

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

EMERSON ELECTRIC CO.

Petitioner,

v.

OLLNOVA TECHNOLOGIES LTD.

Patent Owner.

Case IPR2023-00624

U.S. Patent No. 8,224,282

**DECLARATION OF DEAN P. NEIKIRK IN SUPPORT OF PETITION
FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 8,224,282**

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I. INTRODUCTION

1. I have been retained by Emerson Electric Co. (“Emerson” or “Petitioner”) to provide my opinions on certain issues related to U.S. Patent No. 8,224,282 (the “’282 patent,” which I understand has been designated as Exhibit 1001) in connection with the above-captioned *inter partes* review (IPR) proceeding. In particular, I have been asked to provide my insights, analysis, and opinions regarding whether claims 1-5, 7-11, 13-16, and 20-21 of the ’282 patent (“Challenged Claims”) are anticipated and/or obvious over the prior art references identified below and as to whether persons interested and ordinarily skilled in the subject matter or art exercising reasonable diligence could have located these references.

2. I understand the ’282 patent is titled “Dynamic Value Reporting for Wireless Automated Systems,” identifies as its named inventor Norman R. McFarland, and is currently owned by Ollnova Technologies Ltd. I have considered the ’282 patent.

3. I understand that the file history of the ’282 patent has been designated as Exhibit 1003. I have considered this file history, and I will refer to it as the “’282 File History” or by its exhibit number.

4. I understand that the ’282 patent was filed as U.S. Patent Application 11/402,743 on April 12, 2006.

5. I have considered the prior art cited in my declaration, including:

1. **U.S. Patent Application Publication No. 2007/0242688**
to McFarland (“McFarland”), titled “Dynamic Value
Reporting for Wireless Automated Systems,” filed April
12, 2006 and published October 18, 2007. I understand
that a copy of this patent has been designated as Exhibit
1027.
2. **U.S. Patent Application Publication No. 2006/0071089**
to Kates-089 (“Kates-089”), titled “Zone Thermostat for
Zone Heating and Cooling,” filed on October 6, 2004,
and published April 6, 2006. I understand that a copy of
this publication has been designated as Exhibit 1029.
3. **U.S. Patent No. 8,276,829** to Stoner (“Stoner”), titled
“Building Control System with Control Unit and
Methods of Operation,” filed on November 30, 2007, and
issued on October 2, 2012. I understand that a copy of
this publication has been designated as Exhibit 1030.
4. **U.S. Patent Application Publication No. 2005/0268629**
to Ahmed (“Ahmed-629”), titled “Method and Apparatus

for Controlling Building Component Characteristics,”
filed March 25, 2005 and published December 8, 2005. I
understand that a copy of this patent has been designated
as Exhibit 1036.

6. I am being compensated by Emerson at my standard hourly consulting rate of \$750 for my time on this matter. My compensation is not dependent on the outcome of this proceeding.

7. As set forth herein, I have concluded that each of Challenged Claims is anticipated and/or rendered obvious by the prior art based on the references described below and as explained herein. In forming my opinions, I relied on the documents cited in this declaration and the documents identified in the attached **Appendix B**. These documents comprise patents, file histories, printed publications, and other related documents. As discussed below, each document is a type that experts in my field would have reasonably relied upon when forming their opinions. Further, experts in my field would have had access to each document either through the applicable patent offices and/or well-known libraries, conferences, or publications in the field. My opinions are also based upon my personal and professional experience.

II. QUALIFICATIONS

8. A detailed description of my professional qualifications, including a list of publications, patents, awards, and professional activities, is contained in my curriculum vitae, a copy of which is attached as **Appendix A**.

9. I received a B.S. degree in 1979 in physics from Oklahoma State University, and an M.S. degree and a Ph.D. degree in 1981 and 1984 respectively in applied physics from the California Institute of Technology.

10. Each of my academic degrees involved significant studies in solid state physics, semiconductor devices, electrical engineering, electronic systems, electromagnetics, optics, radio frequency systems, and antennas. For example, courses relating to these fields that I took include two years of study in electromagnetics and optics, one year of study in solid state and semiconductor physics, as well as four years of graduate research in electronic devices, antenna design, antenna fabrication, microwave systems, and optical systems.

11. I am currently a Life Senior Member of the Institute of Electrical and Electronics Engineers (“IEEE”). From March 1991 to October 1994, I served as an Associate Editor for the IEEE publication called “IEEE Transactions on Education.” I also served as a member of the Editorial Board on the IEEE Transactions on Microwave Theory and Techniques in the 1990-2000 timeframe.

12. I have almost 40 years of experience on the faculty of the University of Texas at Austin. My work as a professor began in 1984, when I joined the University of Texas at Austin as an assistant professor. In 1988, I became an associate professor, and became a full professor in 1992.

13. My research over the last forty years has concentrated heavily in the areas of electromagnetics, microwave engineering, microelectronics, semiconductor devices, integrated circuit (IC) fabrication, and new sensors. This research work has been funded by many agencies, focusing on the fabrication and modeling of semiconductor devices, electromagnetic devices and detectors, chemical sensors, temperature sensors, proximity sensors, and pressure sensors, as well as research on the high frequency properties of transmission lines, RF devices, and infrared to terahertz detectors for use in focal plane imaging arrays. My research related to the development of new chemical sensors (an “electronic taste” sensor) was selected for a commercialization venture between The University of Texas and two outside start-up companies.

14. Over the years, I have also taught a variety of electrical engineering courses at the University of Texas. These include Integrated Circuit Fabrication, VLSI Fabrication Techniques, Ultra Large Scale Integrated Circuit Fabrication Techniques, Integrated Circuit Nanomanufacturing Techniques, Electromagnetics in

Packaging, Simulation Methods in CAD/VLSI, Micro-Electromechanical Systems, Electromagnetic Engineering, and Microwave and Radio Frequency Engineering. I have also taught several continuing education courses in these fields.

15. In 1985, I established the Microelectronics Fabrication Teaching Laboratory at The University of Texas at Austin, which continues to this day to provide undergraduate and graduate students with hands-on experience in integrated circuit fabrication. I have taught many courses in integrated-circuit fabrication, microwave devices, integrated circuit packaging, electromagnetics, computer aided design methods for circuit simulation, sensors of all sorts, and micro-electromechanical systems.

16. I conducted research with students and research scientists in the Microelectromagnetics Research Group in the Microelectronics Research Center at The University of Texas at Austin for 37 years. For over ten years, I also served as the Graduate Advisor of the Department of Electrical and Computer Engineering at the University of Texas at Austin, as well as serving for over five years as an Associate Chairman of the Electrical and Computer Engineering Department at The University of Texas at Austin. I also served as Associate Dean of Graduate Studies from 2014 to 2021.

17. Please see my CV, attached hereto as **Appendix A**, for further information.

III. LEGAL UNDERSTANDING

18. In formulating my opinions, I have been informed of certain legal understandings relevant to my opinions. In formulating my opinions, I have relied on the legal understandings I have been provided with as set forth in this declaration.

19. I have been informed that in inter partes review proceedings, invalidity must be shown under a preponderance of the evidence standard.

A. My Understanding of Claim Construction

20. I have been informed that patent claims are construed from the viewpoint of a person having ordinary skill in the art of the patent at the time of the invention. I have been informed that patent claims generally should be interpreted consistent with their plain and ordinary meaning as understood by a person having ordinary skill in the art in the relevant time period (*i.e.*, at the time of the purported invention, or the so called “effective filing date” of the patent application), after reviewing the patent claim language, the specification, and the prosecution history (*i.e.*, the intrinsic record).

21. I have further been informed that a person having ordinary skill in the art must read the claim terms in the context of the claim itself, as well as in the context of the entire patent specification. I understand that in the specification and

prosecution history, the patentee may specifically define a claim term in a way that differs from the plain and ordinary meaning. I understand that the prosecution history of the patent is a record of the proceedings before the U.S. Patent and Trademark Office, and may contain explicit representations or definitions made during prosecution that affect the scope of the patent claims. I understand that an applicant may, during the course of prosecuting the patent application, limit the scope of the claims to overcome prior art or to overcome an examiner's rejection, by clearly and unambiguously arguing to overcome or distinguish a prior art reference, or clearly and unambiguously disavowing claim coverage.

22. In interpreting the meaning of the claim language, I understand that a person having ordinary skill in the art may also consider "extrinsic" evidence, including expert testimony, inventor testimony, dictionaries, technical treatises, other patents, and scholarly publications. I understand this evidence is considered to ensure that a claim is construed in a way that is consistent with the understanding of those of ordinary skill in the art at the time of the claimed invention. For example, this can be useful for a technical term whose meaning may differ from its ordinary English meaning. I understand that extrinsic evidence may not be relied on if it contradicts or varies the meaning of claim language provided by the intrinsic

evidence, particularly if the applicant has explicitly defined a term in the intrinsic record.

23. I understand that certain claim terms may be interpreted to be “means-plus-function” terms. For these terms, I understand that there must be a corresponding structure disclosed in the specification in a way that a person of ordinary skill in the art would understand what structure would perform the claimed function. I understand the disclosure may be implicit in the specification if it would have been clear to a person of ordinary skill in the art what structure corresponds to the claimed function. With respect to a computer-implemented function, an algorithm must be disclosed in the specification.

B. My Understanding of Anticipation

24. I have been informed that if each and every element or step of a claim is disclosed within the “four corners” of a prior art reference, that claim is said to be “anticipated” by that single prior art reference and is invalid under 35 U.S.C. §102 because the alleged invention is not, in fact, new or novel. I have been informed that the standard for anticipation in an *inter partes* review proceeding is by a preponderance of the evidence.

25. I have also been informed that a prior art reference can disclose a claim feature if that feature is expressly described by that reference, or inherent from its

disclosure. I have been informed that something is inherent from a prior art reference, if the missing descriptive matter must necessarily be present, and it would be so recognized by a person of ordinary skill in the art. I also have been informed that inherency cannot be established by probabilities or possibilities, and that the mere fact that something may result from a given set of circumstances is not sufficient to show inherency.

26. I have further been informed that where a reference discloses multiple embodiments, the reference should not be limited to a preferred embodiment. Instead, each disclosed embodiment may anticipate.

27. Moreover, I have been informed that as part of an anticipation analysis, it is proper to take into account not only specific teachings of the reference, but also the inferences that one skilled in the art would reasonably be expected to draw therefrom. A reference can anticipate a claim even if it does not expressly spell out all the limitations arranged or combined as in the claim, if a person of skill in the art, reading the reference, would at once envisage the claimed arrangement or combination.

28. I have been informed that a prior art document can disclose a claim feature, and anticipate an alleged invention, if that feature is described in another document that has been incorporated by reference. I have also been informed that,

to incorporate by reference, the host document must identify with detailed particularity what specific material it incorporates, and clearly indicate where that material is found in the incorporated document. I have also been informed that, in making the determination of the extent to which material is incorporated into a host document, the standard of a person of ordinary skill in the art should be used to determine whether the host document describes the material to be incorporated by reference with sufficient particularity.

C. My Understanding of the Doctrine of Equivalents

29. I have been informed that there is a “doctrine of equivalents” that supports a finding of invalidity if a prior art element is equivalent to a claimed element, even if the prior art element is not identical to the claimed element. Equivalence may be established if the prior art element performs the identical function specified in the claim in substantially the same way and produces substantially the same result.

30. I also understand that insubstantial differences between a prior art element and a claimed element—as understood in light of its specification—will not preclude a finding of invalidity. For example, a difference in a number of parts in a prior art element and the corresponding element disclosed in the patent specification may be an insubstantial difference. Similarly, if a prior art element lacks several

components of an overall structure corresponding to a claimed function, that difference may be insubstantial. And, potential advantages of a structure that do not relate to a claimed function should not be considered in an equivalents determination.

31. I understand that the structures, materials, and acts to be considered equivalent or non-equivalent may be described in a patent's specification. A specification may therefore establish a narrow or broad range of equivalents, although an applicant also need not exhaustively describe the full range of equivalents.

D. My Understanding of Obviousness

32. I understand that a claim may be invalid if the subject matter described by the claim as a whole would have been obvious to a hypothetical person of ordinary skill in the art in view of a prior art reference or in view of a combination of references at the time the claimed invention was made. Therefore, I understand that obviousness is determined from the perspective of a hypothetical person of ordinary skill in the art and that the asserted claims of the patent should be read from the point of view of such a person at the time the claimed invention was made. I further understand that a hypothetical person of ordinary skill in the art is assumed

to know and to have all relevant prior art in the field of endeavor covered by the patent in suit.

33. I have been informed that there are two criteria for determining whether prior art is analogous and thus can be considered prior art: (1) whether the art is from the same field of endeavor, regardless of the problem addressed, and (2) if the reference is not within the field of the patentee's endeavor, whether the reference still is reasonably pertinent to the particular problem with which the patentee is involved. I have also been informed that the field of endeavor of a patent is not limited to the specific point of novelty, the narrowest possible conception of the field, or the particular focus within a given field. I have also been informed that a reference is reasonably pertinent if, even though it may be in a different field from that of the patentee's endeavor, it is one which, because of the matter with which it deals, logically would have commended itself to a patentee's attention in considering their problem.

34. I have also been advised that an analysis of whether a claimed invention would have been obvious should be considered in light of the scope and content of the prior art, the differences (if any) between the prior art and the claimed invention, and the level of ordinary skill in the pertinent art involved. I understand as well that a prior art reference should be viewed as a whole.

35. I have also been advised that in considering whether a claimed invention could be obvious over a combination of prior art references, I may assess whether there are apparent reasons to combine known elements in the prior art in the manner claimed in view of interrelated teachings of multiple prior art references, the effects of demands known to the design community or present in the marketplace, and/or the background knowledge possessed by a person having ordinary skill in the art. I understand that other principles may be relied on in evaluating whether a claimed invention would have been obvious, and that these principles include the following:

- A combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results;
- When a device or technology is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or in a different one, so that if a person having ordinary skill can implement a predictable variation, the variation is likely obvious;
- If a technique has been used to improve one device, and a person having ordinary skill in the art would recognize that it would improve similar

devices in the same way, using the technique is obvious unless its actual application is beyond their skill;

- An explicit or implicit teaching, suggestion, or motivation to combine two prior art references to form the claimed combination may demonstrate obviousness, but proof of obviousness does not depend on or require showing a teaching, suggestion, or motivation to combine;
- Market demand, rather than scientific literature, can drive design trends and may show obviousness;
- In determining whether the subject matter of a patent claim would have been obvious, neither the particular motivation nor the avowed purpose of the named inventor controls whether the claim is obvious;
- One of the ways in which a patent's subject can be proved obvious is by noting that there existed at the time of invention a known problem for which there was an obvious solution encompassed by the patent's claims;
- Any need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed;

- “Common sense” teaches that familiar items may have obvious uses beyond their primary purposes, and in many cases a person having ordinary skill will be able to fit the teachings of multiple patents together like pieces of a puzzle;
- A person having ordinary skill in the art is also a person having ordinary creativity, and is not an automaton;
- A patent claim can be proved obvious by showing that the claimed combination of elements was “obvious to try,” particularly when there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions such that a person having ordinary skill in the art would have had good reason to pursue the known options within his or her technical grasp; and
- One should be cautious of using hindsight in evaluating whether a claimed invention would have been obvious.

36. I further understand that, in making a determination as to whether the claimed invention would have been obvious to a person having ordinary skill, the Board may consider certain objective factors if they are present, such as: commercial success of products practicing the claimed invention; long-felt but unsolved need; teaching away; unexpected results; copying; and praise by others in the field. These

factors are generally referred to as “secondary considerations” or “objective indicia” of nonobviousness. I understand, however, that for such objective evidence to be relevant to the obviousness of a claim, there must be a causal relationship (called a “nexus”) between the claim and the evidence and that this nexus must be based on a novel element of the claim rather than something in the prior art. I also understand that even when they are present, secondary considerations may be unable to overcome primary evidence of obviousness (such as motivation to combine with predictable results) that is sufficiently strong.

IV. BACKGROUND OF THE TECHNOLOGY

37. As discussed in Section V, the purported invention of the '282 patent is a wireless automation device that wirelessly reports sensor readings corresponding to received control information, sensor data in control at another automation component, or a received communication to other parts of a building automation system. For example, claim 1 of the '282 Patent recites “[a]n automation component configured for wireless communication” that includes “a multi-sensor package configured to detect a plurality of variables and generate sensor data for each detected variable.” The wireless automation device is configured to store this sensor data in memory, and upon receipt of sensor control information from another component of the building system, “communicate[s] a portion of the stored sensor data corresponding to the received sensor control information.”

38. During the prosecution of the '282 patent, the Applicant argued that the prior art did not disclose a “multi-sensor package” that is a “combination” of multiple sensors and, instead, disclosed only separate individual sensors.

39. Based on my experience in the field, however, the functionalities of the '282 patent, including a “multi-sensor package,” were well-known in the art prior to the '282 patent's priority date. One example of such prior art is U.S. Patent Publication No. 2007/0242688 (“McFarland”), which identifies McFarland as its inventor. McFarland was originally owned by Siemens Corporation. I understand that a copy of McFarland has been designated as Exhibit 1027. McFarland discloses “a wireless automation system” in which a sensor device uses a “combination” temperature and humidity sensor. McFarland, [0043].

40. Another example reference is U.S. Patent Application No. 2005/0268629 (“Ahmed-629”), Ahmed-629 identifies Ahmed as its inventor. was originally owned by Siemens Corporation. Ahmed teaches implementing multiple different sensors using a single-substrate “[Microelectromechanical Systems (MEMS)] sensor suite.” Ahmed-629, [0048]-[0049]. I understand that a copy of Ahmed-629 has been designated as Exhibit 1036.

41. As I discuss below, the Challenged Claims are anticipated and/or obvious over the prior art. Further, there were no technological barriers to combining

these elements to form the claimed invention and a person having ordinary skill in the art would have been motivated to combine these elements and would have understood that the combination would have yielded predictable results.

V. THE '282 PATENT

A. '282 Patent Overview

42. The Challenged Claims recite components or methods for use in wireless communication within a building automation system. '282, 2:23-28. The claimed wireless communication methods may be used, for example, to communicate sensor data that corresponds to received control information to another component of the building automation system. *See* '282, Claim 1. The claimed wireless communication methods may also be used to communicate stored sensor data that corresponds to sensor data in control at another component of the building automation system(*e.g.*, claims 7, 13) or a received communication (*e.g.*, claim 20). Fig. 2 shown below (emphasis added) provides an embodiment of a component that participates in such a building automation system:

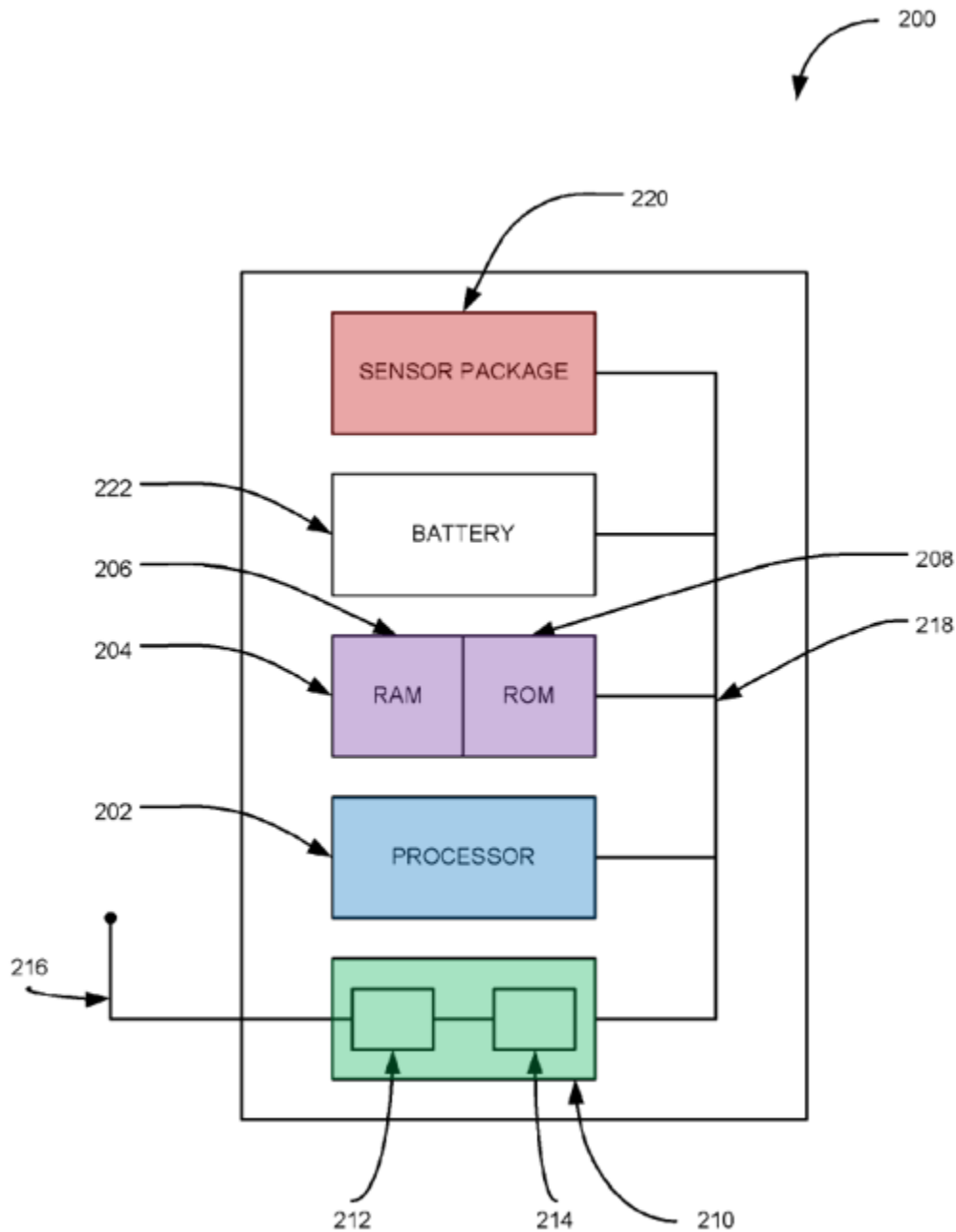


FIG. 2

'282, 3:33-35, 5:52-57, Fig. 2. As the color coding indicates, the pictured component comprises a “**processor**,” “**memory**,” “**communications component**,” and “**sensor package**” configured to sense “a variety of variables such as ... temperature [and]

humidity.” *Id.*; ’282, 6:22-28. The **memory** is utilized to store programs that are read and executed by the **processor** to produce “commands, requests, and queries” as well as values sensed by the **sensor package** which may be accessed by the **processor**. ’282, 5:57-62, 6:10-14, 6:28-30.

43. The automation component shown in Fig. 2 is configurable to receive different types of information from other components of the building automation system, like a “field panel.” The received information includes control information that “relates to or identifies sensor values and routines that are controlling and driving” the field panel, or status information about each of the control routines running in the field panel “in connection with each of the sensor elements in the sensor package 220.” ’282, 9:9-16, 9:55-60. After receiving this information from the field panel, the component sends back to the field panel its stored sensor data. ’282, 9:23-26, 9:64-67. The component is also configurable to communicate sensor data at regular intervals to the field panel “regardless of its status at the field panel.” ’282, 9:27-31, 10:1-5.

B. Prosecution History of the '282 Patent

44. In formulating my opinions, I considered the contents of the prosecution history of the '282 patent, a copy of which I understand has been designated as Exhibit 1003. During prosecution, the Challenged Claims were twice rejected as anticipated by a prior art reference (Petite). Ex. 1003 ("’282 File History"), 72-76, 95-100. In response to the first rejection, the Applicant amended the independent claims of the patent to add that the multi-sensor package is "configured to detect a plurality of variables and generate sensor data for each variable," and argued that the prior art only disclosed a single sensor. ’282 File History, 82-91. After the Examiner maintained the rejection, the Applicant reiterated its argument that the prior art does not disclose a multi-sensor package without making further amendments to the claims:

[I]t is clear that Petite discloses utilizing one or more individual sensors 310 to provide data signals to the data interface 321 which, in turn, provides the data to a data controller 324. *Nowhere in Petite is it disclosed or suggested that a group of individual sensors 310 could be combined to create a multi-sensor package* configured to detect a plurality of variables and generate sensor data for each detected variable as recited by the claims at issue.

Applicant further submits that the any construction or interpretation of the claimed multi-sensor package that includes a group of individual sensors such as though described by Petite would be inconsistent Applicants' specification. ...

Thus, Applicants own specification clearly describes and discusses what is meant by a "multi-sensor package" in both physical and functional terms. Based on this disclosure, *any interpretation of the claimed multi-sensor package that includes a group of individual sensors would be inconsistent with Applicants' specification and in direct conflict with rulings in both the Federal Circuit and the Board of Patent Appeals and Interferences.*

'282 File History, 110-111 (emphasis added). The Examiner then allowed the Challenged Claims. '282 File History, 119-123.

