further, a POSITA would have been motivated to apply the modifications of Staniforth to connect the temperature sensor with integrated electronics incorporated in the handle which is a portion of the temperature sensor clamp, and to provide control buttons for the temperature sensor clamp. Further, the POSITA would have expected success at the combination since Staniforth teaches successful incorporation of electronics, including control buttons, in the handle of a temperature sensor clamp. Moreover, A POSITA would have been further motivated to modify the temperature sensor clamps taught by Fieldpiece-B in combination with Fieldpiece-M and CN '332 under the teachings of Staniforth with integrated electronics, including control buttons, in the handle for enhanced usability as well as a reduced number of parts.

299. It is my opinion that Fieldpiece-B in combination with Fieldpiece-M, CN '332, and Staniforth renders claim 10 of the '051 Patent obvious.

C. Independent Claim 15

300. The claim language of claim 15 **[preamble]** and elements **[a]**, **[b]**, **[c]**, **[d]**, **[e]**, and **[g]** are discussed in Sections VII.A.1, 2, 3, 4, 5, 6, and 8, which are incorporated by reference and the same analysis is applied here to claim 15. The discussions in Sections IX.A.1. and IX.A.3 apply Fieldpiece-B in combination with Fieldpiece-M and CN '332 to elements **[e]** and **[g]**, and are incorporated by reference and the same analysis applies here to claim 15. The only difference between claim 1

and claim 15 is that at element [f'], claim 1 recites “the integrated electronics are incorporated into the handle and in electrical connection with the sensor element,” while at element [f], claim 15 recites “the integrated electronics are incorporated into a portion of the temperature sensor clamp and are in signal communication with the sensor element.”

301. To the extent that it is suggested that Fieldpiece-B in combination with Fieldpiece-M does not disclose element [f], CN '332 and Staniforth disclose that element.

1. ***Claim 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”***

302. The discussion at section IX.A.2, which is incorporated by reference and the same analysis is applied here to claim 15, shows that Fieldpiece in combination with CN '332 and Staniforth teaches element [f']. The integrated electronics in either CN '332 or in the handle of Staniforth are in “a portion” of either. Section VI, incorporated herein, shows that “in signal communication” encompasses “in electrical connection.” For at least the same reasons as at Section IX.A.2, Fieldpiece-B in combination with Fieldpiece-M, CN '332, and Staniforth also teaches element [f].

2. Claim 15 Summary and Conclusion

303. A POSITA would have combined the teachings of Fieldpiece-B in combination with Fieldpiece-M, CN '332, and Staniforth to provide for wireless pressure sensors and wireless temperatures sensor clamps as disclosed in Fieldpiece-B in combination with Fieldpiece-M, with modification of the temperature sensor clamps therein with the CN '332 wireless temperature sensor and Staniforth temperature sensor clamp and integrated electronics to arrive at a combination of improve wireless sensors for HVACR analysis.

304. Based on the foregoing analysis, it is my opinion that a POSITA would appreciate that the complementary disclosures of Fieldpiece-B and Fieldpiece-M teach incorporation of wireless technology in HVACR sensors configured to transmit data to a remote, portable electronic device used for analysis of HVACR systems. A POSITA would recognize that Fieldpiece-B or Fieldpiece-M temperature sensor clamps could be improved by placing wireless technology and integrated electronics in the temperature sensor clamp handles in order to enhance usability of the assembled sensor system components, and based on this understanding, a POSITA would have been motivated to combine Fieldpiece-B, Fieldpiece-M, and CN '332 to arrive at improved, wireless temperature clamps. Further, the POSITA would have expected success at the combination since Fieldpiece-B, Fieldpiece-M, and CN '332 teach success at incorporation of wireless technology in sensors.

Further, a POSITA would have been motivated to apply the modifications of Staniforth to connect the temperature sensor with integrated electronics incorporated in the handle, and to provide control buttons for the temperature sensor clamp. Further, the POSITA would have expected success at the combination since Staniforth teaches successful incorporation of electronics, including control buttons, in the handle of a temperature sensor clamp.

305. A POSITA would have been motivated to combine the HVACR sensors of Fieldpiece-B in combination with Fieldpiece-M with the wireless temperature sensor clamp of CN '332 in order to reduce the bulk, number, and arrangement of components required in the field. Instead of two temperature sensor clamps, and their respective tethered headpiece-wireless transmitter units, the modification with the integrated electronics, including a wireless transmitter, from CN '332 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. A POSITA would also have been motivated to make the combination in order to eliminate distance constraints imposed by cables or hoses connecting sensors to each other, or to the remote computer collecting sensed data. A POSITA would have understood that without such distance constraints, 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, and without the need for a technician to physically approach,

read, and record data from each sensor. A POSITA would also have known based on the state of the art at the time, as demonstrated by Fieldpiece-B, Fieldpiece-M and CN '332, that wireless communication was predictably effective, and would have expected success at the combination of wireless technology in HVACR sensors and remote computers. Moreover, A POSITA would have been further motivated to modify the temperature sensor clamps taught by Fieldpiece-B in combination with Fieldpiece-M and CN '332 under the teachings of Staniforth with integrated electronics, including control buttons, in the handle for enhanced usability as well as a reduced number of parts.

306. It is my opinion that Fieldpiece-B in combination with Fieldpiece-M, CN '332, and Staniforth renders claim 15 obvious.

D. Independent Claim 20

307. The claim language of element **[a']** is discussed in Section VII.D.2, which is incorporated by reference and the same analysis is applied here to claim 20. The claim language of the **[preamble]** and elements **[b]**, **[d]**, and **[e]** are discussed in Sections VII.A.1, 3, 5, and 6, which are incorporated by reference and the same analysis is applied here to claim 20. As shown in those Sections, Fieldpiece-B in combination with Fieldpiece-M disclose the preamble and elements **[a']**, **[b]**, **[d]**, and **[e]**. To the extent that it is asserted that Fieldpiece-B in combination with

Fieldpiece-M does not disclose elements **[e]** and **[f]**, CN '332 and Staniforth discloses those claim elements.

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

308. CN '332 discloses a temperature sensor clamp having “a handle and integrated electronics.” See FIG. 1 of CN '332 (Ex. 1010) and the discussion of CN '332 in this Ground, Section IX.A.1., which is incorporated by reference and the same analysis is applied here to claim 20. To the extent it is suggested that CN '332 does not disclose a handle, Fieldpiece-B or Fieldpiece-M discloses this element. Ex. 1006, Pg. 4; Ex. 1013, Pg. 23. Fieldpiece-B in combination with Fieldpiece-M and CN '332 teach element **[e]**.

2. 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”

309. The discussion at section IX.A.2, which is incorporated by reference and the same analysis is applied here to claim 20, shows that Fieldpiece-B in view of CN '332 and Staniforth teaches element **[f']**. The integrated electronics in either CN '332 or in the handle of Staniforth are in “a portion” of either. Section VI, incorporated herein, shows that “in signal communication” encompasses “in electrical connection.” For at least the same reasons as at Section IX.A.2, Fieldpiece-

B in combination with Fieldpiece-M, CN '332, and Staniforth also teaches element [f].

3. *Claim 20 Summary and Conclusion*

310. A POSITA would have combined the teachings of Fieldpiece-B in combination with Fieldpiece-M, CN '332, and Staniforth to provide for wireless pressure sensors, wireless temperatures sensor clamps, and a wireless receiving unit as disclosed in Fieldpiece-B in combination with Fieldpiece-M, with modification of the temperature sensor clamps therein with the CN '332 wireless temperature sensor and Staniforth temperature sensor clamp and integrated electronics to arrive at a combination of improved wireless sensors and wireless receiving unit for HVACR analysis.

311. Based on the foregoing analysis, it is my opinion that a POSITA would appreciate that the complementary disclosures of Fieldpiece-B and Fieldpiece-M teach incorporation of wireless technology in HVACR sensors configured to transmit data to a remote, portable electronic device used for analysis of HVACR systems. A POSITA would recognize that Fieldpiece-B or Fieldpiece-M temperature sensor clamps could be improved by placing wireless technology and integrated electronics in the temperature sensor clamp handles in order to enhance usability of the assembled sensor system components, and based on this understanding, a POSITA would have been motivated to combine Fieldpiece-B, Fieldpiece-M, and

CN '332 to arrive at improved, wireless temperature clamps. Further, the POSITA would have expected success at the combination since Fieldpiece-B, Fieldpiece-M, and CN '332 teach success at incorporation of wireless technology in sensors. Further, a POSITA would have been motivated to apply the modifications of Staniforth to connect the temperature sensor with integrated electronics incorporated in the handle, and to provide control buttons for the temperature sensor clamp. Further, the POSITA would have expected success at the combination since Staniforth teaches successful incorporation of electronics, including control buttons, in the handle of a temperature sensor clamp.

312. A POSITA would have been motivated to combine the HVACR sensors of Fieldpiece-B in combination with Fieldpiece-M with the wireless temperature sensor clamp of CN '332 in order to reduce the bulk, number, and arrangement of components required in the field. Instead of two temperature sensor clamps, and their respective tethered headpiece-wireless transmitter units, the modification with the integrated electronics, including a wireless transmitter, from CN '332 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. A POSITA would also have been motivated to make the combination in order to eliminate distance constraints imposed by cables or hoses connecting sensors to each other, or to the remote computer collecting sensed data. A POSITA would have understood that

without such distance constraints, 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, and without the need for a technician to physically approach, read, and record data from each sensor. A POSITA would also have known based on the state of the art at the time, as demonstrated by Fieldpiece-B, Fieldpiece-M and CN '332, that wireless communication was predictably effective, and would have expected success at the combination of wireless technology in HVACR sensors and remote computers. Moreover, A POSITA would have been further motivated to modify the temperature sensor clamps taught by Fieldpiece-B in combination with Fieldpiece-M and CN '332 under the teachings of Staniforth with integrated electronics, including control buttons, in the handle for enhanced usability as well as a reduced number of parts.

313. It is my opinion that Fieldpiece-B in combination with Fieldpiece-M, CN '332, and Staniforth renders claim 20 of the '051 Patent obvious.

E. Dependent Claim 21

314. The claim language of the claim 21 preamble and elements [1], [2], [3], and [4] is discussed in Sections VII.E.1–5., which are incorporated by reference and the same analysis is applied here to claim 21. Fieldpiece-B in combination with Fieldpiece-M discloses the preamble and elements [1], [2], [3], and [4] of claim 21.

To the extent that it is suggested that Fieldpiece-B in combination with Fieldpiece-M does not disclose element [4], CN '332 discloses this element.

1. ***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.”***

315. As set forth in Section IX.A.1.–3., which is incorporated by reference and the same analysis is applied here to claim 21, CN '332 discloses a temperature sensor clamp that includes integrated electronics that are configured for wirelessly communicating temperature sensor data. Fieldpiece-B in combination with Fieldpiece-M and CN '332 teach element [4].

2. Claim 21 Summary and Conclusion

316. A POSITA would have combined the teachings of Fieldpiece-B in combination with Fieldpiece-M, CN '332, and Staniforth to provide for wireless pressure sensors, wireless temperatures sensor clamps, and a wireless portable electronic device as disclosed in Fieldpiece-B in combination with Fieldpiece-M, with modification of the temperature sensor clamps therein with the CN '332 wireless temperature sensor and Staniforth temperature sensor clamp and integrated electronics to arrive at a combination of improved wireless sensors and wireless portable electronic device for HVACR analysis.

317. Claim 21 depends from claim 20. The discussion of claim 20 in Section IX.D. is incorporated by reference and the same analysis is applied here to claim 21.

318. Based on the foregoing analysis, it is my opinion that a POSITA would appreciate that the complementary disclosures of Fieldpiece-B and Fieldpiece-M disclose a portable electronic device and both pressure and temperature sensors configured for high side and low side HVAC measurements. A POSITA would recognize that from the various instruments disclosed in Fieldpiece-B or Fieldpiece-M, 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. See, for example, the Full A/C Diagnostic Kit of Fieldpiece-B. Further, both Fieldpiece-B and Fieldpiece-M suggests tests for calculating superheat and subcool. 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. Still further, a POSITA would have been motivated to incorporate the integrated electronics of CN '332 in the temperature sensor clamps of Fieldpiece-B or Fieldpiece-M in order to enhance usability of the assembled sensor system components by decreasing the bulk, number, and arrangement of components. Instead of two temperature sensor clamps, and their respective tethered headpiece-

wireless transmitter units, the modification with the integrated electronics, including a wireless transmitter, from CN '332 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. The POSITA would also have predicted success given the state of the art in wireless technology, as shown by Fieldpiece-M, Fieldpiece-B, and CN '332.

319. Further, a POSITA would have been motivated to apply the modifications of Staniforth to connect the temperature sensor with integrated electronics incorporated in the handle, and to provide control buttons for the temperature sensor clamp. Still further, the POSITA would have expected success at the combination since Staniforth teaches successful incorporation of electronics, including control buttons, in the handle of a temperature sensor clamp. The POSITA would have recognized that the integrated electronics, including control buttons, in the handle portion would provide enhanced usability as well as a reduced number of parts.

320. It is my opinion that Fieldpiece-B in combination with Fieldpiece-M, CN '078, and Staniforth renders claim 21 of the '051 Patent obvious.

X. GROUND 4: FIELDPIECE-B IN VIEW OF PEIRS AND STANIFORTH RENDERS CLAIMS 1, 10, 15, 20, AND 21 UNPATENTABLE

321. Peirs relates to “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]. As such, it is my opinion that Peirs 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.

322. Staniforth relates to “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 further has electronics incorporated in its handle that connect a thermistor to a display panel, and the display has integrated control buttons. *Id.*, 4:30–49.

323. 3. In my opinion, Fieldpiece-B is analogous art to and in the same field of endeavor as the ’051 Patent since both relate to sensor systems that remotely

transmit temperature and pressure data for refrigeration units. See Ex. 1006, Pg. 1 and Ex. 1001, 1:15–17.

324. Also, Fieldpiece-M is analogous to and in the same field of endeavor as the '051 Patent, namely sensor systems for HVACR. For example, Fieldpiece-M relates to an “HVAC Guide® System Analyzer” and wireless sensors that transmit data to it for, among other purposes, testing “Superheat” and “Subcooling” in an HVAC system. Ex. 1013, Pg. 2. Further, both Fieldpiece-M and the '051 Patent are directed to solving problems similar to the problems addressed by the '051 Patent, namely, a “need in the art for an improved sensor system for refrigeration units for monitoring and collecting system conditions such as superheat and subcooling.” Ex. 1001, 2:37-39.

325. Fieldpiece-M is also from the same field of endeavor as the '051 Patent, namely sensor systems for HVACR. For example, Fieldpiece-M relates to an “HVAC Guide® System Analyzer” and wireless sensors that transmit data to it for, among other purposes, testing “Superheat” and “Subcooling” in an HVAC system. Ex. 1013, Pg. 2. Further, both Fieldpiece-M and the '051 Patent are directed to solving problems similar to the problems addressed by the '051 Patent, namely, a “need in the art for an improved sensor system for refrigeration units for monitoring and collecting system conditions such as superheat and subcooling.” Ex. 1001, 2:37-39.

326. Fieldpiece-B and Fieldpiece-M disclose and both are related to the HG3 System Analyzer, and sensors that wirelessly communicate with it, for HVAC system analysis. Ex. 1003, Pg. 1; Ex. 1013, Pg. 2. A POSITA would have looked to both Fieldpiece-B and Fieldpiece-M, which are complementary references, when considering solving a “need in the art for an improved sensor system for refrigeration units for monitoring and collecting system conditions such as superheat and subcooling.” Ex. 1001, 2:37-39.

327. It is my opinion that a POSITA would have consulted and combined Fieldpiece-B in combination with Fieldpiece-M and Peirs when considering the need identified in the '051 Patent: “improved sensor system for refrigeration units for monitoring and collecting system conditions such as superheat and subcooling.” Ex. 1001, 2:37–39. Further, it is my opinion that Staniforth is analogous since it is reasonably pertinent to the problem providing improved sensor systems, in particular, improved temperature sensor 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.

A. Independent Claim 1

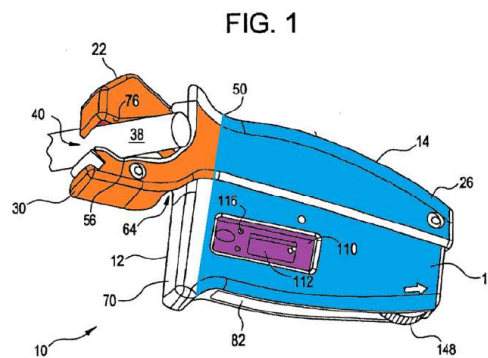
328. The claim language of the **[preamble]** and elements **[a]**, **[b]**, **[c]**, **[d]**, **[e]**, and **[g]** are discussed in Sections VII.A.1, 2, 3, 4, 5, 6, and 8, which are incorporated by reference and the same analysis is applied here to claim 1. As shown

in those Sections, Fieldpiece-B discloses the preamble and elements [a], [b], [c], [d], [e]. Also, Fieldpiece-B discloses element [g] in view of the whole temperature sensor disclosed therein.

329. To the extent that it is asserted that Fieldpiece-B in combination with Fieldpiece-M does not disclose elements [d], [e], [f'], and [g], Peirs and Staniforth teach those claim elements.

1. ***Claim 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;”***

330. Staniforth discloses a temperature sensor clamp, and an annotated FIG. 1 from Staniforth is copied below to show features of the clamp.



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

332. In combination with the two wireless temperature sensors of Peirs, Staniforth teaches **[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,” as recited in claim 1.

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

333. Peirs discloses two wirelessly communicating pressure sensors in an HVAC/R system. Ex. 1012, Abstract, ¶¶[0037] and [0038], and FIG. 1. Peirs also explicitly discloses two wirelessly communicating temperature sensors. *Id.* The below reproduced and annotated 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):

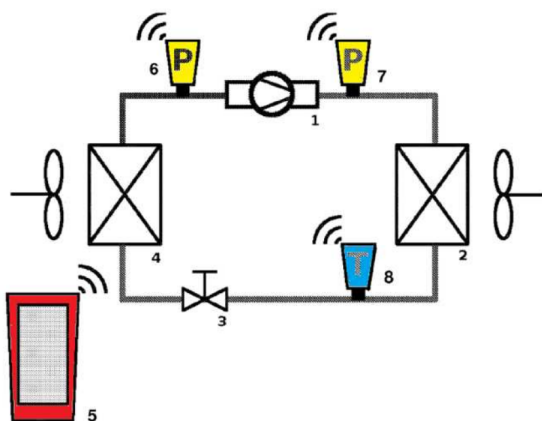
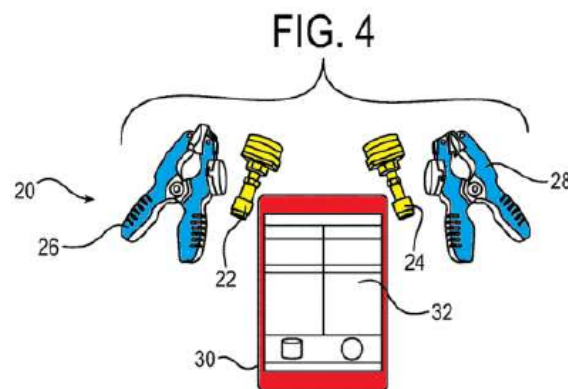


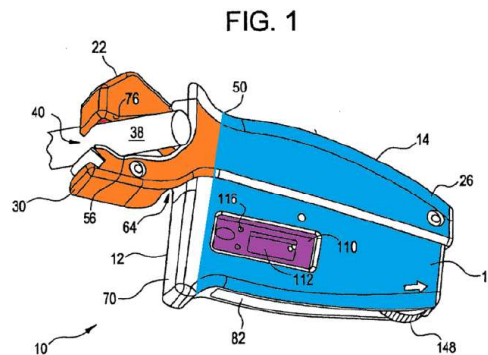
FIG 1
Ex. 1012, FIG. 1



Ex. 1001, FIG. 4

334. Each figure above shows a portable electronic device (Red). Each figure shows two pressure sensors (Yellow). Each figure shows 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 versus the '051 Patent FIG. 4. That difference is accounted for in the specification of Peirs, as Peirs states “two wireless temperature sensors.” Ex. 1012, ¶[0039].