VI. THE '282 PATENT PRIORITY DATE

45. I understand the '282 patent matured from U.S. Application 12/406,799, which was filed on March 18, 2009. I understand that the '282 patent claims priority to a provisional application filed on March 19, 2008. However, for purposes of this declaration, I was asked to assume, with respect to each of the prior art Grounds discussed in this declaration, that the '282 patent is entitled to only its filing date of March 18, 2009. I have thus considered the patent and the prior art from the perspective of a person having ordinary skill in the art as of March 18, 2009. However, even to the extent that the '282 patent were found to be entitled to an earlier date, this would not materially affect my opinions so long as the references cited herein qualify as prior art. I was separately asked to consider whether the provisional application to which the '282 patent claims priority, which I understand has been designated as Exhibit 1045, provides a written description of a "multi-

sensor package” as claimed in the ’282 patent. I have been informed that an application provides written description support if it actually describes the subject matter in question and does not merely provide a description that renders the subject matter obvious to a person having ordinary skill in the art. I did not find any teaching of a multi-sensor package. For example, the provisional application’s specification is two pages long, with no accompanying figures, and discloses a wireless device that is a “multi-sensor wireless device” with the following contents:

- multiple sensors (temperature, humidity, carbon dioxide, volatile organic compounds)
- microprocessor
- signal processing hardware and software
- radio transmitter and receiver hardware and software
- battery

Ex. 1045, 2-3. Hence the “multi-sensor wireless device” is described as being made up of multiple components, each of which would be understood by a person having ordinary skill to be separately packaged. The word “package” itself appears nowhere in the provisional application’s specification. I see no disclosure or suggestion of combining the multiple sensors into a “multi-sensor package.”

VII. LEVEL OF ORDINARY SKILL IN THE ART

46. In rendering the opinions set forth in this declaration, I was asked to consider the patent claims and the prior art through the eyes of a person having ordinary skill in the art at the time of the alleged invention. I understand that the factors considered in determining the ordinary level of skill in a field of art include

the level of education and experience of persons working in the field; the types of problems encountered in the field, the teachings of the prior art, and the sophistication of the technology at the time of the alleged invention. I understand that a person having ordinary skill in the art is not a specific real individual, but rather is a hypothetical individual having the qualities reflected by the factors above. I understand that a person having ordinary skill in the art would also have knowledge from the teachings of the prior art, including the art cited below.

47. I have been asked to assume that the '282 patent is entitled to the priority date of March 18, 2009. Upon consideration of the relevant factors listed above, in my opinion, on or before this priority date, a person of ordinary skill in the art, at the time the application that matured into the '282 patent was filed, would have had a minimum of a bachelor's degree in electrical engineering, or a related field, along with at least two years of professional experience in sensors, controls, and/or wireless communications. Additional graduate education could substitute for professional experience, or significant experience in the field could substitute for formal education.

48. I note that in a parallel litigation, PO submitted the declaration of Dr. Erik De La Iglesia, in which he adopted my definition of a person having ordinary skill in the art; I understand this declaration has been designated as Exhibit 1043.

See Ex. 1043, at 5 (“I have been asked to adopt Dr. Neikirk’s proposed standard as to the relevant skill level of a person of ordinary skill in the art.”).

49. Well before March 19, 2008, my level of skill in the art was at least that of a person having ordinary skill. I am qualified to opine concerning what a person having ordinary skill in the art would have known and understood at the time of the ’282 patent’s purported invention. My analysis and conclusions herein are from the perspective of a person having ordinary skill in the art as of March 18, 2009. Even if that priority date were earlier, however, my opinions would not change as long as the identified prior art were still prior art.

VIII. CLAIM CONSTRUCTION

50. I have been instructed that the Challenged Claims 1-5, 7-11, 13-16, and 20-21 of the ’282 patent are to be given their ordinary and customary meaning as understood by one of ordinary skill in the art at the time of the alleged invention in light of the specification and the prosecution history pertaining to the patent, except as provided below. I have followed these principles in my analysis set forth in this document. I reserve the right to supplement my opinions in this declaration to the extent that any parties later propose claim constructions for any claim terms in the ’282 patent.

A. Preambles ([1.pre], [7.pre], [13.pre], [20.pre])

51. I understand the preamble of a claim may or may not be limiting. For purposes of this declaration, I have not been asked to formulate any opinion as to whether any claim preamble is limiting, and have not formulated any such opinion. Instead, I have been instructed to consider whether the prior art discloses the preambles, to the extent they are limiting. To the extent they are limiting, they are disclosed by the prior art as discussed in Section IX.

B. “a multi-sensor package” ([1.a], [7.a], [13.a], [20.a])

52. For purposes of this declaration, I was instructed to adopt the Patent Owner’s construction that “a multi-sensor package” means “a single packaged sensor device, not a group of individual sensors.” Ex. 1013, 1.

C. “identification flag for each identified sensor value” ([4], [10], [16])

53. I understand that “each identified sensor value” as used in claims 4, 10, and 16 may refer to the sensor values detected in claim elements [1.a], [7.a], and [13.a]; [1.d], [7.d], and [13.d]; [1.e], [7.e]-[7.f], and [13.f]; [1.f], [7.g], and [13.f]; or [3], [9], and [15] respectively. *See* Ex. 1009, 10-12; Ex. 1010, 8-10; Ex. 1011, 10-13; Ex. 1012, 7-9. For purposes of this declaration, I was instructed to consider each of these options. I concluded that under each of these interpretations, the prior art discloses this element because it discloses setting identification flags each time

sensor data is read and stored, as well as setting identification flags for sensor values stored in memory that exceed limits established by thresholds. *See* Section IX.

D. “power-down command” ([13.g])

54. For purposes of this declaration, I was instructed to adopt the Patent Owner’s construction that this term refers to a “command that turns off a device or returns it to a low-power state.” Ex. 1009, 12-13; Ex. 1010, 10-12; Ex. 1011, 14; Ex. 1012, 9-11. I concluded that the identified prior art discloses such a command, and thus, this limitation, under any reasonable interpretation. *See* Section IX.

E. Third-Party Constructions

55. For purposes of this declaration, I was asked to consider several constructions proposed by third-parties and whether they would affect my opinions. A summary of these constructions that I was instructed to consider are set forth below:

Term	Construction
“[first][second] automation component” (e.g., in claim elements [1.pre], [7.pre], [13.pre], [20.a], and [20.c])	Means-plus-function term. Function: “communication with the building automation system” Structure: a “general-purpose computer” implementing an algorithm such as, e.g., the algorithm shown in Figs. 6-7 (showing communication that occurs based on received status or usage/control information) (see Ex. 1015, 17-18)¹
“receive status data related to sensor data in control at a second automation component in communication with the building automation system” (e.g., in claim element [7.e])	“receive information that provides the complete status for each of the control routines or algorithms running at a second automation component in connection with each sensor element in the sensor package, the second automation component in communication with the building automation system” (Ex. 1023, 10-11)

56. I have not adopted any of these third-party constructions as my own, and I express no opinions as to whether any of these constructions should be adopted. Nonetheless, as set forth below in Section IX, each of these elements is disclosed by the prior art cited herein even under these third-party constructions.

¹ I understand that the third-party construction did not identify this algorithm, and was instructed to assume that this algorithm is sufficient. I express no opinions on the sufficiency of this corresponding structure.

IX. GROUNDS OF UNPATENTABILITY

57. As I explained above in Section IV, the methods for wirelessly reporting sensed conditions claimed in the Challenged Claims were well-known in the art.

58. In this section, I will explain why combinations of teachings from the following references anticipate and/or render obvious each of the Challenged Claims:

Name	Ex.	Patent / Publication	Priority Date	Issued / Published
McFarland	1027	U.S. 2007/0242688	4/12/2006	10/18/2007
Kates-089	1029	U.S. 2006/0071089	10/6/2004	4/6/2006
Stoner	1030	U.S. 8,276,829	11/30/2007	10/2/2012
Ahmed-629	1036	U.S. 2005/0268629	3/25/2004	12/8/2005

I have been instructed to assume that each of these references qualifies as prior art.

59. As I explain below, the Challenged Claims are invalid based upon the following prior art grounds:

- a. **Ground 1:** Challenged Claims 1-5, 7-11, 20-21 of the '282 patent are anticipated and rendered obvious by McFarland;
- b. **Ground 2:** Challenged Claims 13-16 of the '282 patent are rendered obvious by McFarland in view of Kates-089;

- c. **Ground 3:** Challenged Claims 1-5, 7-11, 20-21 of the '282 patent are rendered obvious by McFarland in view of Stoner;
- d. **Ground 4:** Challenged Claims 13-16 of the '282 patent are rendered obvious by McFarland in view of Stoner and Kates-089;
- e. **Ground 5:** Challenged Claims 1-5, 7-11, 20-21 of the '282 patent are rendered obvious by McFarland in view of Ahmed-629;
- f. **Ground 6:** Challenged Claims 13-16 of the '282 patent are rendered obvious by McFarland in view of Kates-089 and Ahmed-629;
- g. **Ground 7:** Challenged Claims 1-5, 7-11, and 20-21 of the '282 patent are rendered obvious by McFarland in view of Stoner and Ahmed-629;
- h. **Ground 8:** Challenged Claims 13-16 of the '282 patent are rendered obvious by McFarland in view of Stoner, Kates-089 and Ahmed-629;
- i. **Ground 9:** Challenged Claims 20-21 of the '282 patent are rendered obvious by Kates-089 in view of Ahmed-629.

60. In summary, for **Ground 1, McFarland** teaches a wireless automation system containing a wireless automation device that is responsive to control

instructions from other parts of a network. In **Ground 2, Kates-089** provides additional explicit teachings of commands directing the automation device to wake up and go to standby mode. For **Grounds 3-4, Stoner** provides additional detailed teachings of data that is in control at a second automation component. With respect to **Grounds 5-8, Ahmed-629** provides additional teachings of implementing sensors as a multi-sensor package. For **Ground 9, Kates-089** provides further teachings of a method for wireless communication between wireless automation devices within a building automation system that, when modified with **Ahmed-629's** teachings, renders obvious claims 20-21.

61. It is my opinion that Challenged Claims 1-5, 7-11, 13-16, and 20-21 of the '282 patent are unpatentable as explained below. I note that in this discussion, I may focus on the particular language in specific claims, but it should be understood that my analysis applies to the corresponding elements of all Challenged Claims containing identical or substantially identical language.

A. Ground 1: McFarland (Claims 1-5, 7-11, 20-21)

1. U.S. 2007/0242688 ("McFarland") Overview

62. McFarland discloses a "wireless automation system" that remotely monitors conditions like temperature using a wireless sensor. McFarland, [0001], [0016]. The system communicates data "between devices related to changes in a value of a monitored condition and/or measured parameter" using a process called

“dynamic value reporting.” McFarland, [0016]. Taken together, this monitoring and intra-network communication is used to automate process control for systems like HVAC. McFarland, [0002], [0016]. Fig. 2 below (emphasis added) shows an embodiment of a wireless automation device that enables the described functionality within such a wireless automation system.

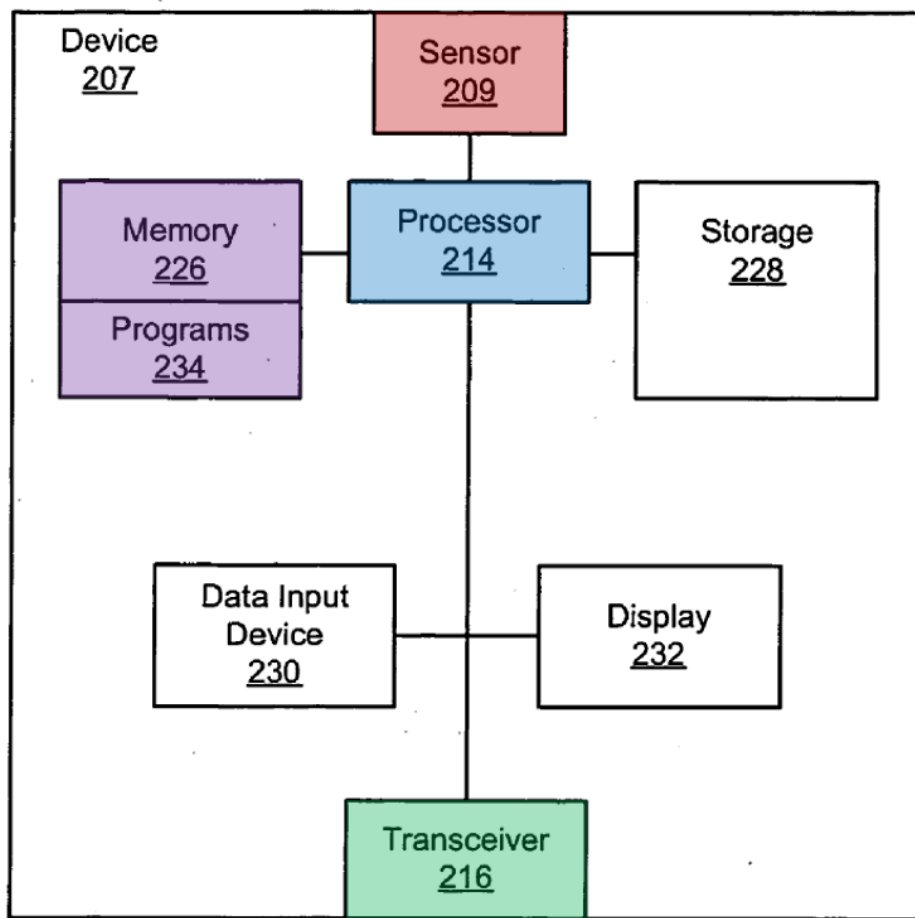


Figure 2

McFarland, [0036]-[0037]. As shown, the wireless automation device includes a “**transceiver**,” “**processor**,” and “**memory**,” and “**sensor**.” McFarland, Fig. 2, [0038]-[0044]. The **sensor** is configured as a “combination[]” of sensors that detect different conditions – for example, temperature and humidity sensors. McFarland, [0043]. The **memory** stores programs (such as program 234 shown in Fig. 2) executed by the **processor** to, for example, “process data” and direct the “storage and retrieval of data.” McFarland, [0038], [0040]. The **memory** also stores prior **sensor** readings along with “[a]ssociated timing data.” McFarland, [0047].

63. The information collected by the **sensors** is used by the **processor** to implement a control process. McFarland, [0039]-[0040], [0043]-[0044]. For example, the **processor** processes the most recent sensor reading by comparing it to one or more prior readings to ascertain whether a change has occurred in the sensed condition that exceeds an acceptable range. McFarland, [0049]-[0050]. If the **processor** determines that the sensed condition exceeds an acceptable range, it sets a flag “identifying [that] a change in the sensed condition was detected.” *Id.* Upon setting a flag, the **processor** “control[s] or trigger[s] the **transceiver 214** to communicate information” over a “network,” where the information includes the triggering event, values or “indicators” of the sensed condition, and timing data associated with the values. McFarland, [0049]-[0050], [0052]-[0054]. The

processor uses the timing data that is stored with the sensor data in **memory** “to associate a time or interval identifier ... with when the flag was set.” McFarland, [0047], [0050].

64. The wireless automation device shown in Figure 2 above also receives and responds to wirelessly-received control instructions from one or more controllers and/or field panels. McFarland, [0024]. The controllers each “correspond[] to an associated localized standard building control subsystem such as a space temperature control.” *Id.* The controllers instruct the wireless automation device to sense conditions and responds by processing the information based on control algorithms. McFarland, [0061]-[0062]. After this processing, the controller directs the wireless automation device to perform functions based on the “sensed conditions and desired set point conditions” including synchronizing timing information, changing sensor threshold limits, and reporting information. McFarland, [0024]-[0026], [0060]-[0062].

65. McFarland discloses that its automation device 507 is implemented using the “dynamic value reporting as described ... with respect to FIGS. 1-4,” indicating the devices shown in Figs. 1-2 are the same as the device shown in Fig. 5, or at least that the features disclosed for one of the devices are applicable to the other devices. McFarland, [0060]. For example, McFarland teaches that “sensor

109a” in Fig. 1 “report[s] sensor information” as well as other information via “dynamic value reporting.” McFarland, [0019], [0023], [0025]-[0026]. The “automation device [or sensor] 207” shown in Fig. 2 also “reports information” “using dynamic value reporting.” McFarland, [0036]-[0037]. Taken together, these disclosures confirm that McFarland’s teachings of devices 207 and 507 and sensor 109a operating to perform dynamic value reporting and sensing information, including monitoring and reporting data periodically and in response to commands describe features that common to each of these devices. Therefore, the features described as belonging to one of these devices is equally applicable to the others. Likewise, since controllers 108a-108e and 508 are all characterized as “controllers” implementing the same functions (namely, executing control processes with respect to other system components), McFarland not only renders obvious but affirmatively discloses that controllers 508 and 108a-108e each implement McFarland’s teachings of control processes based on such monitored and reported information. Therefore, the features described as belonging to one of these devices is equally applicable to the others. *See* McFarland, [0002]-[0004], [0008], [0011], [0015], [0018], [0021], [0023]-[0027], [0033]-[0034], [0060]-[0062]. However, while a person having ordinary skill would have understood that McFarland’s teachings with respect to each of these devices and controllers describe features common to each such device

or controller, even if this were not the case, a person having ordinary skill in the art would have been motivated to modify McFarland's teachings by applying the different device and controller teachings to the other disclosed devices and controllers because their similar structure and purpose would have advantageously benefitted from implementing each of these features to improve the monitoring and reporting effectiveness and efficiency of the system. *See* McFarland, [0060] (“[D]evice 507 is configured ... as described ... with respect to FIGS. 1-4.”). And a person having ordinary skill in the art would have had a reasonable expectation of success combining the teachings of such embodiments as they are taught as part of the same system.

2. Invalidity of Claims 1-5, 7-11, and 20-21 Over McFarland

(a) Element [1.pre]

66. **Element [1.pre] recites “An automation component configured for wireless communication within a building automation system, the automation component comprising.”** This element is met by McFarland.

67. **McFarland discloses an automation component** (e.g., a “wireless automation device”) **configured for wireless communication** (e.g., configured to “wirelessly report[]” events) **within a building automation system** (e.g., within a “building automation system”). *See, e.g.,* McFarland (emphasis added):

- [0024] (“The controllers 108a-108e communicate with one or more sensors 109a using two-way wireless communication protocol....”)
- [0036] (“FIG. 2 illustrate a block diagram of an automation device 207 for a wireless automation system using dynamic value reporting.”)
- [0060] (“FIG. 5 illustrates an exemplary controller 508 of a building automation system in communication with a device 507. The device 507 is configured for dynamic value reporting as described above with respect to FIGS. 1-4. ... The controller [508] may transmit data and information addressed to a specific device 507 according to a binding association. The information may include control instructions, communications settings or other information transmitted from another device 507 or controller.”)
- [0061] (“The controller 508 receives information communicated from the device 507. The controller 508 processes the information according to a control algorithm for the system and for the device 507. The controller 508 may be configured to communicate instructions to the device 507. For example, when a sequence of differences does not change or varies relatively little, the controller 508 may instruct or reprogram the device 507 to a smaller difference limit D. Similarly, the controller 508 may instruct the device to increase the difference limit D, to ignore the difference limit D to

increase and/or decrease the polling interval 338 and/or the transmission interval 336.”)

- **[0062]** (“The controller 508 may also communicate a report instruction to the device 507. In response to a report instruction, the device 507 may wake up from a sleep mode, and sense and report a current indicator V_i or other requested information. ... The controller 508 may also be configured or programmed to communicate information with other devices in response to the information received from device 507.”)
- **See also Abstract, [0006], [0008], [0016], [0019]-[0021], [0036]-[0037].**

68. McFarland discloses a “wireless automation device[]” that wirelessly communicates with controllers to send and receive information as part of a “building automation system.” McFarland, [0024], [0036], [0060]. This system is implemented to function without any human interaction because the system communicates sensor data with controllers automatically depending on current sensor values and thresholds without requiring human intervention to issue commands to cause such communications and operations to take place. *Id.*

69. Based on a construction proposed by a third party (Ex. 1015, 17-18; *see also* Section VIII.E), which I have not adopted as my own, I have been asked to consider whether this term would be met if it was considered to be a means-plus-

function limitation, in which the function includes communicating within the system and the corresponding structure includes a processor as disclosed in the '282 patent's specification for performing this function using algorithms disclosed in the specification (for example, the algorithm shown in Figs. 6-7 (showing communication that occurs based on received status or usage/control information)). Even under such a construction, I conclude this limitation would be met by McFarland. A person having ordinary skill in the art would have understood McFarland to disclose, literally and under the doctrine of equivalents, a processor that meets the "automation component" of this claim element; for example, McFarland discloses a structure (e.g., a processor, *see* my discussion for elements [1.a]-[1.d]) that performs the corresponding functions (e.g., communicating within the system, *see* my discussion of elements [1.e]-[1.f]), either literally or by performing the same function in substantially the same way to achieve substantially the same result. Therefore, the claim element is disclosed by the prior art even if it is considered a means-plus-function element, since both the McFarland apparatus and the claimed invention of the '282 patent use a processor component, which they use to perform the function of communicating with other components the system in the same way, as discussed in more detail for elements [1.a]-[1.f].

(b) Element [1.a]

70. **Element [1.a] recites “a multi-sensor package configured to detect a plurality of variables and generate sensor data for each detected variable.”**

This element is met by McFarland.

71. **McFarland discloses a multi-sensor package configured to detect a plurality of variables** (e.g., a “combination[]” “sensor” that “sense[s] conditions” including “temperature” and “humidity”) **and generate sensor data for each detected variable** (e.g., “generates information or data related to the sensed or monitored condition”). *See, e.g.,* McFarland (emphasis added):

- **Fig. 2:**

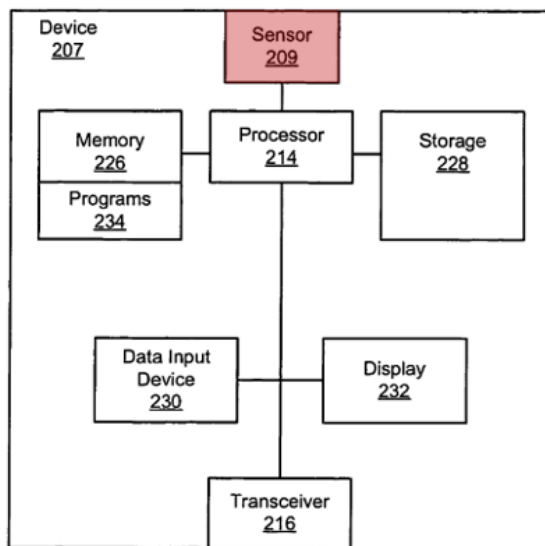
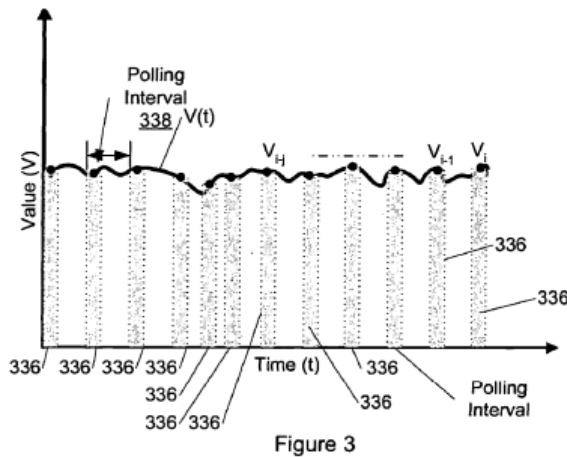


Figure 2

- **Fig. 3:**



- [0038] (“The device 207 includes a processor 214, a transceiver 216, and a sensor 209. Additional, different or fewer components may be provided, such as providing a plurality of different or the same types of sensors. For example, the device may also have a memory 226, a storage device 228, a data input device 230, and a data output 232. A program 234 resides in the memory 226 and includes one or more sequences of executable code or coded instructions.... The program 234 may be implemented using any known or proprietary software platform or frameworks including basic, visual basic, C, C+, C++, J2EE™, Oracle 9i, XML, API based designs, and like software systems.”)
- [0039] (“The processor 214 implements a control process for the device 207. The control process may be implemented based on a signal that is read from and/or provided by the sensor 209, such as a measured value of a

parameter, an indicator of a sensed condition and/or status of an event. The processor 214 may be one or more devices including a general processor, digital signal processor (DSP), control processor unit (CPU)....

The processor 214 has a processing power or capability and associated memory corresponding to the needs of one or more of a plurality of different types of sensors 209 and transceiver 216. The processor 214 implements a control process algorithm specific to the sensor 209. Other control processes may be stored but unused due to a specific configuration.”)