335. Staniforth discloses an upper handle 26 and lower handle 18 (Blue). Ex. 1009, 3:5–11.



336. It is my opinion that having “two wireless temperature sensors,” as taught by Peirs (¶[0039]), would have led a POSITA to replace the cables in the handle and leading away from each temperature sensing clamp of the Full A/C Diagnostic Kit with wireless transceivers located in the handle of each clamp. This would have realized the “two wireless temperature sensors” of Peirs, but in the clamping configuration of Fieldpiece-B — each having a handle and integrated

electronics to establish the wireless communication. The further combination with Staniforth teaches first and second temperature sensor clamps having a handle.

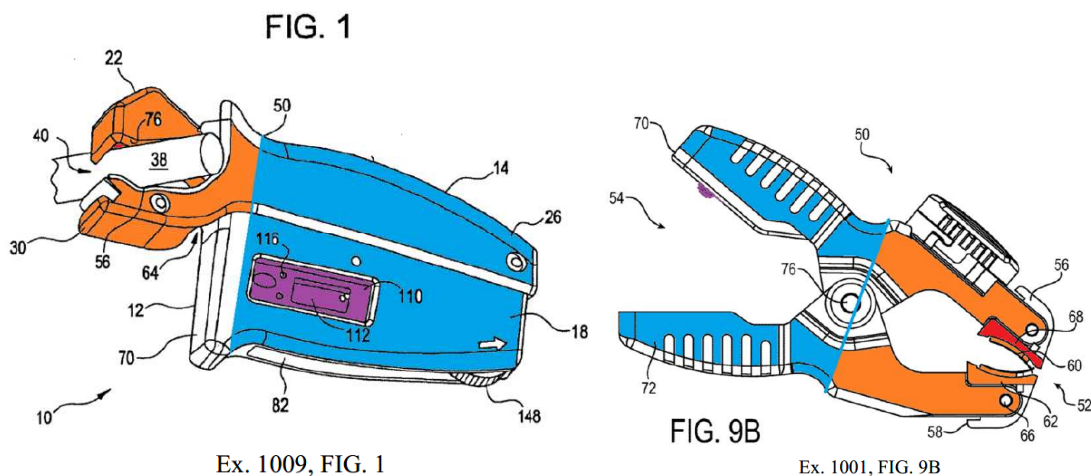
337. Fieldpiece-B in view of Peirs and Staniforth teaches element [e].

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

338. It is my opinion that a POSITA would have connected the sensing element in both of the temperature sensor clamps of the Full A/C Diagnostic Kit temperature sensors to the “integrated transmitting unit” in the wireless temperature sensors taught by Peirs. See Ex. 1012 at ¶[0039] and [0040].

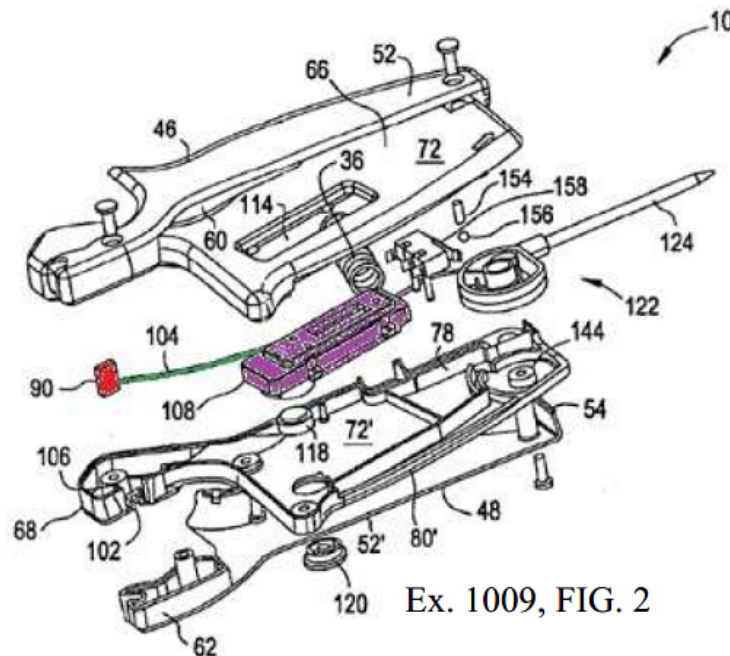
339. Staniforth discloses integrated electronics incorporated in the handle of a temperature sensor clamp, and in electrical connection with the sensor element as follows:

340. 8. FIG. 1 of Staniforth as compared to FIG. 9B of the '051 Patent are annotated and reproduced below for reference:



341. Staniforth discloses upper and lower jaws 22, 30 (Orange) that clamp a pipe 38. Ex. 1009, 3:15-17. This is the same configuration shown in the '051 Patent at FIG. 9B.

342. Referring both the FIG.1 above and FIG. 2, below, a temperature sensor assembly 90 (Red) is “in recess 102 in the clamping surface 76 of the upper jaw 22, with the signal-carrying conductor104 [green] extending through opening 106 in clamping surface 76.” See Ex. 1009, 4:8-11, and FIGS. 1 (above) and 2 (below):



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

344. Staniforth also discloses an upper handle 26 and lower handle 18 (Blue), and an electronics module 108, that is “integrated electronics” (Purple) within lower

handle 18 and within display panel 110. Ex. 1009, 3:5-24. The electronics module includes display panel 110, LCD display 112, and control buttons 116. *Id.*, 4:30-49.

345. Further, 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.

346. It is my opinion that the further combination with Staniforth specifically teaches integrated electronics to the handle of the temperature sensor taught by Fieldpiece-B in combination with Fieldpiece-M and Peirs.

347. It is my opinion that Fieldpiece-B in combination with Fieldpiece-M, Peirs, and Staniforth teaches element [f'].

4. Claim 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”

348. To the extent that the “first and second temperature sensors” of element [g] are interpreted to be only “first and second temperature sensor clamps,” it is my opinion that modification of Fieldpiece-B 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.”

349. The discussion of claim 1 in Ground 1, Section VII.A.8, which is incorporated by reference and the same analysis is applied here to claim 1, shows that Fieldpiece-B in combination with Fieldpiece-M discloses “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.

350. It is my opinion that Fieldpiece-B in combination with Fieldpiece-M, Peirs, and Staniforth teaches element [g].

4. *Claim 1 Summary and Conclusion*

351. A POSITA would have combined the teachings of Fieldpiece-B in combination with Fieldpiece-M, Peirs, and Staniforth to provide for wireless pressure sensors and wireless temperatures sensor clamps as disclosed in Fieldpiece-B in combination with Fieldpiece-M, with modification of the temperature sensor clamps therein with the Peirs wireless temperature sensors having integrated wireless transceivers and Staniforth temperature sensor clamp and integrated electronics to arrive at a combination of improved wireless sensors for HVACR analysis.

352. Based on the foregoing analysis, it is my opinion that a POSITA would appreciate that complementary disclosures of Fieldpiece-B and Fieldpiece-M teach incorporation of wireless technology in HVACR sensors configured to transmit data to a remote, portable electronic device used for analysis of HVACR systems. Based

on the disclosure in Peirs of wireless temperature sensors, a POSITA would recognize that Fieldpiece-B temperature sensor could be improved by placing wireless technology, including the “integrated transmitting unit” in the wireless temperature sensors taught by Peirs (Ex. 1012 at ¶[0039] and [0040]), in the temperature sensor clamp handles of Fieldpiece-B or Fieldpiece-M in order to enhance usability of the assembled sensor system components. A POSITA would have been motivated to combine Fieldpiece-B, Fieldpiece-M, and Peirs to arrive at improved, wireless temperature clamps. Further, the POSITA would have expected success at the combination since both Fieldpiece-B in combination with Fieldpiece-M and Peirs teach success at incorporation of wireless technology in the elements of a sensor system. Further, a POSITA would have been motivated to apply the modifications of Peirs and Staniforth to Fieldpiece-B in combination with Fieldpiece-M to provide a temperature sensor clamp having integrated electronics incorporated in the handle, including the integrated transmitting unit of Peirs and control buttons from Staniforth, in electrical connection with a sensor element. Further, the POSITA would have expected success at the combination since Peirs teaches successful use of wireless technology in sensors, and Staniforth teaches successful incorporation of electronics, including control buttons, in the handle of a temperature sensor clamp.

353. A POSITA would have been motivated to combine the HVACR sensors of Fieldpiece-B in combination with Fieldpiece-M with the wireless temperature sensors of Peirs in order to reduce the bulk, number, and arrangement of components required in the field. Instead of two temperature sensor clamps, and their respective tethered headpiece-wireless transmitter units, the modification with the integrated electronics, including the “integrated transmitting unit” in the wireless temperature sensors taught by Peirs (Ex. 1012 at ¶[0039] and [0040]) 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. A POSITA would also have been motivated to make the combination in order to eliminate distance constraints imposed by cables or hoses connecting sensors to each other, or to the remote computer collecting sensed data. A POSITA would have understood that without such distance constraints, 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, and without the need for a technician to physically approach, read, and record data from each sensor. A POSITA would also have known based on the state of the art at the time, as demonstrated by Fieldpiece-B, Fieldpiece-M, and Peirs, that wireless communication was predictably effective, and would have expected success at the combination of wireless technology in HVACR sensors and remote computers. Moreover, A POSITA would have been further motivated to modify the

temperature sensor clamps taught by Fieldpiece-B in combination with Fieldpiece-M and Peirs under the teachings of Staniforth with integrated electronics, including control buttons, in the handle for enhanced usability as well as a reduced number of parts.

354. It is my opinion that Fieldpiece-B in combination with Fieldpiece-M, Peirs, and Staniforth renders claim 1 of the '051 Patent obvious.

B. Independent claim 10

355. The claim language of the **[preamble]** and elements **[d']**, **[e']**, **[f]**, and **[g']** are discussed in Sections VII.B.1, 2, 3, 4, and 5, which are incorporated by reference and the same analysis is applied here. As shown in those Sections, Fieldpiece-B in combination with Fieldpiece-M discloses the preamble and elements **[d']** and **[e']**. Also, Fieldpiece-B in combination with Fieldpiece-M discloses element **[f]** under the interpretation that “a portion” also includes the junction between the sensor element and electronics; *i.e.*, the thermocouple that is necessarily present and in electrical connection with the sensor element.