- **[0040]** (“The processor 214 executes one or more sequences of instructions of the program 234 to process data. Data and/or instructions may be preprogrammed to the device 207 and or provide to the device 207 using the data input device 230. Data and/or instructions may also be received via the transceiver 216. The processor 214 interfaces data input device 230 and/or the transceiver 216 to receive data and instructions. The processor 214 may also interface the storage device 228 for storage and retrieval of data. Data processed by the processor 214 may be stored in and retrieved from in storage device 228, communicated via the transceiver 216, and/or presented via data output device 232. The data output device 232 may be a display, monitor, a printer, a communications port, an array of lights, combinations

thereof and the like. For example, the processor may control a light array of the output device 232 to indicate an operation status, or read data status, a transmit status and the like.”)

- [0043] (“The sensor 209 may include a device or a collection of devices that sense conditions, parameters and/or events such as an environmental condition in a building. The sensor 209 generates information or data related to the sensed or monitored condition. The information may be provided an output as one or more signals that may be read by the processor 214... The may be provided as an indicator of the sensed condition, parameter or event. In an example, the sensor 209 is configured as any of a temperature sensor, humidity sensor, fire sensor ... combinations thereof, or other now known or later developed sensors. The sensor 209 may be a micro-electro-mechanical sensors (“MEMS”) ... for sensing any condition or parameter.”)
- [0045] (“FIG. 3 illustrates a chart 300 of signal $V(t)$ generated by the sensor 209 representing an indicator of a sensed condition versus time (t).”)
- [0047] (“A signal $V(t)$ representing the sensed condition may be generated. The signal $V(t)$ may be a continuous or discrete signal representing a current value for the sensed condition, or the status of the condition, during

the current interval 336. During a polling period 336, the processor 214 reads the signal $V(t)$ from the sensor 209, and determines value, or most-current indicator V_i , for the current sensed condition. For example, the processor 214 may poll or sample the signal from the sensor 209 to read the most current indicator of the sensed condition.... The indicator may be stored in memory 226. The memory may also store prior readings V_{i-j} , or indicators read during prior periods 336. Associated timing data or an interval sequence may be stored with the indicator V_i to identify a point in time or interval in which the indicator was read.")

- **See also [0002]-[0003], [0008], [0016], [0021], [0023]-[0024], [0046], Figs. 1-2.**

72. McFarland's wireless automation device includes "sensor 209," which it characterizes as a "combination[]" sensor that detects multiple variables (for example, the sensor 209 may be configured to detect multiple different variables, including temperature, humidity, and other variables). McFarland, [0043]. For example, McFarland teaches implementing the combination sensor 209 as "micro-electro-mechanical sensors ('MEMS')." McFarland, [0043], Fig. 2. McFarland's teachings of using such a MEMS device in the wireless automation device illustrated by Fig. 2 not only renders obvious but affirmatively discloses this claim element.

73. This conclusion is supported by assertions made by the Applicant during the prosecution of the '282 patent. As I summarized above in Section V.B, in responding to a rejection, the Applicant distinguished the claim from the prior art by stating that “[n]owhere in the reference was it disclosed or suggested that a group of individual sensors 310 could be combined to create a multi-sensor package configured to detect a plurality of variables and generate sensor data for each detected variable as recited by the claims.” Ex. 1003, 110. In contrast to this prior art, McFarland expressly teaches that its sensor is a “combination” sensor—meaning that McFarland’s sensor teaches a package in which individual sensors are combined to create a multi-sensor package in the same way that the Applicant described creating a multi-sensor package during prosecution. McFarland, [0043]. Therefore, McFarland’s combination sensor device is a multi-sensor package.

74. For each condition that it monitors, the sensor generates and outputs sensor data for each measured variable in the form of “a measured value” or “indicator.” McFarland, [0039], [0045], [0047].

(c) Element [1.b]

75. **Element [1.b] recites “a wireless communications component.”** This element is met by McFarland.

76. **McFarland discloses a wireless communications component** (e.g., “wireless transceiver”). *See, e.g.,* McFarland (emphasis added):

- **Fig. 2:**

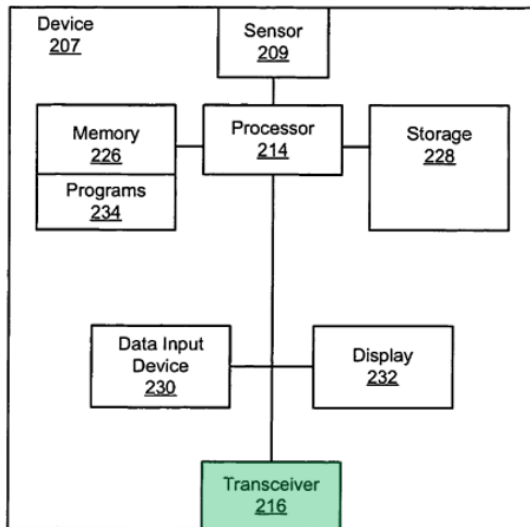


Figure 2

- **[0008]** (“[A] wireless automation device includes a wireless transceiver, such as a RF transceiver, RF transmitter, and/or RF receiver or other device that wirelessly communicates packets of information over a wireless network.”)
- **See also** [0038]-[0042], [0046], [0052]-[0054], [0060], Fig. 5.

77. McFarland discloses a “wireless transceiver” that is part of the wireless automation device and communicates wirelessly over a network. McFarland, [0008].

(d) Element [1.c]

78. **Element [1.c]** recites “a processor in communication with the wireless communications component and the sensor package.” This element is met by McFarland.

79. McFarland discloses a processor in communication with the wireless communications component and the sensor package (e.g., “processor” receives “signal” from the “sensor” and “interfaces” with the “transceiver”). See, e.g., McFarland (emphasis added):

- **Fig. 2:**

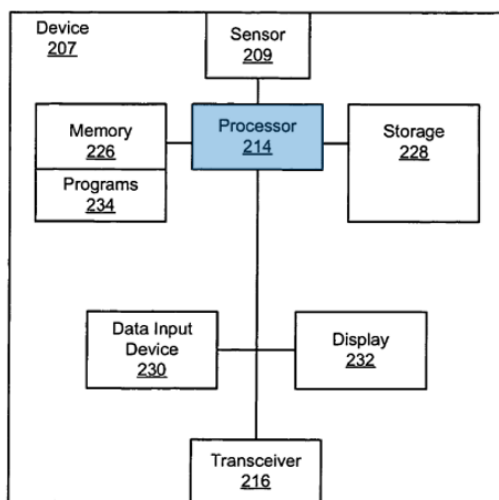


Figure 2

- [0038] (“The device 207 includes a processor 214, a transceiver 216, and a sensor 209. Additional, different or fewer components may be provided, such as providing a plurality of different or the same types of sensors. For example, the device may also have a memory 226, a storage device 228, a data input device 230, and a data output 232. A program 234 resides in the memory 226 and includes one or more sequences of executable code or

coded instructions.... The program 234 may be implemented using any known or proprietary software platform or frameworks including basic, visual basic, C, C+, C++, J2EE™, Oracle 9i, XML, API based designs, and like software systems.”)

- **[0039]** (“The processor 214 implements a control process for the device 207. The control process may be implemented based on a signal that is read from and/or provided by the sensor 209, such as a measured value of a parameter, an indicator of a sensed condition and/or status of an event. The processor 214 may be one or more devices including a general processor, digital signal processor (DSP), control processor unit (CPU).... The processor 214 has a processing power or capability and associated memory corresponding to the needs of one or more of a plurality of different types of sensors 209 and transceiver 216. The processor 214 implements a control process algorithm specific to the sensor 209. Other control processes may be stored but unused due to a specific configuration.”)
- **[0040]** (“The processor 214 executes one or more sequences of instructions of the program 234 to process data. Data and/or instructions may be preprogrammed to the device 207 and or provide to the device 207 using the data input device 230. Data and/or instructions may also be received via the

transceiver 216. The processor 214 interfaces data input device 230 and/or the transceiver 216 to receive data and instructions. The processor 214 may also interface the storage device 228 for storage and retrieval of data. Data processed by the processor 214 may be stored in and retrieved from in storage device 228, communicated via the transceiver 216, and/or presented via data output device 232. The data output device 232 may be a display, monitor, a printer, a communications port, an array of lights, combinations thereof and the like. For example, the processor may control a light array of the output device 232 to indicate an operation status, or read data status, a transmit status and the like.”)

- [0043] (“The sensor 209 may include a device or a collection of devices that sense conditions, parameters and/or events such as an environmental condition in a building. The sensor 209 generates information or data related to the sensed or monitored condition. The information may be provided an output as one or more signals that may be read by the processor 214.... The may be provided as an indicator of the sensed condition, parameter or event. In an example, the sensor 209 is configured as any of a temperature sensor, humidity sensor, fire sensor ... combinations thereof, or other now known or later developed sensors. The sensor 209 may be a

micro-electro-mechanical sensors (“MEMS”) ... for sensing any condition or parameter.”)

- [0044] (“The sensor 209 is responsive to the processor 214 and/or logic executed by the processor 214.”)
- [0046] (“[T]he processor 214 polls the sensor 209 during a recurring polling period 336.... Each period 336 recurs at a variable frequency or interval 338.”)
- [0052] (“The processor 214 controls the transceiver 216 to selectively communicate information during a period of a transmission interval. FIG. 4 illustrates a transmission interval for a device configured for dynamic value reporting. For example, a processor 214 may control or trigger the transceiver 214 to communicate information during a transmission period 436. The transceiver may communicate the information during the transmission period in response to a triggering event such a detecting whether a flag.”)
- **See also [0037], [0047]-[0048], [0060]-[0061], Figs. 4-5.**

80. See my discussion of elements [1.pre]-[1.b]. The wireless automation device disclosed by McFarland also includes a “processor 214” that engages in two-way communications with both the transceiver and the sensor. McFarland, [0038]-

[0040], [0043]-[0044], [0046], [0052]. The processor is disclosed to “interface[]” with and “control[]” the “transceiver”; the transceiver also communicates information to the processor. McFarland, [0040], [0052]. The processor also “read[s]” sensor 209 to determine the value “for the current sensed condition”; sensor 209 is also “responsive to” “logic executed by the processor 214”—meaning the processor and sensor are in communication with one another as well. McFarland, [0044], [0047].

(e) Element [1.d]

81. **Element [1.d] recites “a memory in communication with the processor, the memory configured to store sensor data provided by the sensor package and computer readable instructions which are executable by the processor.”** This element is met by McFarland.

82. **McFarland discloses a memory in communication with the processor, the memory configured to store sensor data provided by the sensor package and computer readable instructions which are executable by the processor** (e.g., “memory,” in communication with the “processor,” is configured to store “readings” or “indicators” from the “sensor,” and a “program” executable by the “processor”). *See, e.g.,* McFarland (emphasis added):

- **Fig. 2:**

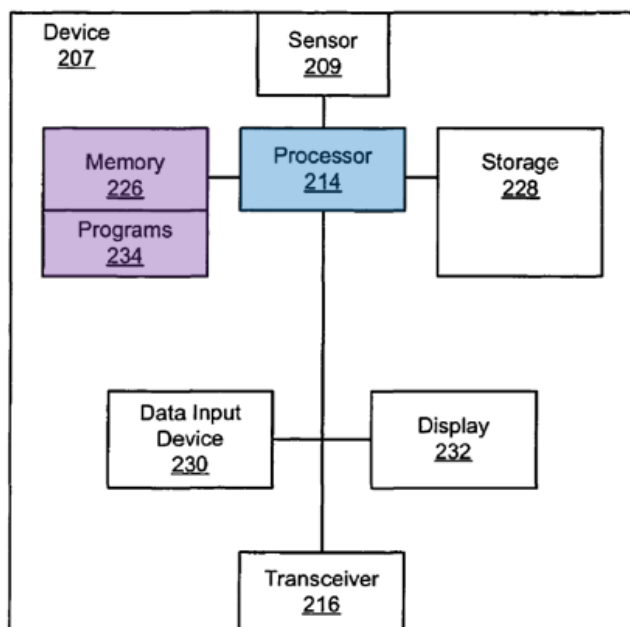


Figure 2

- [0038] (“The device 207 includes a processor 214, a transceiver 216, and a sensor 209. Additional, different or fewer components may be provided, such as providing a plurality of different or the same types of sensors. For example, the device may also have a memory 226, a storage device 228, a data input device 230, and a data output 232. A program 234 resides in the memory 226 and includes one or more sequences of executable code or coded instructions.... The program 234 may be implemented using any known or proprietary software platform or frameworks including basic, visual basic, C, C+, C++, J2EE™, Oracle 9i, XML, API based designs, and like software systems.”)

- [0039] (“The processor 214 implements a control process for the device 207. The control process may be implemented based on a signal that is read from and/or provided by the sensor 209, such as a measured value of a parameter, an indicator of a sensed condition and/or status of an event. The processor 214 may be one or more devices including a general processor, digital signal processor (DSP), control processor unit (CPU). . . . The processor 214 has a processing power or capability and associated memory corresponding to the needs of one or more of a plurality of different types of sensors 209 and transceiver 216. The processor 214 implements a control process algorithm specific to the sensor 209. Other control processes may be stored but unused due to a specific configuration.”)
- [0040] (“The processor 214 executes one or more sequences of instructions of the program 234 to process data. Data and/or instructions may be preprogrammed to the device 207 and or provide to the device 207 using the data input device 230. Data and/or instructions may also be received via the transceiver 216. The processor 214 interfaces data input device 230 and/or the transceiver 216 to receive data and instructions. The processor 214 may also interface the storage device 228 for storage and retrieval of data. Data processed by the processor 214 may be stored in and retrieved from in

storage device 228, communicated via the transceiver 216, and/or presented via data output device 232. The data output device 232 may be a display, monitor, a printer, a communications port, an array of lights, combinations thereof and the like. For example, the processor may control a light array of the output device 232 to indicate an operation status, or read data status, a transmit status and the like.”)

- [0047] (“A signal $V(t)$ representing the sensed condition may be generated. The signal $V(t)$ may be a continuous or discrete signal representing a current value for the sensed condition, or the status of the condition, during the current interval 336. During a polling period 336, the processor 214 reads the signal $V(t)$ from the sensor 209, and determines value, or most-current indicator V_i for the current sensed condition. For example, the processor 214 may poll or sample the signal from the sensor 209 to read the most current indicator of the sensed condition.... The indicator may be stored in memory 226. The memory may also store prior readings V_{i-j} , or indicators read during prior periods 336. Associated timing data or an interval sequence may be stored with the indicator V_i to identify a point in time or interval in which the indicator was read.”)
- **See also** [0017], [0037], [0050], [0055].

83. *See* my discussion for elements [1.pre]-[1.a], [1.c]. McFarland also discloses that the wireless automation device also includes a “memory 226.” McFarland, Fig. 2, [0038]. The memory stores “data” in the form of current and prior readings of “indicator[s]” of the sensed condition that are generated by sensor 209. McFarland, [0040], [0047]. The memory also communicates with the processor and stores programs (such as program 234 shown in Fig. 2) that are executed by the processor to perform functions such as “process[ing] data” and directing the “storage and retrieval of data.” McFarland, [0038], [0040].

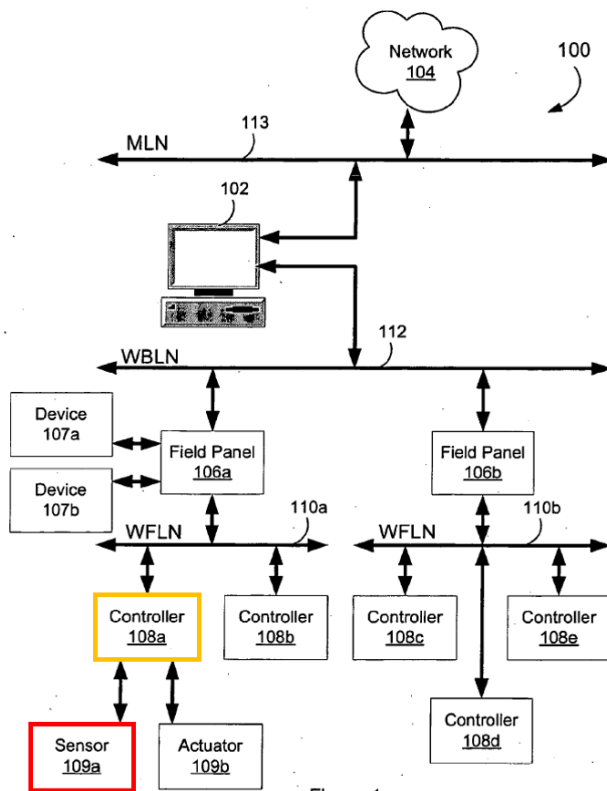
(f) Element [1.e]

84. **Element [1.e] recites “wherein the computer readable instructions are programmed to: receive sensor control information related to sensor data in control at a second automation component in communication with the building automation system.”** This element is met by McFarland.

85. **McFarland discloses that the computer readable instructions are programmed** (e.g., the “program’s” instructions are programmed “using” “software” such as “C”) **to receive sensor control information** (e.g., “wireless automation device” receives “control instructions” including a “report instruction” for a sensor to “sense and report” an “indicator”) **related to sensor data in control at a second automation component in communication with the building automation system** (e.g., the “control instructions” are related to the data from the

“sensor” that a separate “controller” uses to “control[] a subsystem” (e.g., through an actuator) “based on sensed conditions and desired set point conditions” within the “building automation system”). *See, e.g.,* McFarland (emphasis added):

- **Fig. 1:**



- **Fig. 5:**

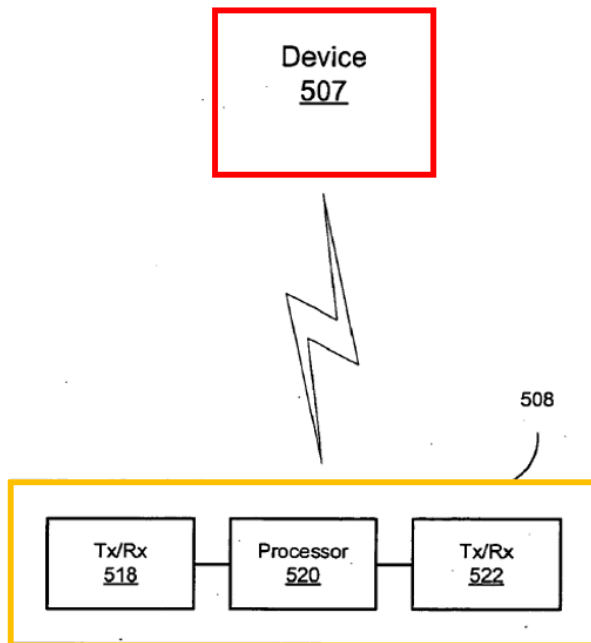


Figure 5

- [0020] (“The devices generate and/or receive information related to a specific event, condition, status, acknowledgement, control, combinations thereof and the like. The devices may also respond to control commands and/or execute an instruction received by or in a signal.”)
- [0025] (“The controller 108a provides control functionality of each, one, or both of the sensor 109a and the actuator 109b. Controller 108a controls a subsystem based on sensed conditions and desired set point conditions. The controller 108a controls the operation of one or more actuators in response to an event reported by a sensor 109a. The controller 108a may drive the one or more actuator to a desired set point.”)

- [0026] (“The controller 108a is programmed with the set points and a code setting forth instructions that are executed by the controller for controlling the actuators to drive the sensed condition to be with the set point. For example, the actuator 109b is operatively connected to an air conditioning damper and sensor 109a may be a room temperature sensor that reports information related to a temperature being monitored by the sensor. ... If the temperature sensed by the sensor 109a exceeds a threshold, the actuator may respond accordingly to open a damper, allowing air conditioning to flow into a room. The sensor 109a may communicate the sensed condition to the actuator 109b and/or to the controller 108a, which thereafter provides an appropriate control signal to the actuator 109a.”)
- [0038] (“The device 207 includes a processor 214, a transceiver 216, and a sensor 209. Additional, different or fewer components may be provided, such as providing a plurality of different or the same types of sensors. For example, the device may also have a memory 226, a storage device 228, a data input device 230, and a data output 232. A program 234 resides in the memory 226 and includes one or more sequences of executable code or coded instructions.... The program 234 may be implemented using any known or proprietary software platform or frameworks including basic,

visual basic, C, C+, C++, J2EE™, Oracle 9i, XML, API based designs, and like software systems.”)

- **[0039]** (“The processor 214 implements a control process for the device 207. The control process may be implemented based on a signal that is read from and/or provided by the sensor 209, such as a measured value of a parameter, an indicator of a sensed condition and/or status of an event. The processor 214 may be may be one or more devices including a general processor, digital signal processor (DSP), control processor unit (CPU).... The processor 214 has a processing power or capability and associated memory corresponding to the needs of one or more of a plurality of different types of sensors 209 and transceiver 216. The processor 214 implements a control process algorithm specific to the sensor 209. Other control processes may be stored but unused due to a specific configuration.”)
- **[0040]** (“The processor 214 executes one or more sequences of instructions of the program 234 to process data. Data and/or instructions may be preprogrammed to the device 207 and or provide to the device 207 using the data input device 230. Data and/or instructions may also be received via the transceiver 216. The processor 214 interfaces data input device 230 and/or the transceiver 216 to receive data and instructions. The processor 214 may

also interface the storage device 228 for storage and retrieval of data. Data processed by the processor 214 may be stored in and retrieved from in storage device 228, communicated via the transceiver 216, and/or presented via data output device 232. The data output device 232 may be a display, monitor, a printer, a communications port, an array of lights, combinations thereof and the like. For example, the processor may control a light array of the output device 232 to indicate an operation status, or read data status, a transmit status and the like.”)

- [0060] (“FIG. 5 illustrates an exemplary controller 508 of a building automation system in communication with a device 507. The device 507 is configured for dynamic value reporting as described above with respect to FIGS. 1-4. ... The controller [508] may transmit data and information addressed to a specific device 507 according to a binding association. The information may include control instructions, communications settings or other information transmitted from another device 507 or controller.”)
- [0061] (“The controller 508 receives information communicated from the device 507. The controller 508 processes the information according to a control algorithm for the system and for the device 507. The controller 508 may be configured to communicate instructions to the device 507. For

example, when a sequence of differences does not change or varies relatively little, the controller 508 may instruct or reprogram the device 507 to a smaller difference limit D . Similarly, the controller 508 may instruct the device to increase the difference limit D , to ignore the difference limit D to increase and/or decrease the polling interval 338 and/or the transmission interval 336.”)

- [0062] (“The controller 508 may also communicate a report instruction to the device 507. In response to a report instruction, the device 507 may wake up from a sleep mode, and sense and report a current indicator V_i or other requested information. ... The controller 508 may also be configured or programmed to communicate information with other devices in response to the information received from device 507.”)
- *See also* [0003], [0021], [0023]-[0027], [0033]-[0034], [0037], [0056]-[0059].

86. See my discussion of elements [1.pre]-[1.c]. McFarland also discloses “controller 508” (which, as explained by McFarland at [0060] and in my discussion in Section IX.A.1, implements the same relevant functionalities as controller 108a in Fig. 1), which is a second automation component that communicates with the “wireless automation device.” McFarland, [0025]-[0026], [0060]. The “wireless

automation device” receives a “report instruction”—an instruction that is sensor control information—from the controller in response to which the wireless automation device “sense[s] and report[s] a current indicator” or provides “other requested information.” McFarland, [0025], [0060]-[0062]. This “report instruction” is sensor control information because the controller sends the instruction based on the sensor information currently needed by the controller to control the system. McFarland teaches that the controller executes control processes that are “specific to the sensor” being used for control. McFarland, [0039]. For example, if one of a “plurality of different types of sensors” in the sensor package is currently in use—for example, temperature and not humidity data from the package is being used—then the control process used with the temperature data is used by the controller to control the system and issue instructions, including request instructions to obtain an “event reported” by the sensor relating to temperature data. *See* McFarland, [0039]-[0040]. If the control system then switches to using, for example, the humidity data, then the first control process “may be stored and unused” while a second (humidity-based) control operation is used, including request instructions to provide events relating to humidity data. *See id.* Accordingly, the report instruction is sensor control information because it is an instruction issued

based on a control operation “specific to the sensor” currently in use to control the system. *Id.*

87. Based on the information about “the sensed condition” relayed by the wireless automation device in response to this instruction, the controller 508 “provides an appropriate control signal to [an] actuator” that “drive[s] the sensed condition” to a “set point.” McFarland, [0025]-[0026]. This behavior illustrates that the communicated sensor data is disclosed to be “in control” at the controller; the sensor data dictates how the controller will in turn control the actuator to achieve the desired set point of the sensed condition.

88. McFarland’s disclosure of a “report instruction” thus not only renders obvious but affirmatively discloses sensor control information because the instruction identifies specific information, such as information from a particular sensor used for the current control operation and, based on the “event reported by a sensor,” which includes sensor values and other data, the “controller ... controls the operation of one or more actuators” to effectuate that control operation. *Id.*

(g) Element [1.f]

89. **Element [1.f] recites “communicate a portion of the stored sensor data corresponding to the received sensor control information to the second automation component.”** This element is met by McFarland.