356. To the extent that it is asserted that Fieldpiece-B in combination with Fieldpiece-M does not disclose elements **[e']**, **[f]**, and **[g']**, Peirs and Staniforth teach those claim elements.

1. Claim 10, [e'] “a handle and integrated electronics, and”

357. See the discussion of Peirs and Staniforth in this Ground at Section X.A.2., which is incorporated by reference and the same analysis is applied here. It is my opinion that Peirs and Staniforth teach modification of a Fieldpiece temperature sensor clamp, which has a handle, to include “integrated electronics.”

2. 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;”

358. The discussion of element [f'] in this Ground at Section X.A.3. is incorporated by reference and the same analysis is applied here. It is my opinion that Peirs and Staniforth teach modification of a Fieldpiece temperature sensor clamp to include “integrated electronics,” which could be incorporated in any portion of the temperature sensor clamp. It is also my opinion that the “integrated electronics” would be in “signal communication” with the sensor element since they would be “in electrical connection,” as taught in Staniforth. It is my opinion that Fieldpiece-B in view of Peirs and Staniforth teaches element [f].

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

359. It is my opinion that the wireless temperature sensor clamp taught by Fieldpiece-B in combination with Fieldpiece-M, Peirs and Staniforth would have no external physical connections, and that Fieldpiece-B in combination with Fieldpiece-M, Peirs and Staniforth teaches element [g'].

4. Claim 10 Summary and Conclusion

360. A POSITA would have combined the teachings of Fieldpiece-B in combination with Fieldpiece-M, Peirs, and Staniforth to provide for wireless temperatures sensor clamps as disclosed in Fieldpiece-B in combination with Fieldpiece-M, with modification of the temperature sensor clamp with the Peirs wireless temperature sensor having an integrated wireless transceiver and the Staniforth temperature sensor clamp and integrated electronics to arrive at an improved temperature sensor clamp for HVACR analysis.

361. Based on the foregoing analysis, it is my opinion that a POSITA would appreciate that the complementary disclosures of Fieldpiece-B and Fieldpiece-M teach incorporation of wireless technology in HVACR sensors for use in HVACR sensor systems. A POSITA would recognize that Fieldpiece-B or Fieldpiece-M temperature sensor clamps could be improved by placing wireless technology, including the “integrated transmitting unit” in the wireless temperature sensors taught by Peirs (Ex. 1012 at ¶[0039] and [0040]), in a portion of the temperature sensor clamps of Fieldpiece-B or Fieldpiece-M in order to enhance usability of the assembled sensor system components. A POSITA would have been motivated to combine teachings of wireless sensors in Peirs with Fieldpiece-B in combination with Fieldpiece-M temperature sensor clamps for these reasons, would have found it obvious to make such a modification, and would have predicted success at the

combination. Further, a POSITA would have been motivated to apply the modifications of Peirs and Staniforth to Fieldpiece-B to provide a temperature sensor clamp having integrated electronics incorporated in the handle, including the integrated transmitting unit of Peirs and control buttons from Staniforth, in electrical connection with a sensor element. Further, the POSITA would have expected success at the combination since Peirs teaches successful use of wireless technology in sensors, and Staniforth teaches successful incorporation of electronics, including control buttons, in the handle of a temperature sensor clamp.

362. A POSITA would have been motivated to combine HVACR sensors and wireless technology in order to reduce the bulk, number, and arrangement of components required in the field. Instead of a temperature sensor clamps, and its tethered headpiece-wireless transmitter unit of Fieldpiece-B, the modification with the integrated electronics, including the “integrated transmitting unit” in the wireless temperature sensors taught by Peirs (Ex. 1012 at ¶[0039] and [0040]), would result in a wireless temperature sensor clamp requiring less bulk and weight, and being more convenient to simply clamp in place and remove at will. A POSITA would also have known based on the state of the art at the time that wireless communication was predictably effective, as shown by both Fieldpiece-B and Peirs, and would have expected success at the combination of wireless technology in sensors. Moreover, A POSITA would have been further motivated to modify the temperature sensor

clamps taught by Fieldpiece-B in combination with Fieldpiece-M and Peirs under the teachings of Staniforth with integrated electronics, including control buttons, in the handle for enhanced usability as well as a reduced number of parts.

363. It is my opinion that Fieldpiece-B in combination with Fieldpiece-M, Peirs, and Staniforth renders claim 10 of the '051 Patent obvious.

C. Independent Claim 15

364. The claim language of the **[preamble]** and elements **[a]**, **[b]**, **[c]**, **[d]**, **[e]**, and **[g]** are discussed in Sections VII.A.1, 2, 3, 4, 5, 6, and 8, which are incorporated by reference and the same analysis is applied here. As shown in those Sections, Fieldpiece-B discloses the preamble and elements **[a]**, **[b]**, **[c]**, **[d]**, and **[e]**. The discussions in Sections X.A.2. and X.A.4 apply Fieldpiece-B in view of Peirs to elements **[e]** and **[g]**, and are incorporated by reference and the same analysis applies here. To the extent that it is asserted that Fieldpiece-B in combination with Fieldpiece-M does not disclose element **[f]**, Peirs and Staniforth teach that claim element.

1. Claim 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”

365. Sections X.A.3 and X.B.2., which are incorporated by reference and the same analysis is applied here, show that Peirs and Staniforth teach element **[f]**.

Fieldpiece-B in combination with Fieldpiece-M, Peirs, and Staniforth teaches element [f].

2. Claim 15 Summary and Conclusion

366. A POSITA would have combined the teachings of Fieldpiece-B in combination with Fieldpiece-M, Peirs, and Staniforth to provide for wireless pressure sensors and wireless temperatures sensor clamps as disclosed in Fieldpiece-B in combination with Fieldpiece-M, with modification of the temperature sensor clamps therein with the Peirs wireless temperature sensors having integrated wireless transceivers and Staniforth temperature sensor clamp and integrated electronics to arrive at a combination of improved wireless sensors for HVACR analysis.

367. Based on the foregoing analysis, it is my opinion that a POSITA would appreciate that complementary disclosures of Fieldpiece-B and Fieldpiece-M teach incorporation of wireless technology in HVACR sensors configured to transmit data to a remote, portable electronic device used for analysis of HVACR systems. Based on the disclosure in Peirs of wireless temperature sensors, a POSITA would recognize that Fieldpiece-B temperature sensor could be improved by placing wireless technology, including the “integrated transmitting unit” in the wireless temperature sensors taught by Peirs (Ex. 1012 at [0039] and [0040]), in the temperature sensor clamp handles of Fieldpiece-B or Fieldpiece-M in order to

enhance usability of the assembled sensor system components. A POSITA would have been motivated to combine Fieldpiece-B, Fieldpiece-M, and Peirs to arrive at improved, wireless temperature clamps. Further, the POSITA would have expected success at the combination since both Fieldpiece-B in combination with Fieldpiece-M and Peirs teach success at incorporation of wireless technology in the elements of a sensor system. Further, a POSITA would have been motivated to apply the modifications of Peirs and Staniforth to Fieldpiece-B in combination with Fieldpiece-M to provide a temperature sensor clamp having integrated electronics incorporated in the handle, including the integrated transmitting unit of Peirs and control buttons from Staniforth, in electrical connection with a sensor element. Further, the POSITA would have expected success at the combination since Peirs teaches successful use of wireless technology in sensors, and Staniforth teaches successful incorporation of electronics, including control buttons, in the handle of a temperature sensor clamp.

368. A POSITA would have been motivated to combine the HVACR sensors of Fieldpiece-B in combination with Fieldpiece-M with the wireless temperature sensors of Peirs in order to reduce the bulk, number, and arrangement of components required in the field. Instead of two temperature sensor clamps, and their respective tethered headpiece-wireless transmitter units, the modification with the integrated electronics, including the “integrated transmitting unit” in the wireless temperature

sensors taught by Peirs (Ex. 1012 at [0039] and [0040]) 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. A POSITA would also have been motivated to make the combination in order to eliminate distance constraints imposed by cables or hoses connecting sensors to each other, or to the remote computer collecting sensed data. A POSITA would have understood that without such distance constraints, 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, and without the need for a technician to physically approach, read, and record data from each sensor. A POSITA would also have known based on the state of the art at the time, as demonstrated by Fieldpiece-B, Fieldpiece-M, and Peirs, that wireless communication was predictably effective, and would have expected success at the combination of wireless technology in HVACR sensors and remote computers. Moreover, A POSITA would have been further motivated to modify the temperature sensor clamps taught by Fieldpiece-B in combination with Fieldpiece-M and Peirs under the teachings of Staniforth with integrated electronics, including control buttons, in the handle for enhanced usability as well as a reduced number of parts.

369. It is my opinion that Fieldpiece-B in combination with Fieldpiece-M, Peirs, and Staniforth renders claim 15 of the '051 Patent obvious.

D. Independent Claim 20

370. The claim language of element **[a']** is discussed in Section VII.D.2, which is incorporated by reference and the same analysis is applied here. The claim language of the **[preamble]** and elements **[b]**, **[d]**, and **[e]** are discussed in Sections VII.A.1, 3, 5, and 6, which are incorporated by reference and the same analysis is applied here. As shown in those Sections, Fieldpiece-B in combination with Fieldpiece-M discloses the preamble and elements **[a']**, **[b]**, **[d]**, and **[e]**. To the extent that it is asserted that Fieldpiece-B does not disclose elements **[e]** and **[f]**, Peirs teaches those claim elements.

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

371. The discussion of element **[e]** in Section X.A.2. is incorporated by reference and the same analysis is applied here. It is my opinion that Fieldpiece-B in combination with Fieldpiece-M, Peirs, and Staniforth teaches element **[e]**.

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

372. The discussions of element **[f']** and **[f]** in Sections X.A.3. and X.B.2 are incorporated by reference and the same analysis is applied here. It is my opinion that Fieldpiece-B in combination with Fieldpiece-M, Peirs, and Staniforth teach element **[f]**.

3. Claim 20 Summary and Conclusion

373. A POSITA would have combined the teachings of Fieldpiece-B in combination with Fieldpiece-M, Peirs, and Staniforth to provide for wireless pressure sensors, wireless temperatures sensor clamps, and a wireless receiving unit as disclosed in Fieldpiece-B in combination with Fieldpiece-M, with modification of the temperature sensor clamps therein with the Peirs wireless temperature sensors having integrated wireless transceivers and Staniforth temperature sensor clamp and integrated electronics to arrive at a combination of improved wireless sensors and wireless receiving unit for HVACR analysis.