90. McFarland discloses that the computer readable instructions are programmed to communicate a portion of the stored sensor data corresponding to the received sensor control information to the second automation component (e.g., “[i]n response to a report instruction” from the “controller,” the wireless automation device, executing its “program,” will “sense and report a current indicator V_i ” or “prior measurements”). *See, e.g.,* McFarland (emphasis added):

- [0023] (“A sensing device monitors a condition and/or status of an event. The sensing device may report appropriate sensor information, such as a current value or indicator of the condition, timing of a reading, prior measurements, status of the sensor and/or a comparison of a measured value to a desired limit, range or a previous measurement.”)
- [0038] (“The device 207 includes a processor 214, a transceiver 216, and a sensor 209. Additional, different or fewer components may be provided, such as providing a plurality of different or the same types of sensors. For example, the device may also have a memory 226, a storage device 228, a data input device 230, and a data output 232. A program 234 resides in the memory 226 and includes one or more sequences of executable code or coded instructions.... The program 234 may be implemented using any known or proprietary software platform or frameworks including basic,

visual basic, C, C+, C++, J2EE™, Oracle 9i, XML, API based designs, and like software systems.”)

- **[0039]** (“The processor 214 implements a control process for the device 207. The control process may be implemented based on a signal that is read from and/or provided by the sensor 209, such as a measured value of a parameter, an indicator of a sensed condition and/or status of an event. The processor 214 may be may be one or more devices including a general processor, digital signal processor (DSP), control processor unit (CPU).... The processor 214 has a processing power or capability and associated memory corresponding to the needs of one or more of a plurality of different types of sensors 209 and transceiver 216. The processor 214 implements a control process algorithm specific to the sensor 209. Other control processes may be stored but unused due to a specific configuration.”)
- **[0040]** (“The processor 214 executes one or more sequences of instructions of the program 234 to process data. Data and/or instructions may be preprogrammed to the device 207 and or provide to the device 207 using the data input device 230. Data and/or instructions may also be received via the transceiver 216. The processor 214 interfaces data input device 230 and/or the transceiver 216 to receive data and instructions. The processor 214 may

also interface the storage device 228 for storage and retrieval of data. Data processed by the processor 214 may be stored in and retrieved from in storage device 228, communicated via the transceiver 216, and/or presented via data output device 232. The data output device 232 may be a display, monitor, a printer, a communications port, an array of lights, combinations thereof and the like. For example, the processor may control a light array of the output device 232 to indicate an operation status, or read data status, a transmit status and the like.”)

- [0047] (“A signal $V(t)$ representing the sensed condition may be generated. The signal $V(t)$ may be a continuous or discrete signal representing a current value for the sensed condition, or the status of the condition, during the current interval 336. During a polling period 336, the processor 214 reads the signal $V(t)$ from the sensor 209, and determines value, or most-current indicator V_i , for the current sensed condition. For example, the processor 214 may poll or sample the signal from the sensor 209 to read the most current indicator of the sensed condition.... The indicator may be stored in memory 226. The memory may also store prior readings V_{i-j} , or indicators read during prior periods 336. Associated timing data or an

interval sequence may be stored with the indicator V_i to identify a point in time or interval in which the indicator was read.”)

- [0053] (“The transceiver communicates the information as packets of information.... The information may also include one or more of the triggering event, the most current indicator V_i , one or more prior indicators current value V_{i-j} Alternatively, the transceiver 216 may be controlled to communicate the information in response to a triggering event such as the flag being set.... The transceiver 216 also may transmit information in an interval or subsequent interval in which an external control signal is received from another device.”)
- [0054] (“The information may include multiple indicators such as the most current indicator V_i and one or more indicators V_{i-j} read during one or more prior polling periods 336. A counter may count a number of successive polling periods 336 for which a flag or triggering event has not been set, and thus a transmission of information may not have been made. If the counter exceeds a maximum, the transceiver may communicate information such as a current time during a current or successive transmission period. The counter also or alternatively may counter a number of polling intervals when a change has been detected, such as when a flag

has been set. When the count reaches a maximum or a limit. The transceiver may be controlled to suspend the transmission of information transmission period, until the counter reaches a send limit. For example, the send limit may be set at five. During each polling period 336 in which a change in the sensed condition is determined, the indicator V_i is stored and the count incremented. The transmission of information is suspended during a transmission period 436 until the counter is increment to the send limit (i.e., 5). When the counter reaches the send limit, each of the five stored indicators V_i are communicated. The information may include timing information or date associated with the indicators V_i and the counter information. Similarly, the information may be transmitted, notwithstanding the status of the counter, in response to other stimulus or determinations.")

- [0062] (“The controller 508 may also communicate a report instruction to the device 507. In response to a report instruction, the device 507 may wake up from a sleep mode, and sense and report a current indicator V_i or other requested information. ... The controller 508 may also be configured or programmed to communicate information with other devices in response to the information received from device 507.”)

- *See also* [0003], [0008], [0024]-[0027], [0037], [0040], [0046]-[0047], [0052]-[0054], [0055], [0060]-[0062]; Figs. 1, 5; Claims 2, 4.

91. *See* my discussion of elements [1.pre], [1.d]-[1.e]. McFarland also discloses that the wireless automation device executes a “program” stored in its memory (as discussed for element [1.d]) to, upon receiving a “report instruction” from the controller, send reports corresponding to the request (e.g., in response to a command to report information, the processor creates and communicates such a report back to the controller). This report includes stored sensor information such as “a current value or indicator,” “prior measurements,” “timing information” associated with the current and prior measurements, “or other requested information”—and therefore not only renders obvious but affirmatively discloses this element. McFarland, [0023], [0038]-[0040], [0047], [0053]-[0054], [0062].

(h) Claim [2]

92. **Claim [2] recites “The automation component of claim 1, wherein the sensor package includes one or more sensors selected from the group consisting of a temperature sensor, a humidity sensor; a carbon monoxide sensor; a carbon dioxide sensor and a volatile organic compound sensor.”** This claim is met by McFarland.

93. **McFarland discloses wherein the sensor package includes one or more sensors selected from the group consisting of a temperature sensor, a**

humidity sensor; a carbon monoxide sensor; a carbon dioxide sensor and a volatile organic compound sensor (e.g., “the sensor 209 is configured as any of a temperature sensor, humidity sensor ... gas sensor, O₂, CO or CO₂ sensor ... [and] combinations thereof”). *See, e.g.,* McFarland (emphasis added):

- **[0043]** (“The sensor 209 may include a device or a collection of devices that sense conditions, parameters and/or events such as an environmental condition in a building. The sensor 209 generates information or data related to the sensed or monitored condition. The information may be provided an output as one or more signals that may be read by the processor 214.... The may be provided as an indicator of the sensed condition, parameter or event. In an example, the sensor 209 is configured as any of a temperature sensor, humidity sensor, fire sensor, pressure sensor, smoke sensor, occupancy sensor, air quality sensor, gas sensor, O₂, CO or CO₂ sensor, ... combinations thereof, or other now known or later developed sensors. The sensor 209 may be a micro-electro-mechanical sensors (“MEMS”) ... for sensing any condition or parameter.”)

94. *See* my discussion for element [1.a]. McFarland also discloses that its sensor “may include a device or a collection of devices that sense conditions” such as “temperature,” “humidity,” “gas,” “CO,” and “CO₂.”

(i) Claim [3]

95. Claim [3] recites “The automation component of claim 1, wherein the computer readable instructions are further programmed to: identify sensor values within the sensor data that exceed a corresponding change-of-value threshold.” This claim is met by McFarland.

96. McFarland discloses that the computer readable instructions are further programmed to identify sensor values within the sensor data that exceed a corresponding change-of-value threshold (e.g., “program” instructions are programmed to “detect[] or identify[] a change in the sensed condition beyond a limit [or] outside a range”). See, e.g., McFarland (emphasis added):

- [0047] (“A signal $V(t)$ representing the sensed condition may be generated.

The signal $V(t)$ may be a continuous or discrete signal representing a current value for the sensed condition, or the status of the condition, during the current interval 336. During a polling period 336, the processor 214 reads the signal $V(t)$ from the sensor 209, and determines value, or most-current indicator V_i , for the current sensed condition. For example, the processor 214 may poll or sample the signal from the sensor 209 to read the most current indicator of the sensed condition.... The indicator may be stored in memory 226. The memory may also store prior readings V_{i-j} , or indicators read during prior periods 336. Associated timing data or an

interval sequence may be stored with the indicator V_i to identify a point in time or interval in which the indicator was read.”)

- [0049]-[0050] (“The value V_i is processed by the processor 214 according to a control algorithm to identify whether the sensed condition has changed.

For example, the most current indicator V_i may be compared to one or more indicators read during a prior periods V_{i-j} . Thus, a change in the sensed condition may be identified by comparing indicators V_i and V_{i-j} read during different periods 336. The change or difference may be compared to a limit.

... Where the current difference D_i greater than the difference limit D_1 (i.e., $D_i > D_1$) the difference between the current value V_i and the value V_{i-j} in the prior interval may be considered outside a control range or band limit. [¶]

Similarly, a negative difference ... may be compared to a lower limit LL, and a positive difference ... may be compared to an upper limit UL....

Where a change has been determined, a flag may be set, and/or stored in memory, identifying a change in the sensed condition has been detected. The

most current indicator V_i also or alternatively may be compared to a limit

$V_{\max}$ and/or $V_{\min}$. The flag may be set if the most current indicator is

determined to be greater than $V_{\max}$ or less than $V_{\min}$. A time or interval

identifier associated with when the flag was set may also be identified and stored in memory.”)

- [0052] (“The processor 214 controls the transceiver 216 to selectively communicate information during a period of a transmission interval. FIG. 4 illustrates a transmission interval for a device configured for dynamic value reporting. For example, a processor 214 may control or trigger the transceiver 214 to communicate information during a transmission period 436. The transceiver may communicate the information during the transmission period in response to a triggering event such a detecting whether a flag. The flag may be set in response to detecting or identifying a change in the sensed condition beyond a limit, outside a range, or a reading of an indicator above an upper limit or below a lower limit, or in response to an external stimulus, such as a control signal received by the sensor. The triggering event additionally or alternatively may be ... a determination that ... the current value V_i exceeds a limit such as V_{max} and/or V_{min} , combinations thereof, and the like.”)
- [0054] (“The information may include multiple indicators such as the most current indicator V_i and one or more indicators V_{i-j} read during one or more prior polling periods 336. A counter may count a number of

successive polling periods 336 for which a flag or triggering event has not been set, and thus a transmission of information may not have been made. If the counter exceeds a maximum, the transceiver may communicate information such as a current time during a current or successive transmission period. The counter also or alternatively may counter a number of polling intervals when a change has been detected, such as when a flag has been set. When the count reaches a maximum or a limit. The transceiver may be controlled to suspend the transmission of information transmission period, until the counter reaches a send limit. For example, the send limit may be set at five. During each polling period 336 in which a change in the sensed condition is determined, the indicator V_i is stored and the count incremented. The transmission of information is suspended during a transmission period 436 until the counter is increment to the send limit (i.e., 5). When the counter reaches the send limit, each of the five stored indicators V_i are communicated. The information may include timing information or date associated with the indicators V_i and the counter information. Similarly, the information may be transmitted, notwithstanding the status of the counter, in response to other stimulus or determinations.")

- *See also* Abstract, [0003], [0007]-[0008], [0016]-[0018], [0026], [0044], [0053], [0056]-[0059].

97. *See* my discussions of elements [1.pre], [1.d]-[1.f]. McFarland also discloses that a sensor value for “the most current” sensed condition is detected during each “polling period,” which occurs at set “interval[s].” McFarland, [0047]. The wireless automation device’s processor executes a program stored in memory to “process[]” the “value V_i ” that represents “the most-current” sensed condition. McFarland, [0047]-[0049]. The processor calculates the “difference” between the current sensor value V_i and sensor values V_{i-j} for “different periods” or “intervals” and compare the differences to a “limit” to determine whether “the sensed condition has changed.” McFarland, [0049]-[0050]. This limit not only renders obvious but affirmatively discloses a change-of-value threshold because it defines an acceptable limit and/or range within which the sensed value may vary. *Id.* When a calculated difference for the most current sensed condition V_i exceeds this limit and/or range (*i.e.*, the change-of-value threshold), the system sets and stores in memory a “flag” “identifying” a detected change that is “beyond a limit [and/or] outside a range” – that is, values that exceed the change-of-value threshold. McFarland, [0049]-[0050], [0052]. Because the sensor value V_i is sensed and evaluated once each sensor polling period, and because a “flag” is set each time a change in the sensed value V_i

is detected, each sensor value V_i identified as exhibiting a change is therefore flagged. *See id.*; *see also* McFarland, [0054] (showing that multiple flags are set over multiple periods).

(j) Claim [4]

98. Claim [4] recites “The automation component of claim 1, wherein the computer readable instructions are further programmed to: set an identification flag for each identified sensor value.” This claim is met by McFarland.

99. McFarland discloses that the computer readable instructions are further programmed to set an identification flag for each identified sensor value (e.g., a “flag may be set in response to detecting or identifying a change in the sensed condition beyond a limit” during “each polling period;” “timing data or an interval sequence” that is “stored with the indicator” for each indicator). *See, e.g.*, McFarland (emphasis added):

- [0047] (“A signal $V(t)$ representing the sensed condition may be generated. The signal $V(t)$ may be a continuous or discrete signal representing a current value for the sensed condition, or the status of the condition, during the current interval 336. During a polling period 336, the processor 214 reads the signal $V(t)$ from the sensor 209, and determines value, or most-current indicator V_i , for the current sensed condition. For example, the

processor 214 may poll or sample the signal from the sensor 209 to read the most current indicator of the sensed condition.... The indicator may be stored in memory 226. The memory may also store prior readings V_{i-j} , or indicators read during prior periods 336. Associated timing data or an interval sequence may be stored with the indicator V_i to identify a point in time or interval in which the indicator was read.")

- [0050] (“Where a change has been determined, a flag may be set, and/or stored in memory, identifying a change in the sensed condition has been detected. The most current indicator V_i also or alternatively may be compared to a limit $V_{\max}$ and/or $V_{\min}$. The flag may be set if the most current indicator is determined to be greater than $V_{\max}$ or less than $V_{\min}$. A time or interval identifier associated with when the flag was set may also be identified and stored in memory.”)
- [0052] (“The processor 214 controls the transceiver 216 to selectively communicate information during a period of a transmission interval. FIG. 4 illustrates a transmission interval for a device configured for dynamic value reporting. For example, a processor 214 may control or trigger the transceiver 214 to communicate information during a transmission period 436. The transceiver may communicate the information during the

transmission period in response to a triggering event such a detecting whether a flag. The flag may be set in response to detecting or identifying a change in the sensed condition beyond a limit, outside a range, or a reading of an indicator above an upper limit or below a lower limit, or in response to an external stimulus, such as a control signal received by the sensor. The triggering event additionally or alternatively may be ... a determination that ... the current value V_i exceeds a limit such as $V_{\max}$ and/or $V_{\min}$, combinations thereof, and the like.”)

- **[0054]** (“The information may include multiple indicators such as the most current indicator V_i and one or more indicators V_{i-j} read during one or more prior polling periods 336. A counter may count a number of successive polling periods 336 for which a flag or triggering event has not been set, and thus a transmission of information may not have been made. If the counter exceeds a maximum, the transceiver may communicate information such as a current time during a current or successive transmission period. The counter also or alternatively may counter a number of polling intervals when a change has been detected, such as when a flag has been set. When the count reaches a maximum or a limit. The transceiver may be controlled to suspend the transmission of information transmission

period, until the counter reaches a send limit. For example, the send limit may be set at five. During each polling period 336 in which a change in the sensed condition is determined, the indicator V_i is stored and the count incremented. The transmission of information is suspended during a transmission period 436 until the counter is increment to the send limit (i.e., 5). When the counter reaches the send limit, each of the five stored indicators V_i are communicated. The information may include timing information or date associated with the indicators V_i and the counter information. Similarly, the information may be transmitted, notwithstanding the status of the counter, in response to other stimulus or determinations.”)

- **See also [0053], [0055], [0059].**

100. See my discussion for elements [1.pre], [1.d], [3]. As I discussed for claim [3], McFarland discloses flagging each sensor value that is identified as exceeding a limit and/or range that indicates the acceptable values of the sensed condition. See [3]. McFarland further discloses “flag[ging]” every “change in the sensed condition” that is identified during each polling period. McFarland, [0052], [0054]. McFarland also discloses setting these flags for data that is to be communicated, which are identified in response to an “external stimulus, such as a control signal received by the sensor” from a controller. McFarland, [0052].

101. McFarland also not only renders obvious but affirmatively discloses that each measured value of the sensed condition is associated with “timing data or an interval sequence” that is read and stored along with the sensed data; this “timing data” or “interval sequence” is itself also a flag because it is used “to identify” its associated values based on the “point in time or interval” during which the values were identified. McFarland, [0047], [0050].

102. Accordingly, this claim element is met regardless of whether “each identified sensor value” as used in this claim refers to the sensor values detected in claim elements [1.a] [7.a], and [13.a]; [1.d], [7.d], and [13.d]; [1.e], [7.e]-[7.f], and [13.f]; [1.f], [7.g], and [13.f]; or [3], [9], and [15], respectively. *See* Ex. 1011, 10-13; Ex. 1012, 7-9; Section VIII.C. McFarland discloses setting identification flags (“timing data” and “interval sequence” flags) each time sensor data is read and stored, as well as setting additional identification flags (“flags” for data exceeding a threshold) for sensor values stored in memory that exceed limits established by thresholds and for sensor values to be communicated in response to external stimuli; either one or both of these flags is set for each of the different sensor values recited in these elements.

(k) Claim [5]

103. **Claim [5] recites “The automation component of claim 1, wherein the computer readable instructions are further programmed to: communicate**

all of the stored sensor data corresponding to the received sensor control information to the second automation component.” This claim is met by McFarland.

104. McFarland discloses that the computer readable instructions are further programmed to communicate all of the stored sensor data corresponding to the received sensor control information to the second automation component (e.g., in response to a “report instruction” from the “controller,” the wireless automation device “sense[s] and report[s] a current indicator V_i or other requested information” such as “prior indicators” to the “controller”). *See, e.g.,* McFarland (emphasis added):

- [0023] (“A sensing device monitors a condition and/or status of an event. The sensing device may report appropriate sensor information, such as a current value or indicator of the condition, timing of a reading, prior measurements, status of the sensor and/or a comparison of a measured value to a desired limit, range or a previous measurement.”)
- [0052] (“The processor 214 controls the transceiver 216 to selectively communicate information during a period of a transmission interval. FIG. 4 illustrates a transmission interval for a device configured for dynamic value reporting. For example, a processor 214 may control or trigger the

transceiver 214 to communicate information during a transmission period 436. The transceiver may communicate the information during the transmission period in response to a triggering event such a detecting whether a flag. The flag may be set in response to detecting or identifying a change in the sensed condition beyond a limit, outside a range, or a reading of an indicator above an upper limit or below a lower limit, or in response to an external stimulus, such as a control signal received by the sensor. The triggering event additionally or alternatively may be ... a determination that ... the current value V_i exceeds a limit such as V_{max} and/or V_{min} , combinations thereof, and the like.”)

- [0053] (“The transceiver communicates the information as packets of information.... The information may also include one or more of the triggering event, the most current indicator V_i , one or more prior indicators current value V_{i-j} Alternatively, the transceiver 216 may be controlled to communicate the information in response to a triggering event such as the flag being set.... The transceiver 216 also may transmit information in an interval or subsequent interval in which an external control signal is received from another device.”)

- [0054] (“The information may include multiple indicators such as the most current indicator V_i and one or more indicators V_{i-j} read during one or more prior polling periods 336. A counter may count a number of successive polling periods 336 for which a flag or triggering event has not been set, and thus a transmission of information may not have been made. If the counter exceeds a maximum, the transceiver may communicate information such as a current time during a current or successive transmission period. The counter also or alternatively may counter a number of polling intervals when a change has been detected, such as when a flag has been set. When the count reaches a maximum or a limit. The transceiver may be controlled to suspend the transmission of information transmission period, until the counter reaches a send limit. For example, the send limit may be set at five. During each polling period 336 in which a change in the sensed condition is determined, the indicator V_i is stored and the count incremented. The transmission of information is suspended during a transmission period 436 until the counter is increment to the send limit (i.e., 5). When the counter reaches the send limit, each of the five stored indicators V_i are communicated. The information may include timing information or date associated with the indicators V_i and the counter

information. Similarly, the information may be transmitted, notwithstanding the status of the counter, in response to other stimulus or determinations.”)

- [0062] (“The controller 508 may also communicate a report instruction to the device 507. In response to a report instruction, the device 507 may wake up from a sleep mode, and sense and report a current indicator V_i or other requested information. ... The controller 508 may also be configured or programmed to communicate information with other devices in response to the information received from device 507.”)
- *See also* [0024]-[0027], [0037], [0040], [0052], [0060]-[0061], Fig. 5.

105. *See* my discussion for elements [1.pre], [1.d]-[1.f]. This element requires communicating all of the stored sensor data ***corresponding to the received sensor control information*** to the second automation component—for example, all of the data understood as being required for reporting based on the received sensor control information. McFarland not only renders obvious but affirmatively discloses that, in response to a “report instruction,” or “control signal” from the controller, the wireless automation device communicates information to the controller. McFarland, [0052], [0062]. McFarland discloses that the information communicated by the wireless automation devices, as dictated by the report instruction or control signal, includes information about the “current indicator” of a sensed condition, “prior

indicators” of the sensed condition, or “other requested information.” McFarland, [0053]-[0055], [0062]. Therefore, the wireless automation device reports to the controller all of the stored sensor data stored that corresponds to the control signal or report instruction received from the controller in order to respond to that report instruction in full; if it were to send less than all of the stored sensor data, then the device’s corresponding response would not be a complete response to the command.

(I) Elements [7.pre]-[7.d].

106. Elements [7.pre] to [7.d] are identical to the elements [1.pre] to [1.d], with the exception of [7.a], which is substantially similar to element [1.a]. These elements are met by McFarland for the reasons provided in Sections IX.A.2(a)-IX.A.2(e).

107. With respect to [7.a], the differences in claim language do not materially affect my opinions. Element [7.a] recites “a multi-sensor package configured to generate a plurality of sensor data for each sensor within the multi-sensor package,” while element [1.a] recites “a multi-sensor package configured to detect a plurality of variables and generate sensor data for each detected variable.” Element [7.a] is met by McFarland for the same reasons I discussed for element [1.a]. Both elements require generating sensor data for each sensor in the multi-sensor package. As discussed for element [1.a], McFarland discloses a multi-sensor package that is configured to generate a plurality of sensor data spanning a temporal

range (e.g., current and prior periodic readings) with respect to multiple variables (e.g., temperature and humidity) that correspond to each sensor that is included within the multi-sensor package. *See* Section IX.A.2(b). My reasoning for element [1.a] therefore also applies to [7.a].

(m) Element [7.e]

108. **Element [7.e] recites “wherein the computer readable instructions are programmed to: receive status data related to sensor data in control at a second automation component in communication with the building automation system.”** This element is met by McFarland.