374. Based on the foregoing analysis, it is my opinion that a POSITA would appreciate that complementary disclosures of Fieldpiece-B and Fieldpiece-M teach incorporation of wireless technology in HVACR sensors configured to transmit data to a remote, portable electronic device used for analysis of HVACR systems. Based on the disclosure in Peirs of wireless temperature sensors, a POSITA would recognize that Fieldpiece-B temperature sensor could be improved by placing wireless technology, including the “integrated transmitting unit” in the wireless temperature sensors taught by Peirs (Ex. 1012 at [0039] and [0040]), in the temperature sensor clamp handles of Fieldpiece-B or Fieldpiece-M in order to enhance usability of the assembled sensor system components. A POSITA would have been motivated to combine Fieldpiece-B, Fieldpiece-M, and Peirs to arrive at

improved, wireless temperature clamps. Further, the POSITA would have expected success at the combination since both Fieldpiece-B in combination with Fieldpiece-M and Peirs teach success at incorporation of wireless technology in the elements of a sensor system. Further, a POSITA would have been motivated to apply the modifications of Peirs and Staniforth to Fieldpiece-B in combination with Fieldpiece-M to provide a temperature sensor clamp having integrated electronics incorporated in the handle, including the integrated transmitting unit of Peirs and control buttons from Staniforth, in electrical connection with a sensor element. Further, the POSITA would have expected success at the combination since Peirs teaches successful use of wireless technology in sensors, and Staniforth teaches successful incorporation of electronics, including control buttons, in the handle of a temperature sensor clamp.

375. A POSITA would have been motivated to combine the HVACR sensors of Fieldpiece-B in combination with Fieldpiece-M with the wireless temperature sensors of Peirs in order to reduce the bulk, number, and arrangement of components required in the field. Instead of two temperature sensor clamps, and their respective tethered headpiece-wireless transmitter units, the modification with the integrated electronics, including the “integrated transmitting unit” in the wireless temperature sensors taught by Peirs (Ex. 1012 at [0039] and [0040]) 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. A POSITA would also have been motivated to make the combination in order to eliminate distance constraints imposed by cables or hoses connecting sensors to each other, or to the remote computer collecting sensed data. A POSITA would have understood that without such distance constraints, 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, and without the need for a technician to physically approach, read, and record data from each sensor. A POSITA would also have known based on the state of the art at the time, as demonstrated by Fieldpiece-B, Fieldpiece-M, and Peirs, that wireless communication was predictably effective, and would have expected success at the combination of wireless technology in HVACR sensors and remote computers. Moreover, A POSITA would have been further motivated to modify the temperature sensor clamps taught by Fieldpiece-B in combination with Fieldpiece-M and Peirs under the teachings of Staniforth with integrated electronics, including control buttons, in the handle for enhanced usability as well as a reduced number of parts.

376. It is my opinion that Fieldpiece-B in combination with Fieldpiece-M, Peirs, and Staniforth renders claim 20 of the '051 Patent obvious.

E. Dependent Claim 21

377. The claim language of the claim 21 preamble and elements [1], [2], [3], and [4] is discussed in Sections VII.E.1.–5., which are incorporated by reference and the same analysis is applied here. Fieldpiece-B in combination with Fieldpiece-M discloses the preamble and elements [1], [2], [3], and [4] of claim 21. To the extent that it is suggested that Fieldpiece does not disclose element [4], Peirs and Staniforth teach it.

1. ***[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.”***

378. The discussion in Sections X.A.2.–3., which are incorporated by reference and the same analysis is applied here, show that Fieldpiece-B in combination with Fieldpiece-M, Peirs, and Staniforth 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.” Further, Peirs teaches that the integrated electronics include an integrated wireless transmitter. Ex. 1012, ¶[0040]. It is my opinion that 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, and that Fieldpiece in view of Peirs teaches element [4].

2. Claim 21 Summary and Conclusion

379. A POSITA would have combined the teachings of Fieldpiece-B in combination with Fieldpiece-M, Peirs, and Staniforth to provide for wireless pressure sensors, wireless temperatures sensor clamps, and a wireless portable electronic device as disclosed in Fieldpiece-B in combination with Fieldpiece-M, with modification of the temperature sensor clamps therein with the Peirs wireless temperature sensors having integrated wireless transceivers and Staniforth temperature sensor clamp and integrated electronics to arrive at a combination of improved wireless sensors and wireless portable electronic device for HVACR analysis.

380. Claim 21 depends from claim 20. The discussion of claim 20 in Section X.D. is incorporated by reference and the same analysis is applied here to claim 21.

381. Based on the foregoing analysis, it is my opinion that a POSITA would appreciate that the complementary disclosures of Fieldpiece-B and Fieldpiece-M discloses a portable electronic device and both pressure and temperature sensors configured for high side and low side HVAC measurements. A POSITA would recognize that from the various instruments disclosed in Fieldpiece-B or Fieldpiece-M, 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. See, for example, the Full A/C Diagnostic Kit of Fieldpiece-B. Further, both Fieldpiece-B and Fieldpiece-M suggests tests for calculating superheat and subcool. 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. Still further, a POSITA would have been motivated to incorporate the integrated wireless transmitter of Peirs and integrated electronics of Staniforth in the temperature sensor clamps of Fieldpiece-B or Fieldpiece-M in order to enhance usability of the assembled sensor system components by decreasing the bulk, number, and arrangement of components. Instead of two temperature sensor clamps, and their respective tethered headpiece-wireless transmitter units, the modification with the integrated electronics, including a wireless transmitter, from Peirs 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. The POSITA would also have predicted success given the state of the art in wireless technology, as shown by Fieldpiece-M, Fieldpiece-B, and Peirs.

382. Further, a POSITA would have been motivated to apply the modifications of Staniforth to connect the temperature sensor with integrated

electronics incorporated in the handle, and to provide control buttons for the temperature sensor clamp. Still further, the POSITA would have expected success at the combination since Staniforth teaches successful incorporation of electronics, including control buttons, in the handle of a temperature sensor clamp. The POSITA would have recognized that the integrated electronics, including control buttons, in the handle portion would provide enhanced usability as well as a reduced number of parts.

383. It is my opinion that Fieldpiece-B in combination with Fieldpiece-M, Peirs, and Staniforth renders claim 21 of the '051 Patent obvious.

**XI. GROUND 5: KANE IN VIEW OF CN '078 AND STANIFORTH
RENDERS CLAIMS 1, 10, 15, 20, AND 21 UNPATENTABLE**

384. Kane relates to “servicing and testing equipment used in the heating, ventilating, air conditioning, and refrigeration (HVAC/R) field and, more particularly to handheld test and measurement devices useful for HVAC/R technicians for the performance of their vocation.” Ex. 1014, ¶[0002].

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

386. Staniforth relates to “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 further has electronics incorporated in its handle that connect a thermistor to a display panel, and the display has integrated control buttons. *Id.*, 4:30–49.

387. In my opinion, Kane is analogous to the '051 Patent as it is in the same field of endeavor as the '051 Patent; both relate to sensor systems for refrigeration units. See Ex. 1014, ¶[0002] and Ex. 1001, 1:15–17. It is also my opinion that CN '078 is analogous art to Kane and the '051 Patent, since 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. In particular, CN '078 discloses a wireless temperature sensor clamp. Ex. 1007, FIG. 5. It is also my opinion that Staniforth is analogous since it relates to a clamping temperature sensor, and is reasonable pertinent to the problem solved of providing improved sensors.

A. Independent Claim 1

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

388. Kane discloses “servicing and testing equipment used in the heating, ventilating, air conditioning, and refrigeration (HVAC/R) field.” Ex. 1014, ¶[0001]. Kane discloses this preamble.

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

AND

- 3. Claim 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”**

389. Kane discloses pressure sensors 416 and 426, and 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 *Id.*

390. It is my opinion that Kane discloses elements [a] and [b].

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

391. Kane discloses that each of 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 on pressure sensors 416 and 426 would be connectors that connect to a tube of the refrigerant unit.

392. It is my opinion that Kane discloses element [c].

5. ***Claim 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;”***

393. Kane discloses “The . . . temperature sensors . . . 418 [is] preferably equipped with . . . pipe engaging sensor clamps for quality transducer contact for measuring refrigerant (line) temperature.” Ex. 1014, ¶[0042], underline emphasis added. Further, Kane states that both temperature sensors 418 and 428 can have these features. Ex. 1014, ¶[0043].

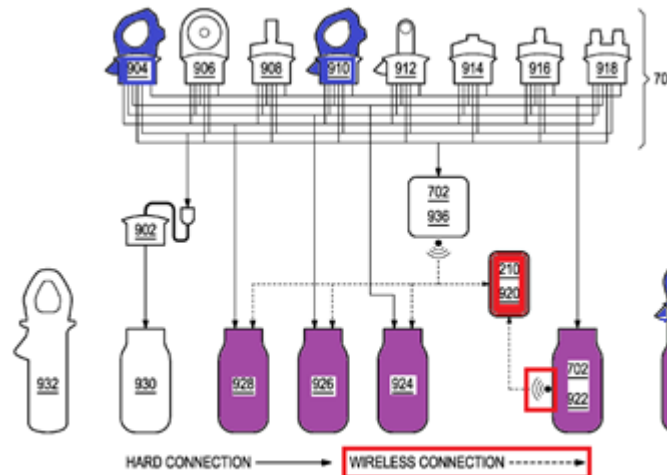
394. Temperature sensors 418 and 428 are “pipe engaging sensor clamps for quality transducer contact for measuring refrigerant (line) temperature.”

395. A POSITA would have understood that (1) a pipe engaging sensor clamp has a “clamping portion configured to clamp on a tube of the refrigerant unit,” and (2) quality transducer contact for measuring refrigerant (line) temperature occurs through a “sensor element to measure temperature about the tube.”

396. Kane describes kit 404, says it has 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].

397. Further Kane discloses that both of these temperature sensors can be wireless, and transmit data to the “central/main unit 120” wirelessly: “The 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].