109. **McFarland discloses that the computer readable instructions are programmed to receive status data related to sensor data in control at a second automation component in communication with the building automation system** (e.g., the “wireless automation device” is programmed to receive “a value or status” for the “condition and/or sensor” used for “process control” at the controller in the building automation system (*see* [1.e]) in order to “execut[e] a responsive action” or “communicat[e] an appropriate control signal”). *See, e.g.,* McFarland (emphasis added):

- **Fig. 1:**

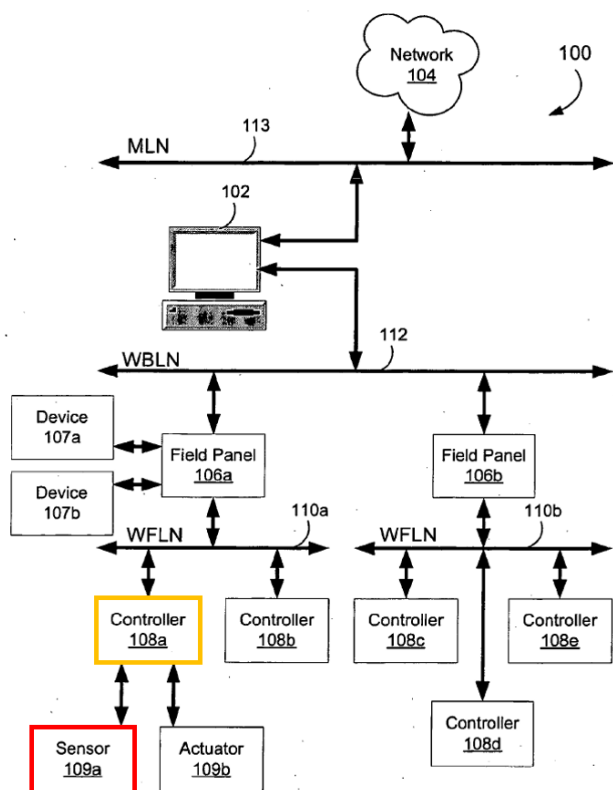


Figure 1

- **Fig. 5:**

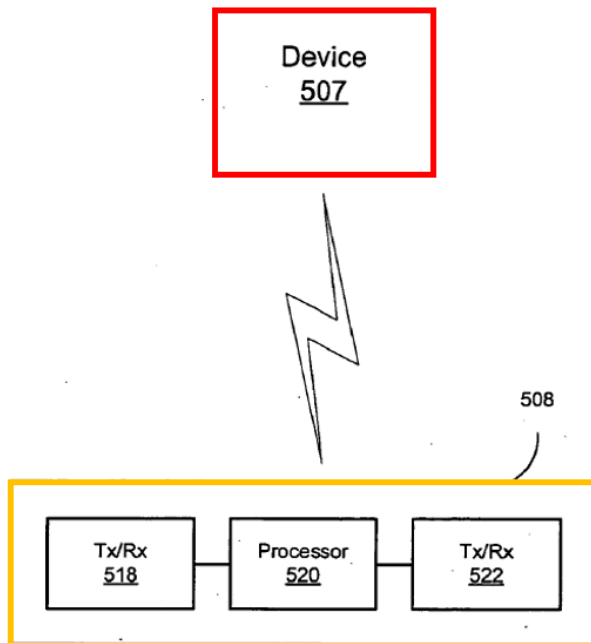


Figure 5

- [0018] (“The device wirelessly receives and transmits information.... The information may include a current indicator of the condition, a value or status for the condition and/or sensor, ... The information is communicated to destination device, such as ... a controller that executes a process control such as executing a responsive action, and/or communicating an appropriate control signal.”)
- [0020] (“The devices generate and/or receive information related to a specific event, condition, status, acknowledgement, control, combinations thereof and the like. The devices may also respond to control commands and/or execute an instruction received by or in a signal.”)

- [0025] (“The controller 108a provides control functionality of each, one, or both of the sensor 109a and the actuator 109b. Controller 108a controls a subsystem based on sensed conditions and desired set point conditions. The controller 108a controls the operation of one or more actuators in response to an event reported by a sensor 109a. The controller 108a may drive the one or more actuator to a desired set point.”)
- [0026] (“The controller 108a is programmed with the set points and a code setting forth instructions that are executed by the controller for controlling the actuators to drive the sensed condition to be with the set point. For example, the actuator 109b is operatively connected to an air conditioning damper and sensor 109a may be a room temperature sensor that reports information related to a temperature being monitored by the sensor. ... If the temperature sensed by the sensor 109a exceeds a threshold, the actuator may respond accordingly to open a damper, allowing air conditioning to flow into a room. The sensor 109a may communicate the sensed condition to the actuator 109b and/or to the controller 108a, which thereafter provides an appropriate control signal to the actuator 109a.”)
- [0038] (“The device 207 includes a processor 214, a transceiver 216, and a sensor 209. Additional, different or fewer components may be provided,

such as providing a plurality of different or the same types of sensors. For example, the device may also have a memory 226, a storage device 228, a data input device 230, and a data output 232. A program 234 resides in the memory 226 and includes one or more sequences of executable code or coded instructions.... The program 234 may be implemented using any known or proprietary software platform or frameworks including basic, visual basic, C, C+, C++, J2EE™, Oracle 9i, XML, API based designs, and like software systems.”)

- [0039] (“The processor 214 implements a control process for the device 207. The control process may be implemented based on a signal that is read from and/or provided by the sensor 209, such as a measured value of a parameter, an indicator of a sensed condition and/or status of an event. The processor 214 may be may be one or more devices including a general processor, digital signal processor (DSP), control processor unit (CPU).... The processor 214 has a processing power or capability and associated memory corresponding to the needs of one or more of a plurality of different types of sensors 209 and transceiver 216. The processor 214 implements a control process algorithm specific to the sensor 209. Other control processes may be stored but unused due to a specific configuration.”)

- [0040] (“The processor 214 executes one or more sequences of instructions of the program 234 to process data. Data and/or instructions may be preprogrammed to the device 207 and or provide to the device 207 using the data input device 230. Data and/or instructions may also be received via the transceiver 216. The processor 214 interfaces data input device 230 and/or the transceiver 216 to receive data and instructions. The processor 214 may also interface the storage device 228 for storage and retrieval of data. Data processed by the processor 214 may be stored in and retrieved from in storage device 228, communicated via the transceiver 216, and/or presented via data output device 232. The data output device 232 may be a display, monitor, a printer, a communications port, an array of lights, combinations thereof and the like. For example, the processor may control a light array of the output device 232 to indicate an operation status, or read data status, a transmit status and the like.”)
- [0058] (“The difference limit D_I and the period 338 may also be adjusted in accordance with state of the control algorithm for the system. For example ... a temperature sensor may be controlled to ignore greater temperature fluctuations.... The device may be controlled to compare a value to a larger difference limit D_I , to only report information after a predetermined number

of intervals, or to report after a difference D_i below a threshold is detected, or other condition when it is appropriate for the device to report a condition.”)

- **[0061]** (“The *controller 508 receives information communicated from the device 507*. The *controller 508 processes the information according to a control algorithm* for the system and for the device 507. *The controller 508 may be configured to communicate instructions to the device 507*. For example, when a sequence of differences does not change or varies relatively little, *the controller 508 may instruct or reprogram the device 507 to a smaller difference limit D* . Similarly, the controller 508 may instruct the device to *increase the difference limit D* , to ignore the difference limit D to increase and/or decrease the polling interval 338 and/or the transmission interval 336.”)
- **See also [0023], [0027], [0039], [0044], [0047], [0056].**

110. See my discussion for element [1.e]. McFarland not only renders obvious but affirmatively discloses elements [7.e]-[7.f] based on two different sets of disclosures. The first set of disclosures are teachings of an automation device receiving a transmission from a controller identifying data to be provided to the controller, which I refer to as “Information Disclosures.” The second set of

disclosures are disclosures of an automation device receiving a transmission from a controller regarding a sensor setpoint, which Patent Owner has taken the position meets this element. I refer to this second set of disclosures as “Setpoint Disclosures.”

111. With respect to the Information Disclosures, McFarland discloses that the automation device “receives” a “status for the ... sensor” from the controller that provides information specifying the “condition” or “event” data that the device must sense and/or transmit back to the controller, which then uses the data to control the system. McFarland, [0018], [0059], [0061]-[0062]. This not only renders obvious, but affirmatively discloses that the claimed status data is received. Because the controller is used for process control, instructions to the device to report specific data will identify the data being used to control the system. The request is therefore status data that relates to sensor data in control at the controller—*i.e.*, the sensor information that the controller is currently using—and therefore needs—for control. *See id.*

112. With respect to the Setpoint Disclosures: I understand that Patent Owner took the position in its Preliminary Infringement Contentions in the parallel district court proceeding that this element is met by a thermostat, which Patent Owner alleges is a first automation component, receiving “set point” status data from a smart phone, which Patent Owner alleges is a second automation component via a

cloud network. Ex. 1025, Exhibit A at 39-45. McFarland teaches this same type of communication of setpoints to the first automation device from a controller (second automation component). McFarland's automation device receives from the controller "difference limit" and "threshold" set point status data that are "adjusted in accordance with state of the control algorithm" and uses these to implement limits and thresholds for sensed variables. McFarland, [0058]-[0059], [0061]. These difference limits and thresholds are in turn utilized by process control algorithms to evaluate sensed conditions to determine whether they should be for flagged for transmission, and implement the same features as the set points identified by Patent Owner. *See id.* Indeed, in the same way, the '282 patent simply describes "a pre-defined set point" as one element of a "process control routine." '282, 1:38-42. McFarland therefore discloses, under Patent Owner's apparent interpretation, that the device receives and implements "status data related to sensor data in control..." in the form of "difference limit" and "threshold" status data that are used to control the system's behavior in response to sensor measurements. McFarland, [0058], [0061].

(n) Element [7.f]

113. Element [7.f] recites “determine the sensor data in control at the second automation component based on the received status data.” This element is met by McFarland.

114. McFarland discloses wherein the computer readable instructions are programmed to determine the sensor data in control at the second automation component based on the received status data (e.g., based on the received status data related to sensor data in control at a second automation component (*see* [7.e]), determine the “sensor” associated with the “status data” to “report” on the “status of the sensor”). *See, e.g.,* McFarland (emphasis added):

- [0003] (“The controller generates control signals, which are communicated to a device for an appropriate responsive action.”)
- [0020] (“*The devices* generate and/or *receive information related to a* specific event, *condition*, *status*, acknowledgement, *control*, *combinations thereof* and the like. *The devices may also respond to control commands and/or execute an instruction received by or in a signal.*”)
- [0023] (“A sensing device monitors a condition and/or status of an event. The *sensing device may report* appropriate sensor information, such as *a current value or indicator of the condition, timing of a reading, prior*

measurements, status of the sensor and/or a comparison of a measured value to a desired limit, range or a previous measurement.”)

- **[0039]** (“The processor 214 implements a control process for the device 207. The control process may be implemented based on a signal that is read from and/or provided by the sensor 209, such as a measured value of a parameter, an indicator of a sensed condition and/or status of an event. The processor 214 may be may be one or more devices including a general processor, digital signal processor (DSP), control processor unit (CPU).... The processor 214 has a processing power or capability and associated memory corresponding to the needs of one or more of a plurality of different types of sensors 209 and transceiver 216. The processor 214 implements a control process algorithm specific to the sensor 209. Other control processes may be stored but unused due to a specific configuration.”)
- **[0040]** (“The processor 214 executes one or more sequences of instructions of the program 234 to process data. Data and/or instructions may be preprogrammed to the device 207 and or provide to the device 207 using the data input device 230. Data and/or instructions may also be received via the transceiver 216. The processor 214 interfaces data input device 230 and/or the transceiver 216 to receive data and instructions. The processor 214 may

also interface the storage device 228 for storage and retrieval of data. Data processed by the processor 214 may be stored in and retrieved from in storage device 228, communicated via the transceiver 216, and/or presented via data output device 232. The data output device 232 may be a display, monitor, a printer, a communications port, an array of lights, combinations thereof and the like. For example, the processor may control a light array of the output device 232 to indicate an operation status, or read data status, a transmit status and the like.”)

- [0058] (“The difference limit D_L and the period 338 may also be adjusted in accordance with state of the control algorithm for the system. For example ... a temperature sensor may be controlled to ignore greater temperature fluctuations.... The device may be controlled to compare a value to a larger difference limit D_L , to only report information after a predetermined number of intervals, or to report after a difference D_i below a threshold is detected, or other condition when it is appropriate for the device to report a condition.”)
- [0060] (“FIG. 5 illustrates an exemplary controller 508 of a building automation system in communication with a device 507. The device 507 is configured for dynamic value reporting as described above with respect to

FIGS. 1-4. ... The controller [508] may transmit data and information addressed to a specific device 507 according to a binding association. The information may include control instructions, communications settings or other information transmitted from another device 507 or controller.”)

- [0061] (“The controller 508 receives information communicated from the device 507. The controller 508 processes the information according to a control algorithm for the system and for the device 507. The controller 508 may be configured to communicate instructions to the device 507. For example, when a sequence of differences does not change or varies relatively little, the controller 508 may instruct or reprogram the device 507 to a smaller difference limit D . Similarly, the controller 508 may instruct the device to increase the difference limit D , to ignore the difference limit D to increase and/or decrease the polling interval 338 and/or the transmission interval 336.”)
- [0062] (“The controller 508 may also communicate a report instruction to the device 507. In response to a report instruction, the device 507 may wake up from a sleep mode, and sense and report a current indicator V_i or other requested information. ... The controller 508 may also be configured or

programmed to communicate information with other devices in response to the information received from device 507.”)

- *See also* [0018], [0025]-[0027], [0031], [0033], [0044], [0047], [0059].

115. **McFarland** also discloses that the wireless automation device stores several control processes, but that only a subset of these processes are used at any particular time in light of the sensor being used and the device’s “specific configuration.” McFarland, [0039]. In the case where the device is not “preprogrammed” in a desired configuration, “[d]ata and/or instructions” may be received, via a transceiver, for the processor to execute and process data. McFarland, [0040]. As a result, with respect to Information Disclosures, McFarland discloses that upon receipt of such “information” from the controller in the form of “control instructions, communications settings or other information,” the wireless automation device “respond[s] to [the] control commands” by commencing “appropriate responsive action[s].” McFarland, [0003], [0020], [0040], [0060].

116. As I discussed in [7.e], the wireless automation device receives “status data” that specifies the nature of the information to be transmitted to the controller for use in process control. This not only renders obvious, but affirmatively discloses that when the device receives the “status for the ... sensor” from the controller, the device is programmed to take an “appropriate responsive action,” which in the case

of receiving status data, includes evaluating the received status data to determine what event and condition “status[es]” – that is, what sensor data – to monitor and report to the controller. This determination is a determination of the sensor information that is in control at the controller; that is, the information that will affect the controller’s control of the system. McFarland, [0018], [0059], [0061]-[0062].

117. Additionally, with respect to the Setpoint Disclosures, I understand that Patent Owner took the position in district court that this element is met by a device “enabling and setting” “set point” status data received from a second automation component. Ex. 1025, at 45-52. Applying Patent Owner’s apparent interpretation, McFarland further discloses this element. McFarland discloses that the wireless automation device is “reprogram[med]” with the new or different “difference limit” and “threshold” status data that it receives, which, as I discussed in [7.e], are types of set point status data that are received from the controller and used to control the system. McFarland, [0058], [0061]. When evaluating which data to send back to the controller in light of the “difference limit” or “threshold,” the wireless automation determines the sensor data in control at the controller, meeting the claim element.

(o) Element [7.g]

118. Element [7.g] recites “communicate the stored sensor data corresponding the sensor data in control to the second automation component.”

This element is met by McFarland.

119. McFarland discloses wherein the computer readable instructions are programmed to communicate the stored sensor data corresponding the sensor data in control to the second automation component (e.g., reporting “current” and “prior” measurements, which correspond to sensor data in control, (see [7.e]-[7.f])). *See, e.g.,* McFarland (emphasis added):

- [0023] (“A sensing device monitors a condition and/or status of an event. The sensing device may report appropriate sensor information, such as a current value or indicator of the condition, timing of a reading, prior measurements, status of the sensor and/or a comparison of a measured value to a desired limit, range or a previous measurement.”)
- [0062] (“The controller 508 may also communicate a report instruction to the device 507. In response to a report instruction, the device 507 may wake up from a sleep mode, and sense and report a current indicator V_i or other requested information. ... The controller 508 may also be configured or programmed to communicate information with other devices in response to the information received from device 507.”)
- *See also* [0038]-[0040], [0047], [0053]-[0054].

120. McFarland also discloses that the wireless automation device sends reports to the controller that include “appropriate sensor information”; such

information includes “a current value or indicator” in addition to “prior measurements” or other requested information responsive to the request. As I discussed in [7.e], the wireless automation device’s receipt of “status data” specifies the nature of the information to be transmitted to the controller for use in process control, and therefore the information transmitted to the controller corresponds to sensor data in control at the controller.

(p) Claims [8]-[10]

121. Claims [8]-[10] recite the same limitations as claims [2]-[4], except that they depend on claim [7] instead of claim [1]. These claims are met by McFarland for the reasons provided in Sections IX.A.2(h)-IX.A.2(j).

(q) Claim [11]

122. **Claim [11] recites “The automation component of claim 7, wherein the computer readable instructions are further programmed to: communicate all of the stored sensor data corresponding to the received status information to the second automation component.”** This claim is met by McFarland.

123. **McFarland discloses that the computer readable instructions are further programmed to communicate all of the stored sensor data corresponding to the received status information to the second automation component** (e.g., all current and prior indicators). *See, e.g.,* McFarland:

- [0023] (“A sensing device monitors a condition and/or status of an event. The sensing device may report appropriate sensor information, such as a current value or indicator of the condition, timing of a reading, prior measurements, status of the sensor and/or a comparison of a measured value to a desired limit, range or a previous measurement.”)
- [0053] (“The transceiver communicates the information as packets of information.... The information may also include one or more of the triggering event, the most current indicator V_i , one or more prior indicators current value V_{i-j} Alternatively, the transceiver 216 may be controlled to communicate the information in response to a triggering event such as the flag being set.... The transceiver 216 also may transmit information in an interval or subsequent interval in which an external control signal is received from another device.”)
- [0054] (“The information may include multiple indicators such as the most current indicator V_i and one or more indicators V_{i-j} read during one or more prior polling periods 336. A counter may count a number of successive polling periods 336 for which a flag or triggering event has not been set, and thus a transmission of information may not have been made. If the counter exceeds a maximum, the transceiver may communicate

information such as a current time during a current or successive transmission period. The counter also or alternatively may counter a number of polling intervals when a change has been detected, such as when a flag has been set. When the count reaches a maximum or a limit. The transceiver may be controlled to suspend the transmission of information transmission period, until the counter reaches a send limit. For example, the send limit may be set at five. During each polling period 336 in which a change in the sensed condition is determined, the indicator V_i is stored and the count incremented. The transmission of information is suspended during a transmission period 436 until the counter is increment to the send limit (i.e., 5). When the counter reaches the send limit, each of the five stored indicators V_i are communicated. The information may include timing information or date associated with the indicators V_i and the counter information. Similarly, the information may be transmitted, notwithstanding the status of the counter, in response to other stimulus or determinations.")

- [0055] (“The most current indicator V_i , prior indicators V_{i-j} , the differences D_i , past differences, the difference limit D_1 , and/or the limits V_{max} and/or V_{min} may be stored in the storage 228, memory 226, and/or a buffer for the processor. The indicator V_i and limits may be may be stored with associated

timing data or information identifying a corresponding time or period in an interval during which the value was or difference was determined. The processor 214 may process consecutive differences D_i and indicators V_i to determine control limits and distribution. For example, an analysis may be performed on the indicators V_i for multiple polling intervals 336. By statistically analyzing consecutive or a series of indicators V_i and differences D_i , an estimate for the quality of the control of the sensed condition may be made. For example, a sequence of zero differences or small differences will be associated with a sensed condition that has little or no change over time. Conversely, a series of large differences will be associated with a sensed condition that has greater change over time.”)

- [0062] (“The controller 508 may also communicate a report instruction to the device 507. In response to a report instruction, the device 507 may wake up from a sleep mode, and sense and report a current indicator V_i or other requested information. ... The controller 508 may also be configured or programmed to communicate information with other devices in response to the information received from device 507.”)

124. See my discussion for claims [5] and [7]. As I discussed for element [7.e], McFarland discloses status data received from the controller by the wireless

automation device from which the device can determine the “sensor data in control” at the controller (i.e., the second automation component) because this data is used for “process control” at the controller. McFarland, [0018], [0059], [0061]-[0062]. Additionally, as I discussed for elements [7.f]-[7.g], the controller uses the “status data” to carry out the “responsive action” of determining the “sensor data in control” and then communicating stored “sensor data” corresponding to the “sensor data in control” based on which the controller may execute process control. McFarland, [0003], [0020], [0040], [0060]. Therefore, McFarland’s “sensor data” corresponding to the received “status information” or “status data” includes “sensor data” corresponding to “sensor data in control.”

125. Additionally, as discussed for claim [5], McFarland discloses that the wireless automation device reports information to the controller in response to a request; this information includes a “current value or indicator” of the sensed conditions as well as “prior indicators” of the same condition that are stored in memory. McFarland, [0023], [0053]-[0055], [0062]. Therefore, McFarland discloses communicating all sensor data that corresponds to the received status information, in the form of current and prior sensor data.

(r) Element [20.pre]

126. Element [20.pre] recites “A method for providing power saving wireless communication within a building automation system, the method comprising.” This element is met by McFarland.

127. McFarland discloses a method for providing power saving wireless communication within a building automation system (e.g., a method for using “low-power wireless RF communications” within a “building automation system” (see [1.pre])). See, e.g., McFarland (emphasis added):

- [0004]-[0005] (“The continuous monitoring of conditions and broadcast of information consumes large amounts of power, which may shorten a limited-lifetime power source. The continuous stream of information from and to devices uses a great amount processing power for a controller, and may provide redundant information that may need to be filtered before being processed. [¶] Accordingly, there is a need for a system for reducing an amount of communication over a wireless automated system using dynamic value reporting.”)
- [0006] (“methods ... and systems for reporting information over ... a wireless building automation system. An automated wireless system using dynamic value reporting provides for a robust process control that minimizes an amount of communications in the wireless network.”)

- [0022] (“That is, the communication of information between and among devices includes transmitting, routing, and/or information hopping using low-power wireless RF communications across a network defined by the devices.”)
- [0048] (“the processor 214 may enter a standby or sleep mode, where the processor operates at lower or with very little power consumption.”)
- **See also Abstract, [0008], [0016], [0018]-[0021], [0036]-[0037], [0048], Figs. 1-2.**

128. See my discussions for elements [1pre] and [7.pre]. McFarland further discloses that “continuous monitoring of conditions and broadcasting of information consumes large amounts of power” and that there is a need “for a system for reducing an amount of communication over a wireless automated system.” McFarland, [0004]-[0005]. As a solution, McFarland discloses a system of “dynamic value reporting” in which the wireless automation device saves power by “using low-power wireless RF communications” and “enter[s] a standby or sleep mode” between transmission intervals to reduce power consumption. McFarland, [0005], [0022], [0048].

(s) Element [20.a]

129. Element [20.a] recites “scanning sensor data associated with each of a plurality of sensors contained within a multi-sensor package of a first automation component.” This element is met by McFarland.

130. McFarland discloses scanning sensor data associated with each of a plurality of sensors contained within a multi-sensor package of a first automation component (e.g., “poll[ing] the sensor” during a “recurring polling period” for each of a plurality of sensors within a multi-sensor package of a wireless automation device, *see* [1.pre]-1.a], [1.c])). *See, e.g.*, McFarland (emphasis added):

- Fig. 2:

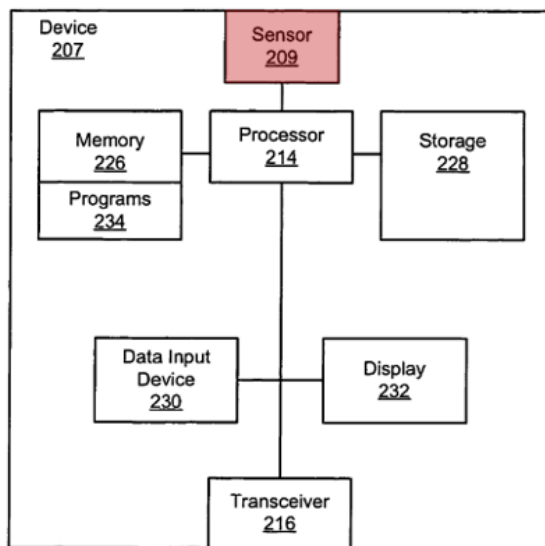
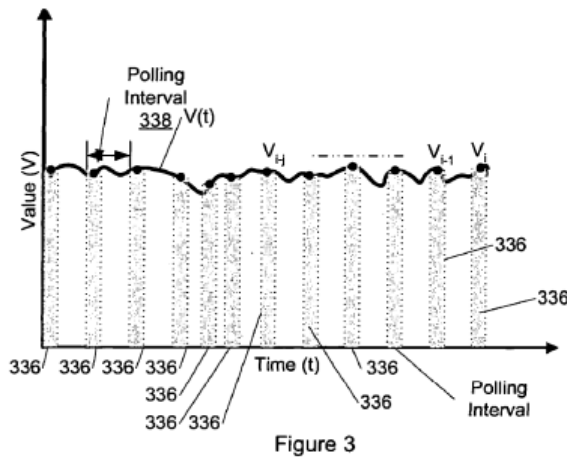


Figure 2

- Fig. 3:



- [0038] (“The device 207 includes a processor 214, a transceiver 216, and a sensor 209. Additional, different or fewer components may be provided, such as providing a plurality of different or the same types of sensors. For example, the device may also have a memory 226, a storage device 228, a data input device 230, and a data output 232. A program 234 resides in the memory 226 and includes one or more sequences of executable code or coded instructions.... The program 234 may be implemented using any known or proprietary software platform or frameworks including basic, visual basic, C, C+, C++, J2EE™, Oracle 9i, XML, API based designs, and like software systems.”)
- [0039] (“The processor 214 implements a control process for the device 207. The control process may be implemented based on a signal that is read from and/or provided by the sensor 209, such as a measured value of a

parameter, an indicator of a sensed condition and/or status of an event. The processor 214 may be one or more devices including a general processor, digital signal processor (DSP), control processor unit (CPU)....

The processor 214 has a processing power or capability and associated memory corresponding to the needs of one or more of a plurality of different types of sensors 209 and transceiver 216. The processor 214 implements a control process algorithm specific to the sensor 209...”)