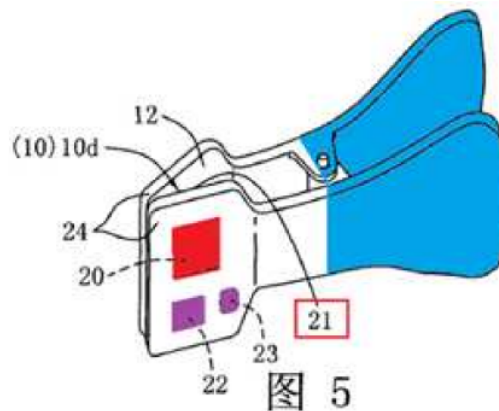
398. 7. Over FIG. 9, Kane discloses many “sensors 704 [that] comprise any one or more attachment heads 904, 906, 908, 910, 912, 914, 916, 918, or another sensor attachment head not shown, each of which preferably interconnects with the sensor interface 702.” Ex. 1014, ¶[0063]. See FIG. 9:



399. The meter 934 has a “clamp-on type head 904.” Ex. 1014, ¶[0065]. Meter 34 is the integral combination of base unit 922 and sensor head 904. *Id.* As illustrated, base unit 922 includes wireless technology; i.e., integrated electronics. Ex. 1014, ¶[0065].

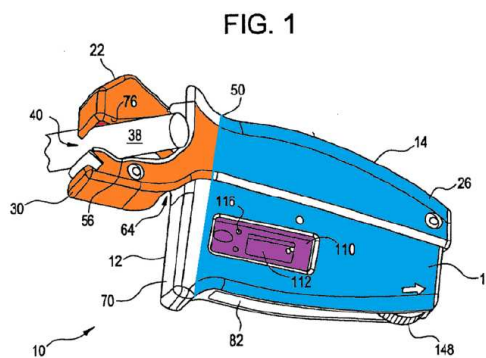
400. Any of the wireless base units 922, 924, 926, 928 may be attached to a sensor attachment head 704, and “sensor kits 704 are as in FIG. 4,” including kit 404, which includes two temperature sensors. Ex. 1014, [0042], [0043], [0057], [0063]–[0066].

401. See also CN '078, which discloses a clamp: “a clamping portion 24, as shown in Fig. 5, [that] directly clamps and is fixed on” the item being monitored. Ex. 1008, Pg. 6 and FIG. 5, copied below.



Ex. 1007, FIG. 5

402. See also the below annotated FIG. 1 from Staniforth showing a temperatures sensor clamp.



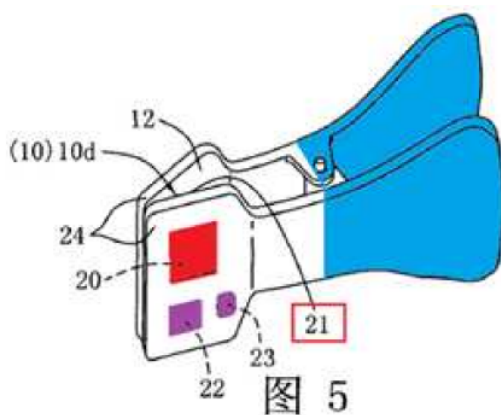
Ex. 1009, FIG. 1

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

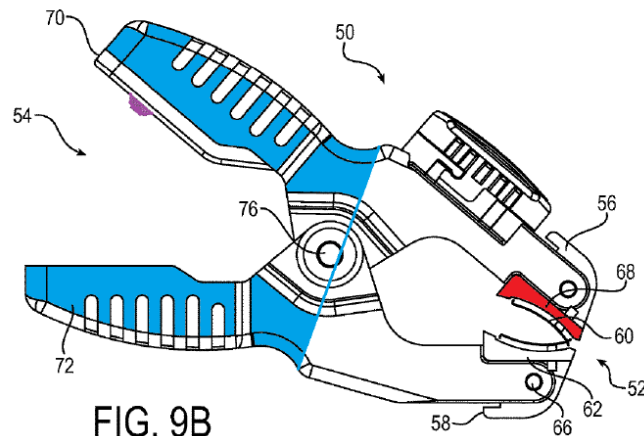
404. It is my opinion that Kane in view of CN '078 and Staniforth disclose element [d].

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

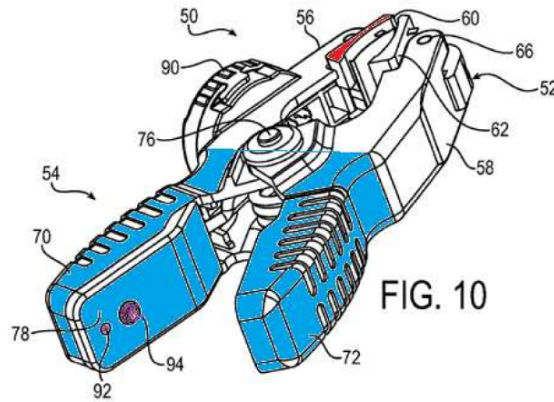
405. Below is a color-coded comparison of the temperature sensor clamp of CN '078 at FIG. 5 to the temperatures sensor clamp of the '051 Patent at FIGS. 9B and 10:



Ex. 1007, FIG. 5



Ex. 1001, FIG. 9B



Ex. 1001, FIG. 10

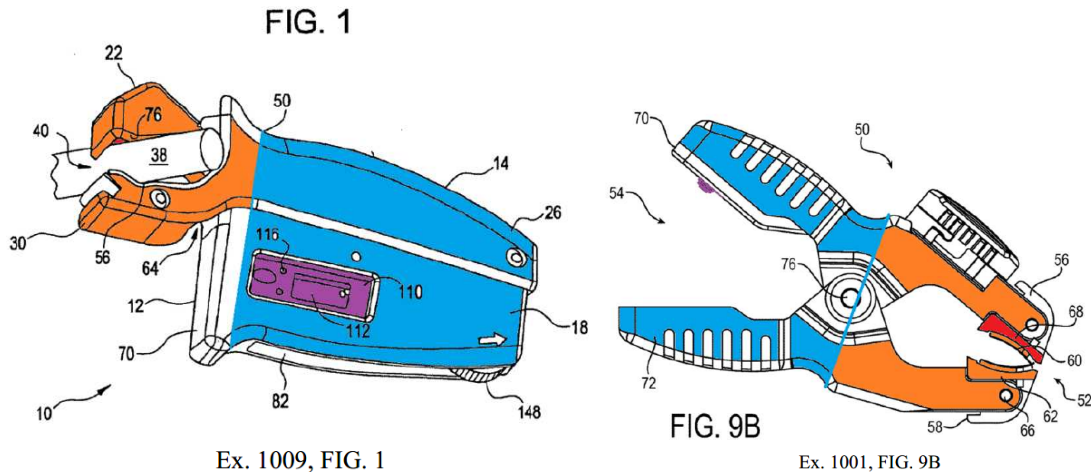
406. With reference to the annotated FIGS. 9B and 10 of the '051 Patent, above, the '051 Patent describes integrated electronics (Purple). Ex. 1001, 9:56–63. Further, the integrated electronics are described in “electrical connection” to the sensor 68 (Red). *Id.* The '051 Patent also states that the “integrated electronics may include . . . wireless interface pair button.” *Id.*

407. 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.

408. The device of CN '078 also discloses a clamp: “a clamping portion 24, as shown in Fig. 5, [that] directly clamps and is fixed on” the item being monitored. Ex. 1008, Pg. 6 and FIG. 5, copied above.

409. The device of CN '078 also comprises a “handle.” See Ex. 1007, FIG. 5, as reproduced above.

410. Also compare FIG. 1 of Staniforth as compared to FIG. 9B of the '051 Patent are annotated and reproduced below for reference:

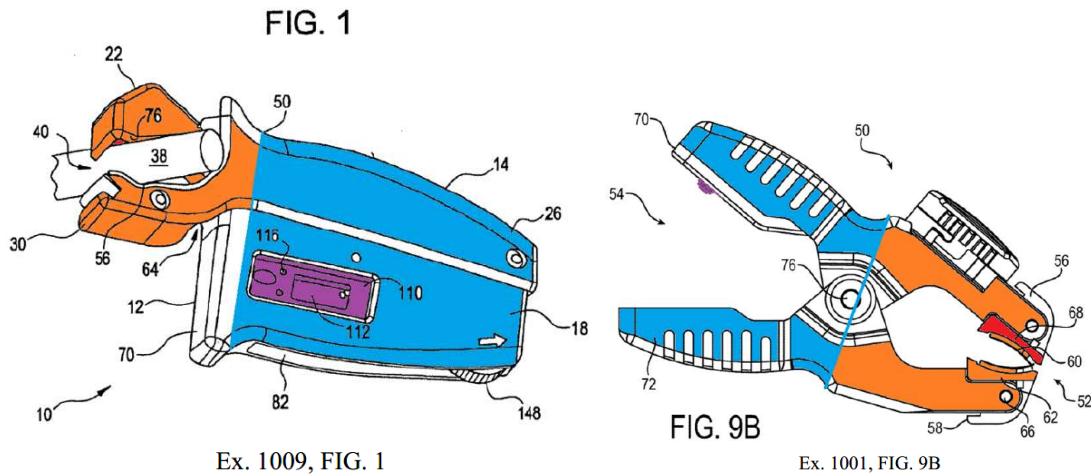


411. As shown above, Staniforth (Ex. 1009, FIG. 1) discloses an upper handle 26 and lower handle 18 (Blue), and an electronics module 108, that is “integrated electronics” (Purple) within lower handle 18 and within display panel 110. Ex. 1009, 3:5-24. The electronics module includes display panel 110,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

412. In my opinion, Kane, CN '078, and Staniforth teach two temperatures sensors with handles and integrated electronics. It is also my opinion that, based on Kane and CN '078, the integrated electronics include a wireless transmitter. It is also my opinion that, based on Staniforth, that the integrated electronics include control buttons.