- [0040] (“The processor 214 executes one or more sequences of instructions of the program 234 to process data. Data and/or instructions may be preprogrammed to the device 207 and or provide to the device 207 using the data input device 230. Data and/or instructions may also be received via the transceiver 216. The processor 214 interfaces data input device 230 and/or the transceiver 216 to receive data and instructions. The processor 214 may also interface the storage device 228 for storage and retrieval of data. Data processed by the processor 214 may be stored in and retrieved from in storage device 228, communicated via the transceiver 216, and/or presented via data output device 232. The data output device 232 may be a display, monitor, a printer, a communications port, an array of lights, combinations thereof and the like. For example, the processor may control a light array of

the output device 232 to indicate an operation status, or read data status, a transmit status and the like.”)

- [0043] (“*The sensor 209 may include a device or a collection of devices that sense conditions, parameters and/or events such as an environmental condition in a building. The sensor 209 generates information or data related to the sensed or monitored condition. The information may be provided an output as one or more signals that may be read by the processor 214...* The may be provided as an indicator of the sensed condition, parameter or event. In an example, *the sensor 209 is configured as any of a temperature sensor, humidity sensor, fire sensor ... combinations thereof*, or other now known or later developed sensors. The sensor 209 may be a micro-electro-mechanical sensors (“MEMS”) ... for sensing any condition or parameter.”)
- [0044] (“The *sensor 209 is responsive to the processor 214 and/or logic executed by the processor 214.*”)
- [0045] (“*FIG. 3 illustrates a chart 300 of signal $V(t)$ generated by the sensor 209 representing an indicator of a sensed condition versus time (t).*”)

- [0046] (“[T]he processor 214 polls the sensor 209 during a recurring polling period 336.... Each period 336 recurs at a variable frequency or interval 338.”)
- [0047] (“A signal $V(t)$ representing the sensed condition may be generated. The signal $V(t)$ may be a continuous or discrete signal representing a current value for the sensed condition, or the status of the condition, during the current interval 336. During a polling period 336, the processor 214 reads the signal $V(t)$ from the sensor 209, and determines value, or most-current indicator V_i , for the current sensed condition. For example, the processor 214 may poll or sample the signal from the sensor 209 to read the most current indicator of the sensed condition.... The indicator may be stored in memory 226. The memory may also store prior readings V_{i-j} , or indicators read during prior periods 336. Associated timing data or an interval sequence may be stored with the indicator V_i to identify a point in time or interval in which the indicator was read.”)
- [0052] (“The processor 214 controls the transceiver 216 to selectively communicate information during a period of a transmission interval. FIG. 4 illustrates a transmission interval for a device configured for dynamic value reporting. For example, a processor 214 may control or trigger the

transceiver 214 to communicate information during a transmission period

436. The transceiver may communicate the information during the

transmission period in response to a triggering event such a detecting

whether a flag.”)

- **See also [0023], [0048], [0053]-[0054].**

131. See my discussions for elements [1.pre]-[1.a], [1.c], [7.pre]-[7.a], [7.c], [13.pre]-[13.a], [13.c], and [20.pre]. As discussed for [1.a], McFarland’s “sensor 209” is a multi-sensor package because it contains more than one sensor configured to sense data related to more than one condition (e.g., temperature and humidity). McFarland, [0043]. Each sensor in the package is scanned because it is polled during a “recurring polling period” in order to generate a signal “representing a current value for the sensed condition, or the status of the condition, during the current interval.” McFarland, [0046]-[0047]. As discussed for [1.c], these sensor values are detected by the “collection of devices” that make up sensor 209 and “read” by the processor 214, based on which it “implements a control process.” McFarland, [0038]-[0040], [0043]-[0044].

(t) Element [20.b]

132. **Element [20.b] recites “identifying changed sensor values within the sensor data.”** This element is met by McFarland.

133. **McFarland discloses identifying changed sensor values within the sensor data** (e.g., “program” instructions are programmed to “detect[] or identify[] a change in the sensed condition beyond a limit [or] outside a range,” see [3]). See, e.g., McFarland (emphasis added):

- [0047] (“A signal $V(t)$ representing the sensed condition may be generated. The signal $V(t)$ may be a continuous or discrete signal representing a current value for the sensed condition, or the status of the condition, during the current interval 336. During a polling period 336, the processor 214 reads the signal $V(t)$ from the sensor 209, and determines value, or most-current indicator V_i , for the current sensed condition. For example, the processor 214 may poll or sample the signal from the sensor 209 to read the most current indicator of the sensed condition.... The indicator may be stored in memory 226. The memory may also store prior readings V_{i-j} , or indicators read during prior periods 336. Associated timing data or an interval sequence may be stored with the indicator V_i to identify a point in time or interval in which the indicator was read.”)
- [0049]-[0050] (“The value V_i is processed by the processor 214 according to a control algorithm to identify whether the sensed condition has changed. For example, the most current indicator V_i may be compared to one or more

indicators read during a prior periods V_{i-j} . Thus, a change in the sensed condition may be identified by comparing indicators V_i and V_{i-j} read during different periods 336. The change or difference may be compared to a limit. ... Where the current difference D_i greater than the difference limit D_L (i.e., $D_i > D_L$) the difference between the current value V_i and the value V_{i-j} in the prior interval may be considered outside a control range or band limit. [¶]

Similarly, a negative difference ... may be compared to a lower limit LL, and a positive difference ... may be compared to an upper limit UL....

Where a change has been determined, a flag may be set, and/or stored in memory, identifying a change in the sensed condition has been detected. The most current indicator V_i also or alternatively may be compared to a limit V_{max} and/or V_{min} . The flag may be set if the most current indicator is determined to be greater than V_{max} or less than V_{min} . A time or interval identifier associated with when the flag was set may also be identified and stored in memory.”)

- [0052] (“The processor 214 controls the transceiver 216 to selectively communicate information during a period of a transmission interval. FIG. 4 illustrates a transmission interval for a device configured for dynamic value reporting. For example, a processor 214 may control or trigger the

transceiver 214 to communicate information during a transmission period 436. The transceiver may communicate the information during the transmission period in response to a triggering event such a detecting whether a flag. The flag may be set in response to detecting or identifying a change in the sensed condition beyond a limit, outside a range, or a reading of an indicator above an upper limit or below a lower limit, or in response to an external stimulus, such as a control signal received by the sensor. The triggering event additionally or alternatively may be ... a determination that ... the current value V_i exceeds a limit such as V_{max} and/or V_{min} , combinations thereof, and the like.”)

- [0054] (“The information may include multiple indicators such as the most current indicator V_i and one or more indicators V_{i-j} read during one or more prior polling periods 336. A counter may count a number of successive polling periods 336 for which a flag or triggering event has not been set, and thus a transmission of information may not have been made. If the counter exceeds a maximum, the transceiver may communicate information such as a current time during a current or successive transmission period. The counter also or alternatively may counter a number of polling intervals when a change has been detected, such as when a flag

has been set. When the count reaches a maximum or a limit. The transceiver may be controlled to suspend the transmission of information transmission period, until the counter reaches a send limit. For example, the send limit may be set at five. During each polling period 336 in which a change in the sensed condition is determined, the indicator Vi is stored and the count incremented. The transmission of information is suspended during a transmission period 436 until the counter is increment to the send limit (i.e., 5). When the counter reaches the send limit, each of the five stored indicators Vi are communicated. The information may include timing information or date associated with the indicators Vi and the counter information. Similarly, the information may be transmitted, notwithstanding the status of the counter, in response to other stimulus or determinations.”)

134. See my discussions for elements [3], [9], [15], [20.pre], [20.a]. As discussed for claim [3], McFarland discloses identifying values of sensor data that have changed by comparing them to a change-of-value threshold that takes the form of, e.g., a “limit” on the maximum degree of acceptable change. McFarland, [0049].

(u) Element [20.c]

135. Element [20.c] recites “receiving a first communication from a second automation component in communication with the first automation

component and the building automation system.” This element is met by McFarland.

136. **McFarland discloses receiving a first communication from a second automation component** (e.g., “wireless automation device” receives, from a “controller,” “control instructions” including a “report instruction”) **in communication with the first automation component and the building automation system** (“controller” is “in communication with a device 507” and the rest of the “building automation system”). *See, e.g.,* McFarland (emphasis added):

- [0020] (“The devices generate and/or receive information related to a specific event, *condition*, *status*, acknowledgement, *control*, *combinations thereof* and the like. *The devices may also respond to control commands and/or execute an instruction received by or in a signal.*”)
- [0025] (“The controller 108a provides control functionality of each, one, or both of *the sensor 109a* and the actuator 109b. Controller 108a controls a subsystem based on sensed conditions and desired set point conditions. *The controller 108a controls the operation of one or more actuators in response to an event reported by a sensor 109a. The controller 108a may drive the one or more actuator to a desired set point.*”)

- [0026] (“The controller 108a is programmed with the set points and a code setting forth instructions that are executed by the controller for controlling the actuators to drive the sensed condition to be with the set point. For example, the actuator 109b is operatively connected to an air conditioning damper and sensor 109a may be a room temperature sensor that reports information related to a temperature being monitored by the sensor. ... If the temperature sensed by the sensor 109a exceeds a threshold, the actuator may respond accordingly to open a damper, allowing air conditioning to flow into a room. The sensor 109a may communicate the sensed condition to the actuator 109b and/or to the controller 108a, which thereafter provides an appropriate control signal to the actuator 109a.”)
- [0038] (“The device 207 includes a processor 214, a transceiver 216, and a sensor 209. Additional, different or fewer components may be provided, such as providing a plurality of different or the same types of sensors. For example, the device may also have a memory 226, a storage device 228, a data input device 230, and a data output 232. A program 234 resides in the memory 226 and includes one or more sequences of executable code or coded instructions.... The program 234 may be implemented using any known or proprietary software platform or frameworks including basic,

visual basic, C, C+, C++, J2EE™, Oracle 9i, XML, API based designs, and like software systems.”)

- [0060] (“FIG. 5 illustrates an exemplary controller 508 of a building automation system in communication with a device 507. The device 507 is configured for dynamic value reporting as described above with respect to FIGS. 1-4. ... The controller [508] may transmit data and information addressed to a specific device 507 according to a binding association. The information may include control instructions, communications settings or other information transmitted from another device 507 or controller.”)
- [0061] (“The controller 508 receives information communicated from the device 507. The controller 508 processes the information according to a control algorithm for the system and for the device 507. The controller 508 may be configured to communicate instructions to the device 507. For example, when a sequence of differences does not change or varies relatively little, the controller 508 may instruct or reprogram the device 507 to a smaller difference limit D. Similarly, the controller 508 may instruct the device to increase the difference limit D, to ignore the difference limit D to increase and/or decrease the polling interval 338 and/or the transmission interval 336.”)

- [0062] (“The controller 508 may also communicate a report instruction to the device 507. In response to a report instruction, the device 507 may wake up from a sleep mode, and sense and report a current indicator V_i or other requested information. ... The controller 508 may also be configured or programmed to communicate information with other devices in response to the information received from device 507.”)
- *See also* [0003], [0021], [0023]-[0027], [0033]-[0034], [0037], [0056]-[0059].

137. *See* my discussions for elements [1.e], [7.e], [13.e], [13.g], [20.pre], [20.a]. As discussed for elements [1.e] and [13.e], McFarland discloses that the wireless automation device (i.e., the first automation device) receives communications in the form of “report instructions” and “control information” from the controller (i.e., the second automation component). McFarland, [0025], [0060]-[0062]. The controller is a component of the “building automation system” disclosed by McFarland, and accordingly communicates with other components of the “building automation system.” McFarland, [0060].

(v) Element [20.d]

138. **Element [20.d] recites “communicating a portion of the identified changed sensor values associated with the first communication received from the second automation component.”** This element is met by McFarland.

139. **McFarland discloses communicating a portion of the identified changed sensor values** (e.g., “processor” may “communicate” “indicators V_i ” where there has been a “change in the sensed condition”) **associated with the first communication received from the second automation component** (e.g., “in response to...a control signal received by the sensor”). *See, e.g.,* McFarland (emphasis added):

- **[0023]** (“A sensing device monitors a condition and/or status of an event. The sensing device may report appropriate sensor information, such as a current value or indicator of the condition, timing of a reading, prior measurements, status of the sensor and/or a comparison of a measured value to a desired limit, range or a previous measurement.”)
- **[0052]** (“The processor 214 controls the transceiver 216 to selectively communicate information during a period of a transmission interval. FIG. 4 illustrates a transmission interval for a device configured for dynamic value reporting. For example, a processor 214 may control or trigger the transceiver 214 to communicate information during a transmission period 436. The transceiver may communicate the information during the transmission period in response to a triggering event such a detecting whether a flag.”)

- [0053] (“The transceiver communicates the information as packets of information.... The information may also include one or more of the triggering event, the most current indicator V_i , one or more prior indicators current value V_{i-j} Alternatively, the transceiver 216 may be controlled to communicate the information in response to a triggering event such as the flag being set.... The transceiver 216 also may transmit information in an interval or subsequent interval in which an external control signal is received from another device.”)
- [0054] (“The information may include multiple indicators such as the most current indicator V_i and one or more indicators V_{i-j} read during one or more prior polling periods 336. A counter may count a number of successive polling periods 336 for which a flag or triggering event has not been set, and thus a transmission of information may not have been made. If the counter exceeds a maximum, the transceiver may communicate information such as a current time during a current or successive transmission period. The counter also or alternatively may counter a number of polling intervals when a change has been detected, such as when a flag has been set. When the count reaches a maximum or a limit. The transceiver may be controlled to suspend the transmission of information transmission

period, until the counter reaches a send limit. For example, the send limit may be set at five. During each polling period 336 in which a change in the sensed condition is determined, the indicator V_i is stored and the count incremented. The transmission of information is suspended during a transmission period 436 until the counter is increment to the send limit (i.e., 5). When the counter reaches the send limit, each of the five stored indicators V_i are communicated. The information may include timing information or date associated with the indicators V_i and the counter information. Similarly, the information may be transmitted, notwithstanding the status of the counter, in response to other stimulus or determinations.")

- **[0062]** (“The controller 508 may also communicate a report instruction to the device 507. In response to a report instruction, the device 507 may wake up from a sleep mode, and sense and report a current indicator V_i or other requested information. ... The controller 508 may also be configured or programmed to communicate information with other devices in response to the information received from device 507.”)
- **See also** [0003], [0008], [0016], [0018], [0024]-[0027], [0037], [0040], [0044], [0046]-[0047], [0060]-[0062], Figs. 1 and 5.

140. See my discussions for elements [1.f], [3], [7.g], [9], [13.f], [15], [20.pre], [20.c]. McFarland discloses storing an indicator “V_i” for each instance of a sensed condition where there is a “change in the sensed condition.” McFarland, [0054]. In response to “other stimul[i]” including “control signal[s]” and “report instructions,” the most recent indicators V_i stored in memory are then transmitted to the controller. McFarland, [0052]; see [1.f], [20.b]-[20.c]. McFarland further discloses that reports from the wireless automation device to the controller comprise “current” “or” “prior” measurements of the sensed conditions that are stored in memory. McFarland, [0023], [0053]-[0055], [0062].

(w) Claim [21]

141. **Claim [21] recites “The method of claim 20, wherein identifying changed sensor values includes identifying changed sensor values as a function of a change-of-value threshold.”** This claim is met by McFarland.

142. **McFarland discloses that identifying changed sensor values includes identifying changed sensor values as a function of a change-of-value threshold.** See, e.g., McFarland (emphasis added):

- [0047] (“A signal $V(t)$ representing the sensed condition may be generated.

The signal $V(t)$ may be a continuous or discrete signal representing a current value for the sensed condition, or the status of the condition, during the current interval 336. During a polling period 336, the processor 214

reads the signal $V(t)$ from the sensor 209, and determines value, or most-current indicator V_i , for the current sensed condition. For example, the processor 214 may poll or sample the signal from the sensor 209 to read the most current indicator of the sensed condition.... The indicator may be stored in memory 226. The memory may also store prior readings V_{i-j} , or indicators read during prior periods 336. Associated timing data or an interval sequence may be stored with the indicator V_i to identify a point in time or interval in which the indicator was read.”)

- [0049]-[0050] (“The value V_i is processed by the processor 214 according to a control algorithm to identify whether the sensed condition has changed.

For example, the most current indicator V_i may be compared to one or more indicators read during a prior periods V_{i-j} . Thus, a change in the sensed condition may be identified by comparing indicators V_i and V_{i-j} read during different periods 336. The change or difference may be compared to a limit. ... Where the current difference D_i greater than the difference limit D_L (i.e., $D_i > D_L$) the difference between the current value V_i and the value V_{i-j} in the prior interval may be considered outside a control range or band limit. [¶]

Similarly, a negative difference ... may be compared to a lower limit LL, and a positive difference ... may be compared to an upper limit UL....

Where a change has been determined, a flag may be set, and/or stored in memory, identifying a change in the sensed condition has been detected. The most current indicator V_i also or alternatively may be compared to a limit $V_{\max}$ and/or $V_{\min}$. The flag may be set if the most current indicator is determined to be greater than $V_{\max}$ or less than $V_{\min}$. A time or interval identifier associated with when the flag was set may also be identified and stored in memory.”)

- [0052] (“The processor 214 controls the transceiver 216 to selectively communicate information during a period of a transmission interval. FIG. 4 illustrates a transmission interval for a device configured for dynamic value reporting. For example, a processor 214 may control or trigger the transceiver 214 to communicate information during a transmission period 436. The transceiver may communicate the information during the transmission period in response to a triggering event such a detecting whether a flag. The flag may be set in response to detecting or identifying a change in the sensed condition beyond a limit, outside a range, or a reading of an indicator above an upper limit or below a lower limit, or in response to an external stimulus, such as a control signal received by the sensor. The triggering event additionally or alternatively may be ... a determination that

... the current value V_i exceeds a limit such as $V_{\max}$ and/or $V_{\min}$, combinations thereof, and the like.”)

- **[0054]** (“The information may include multiple indicators such as the most current indicator V_i and one or more indicators V_{i-j} read during one or more prior polling periods 336. A counter may count a number of successive polling periods 336 for which a flag or triggering event has not been set, and thus a transmission of information may not have been made. If the counter exceeds a maximum, the transceiver may communicate information such as a current time during a current or successive transmission period. The counter also or alternatively may counter a number of polling intervals when a change has been detected, such as when a flag has been set. When the count reaches a maximum or a limit. The transceiver may be controlled to suspend the transmission of information transmission period, until the counter reaches a send limit. For example, the send limit may be set at five. During each polling period 336 in which a change in the sensed condition is determined, the indicator V_i is stored and the count incremented. The transmission of information is suspended during a transmission period 436 until the counter is increment to the send limit (i.e., 5). When the counter reaches the send limit, each of the five stored

indicators V_i are communicated. The information may include timing information or date associated with the indicators V_i and the counter information. Similarly, the information may be transmitted, notwithstanding the status of the counter, in response to other stimulus or determinations.”)

- **See also Abstract, [0003], [0007]-[0008], [0016]-[0018], [0026], [0044], [0047], [0053], [0056]-[0059].**

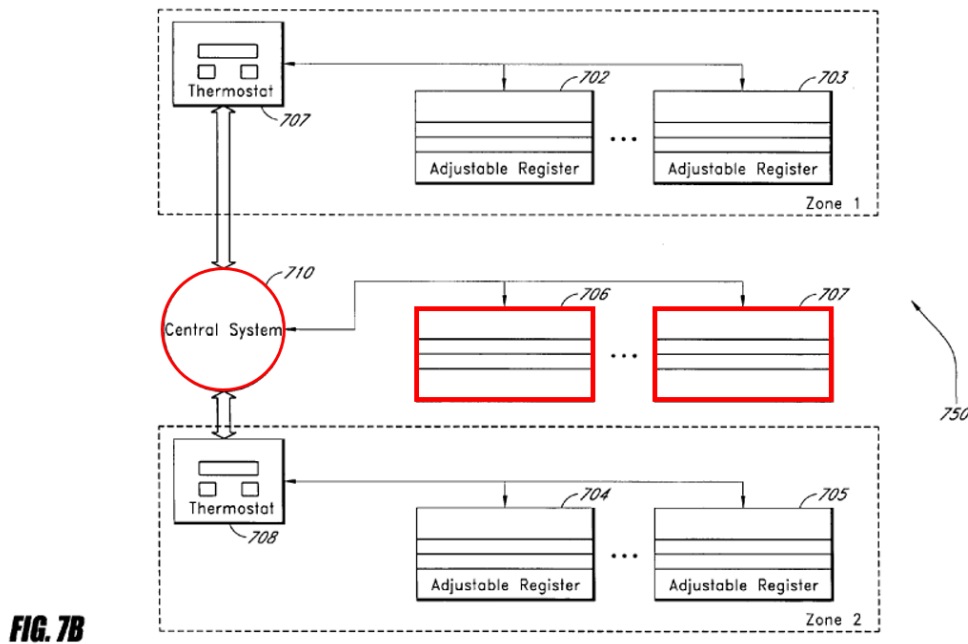
143. See my discussion for elements [3], [9], [15], [20.pre], [20.b]. As discussed for [3], McFarland discloses that the processor reads and evaluates sensor values to identify changes in the sensed condition that exceed a “limit” – the system’s change-of-value threshold. During this evaluation process, the sensor values that have changed beyond the limit are flagged for later reference; because this limit is a change-of-value threshold, the evaluation process is a function of the change-of-value threshold. See [3].

B. Ground 2: McFarland in view of Kates-089 (Claims 13-16)

1. Overview of U.S. 2006/0071089 (“Kates-089”) and Motivation to Modify McFarland with Kates-089’s Teachings

144. Kates-089 discloses a system and method that utilizes Electronically Controlled Register Vents (“ECRVs”) to provide zoned heating and cooling that adapts to changing conditions in one “zone” of a building “without affecting other

areas.” Kates-089, [0002], [0005], [0010]-[0016]. Fig. 7B below (emphasis added), provides an embodiment of the system disclosed in Kates-089. Kates-089, [0056].



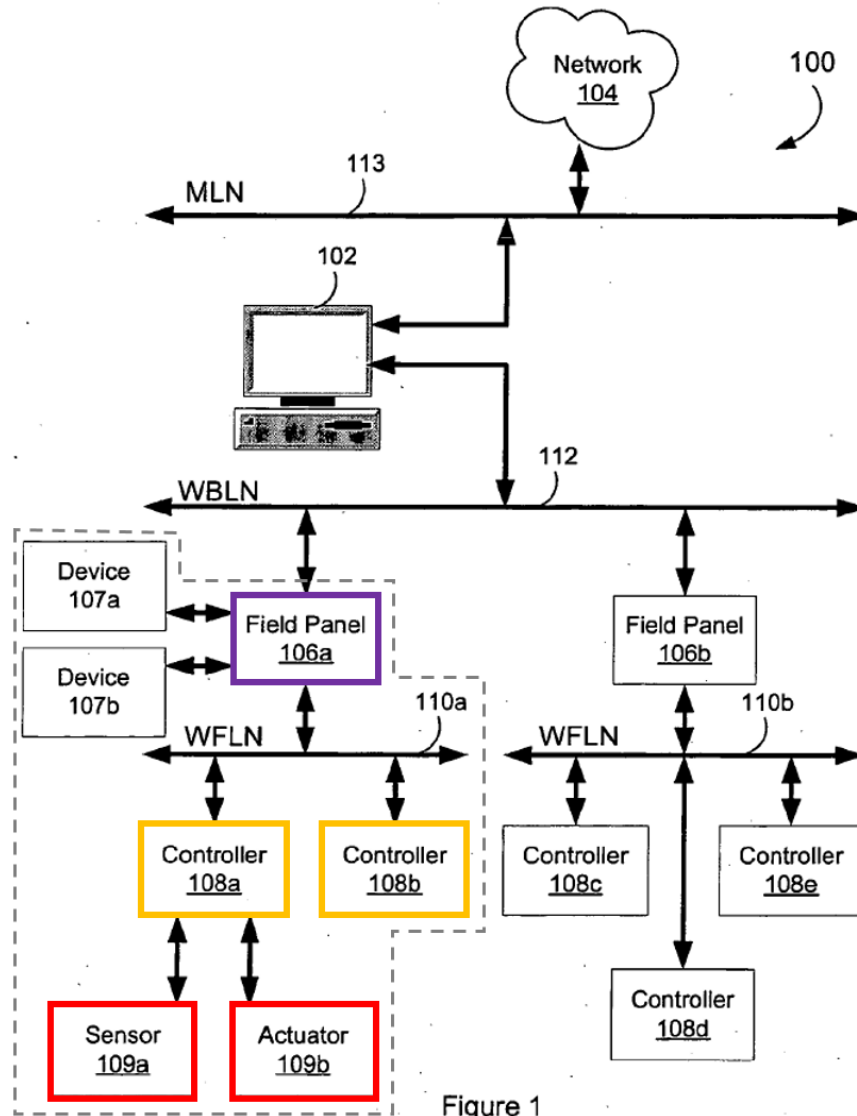
145. ECRVs 706 and 707 pictured in Fig. 7B include several components, including controllers, sensors, displays, communication systems, and vent actuators that are used to control airflow. Kates-089, Fig. 10, [0041], [0064]-[0065]. The central system shown in Fig. 7B above communicates with an ECRV and instructs it to perform any of a variety of functions, including “to perform additional measurements, to go to a standby mode, to wake up, to report battery status, to change wake-up interval, to run self-diagnostics and report results, etc.” Kates-089, [0082], [0086].

146. A person having ordinary skill in the art would have understood McFarland and Kates-089 to be in the same field as the '282—sensors, controls, and/or wireless communications—and reasonably pertinent to the alleged problem(s) identified in the '282—namely, avoiding wiring and installation costs while maximizing power conservation to extend the operating life of wireless devices. *See* '282 patent, 1:63-2:19 (“Wireless devices ... may be implemented within the control scheme of a building automation system without incurring additional wiring or installation costs.... Wireless devices ... must operate ... on a limited battery charge.”); McFarland, [0057] (“With the extended interval 338, the device 207 may have a reduced number of communications, and thus energy consumed by and bandwidth used by the device 207 may also be reduced.”); Kates-089, [0008]-[0010], [0014], [0065] (system “communicate[s] using wireless communication”), [0075] (“Although the listen block 1403 can be implemented to use relatively little power, a sleep block can be implemented to use even less power.”), [0094], [0103].

147. While McFarland discloses that its wireless automation device “wake[s] up” and “enter[s] a standby or sleep mode” between periodic intervals in response to receiving a “report instruction,” it does not provide explicit teachings of the “report instruction” as including a “wake-up command” or how the device is

instructed to return to “sleep” between reporting intervals. McFarland, [0008], [0018], [0048], [0062]. Kates-089 explicitly teaches an “instruction[] from the central system” that comprises a “wake-up signal,” and, similarly, a “standby mode” instruction. Kates-089, [0078], [0082], [0086]. A person having ordinary skill in the art would have been motivated to modify McFarland with Kates-089’s teachings to advantageously achieve two objectives: one, a system that is configured to report data both periodically and in response to commands, and two, conservation of power by utilizing “wake up” and “standby” commands to reduce energy use. McFarland, [0062]; Kates-089, [0050], [0074]-[0075], [0082], [0086].

148. First, Kates-089 provides additional teachings of “wake up” signals that are compatible with McFarland’s disclosed report instruction. The systems taught by Kates-089 and McFarland are similarly structured. For example, in Figure 1 of McFarland below (emphasis added), McFarland teaches a system in which, as relevant here, **controllers** and **field panels** each communicate with **automation devices** such as sensors and actuators:



McFarland, Fig. 1, [0024]-[0031]. Similarly, Kates-089 teaches a system in which **central systems** and **thermostats**—which implement features of McFarland’s controllers and field panels—communicate with **ECRVs**—which implement features of, e.g., McFarland’s sensors, as shown in Fig. 7B (emphasis added):

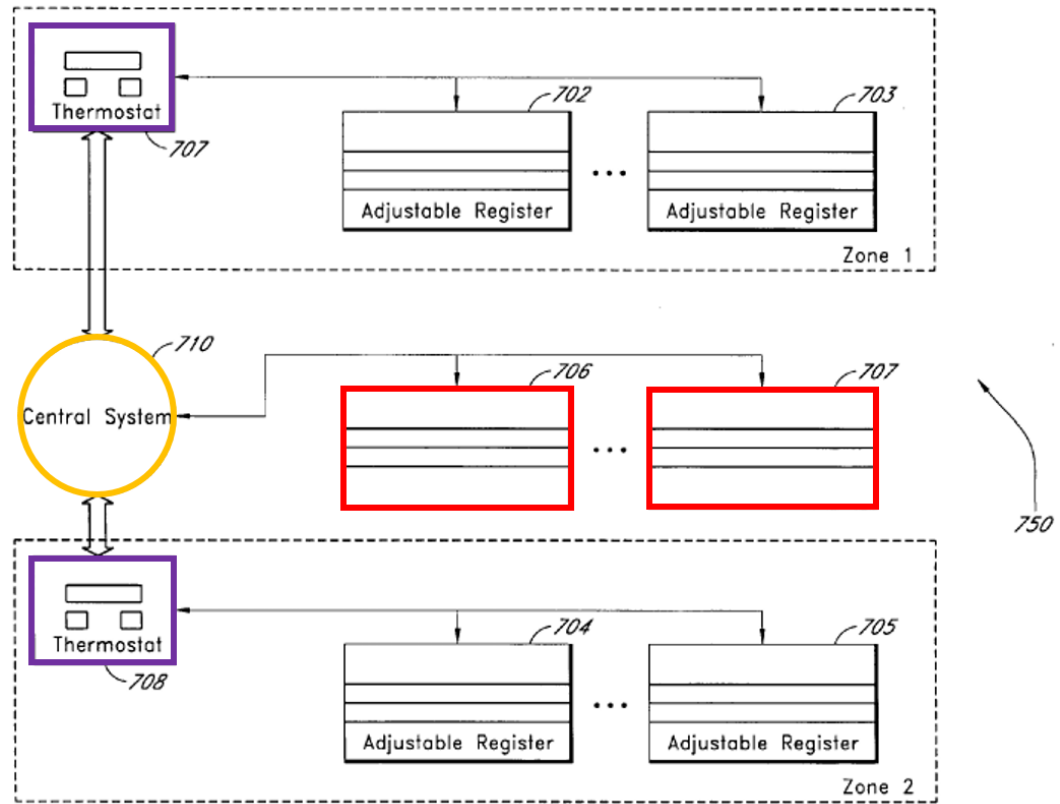
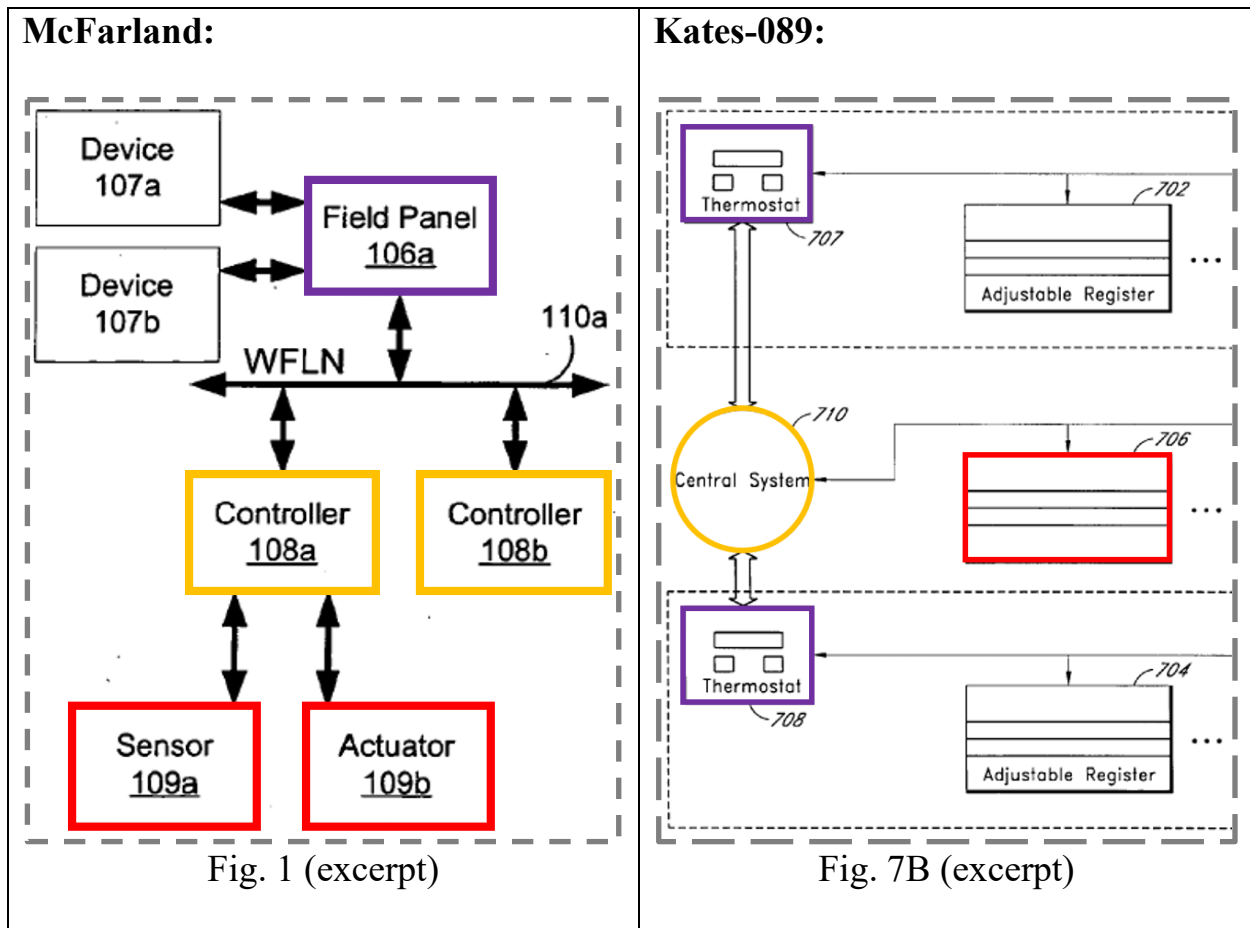


FIG. 7B

Kates, Fig. 7B, [0056]-[0062], [0090]-[0097]; *see also* McFarland, [0024]-[0031] (describing similar features within McFarland's components). Thus, comparing the relevant portion of McFarland's Figure 1 with Kates-089 Fig. 7B, the references teach aspects of a system that are similarly structured:



Indeed, while Fig. 7B depicts only one “Central System,” Kates-089 teaches implementing systems in which there are multiple “Central Systems,” similar to McFarland’s teaching of multiple controllers. *See* Kates-089, [0084] (“another central system”), [0110]. Kates-089’s teachings of commands and communications within a system are thus compatible with McFarland’s teachings. For example, Kates-089’s teachings of communicating commands from a central server, which, e.g., controls airflow in a home according to sensed conditions reported from ECRVs, are directly applicable to McFarland’s controller, which also controls an

HVAC system according to sensed conditions reported from sensor devices. Kates-089, [0056]-[0062], [0090]-[0097]; McFarland, [0024]-[0026], [0060]-[0062].

149. Second, within such a system, McFarland broadly teaches that a device “wake[s] up” in response to a report instruction, but leaves it to a person having ordinary skill in the art to determine how to deploy an instruction that causes the device to wake up. McFarland, [0062]. Kates-089 further teaches that “wake up” signals are signals used to prompt a device to transmit sensor data. Kates-089, [0078]-[0079], [0082]. A person having ordinary skill in the art would have understood, based on Kates-089’s teachings, that McFarland’s “report” instruction teaches a wake-up command. *Id.* And even to the extent there is any disagreement about that understanding, alternatively, a person having ordinary skill in the art would have at least been motivated to modify McFarland’s “report” instruction to include the wake-up command taught by Kates-089 to instruct the device to wake up. *Id.*

150. Third, a person having ordinary skill in the art would have understood that implementing a “standby” command would provide the benefit of saving power by reducing the energy expenditure of a monitoring system. McFarland teaches that its system utilizing a variety of polling period lengths (i.e., the duration for which the sensed value is polled) relative to its polling intervals (i.e., the time between

polling), ranging from “a short amount of time” on the scale of “one or more milliseconds every second”— around 0.1% of the interval—to “minutes every several minutes.” McFarland, [0046]. That is, during certain polling intervals, the device will be awake and consuming power during a polling interval, even though it needs to be active only 0.1% of the time during that interval. Kates-089 therefore teaches advantageously “conserv[ing] power by turning off elements of the ECRV 400 that are not in use.” Kates-089, [0050], [0078], [0086]. Kates-089 teaches that, in addition to going to sleep after periodic sensor readings in a manner similar to McFarland, its central system sends a command specifically instructing the ECRV to “go to a standby mode.” Kates-089, [0079], [0082]. Kates-089 teaches that “sleep” modes use “even less power” than “wake-up” modes, such as a “listen” mode. Kates-086, [0074]-[0076], [0079]-[0080]. A person having ordinary skill in the art would have been motivated to apply this teaching to McFarland’s system by directing a device to enter standby mode after completing a requested command, which facilitates the advantageous achievement of improved energy efficiency and power savings. In the case of McFarland, implementing such a standby mode would have been understood by a person having ordinary skill in the art to result in substantial power savings where the system would otherwise be unnecessarily turned on, which, as discussed above, could be up to 99.9% of the polling interval time.

151. In light of the above teachings, a person having ordinary skill in the art also would have had a reasonable expectation of success in applying Kates-089's teachings of wake-up and power-down commands to McFarland's wireless automation device. Indeed, McFarland already teaches that its disclosed wireless automation device is configured to respond to commands that direct it to wake up and power down in particular circumstances. McFarland, [0008], [0018], [0048], [0062]. Moreover, receipt of wake-up and power-down commands at a wireless automation device were well-understood by people having ordinary skill in the art. For example, PCT International Publication No. WO 99/17477, which I understand has been designated as Exhibit 1033, which claims a priority date more than a decade before the '282 patent, describes "logic" used to "reduc[e] device power requirements" that utilizes a "wakeup signal" and a "sleep mode." Ex. 1033, 12:16-22. As another example, U.S. Patent No. 7,455,236 to Kates ("Kates-236"), which I understand has been designated as Exhibit 1032, also discloses that a controller reads sensors "in response to a wake-up signal from the central system" and "sleeps between sensor readings." Kates-236 (Ex. 1032), 12:48-54). *See also* Hitt (Ex. 1005), [0072].

2. Invalidity of Claims 13-16

(a) Elements [13.pre]-[13.d]

152. Elements [13.pre]-[13.d] recite the same limitations as elements [1.pre]-[1.d] and [7.pre]-[7.d]. Accordingly, these elements are met by McFarland for the reasons provided in Sections IX.A.2(a)-IX.A.2(e), IX.A.2(l).

(b) Element [13.e]

153. Element [13.e] recites “wherein the computer readable instructions are programmed to: receive a wake-up command from a second automation component.” This element is met by McFarland in view of Kates-089.

154. McFarland discloses wherein the computer readable instructions are programmed to receive a wake-up command from a second automation component (e.g., receive a “report” instruction and, “[i]n response,” “wake up from a sleep mode”). *See, e.g.,* McFarland (emphasis added):

- [0048] (“the processor 214 may enter a standby or sleep mode, where the processor operates at lower or with very little power consumption.”)
- [0062] (“The controller 508 may also communicate a report instruction to the device 507. In response to a report instruction, the device 507 may wake up from a sleep mode, and sense and report a current indicator V_i or other requested information. ... The controller 508 may also be configured or

programmed to communicate information with other devices in response to the information received from device 507.”)

- *See also* [0008], [0018].

155. To the extent additional disclosure of a “wake-up command” is required, Kates-089 discloses receiving a wake-up command from the second automation component (e.g., “central system can instruct the ECRV to ... wake up”). *See, e.g.,* Kates-089 (emphasis added):

- [0082] (“the ECRV ... is configured to receive data and/or instructions from the central system. Thus, for example, the central system can instruct the ECRV to perform additional measurements, to go to a standby mode, to wake up, to report battery status, to change wake-up interval, to run self-diagnostics and report results, etc.”)
- [0086] (“In one embodiment, the controller 401 reads the sensors 406, 407, 416 at regular periodic intervals.... In one embodiment, the controller 401 reads the sensors 406, 407, 416 in response to a wake-up signal from the central system. In one embodiment, the controller 401 sleeps between sensor readings.”)
- *See also* [0078]-[0080].

156. McFarland discloses that “the device 507 may wake up from a sleep mode” state in which it “operates at lower or with very little power consumption” after receiving a command from a controller in the form of a “report instruction.” As I explained above in Section IX.B.1, a person having ordinary skill in the art would have understood that commands that cause a device to wake up either are or include wake-up commands, regardless of whether the command has a different name. Since the report instruction commands the device 507 to wake up, it is a “wake-up command.”

157. Kates-089 further discloses using its disclosed “wake up” command to prompt a controller to read a sensed value from a sensor. Kates, [0086]. As discussed in more detail in Section IX.B.1, a person having ordinary skill in the art would have been motivated to modify McFarland by implementing Kates-089’s “wake up command” to achieve the advantageous functionality of prompting additional reporting of sensor data outside of preset periodic reporting intervals using a specific command.

(c) Element [13.f]

158. **Element [13.f] recites “communicate stored sensor data related to the sensor data in control at a second automation component.”** This element is met by McFarland.

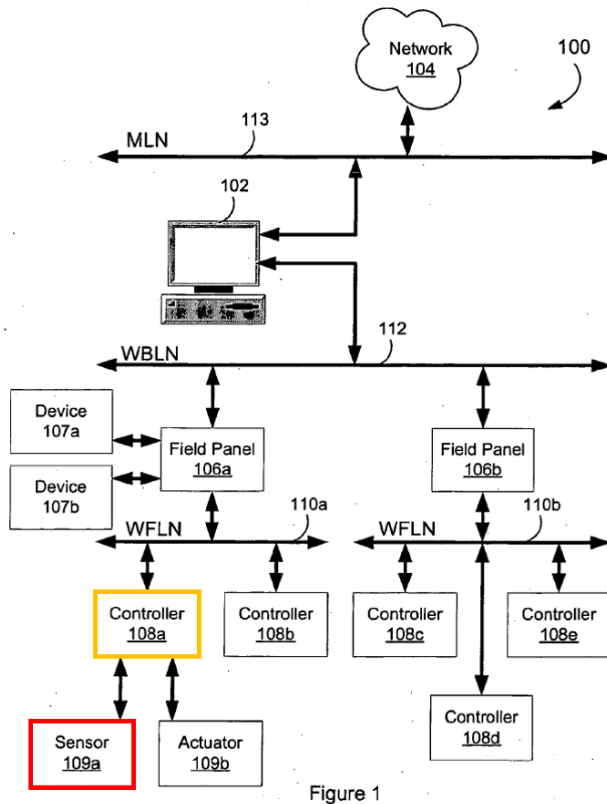
159. *See* my discussions for elements [1.e]-[1.f], [7.e]-[7.g], [13.e]. Element [13.f] substantively recites the same limitation as elements [1.f] and [7.g] and thus discloses this element for the same reasons discussed for elements [1.f] and [7.g] above. Namely, the wireless automation device is configured to send current and past sensor values that are responsive to a “report” command from the controller; this information is thus related to the sensor data in control at the controller.

(d) Element [13.g]

160. **Element [13.g] recites “receive a power-down command from the second automation component.”** This element is met by McFarland in view of Kates-089.

161. **McFarland discloses the second automation component** (e.g., a controller). *See, e.g.,* McFarland (emphasis added):

- **Fig. 1:**



- [0025] (“The controller 108a provides control functionality of each, one, or both of the sensor 109a and the actuator 109b. Controller 108a controls a subsystem based on sensed conditions and desired set point conditions. The controller 108a controls the operation of one or more actuators in response to an event reported by a sensor 109a. The controller 108a may drive the one or more actuator to a desired set point.”)
- [0062] (“The controller 508 may also communicate a report instruction to the device 507. In response to a report instruction, the device 507 may wake up from a sleep mode, and sense and report a current indicator V_i or other

requested information. ... The controller 508 may also be configured or programmed to communicate information with other devices in response to the information received from device 507.”)

- *See also* [0020], [0025]-[0026], [0038], [0060]-[0061].

162. **Kates-089 discloses receiving a power-down command from the second automation component** (e.g., “central system can instruct the ECRV to ... go to a standby mode”). *See, e.g.*, Kates-089 (emphasis added):

- [0075] (“a sleep block can be implemented to use even less power”)
- [0082] (“the ECRV ... is configured to receive data and/or instructions from the central system. Thus, for example, the central system can instruct the ECRV to perform additional measurements, to go to a standby mode, to wake up, to report battery status, to change wake-up interval, to run self-diagnostics and report results, etc.”)
- [0086] (“In one embodiment, the controller 401 reads the sensors 406, 407, 416 at regular periodic intervals.... In one embodiment, the controller 401 reads the sensors 406, 407, 416 in response to a wake-up signal from the central system. In one embodiment, the controller 401 sleeps between sensor readings.”)

163. *See* my discussion for element [13.f], and my discussion of the construction of “power-down command” in Section VIII.D. In addition, McFarland discloses a controller that is part of its building automation system that may “communicate a report instruction” that prompts the wireless automation device to “wake up from a sleep mode.” McFarland, [0062]. However, McFarland leaves the details of how to cause the device to re-enter a sleep mode after waking up to a person having ordinary skill. For example, if the device simply periodically returns back to sleep, then as I discussed above in Section IX.B.1, this could result in the device wasting power for as much as 99.9% of a polling interval depending on when the device is turned on. McFarland, [0008], [0018], [0046], [0048], [0062].

164. Kates-089 provides a complementary teaching that its central system can also instruct the ECRV “to go to a standby mode.” Kates-089, [0082]. As I discussed in Section IX.B.1, a person having ordinary skill in the art would have been motivated to combine Kates-089’s teaching of a “power down” instruction to complement McFarland’s “wake up” instruction in order to advantageously achieve a system that is more energy efficient. Kates-089, [0075]. This yields a modified system that uses the power-down command as taught by Kates to advantageously go into a standby mode to save power, thereby disclosing this element.

(e) Claims [14]-[16]

165. Claims [14]-[16] recite the same limitations as claims [2]-[4], except that they depend on claim [13] instead of claim [1]. These claims are therefore met by McFarland for the reasons provided in Sections IX.A.2(h)-IX.A.2(j).

C. Grounds 3-4: McFarland in view of Stoner (Claims 1-5, 7-11, and 20-21) and Kates-089 (Claims 13-16)

1. Overview of U.S. 8,276,829 (“Stoner”) and Motivation to Modify McFarland (and McFarland in view of Kates-089) with Stoner’s Teachings

166. Stoner discloses a “remote controller” for use in building control systems to control HVAC systems. Stoner, 1:7-11, 3:35-54. Fig. 2 shown below (emphasis added) displays an embodiment of a building control system that has both an HVAC controller and remote controller. Stoner, 3:35-40, 6:45-47.

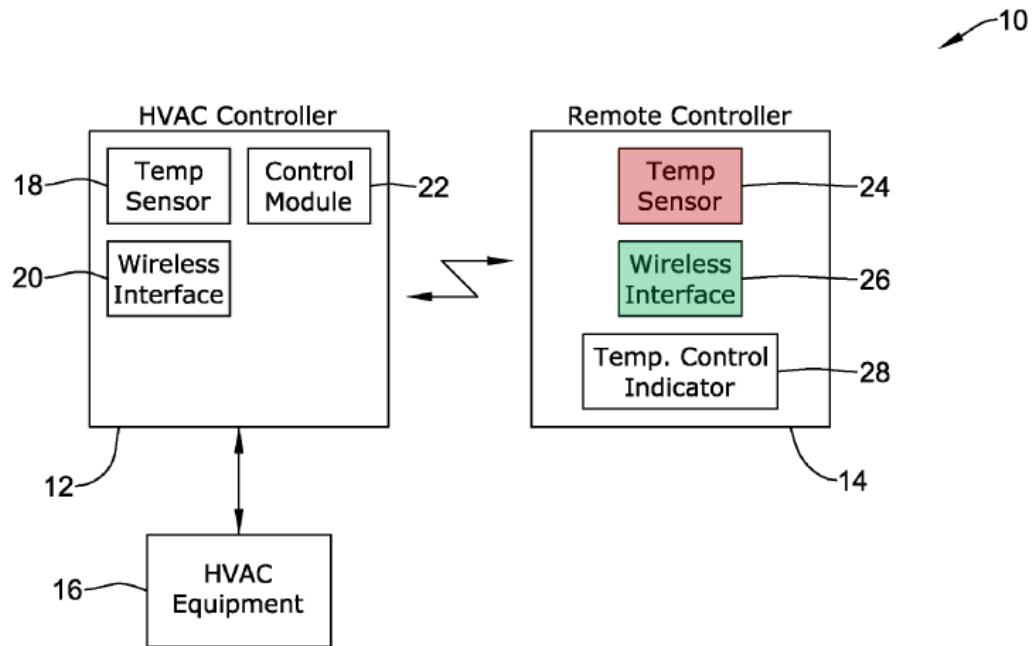


Figure 2

167. Stoner discloses that the HVAC controller and remote controller “may be any suitable devices, as desired.” Stoner, 3:51-54, 4:31-32, 6:26-28. The HVAC controller includes a “**temperature sensor**” to “sense the temperature proximate to the HVAC controller” and a “**wireless interface**” for wirelessly communicating with the wireless interface of the portable remote controller that controls the HVAC equipment. Stoner, Fig. 2, 3:40-61, 4:28-40, 4:54-63.