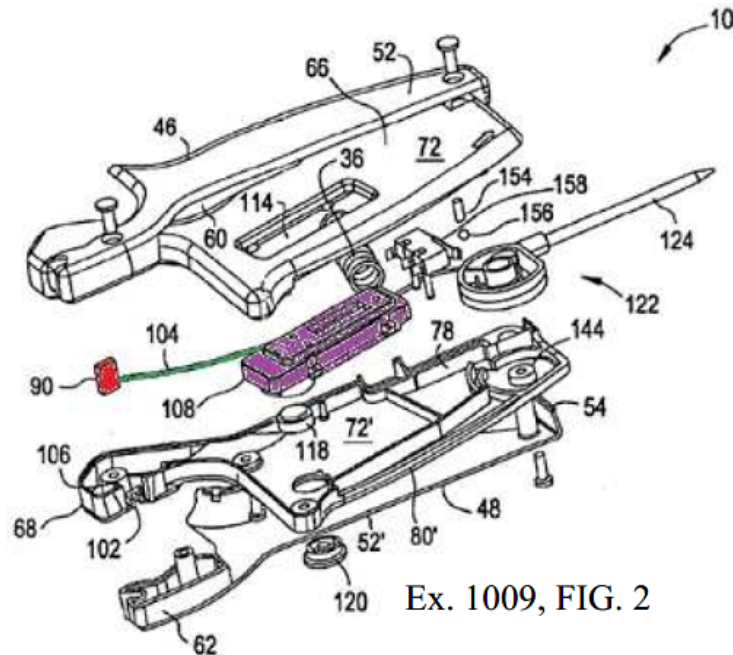
7. **Claim 1, [f'] “the integrated electronics are incorporated into the handle and in electrical connection with the sensor element; and”**

413. Returning to Staniforth, and the comparison to FIG. 9B of the '051 Patent:



414. Staniforth discloses upper and lower jaws 22, 30 (Orange) that clamp a pipe 38. Ex. 1009, 3:15-17. This is the same configuration shown in the '051 Patent at FIG. 9B.

415. Referring both the FIG.1 above and FIG. 2, below, 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.” See Ex. 1009, 4:8-11, and FIGS. 1 (above) and 2 (below):



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

417. Staniforth also discloses an upper handle 26 and lower handle 18 (Blue), and an electronics module 108, that is “integrated electronics” (Purple) within lower handle 18 and within display panel 110. Ex. 1009, 3:5-24. The electronics module includes display panel 110, LCD display 112, and control buttons 116. *Id.*, 4:30-49.

418. Further, 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.

419. To the extent that Kane or CN '078 teaches a wireless transmitter at a location other than the handle, Staniforth teaches moving the wireless transmitter to the handle.

420. It is my opinion that the combination with Staniforth specifically teaches integrated electronics to the handle of the temperature sensor taught by Kane and CN '078.

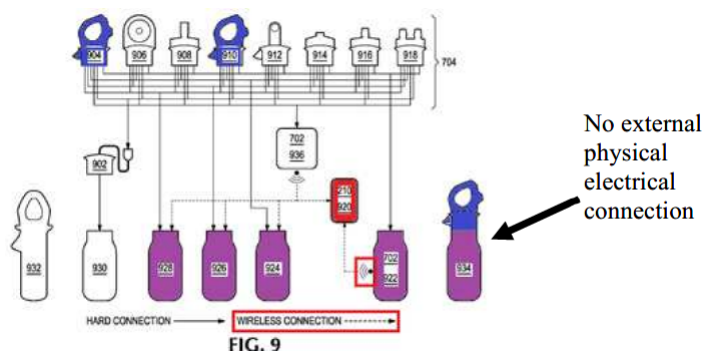
421. It is my opinion that Kane in combination with CN '078, and Staniforth teaches element [f'].

8. Claim 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.”

422. Kane discloses an option for pressure sensors 416 and 426, and temperature sensors 418 and 428 to be wireless: “The AC/R kit 404 may include a combination of wired and wireless sensors” Ex. 1014, ¶¶[0042] and [0043]. In addition, the embodiment of FIG. 9 contemplates these pressure sensors as options for its wireless sensors. *Id.*, ¶[0042], [0043], [0057], [0063]–[0066].

423. The two wireless temperature sensors disclosed either over FIG. 4 or FIG. 9, have no external physical electrical connections that extend therefrom, and the two wireless pressure sensors, also disclosed over FIG. 4 or FIG. 9, have no external physical fluidic connections that extend from the first and second pressure sensors oppositely from the connectors.

424. The exemplary assembled wireless sensor in Kane's FIG. 9 is annotated with "No external physical electrical connection" since one of the headpiece options is a temperatures sensor. Kane, ¶[0042], [0043], [0057], [0063].



425. Another option is to assemble a wireless pressure sensor. Kane, ¶[0042], [0043], [0057], [0063]. 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."

426. The discussions above with respect to element [e] and [f'] in this Ground are incorporated here. Kane teaches wireless transmission of sensed data. CN '078 teaches incorporating a wireless transmitter in a temperature sensor clamp.

427. To the extent that it is suggested that Kane does not teach wireless sensors, it is my opinion that the modification with CN '078 and Staniforth, as set forth above, teaches wireless sensors. Further, the suggestion of wireless transmitter would be applied to any of the Kane sensors, including pressure sensors.

428. The two wireless temperature sensors taught in Kane and modified by CN '078 and Staniforth would have “no external physical electrical connections that extend from the first and second temperature sensors.”

429. Further, the two wireless pressure sensors taught by Kane and modified by at least CN '078 would have “no external physical fluidic connections that extend from the first and second pressure sensors oppositely from the connectors.”

430. It is my opinion that Kane in view of CN '078 and Staniforth teaches element [g].

9. Claim 1 Summary and Conclusion

431. A POSITA would have combined the teachings of Kane in view of CN '078 and Staniforth to provide for wireless pressure sensors and wireless temperatures sensor clamps as disclosed in Kane, with modification of the temperature sensor clamps therein with the CN '078 wireless temperature sensor clamp and Staniforth integrated electronics to arrive at a combination of improved wireless sensors for HVACR analysis.

432. A POSITA would have been motivated to combine HVACR sensors and wireless pressure and temperature sensors disclosed by Kane at ¶¶[0042]-[0043] in order to reduce the bulk and number of components required in the field. A POSITA would also have been motivated to make the combination of wireless sensors and a wireless remote computer in order to eliminate distance constraints

imposed by cables or hoses connecting sensors to each other, or to the remote computer collecting sensed data. A POSITA would have understood that without such distance constraints, 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, and without the need for a technician to physically approach, read, and record data from each sensor. A POSITA would also have known based on the state of the art at the time, as evidenced by Kane, that wireless communication was predictably effective, and would have expected success at the combination of wireless technology in HVACR sensors and remote devices.

433. A POSITA with such an understanding would have been motivated to combine Kane with CN '078 to arrive at wireless, clamping temperature sensors, and even wireless pressure sensor to achieve the above-listed advantages. Further, with integrated electronics in a portion of the temperature sensor clamp, which would require less bulk and weight, and be more convenient to simply clamp in place and remove at will. Also, the POSITA would anticipate success at the combination give the state of the art in wireless technology, as evidenced by Kane and CN '078.

434. Further, a POSITA would have been motivated to apply the modifications Staniforth to the Kane and CN '078 combination to provide a temperature sensor clamp having integrated electronics incorporated in the handle, control buttons from Staniforth, in electrical connection with a sensor element.

Further, the POSITA would have expected success at the combination since Staniforth teaches successful incorporation of electronics, including control buttons, in the handle of a temperature sensor clamp.

435. It is my opinion that Kane in view of CN '078 and Staniforth renders claim 1 of the '051 Patent obvious.

B. Independent Claim 10

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

436. The discussion at Section XI.A.5. is incorporated by reference and the same analysis is applied here. It is my opinion that Kane in view CN '078 and Staniforth discloses a “temperature sensor clamp for sensing temperature in a refrigerant unit.”

2. 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”

437. The discussion at Section XI.A.5., is incorporated by reference and the same analysis is applied here. It is my opinion that Kane in view CN '078 and Staniforth discloses element [d'].

3. Claim 10, [e'] “a handle and integrated electronics, and”

438. The discussion at Section X1.A.6 is incorporated by reference and the same analysis is applied here. It is my opinion that Kane in view of CN '078 and Staniforth teaches element [e'].

4. 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;”

439. See Section XI.A.7, which is incorporated by reference and the same analysis is applied here. Claim 10, element [f] differs from claim 1 element [f'] in reciting that the integrated electronics “incorporated into a portion of the temperature sensor clamp,” rather than “into the handle” as in claim 1. A “portion” includes the “handle.” For at least the same reasons as set forth for claim 1, element [f'], Kane in view of CN '078 teaches “the integrated electronics are incorporated into a portion of the temperature sensor clamp.” It is my opinion that Kane in view of CN '078 and Staniforth teaches element [f].

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

440. See Section XI.A.8, which is incorporated by reference and the same analysis is applied here. It is my opinion that Kane in view of CN '078 and Staniforth teaches element [g'].

6. Claim 10 Summary and Conclusion

441. A POSITA would have combined the teachings of Kane in view of '078 and Staniforth to provide for a wireless temperatures sensor clamp as disclosed in Kane, with modification of the temperature sensor clamp with the CN '078 wireless temperature sensor clamp and Staniforth integrated electronics to arrive at an improved temperature sensor clamp for HVACR analysis.

442. A POSITA would have been motivated to combine HVACR sensors and wireless pressure and temperature sensors disclosed by Kane at ¶¶[0042]–[0043] in order to reduce the bulk and number of components required in the field. A POSITA would also have been motivated to make the combination of wireless sensors and a wireless remote computer in order to eliminate distance constraints imposed by cables or hoses connecting sensors to each other, or to the remote computer collecting sensed data. A POSITA would have understood that without such distance constraints, 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, and without the need for a technician to physically approach, read, and record data from each sensor. A POSITA would also have known based on the state of the art at the time, as evidenced by Kane, that wireless communication was predictably effective, and would have expected success at the combination of wireless technology in HVACR sensors and remote computers.

443. A POSITA with such an understanding would have been motivated to combine Kane with CN '078 to arrive at wireless, clamping temperature sensors, with integrated electronics in a portion of the temperature sensor clamp, which would require less bulk and weight, and be more convenient to simply clamp in place and remove at will.

444. Further, a POSITA would have been motivated to apply the modifications Staniforth to the Kane and CN '078 combination to provide a temperature sensor clamp having integrated electronics incorporated in the handle, control buttons from Staniforth, in electrical connection with a sensor element. Further, the POSITA would have expected success at the combination since Staniforth teaches successful incorporation of electronics, including control buttons, in the handle of a temperature sensor clamp.

445. It is my opinion that Kane in view of CN '078 and Staniforth renders claim 10 of the '051 Patent obvious.

C. Independent Claim 15

446. The claim language of the **[preamble]** and elements **[a]**, **[b]**, **[c]**, **[d]**, **[e]**, and **[g]** is discussed in Sections XI.A.1, 2, 3, 4, 5, 6, and 8, which are incorporated by reference and the same analysis is applied here. As shown in those Sections, Kane discloses the preamble and elements **[a]**, **[b]**, **[c]**, **[d]**, and Kane in view of CN '078 teaches elements **[e]** and **[g]**.

1. Claim 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

447. The discussion in sections XI.A.7 and XI.B.4 are incorporated by reference and the same analysis is applied here. For the same reasons, it is my opinion that Kane in view of CN '078 and Staniforth teach element [f].

2. Claim 15 Summary and Conclusion

448. A POSITA would have combined the teachings of Kane in view of CN '078, and Staniforth to provide for wireless pressure sensors and wireless temperatures sensor clamps as disclosed in Kane, with modification of the temperature sensor clamps therein with the CN '078 wireless temperature sensor clamp and Staniforth integrated electronics to arrive at a combination of improved wireless sensors for HVACR analysis.

449. A POSITA would have been motivated to combine HVACR sensors and wireless pressure and temperature sensors disclosed by Kane at ¶¶[0043] in order to reduce the bulk and number of components required in the field. A POSITA would also have been motivated to make the combination of wireless sensors and a wireless remote computer in order to eliminate distance constraints imposed by cables or hoses connecting sensors to each other, or to the remote computer collecting sensed data. A POSITA would have understood that without such distance constraints, 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, and without the need for a technician to physically approach, read, and record data from each sensor. A POSITA would also have known based on the state of the art at the time, as evidenced by Kane, that wireless communication was predictably effective, and would have expected success at the combination of wireless technology in HVACR sensors and remote computers.

450. A POSITA with such an understanding would have been motivated to combine Kane with CN '078 to arrive at wireless, clamping temperature sensors, with integrated electronics in a portion of the temperature sensor clamp, which would require less bulk and weight, and be more convenient to simply clamp in place and remove at will.

451. Further, a POSITA would have been motivated to apply the modifications Staniforth to the Kane and CN '078 combination to provide a temperature sensor clamp having integrated electronics incorporated in the handle, control buttons from Staniforth, in electrical connection with a sensor element. Further, the POSITA would have expected success at the combination since Staniforth teaches successful incorporation of electronics, including control buttons, in the handle of a temperature sensor clamp.

452. It is my opinion that Kane in view of CN '078 and Staniforth renders claim 15 of the '051 Patent obvious.

D. Independent Claim 20

1. Claim 20, [Preamble] “A sensor system for a refrigerant unit comprising:”

453. The discussion in Section XI.A.1 is incorporated by reference and the same analysis is applied here. It is my opinion that Kane discloses this preamble.

2. 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:”

454. The discussion of claim 1, element [a] in this Ground, Section XI.A.2 is incorporated by reference and the same analysis is applied here. It is my opinion that Kane discloses “a plurality of sensors for sensing system parameters of the refrigerant unit.”

455. The remaining portion of element [a’] recites “and a receiving unit that gathers and combines data from at least two of the plurality of sensors.”

456. Kane discloses “main unit 120,” which is “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.).” In some embodiment, the main unit functions

are split between a handheld data interface unit 702 and user interface 708. Ex. 1014, ¶¶[0057], [0064]–[0066].

457. Through main unit 120, Kane discloses “a receiving unit that gathers and combines data from at least two of the plurality of sensors.”

458. It is my opinion that Kane discloses element [a’].

3. ***Claim 20, [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;”***

459. The discussion in Section XI.A.3 is incorporated by reference and the same analysis is applied here. It is my opinion that Kane discloses element [b].

4. ***Claim 20, [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;”***

460. The discussion in Section XI.A.5 is incorporated by reference and the same analysis is applied here. It is my opinion that Kane in view of CN ’332 and Staniforth discloses element [d].

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

461. The discussion in Section XI.A.6 is incorporated by reference and the same analysis is applied here. It is my opinion that Kane in view of CN ’332 and Staniforth teaches element [e].

6. 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”

462. The discussion in Sections XI.A.7 and XI.B.4 are incorporated by reference and the same analysis is applied here. It is my opinion that Kane in view of CN '332 and Staniforth teaches element [f].

7. Claim 20 Summary and Conclusion

463. A POSITA would have combined the teachings of Kane in view of CN '078, and Staniforth to provide for wireless pressure sensors, wireless temperatures sensor clamps, and a wireless receiving unit as disclosed in Kane, with modification of the temperature sensor clamps therein with the CN '078 wireless temperature sensor clamp and Staniforth integrated electronics to arrive at a combination of improved wireless sensors and wireless receiving unit for HVACR analysis.

464. A POSITA would have been motivated to combine HVACR sensors and wireless pressure and temperature sensors disclosed by Kane at ¶¶[0043], and the wireless portable electronic device (disclosed throughout, but see main unit 120, ¶[0039]; or main unit 120 substitutes interface unit 702/user interface 708, ¶¶[0057], [0064]–[0066]) in order to reduce the bulk and number of components required in the field. A POSITA would also have been motivated to make the combination of wireless sensors and a wireless remote computer in order to eliminate distance constraints imposed by cables or hoses connecting sensors to each other, or to the

remote computer collecting sensed data. A POSITA would have understood that without such distance constraints, 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, and without the need for a technician to physically approach, read, and record data from each sensor. A POSITA would also have known based on the state of the art at the time, as evidenced by Kane, that wireless communication was predictably effective, and would have expected success at the combination of wireless technology in HVACR sensors and remote computers.

465. A POSITA with such an understanding would have been motivated to combine Kane with CN '078 to arrive at wireless, clamping temperature sensors, with integrated electronics in a portion of the temperature sensor clamp, which would require less bulk and weight, and be more convenient to simply clamp in place and remove at will.

466. Further, a POSITA would have been motivated to apply the modifications Staniforth to the Kane and CN '078 combination to provide a temperature sensor clamp having integrated electronics incorporated in the handle, control buttons from Staniforth, in electrical connection with a sensor element. Further, the POSITA would have expected success at the combination since Staniforth teaches successful incorporation of electronics, including control buttons, in the handle of a temperature sensor clamp.

467. It is my opinion that Kane in view of CN '078 and Staniforth renders claim 20 of the '051 Patent obvious.

E. Dependent Claim 21

1. Claim 21, [Preamble] “The sensor system of claim 20, wherein:”

468. The discussion of claim 20 Sections XI.D.1.–XI.D.6. is incorporated by reference and is applied here. It is my opinion that Kane discloses this preamble.

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

469. Kane discloses that “main unit” 120 is “handheld.” Ex. 1014, ¶[0023]. A handheld device is a “portable,” and main unit 120 is an electronic device. Ex. 1014, ¶[0055]. The user interface 708, in combination with a handheld data interface unit 702, functions as the main unit 120, and can be a “portable tablet computing device, netbook, or smartphone device.” Ex. 1014, ¶[0058]. These are all portable electronic devices.

470. It is my opinion that Kane discloses element [1].

3. 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;”

471. See Ex. 1014 at ¶¶[0042]-[0043]. 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.”

472. See claim 1, element [g] in this Ground, Section XI.A.8, which is incorporated by reference and the same analysis is applied here. Kane in view of CN '078 teaches “the first pressure sensor and the second pressure sensor are configured for wirelessly communicating pressure sensor data to the portable electronic device.”

4. 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”

473. See claim 1, element [d], Section XI.A.5, which is incorporated by reference and the same analysis is applied here. Kane discloses first and second temperatures sensors with clamping portions.

474. See also Ex. 1014, ¶¶[0042]-[0043] where Kane disclose a temperature sensor on the high side, and another on the low side. It is my opinion that Kane discloses element [3].

5. ***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.”***

475. The discussion of claim 1 elements [e]–[g] in Sections XI.A.6.–8., which are incorporated by reference and the same analysis is applied here, show that clamping wireless temperatures sensors are taught by Kane in view of CN '078 and Staniforth teaches element [4].

6. ***Claim 21 Summary and Conclusion***

476. A POSITA would have combined the teachings of Kane in view of CN '078, and Staniforth to provide for wireless pressure sensors, wireless temperatures sensor clamps, and a wireless portable electronic device as disclosed in Kane, with modification of the temperature sensor clamps therein with the CN '078 wireless temperature sensor clamp and Staniforth integrated electronics to arrive at a combination of improved wireless sensors and wireless portable electronic device for HVACR analysis.

477. The conclusion and summary of Section XI.D.7. provide the rationale of combination of Kane, CN '078, and Staniforth over claim 20, and is incorporated by reference and the same analysis is applied here.

478. Kane teaches analysis of superheat and subcool, and the combination with CN '078 provides for clamping wireless temperature sensors. Staniforth

provides integrated electronics. Further Kane teaches portable electronic devices interfacing with the wireless temperature and pressure sensors of an HVAC sensor system. A POSITA would have been motivated to deploy wireless, clamping temperature sensors taught by Kane and CN '078 in the configuration taught by Kane for testing superheat and subcool, which is the same configuration recited in claim 21. A POSTIA would have expected success at choosing the various sensors for superheat and subcool analysis and linking them wirelessly given (1) the disclosure in Kane for superheat and subcool analysis, and (2) the state of the art in wireless technology, as shown by Kane and CN '078.

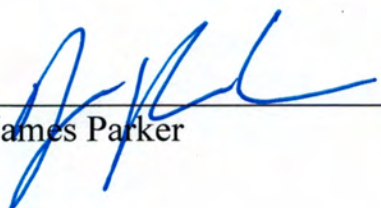
479. It is my opinion that Kane in view of CN '078 and Staniforth renders claim 21 of the '051 Patent obvious.

XII. CONCLUSION

480. For the reasons set forth above, I believe claims 1, 10, 15, 20, and 21 of the '051 Patent are unpatentable in view of the prior art. In signing this declaration, I understand that the declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I acknowledge that I may be subject to cross-examination in this case and that cross-examination will take place within the United States. If cross-examination is required of me, I will appear for cross-examination within the United States during the time allotted for cross-examination.

481. I declare that all statements made herein of my knowledge are true, that all statements made on information and belief are believed to be true, and that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

Dated: MARCH 06/2023

By: 
James Parker