168. The HVAC controller uses information about the sensed conditions at either the HVAC controller (*i.e.*, at a fixed location with respect to the HVAC equipment) or the portable remote controller (*i.e.*, at a variable location relative to

the HVAC equipment) to “selectively control” environmental conditions within the HVAC system (*e.g.*, the comfort level in the building). Stoner, 4:5-10, 4:64-5:23, 9:11-23, 9:43-52. For example, the HVAC controller may control the HVAC system based first on the temperature measurement by remote controller temperature sensor, then switch to using the controller’s temperature sensor to dictate which temperature is controlling the HVAC system. Stoner, 9:58-67, 10:38-58. Stoner further discloses that these teachings may be implemented to monitor and adjust other variables, including humidity by the use of humidity sensors. Stoner, 1:15-27, 4:64-5:10, 8:53-61.

169. The HVAC controller may switch between using the temperature sensor in the HVAC controller and the remote controller based on predetermined conditions, including, for example, whether the difference between two measurements at one of the controllers exceeds a threshold. Stoner, 10:1-37. When a predetermined condition is detected (*e.g.*, the temperature detected at one of the controllers varied beyond an acceptable threshold) and the temperature sensor being used for control is switched to the one at the other controller, the HVAC controller and remote controller exchange data. Stoner, 9:18-23. The exchanged data includes “any suitable data,” including operational information such as sensed readings, setpoints, system status, and operational status information. Stoner, 7:48-55, 8:46-

52, 9:24-30. Upon receipt of the operational information, the remote controller updates its user interface by displaying the particular temperature sensor data that is currently in control of the HVAC controller. As shown in Fig. 4C below (emphasis added), this display indicates which device's sensor the temperature is read from – e.g., the “thermostat” (the HVAC controller) or “this device” (the remote controller) – as well as various temperatures and setpoints. Stoner, 8:46-9:10, 9:34-42.

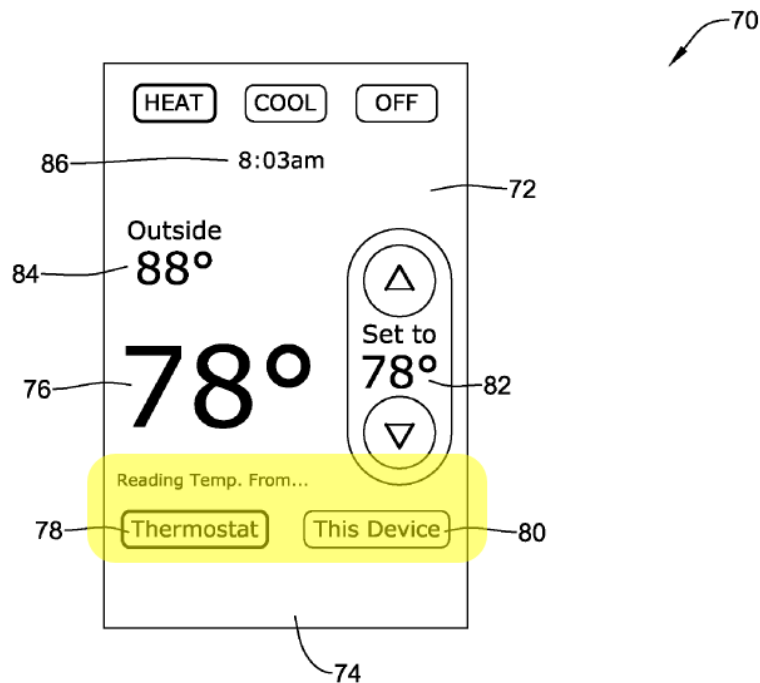


Figure 4C

170. McFarland, Kates-089, and Stoner are in the same field as the '282—sensors, controls, and/or wireless communications—and reasonably pertinent to the alleged problem(s) identified in the '282—e.g., avoiding wiring and installation costs while maximizing power conservation to extend the operating life of wireless

devices. *See* Section IX.B.1; Stoner, Abstract, 1:15-61 (“The present invention relates generally to building control systems that include an HVAC controller as well as a remote control unit, and more particularly, to devices and methods for remote control unit sensing and control in such building control systems”), 2:27-53 (monitoring various aspects of HVAC components), 4:28-53 (using a wireless remote controller that can be moved between multiple locations within a building or structure by a user), 5:24-36 (recognizing the advantageous benefits of using portable controllers to avoid situations in which an “HVAC system [may] consume excess energy”).

171. As previously discussed for Grounds 1-2, McFarland teaches an automation system that includes devices for monitoring temperature, humidity, and other conditions. McFarland, [0036]-[0044]. Stoner teaches a portable remote controller that monitors conditions and displays the status of a system controlling comfort within a building; the controller also specifies whether the temperature sensed at the remote controller or the HVAC controller is presently controlling the HVAC system’s function. Stoner, Figs. 4A-4D, 5:13-16, 8:28-9:57. A person having ordinary skill in the art would have been motivated to modify McFarland (including in combination with Kates-089’s teachings as discussed in Section IX.B) with these teachings from Stoner by making McFarland’s automation device a

remote controller as taught by Stoner. This would result in an automation system in which a user may use a remote controller device with an interface displaying the current sensor data being used for control to adjust system settings from any location, thereby allowing the system to be operated using sensors located where the user is located (i.e., in the remote controller). A person having ordinary skill in the art would have been motivated to modify McFarland with these teachings for several reasons.

172. First, Stoner explicitly discloses that its remote controller teachings would advantageously improve systems like McFarland's building automation system that uses devices that are "installed, positioned, and/or located" around a building. McFarland, [0036]. Stoner explains that thermostats are typically mounted in fixed locations (e.g., on a wall) and that these thermostats interface with remote sensors that are also usually installed in fixed locations (e.g., also mounted on walls). Stoner, 1:28-37. As a result, the control processes directing the function of these systems rely on conditions sensed in fixed locations, which frequently "do not accurately represent the actual environmental conditions at the location of the occupants," who would be expected to move about and not necessarily remain fixed in the same locations as the thermostats, and thus may not accurately control ambient conditions as desired. Stoner, 1:38-47. Such controllers are also harder to use

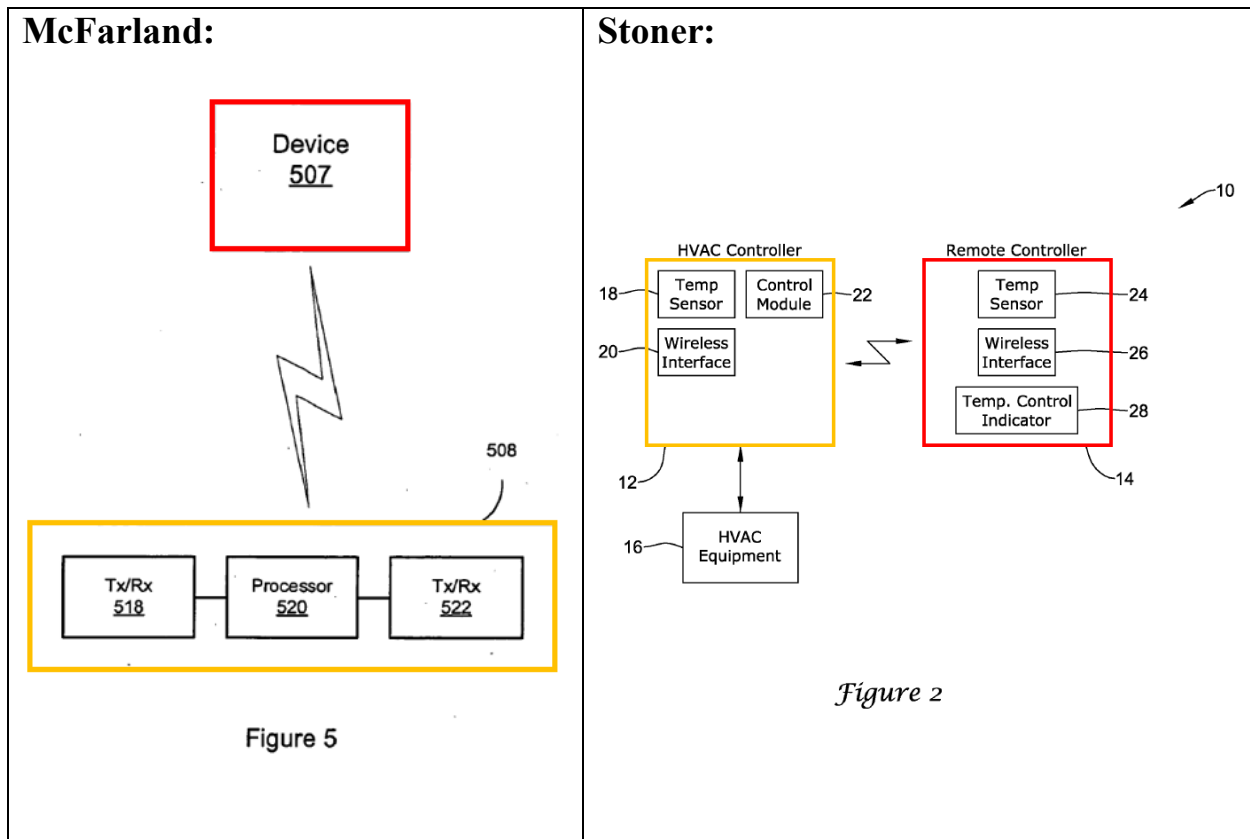
because users have to specifically go to such fixed locations to control the system. Stoner further teaches that its “remote controller 14 may be any suitable devices, as desired.” Stoner, 6:24-28. A person having ordinary skill in the art therefore would have been motivated to modify McFarland by implementing its automation component as a remote controller as explicitly taught by Stoner to improve the accuracy and convenience to the user of the system. *See id.*; Stoner, 2:15-3:5.

173. Second, Stoner teaches that its remote controller can advantageously improve the ability of a system like McFarland’s building automation system by enabling detection of, and response to, temperatures in desired locations (i.e., where the user is currently located). Stoner, 1:28-42, 4:54-5:36. Stoner teaches that making sensors (such as those in found in McFarland’s wireless automation device) portable (e.g., by providing such a sensor within a remote controller that “can be carried to various rooms or locations”) enables the sensors to detect conditions “at the current location of the Remote Controller 14, instead of using the temperature (and/or other [parameter]) sensed at the fixed location of the HVAC controller 12” for control. Stoner, 5:5-10. A person having ordinary skill in the art would have appreciated the usefulness of directing the functioning of a system based on where the user is actually located and would care most about the ambient conditions.

174. Third, Stoner teaches that it is advantageous to display for the user which sensor is currently providing the information based on which the system is controlled so the user may make changes accordingly. Stoner, 1:42-47, 4:36-40, 4:50-53, 8:28-9:57. A user would otherwise need to “walk over and physically interact with [a] controller” that is in the typical form of a wall-mounted thermostat—in systems with multiple controllers in different zones like McFarland’s (see McFarland, [0024]), (e.g., an upstairs wall-mounted controller and a downstairs wall-mounted controller), this inconvenience is compounded because the user must separately visit multiple different controllers to control different zones. Stoner, 1:42-47. A person having ordinary skill in the art therefore would have been motivated to modify McFarland’s device with Stoner’s display teachings to advantageously enable the user to make changes and determine system status for multiple zones in a building without having to go through the inconvenience of visiting multiple fixed devices to exercise such control over the system’s functioning. Stoner, 4:31-40, 5:24-36, 7:48-55. For example, consistent with Stoner’s teachings of using the remote controller to eliminate the need to separately set a temperature at multiple different controllers, depending on the room the remote controller is located in, the remote controller is used to control the temperature in

the zone associated with that room regardless of if a different HVAC controller would typically control that room. *See id.*; Stoner, 5:11-23.

175. Fourth, Stoner teaches that it is advantageous to implement McFarland's device's sensor, transceiver, display, input device, and processor and memory using such remote controller functionality. McFarland, [0038]-[0040]. Stoner's remote controller "may be any suitable device[]," and is a sophisticated device in communication with a system's HVAC controller to wirelessly communicate sensor data and direct the system's functioning—just like McFarland's wireless automation device. Stoner, 4:31-40, 4:54-5:4, 6:24-28, 9:24-30; McFarland, Fig. 5 (automation device 507 in communication with controller 508) and Stoner, Fig. 2 (remote controller 14 in communication with HVAC controller 12). Stoner's teachings of an **HVAC Controller** serving to control the HVAC system, communicating with a **Remote Controller**, serving as an interface to sense local conditions near a user, are therefore similarly structured to McFarland's teachings of a **controller** that is controlling the HVAC system in communication with an **automation device** (e.g., a sensor)—as show in the annotated comparison of McFarland's Fig. 5 and Stoner's Fig. 2 below:



Thus, Stoner's teachings of a remote controller, which senses and reports conditions to a controller, are directly applicable to McFarland's sensor device, which senses and reports conditions to a controller. A person having ordinary skill in the art therefore would have been further motivated to make McFarland's automation device a remote controller as taught by Stoner based on their similar teachings of the functionality of these devices; a person having ordinary skill in the art would have recognized that this combination advantageously improves the accuracy and convenience of the system as taught by Stoner based on its portable remote controller.

176. In light of the above teachings, applying Stoner's teachings thus yields a system in which McFarland's automation device includes an indicator of which sensors are currently in control at the central controller, enabling the system to more accurately respond to conditions as the user experiences them and the users to more easily understand and control the operation of the system. *E.g.*, Stoner, 1:28-47, 2:15-3:4, 4:41-53, 6:45-7:18. A person having ordinary skill in the art also would have had a reasonable expectation of success applying Stoner's teachings of a remote controller's functionality to McFarland's automation device. Indeed, McFarland discloses several similarities between the automation device and Stoner's remote controller: both include the same essential processing components, both receive status information from a centralized controller device, and both implement control processes based on sensor information received from the remote controller or automation device. McFarland, [0018], [0038], [0040], [0061]. Indeed, this functionality was well-understood by persons having ordinary skill in the art. For example, U.S. Patent Application Publication No. 2006/0186214 to Simon, which I understand has been designated as Ex. 1028, teaches the use of two different temperature sensors in different locations within the monitored space between which the system may switch for sensor data that is in control of the system's functioning; status data and settings can also be shared between devices, which communicate

with each other. Ex. 1028, [0030], [0053], [0138]-[0142]. And U.S. Patent No. 6,392,536 to Tice, which I understand has been designated as Ex. 1040, teaches issuing commands to perform “[s]ensor selection” in order to advantageously detect different conditions using particular sensors as opposed to expending power to detect data from all sensors at once. Tice, 2:60-3:3, 3:40-4:33. A person having ordinary skill in the art would therefore have found it obvious and straightforward to use these same components to implement the specific displays and data communications taught by Stoner.

2. Invalidity of Claims 7-11 Over McFarland in view of Stoner

(a) Elements [7.pre]-[7.d]

177. As discussed for [7.pre]-[7.d]/[1.pre]-[1.d] in Section IX.A, McFarland teaches a wireless automation device that meets these elements. Stoner further teaches implementing a device that performs the sensor and monitoring functionalities of McFarland’s wireless automation device using a portable remote controller. Stoner, 4:28-5:62. As I discussed in Section IX.C.1, a person having ordinary skill in the art would have been motivated to modify McFarland’s wireless automation device with Stoner’s teachings of a remote controller to advantageously achieve an automation system in which ambient conditions may be monitored and controlled remotely based on sensor data that accurately represents the conditions of

occupied locations (i.e., sensor data that is measured at the location where the user is carrying the remote controller).

(b) Element [7.e]

178. **Element [7.e]** recites “wherein the computer readable instructions are programmed to: receive status data related to sensor data in control at a second automation component in communication with the building automation system.” This element is met by McFarland, as discussed above in Section IX.A.2(f), IX.A.2(m).

179. **To the extent additional disclosure of this element is required, Stoner further discloses receiving status data related to sensor data in control at a second automation component in communication with the building automation system** (*e.g.*, “remote controller” receives “operational information” including “updated system status information, updated operational data and/or other data” from “HVAC controller 12,” including information identifying “the temperature sensor [that] is now controlling” the “HVAC controller 12”). *See, e.g.*, Stoner (emphasis added):

- **Fig. 4C:**

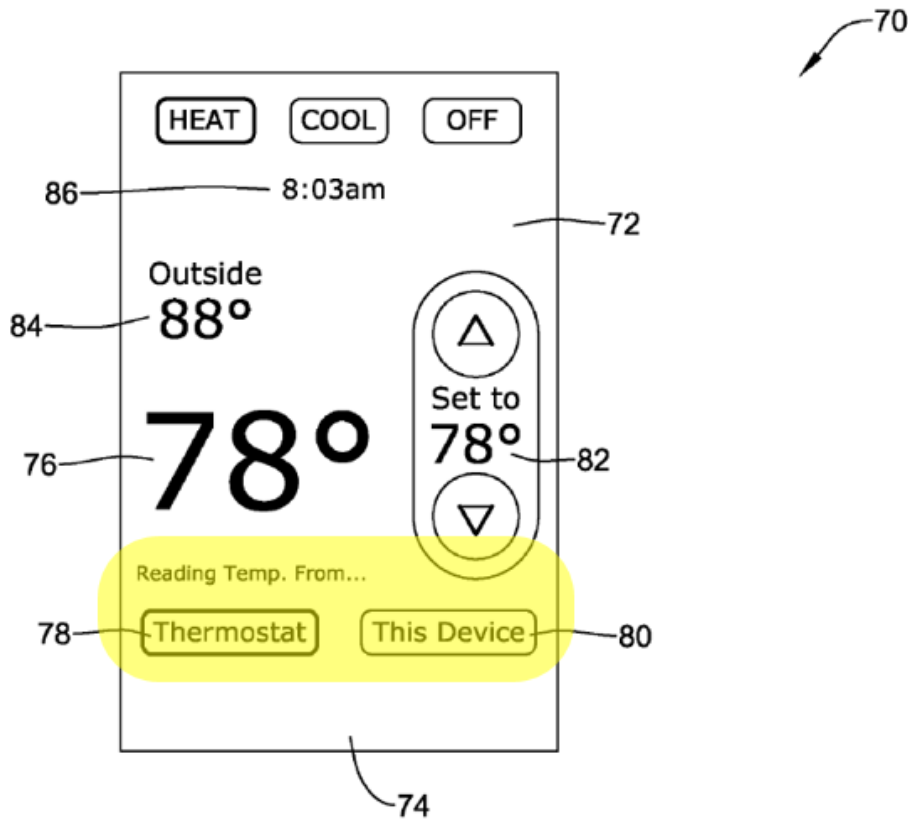


Figure 4C

- **3:64-4:10** (“Control module 22 of HVAC controller 12 may be configured to control the comfort level of at least a portion of the building or structure by activating and/or deactivating the one or more HVAC components of HVAC equipment 16. In some cases, control module 22 may be configured to control one or more HVAC functions.... In the illustrative embodiment, control module 22 may selectively control the comfort level of at least a portion of the building or structure using the temperature sensed by

temperature sensor 18 or a temperature sensed by a temperature sensor 24 of the remote controller 14...)

- **4:54-63** (“As illustrated, remote controller 14 may include a temperature sensor 24 and a wireless interface 26. As briefly mentioned previously, temperature sensor 24 may be configured to sense the temperature of the environment in the vicinity of the remote controller 14.... In some cases, wireless interface 26 may transmit a signal corresponding to the temperature sensed by temperature sensor 24 to the HVAC controller 12.”)
- **4:64-5:4** (“Remote Controller 14 can provide for user interaction with the HVAC Controller 12 from locations remote from the HVAC Controller 12. Also, and as detailed above, the remote controller 14 may include a temperature sensor (and/or other type of sensors such as humidity), and may transmit a temperature (and/or other) sensor value to the HVAC Controller 12 for use in controlling the comfort level of at least a portion of the building or structure.”)
- **7:61-64** (“By pressing various icon buttons ... the controller can be configured to ... modify various operational settings of the HVAC controller 12.”)

- **8:62-9:52** (“[T]he touch screen 54 may also be able to set and/or indicate which temperature sensor (e.g. temperature sensor 18 or temperature sensor 24 of FIG. 1) is being used to control the comfort level of the building or structure. As illustrated, touch screen 74 may include an icon 78 for indicating when the temperature sensor 18 of the HVAC controller 12 is controlling, and an icon 80 for indicating when the temperature sensor 24 of the remote controller 14 is controlling. To indicate which device is controlling, the icon corresponding to the controlling device may include a bold outline, as illustrated by bold outline around icon 80, or may be highlighted or indicated in any other manner, as desired. ... [¶] As illustrated in FIG. 4A..., the temperature sensor 24 of the remote controller 14 is currently being used to control the comfort level of the building or structure. When a condition, such as a predetermined condition or a combination of predetermined conditions, is detected, the temperature control may be automatically switched to use the temperature sensor of the HVAC controller 12.... A data exchange between the HVAC controller 12 and the remote controller 14 may take place during this time period. [¶] In some cases, it may take a period of time for the remote controller 14 to communicate with the HVAC controller 12 and to upload and/or download

updated data. The updated data can include any suitable data including updated set points, updated sensed temperature readings, updated sensed humidity readings, updated system status information, updated operational data and/or other data, as desired.... [¶] As indicated in FIG. 4C, when the remote controller 14 has uploaded the operational information from the HVAC controller 12, the remote user interface 74 may display a similar display 72 as shown in FIG. 4A, with the change of icon 78 indicating that the temperature sensor 18 of the HVAC controller 12 is now controlling instead of the remote controller temperature sensor 24. Also, and in some cases, updated setpoint, sensed temperature, sensed humidity, system status and/or other data may also be displayed. [¶] In some embodiments, when the HVAC controller 12 determines that the condition is no longer detected, ... control may be automatically switch back to the remote controller temperature sensor 24. When switching control back to the remote controller temperature sensor 24, as shown in FIG. 4D, a progress bar 88 and icon 80 may be displayed on the remote user interface 74 as described above.”)

- **9:53-57** (“While the illustrative temperature control indicator has been described with reference to the remote controller 14, it is contemplated that

any or all of the features of the temperature control indicator may instead, or in addition, be included in the user interface 54 of the HVAC controller 12, if desired.”)

- ***See also* Figs. 2, 4A-4D; 2:20-26, 3:35-54, 4:11-16, 4:41-50, 5:42-62, 6:29-33.**

180. As discussed in Section IX.A.2(m), McFarland teaches a “sensor” device that communicates with a “controller” as part of a wireless automation system that regulates an HVAC system. Stoner further discloses a portable remote controller with its own sensors that participates in the wireless automation system where the HVAC controller switches between using sensor data collected by the HVAC controller’s sensors or the remote controller’s sensor(s) in controlling the system. Stoner, 1:28-42, 4:54-5:50, 8:62-9:52. Stoner further teaches that the HVAC controller switches between controlling the system using, for example, the sensors on the remote controller and the sensors on the HVAC controller based on a predetermined condition; the remote controller engages in two-way communication with the HVAC controller to receive and display operational information that indicates which sensor the HVAC controller is using for control (e.g., the HVAC’s or the remote controller’s sensor(s)). This operational information provided from the

HVAC controller is the claimed status data related to sensor data in control at a second automation component (the HVAC controller). *See id.*

181. Based on a construction proposed by a third party (Ex. 1023, 10-11; *see also* Section VIII.E), which I have not adopted as my own, I have been asked to consider whether “receive status data related to sensor data in control at a second automation component in communication with the building automation system” would be met if it was considered to mean “receiv[ing] information that provides the complete status for each of the control routines or algorithms running at a second automation component in connection with each sensor element in the sensor package, the second automation component in communication with the building automation system.” Even under such a construction, I conclude this limitation would be met by Stoner. For example, Stoner also teaches collecting data about humidity in addition to temperature and using this data in making control decisions, and displaying “any or all” such parameters that are collected and used at the remote controller for convenient observation by the user. Stoner, 4:64-5:10, 9:53-57. As a result, the body of shared operational information that is displayed on the remote controller and that facilitate performing HVAC control includes all status data about currently-running control routines and parameters because Stoner teaches the remote

controller receiving “updated system status information” and “operational data” to display the current status of the system. Stoner, 8:62-9:52.

182. As discussed in Section IX.C.1, a POSITA would have been motivated to modify McFarland’s wireless automation device and implement it as the remote controller as taught by Stoner’s portable remote controller to achieve the advantageous outcome of more user-friendly and accurate monitoring and control of the automation system by allowing the user to carry the sensor-equipped remote controller with them wherever they are within the relevant serviced location (e.g., a building).

(c) Element [7.f]

183. **Element [7.f] recites “determine the sensor data in control at the second automation component based on the received status data.”** This element is met by McFarland for the reasons discussed in Section IX.A.2(n).

184. **To the extent additional disclosure of this element is required, Stoner discloses determining the sensor data in control at the second automation component based on the received status data** (e.g., determine the “temperature sensor ... currently being used to control the comfort level of the building,” and displaying the determination). *See, e.g., Stoner* (emphasis added):

- **Fig. 4C:**

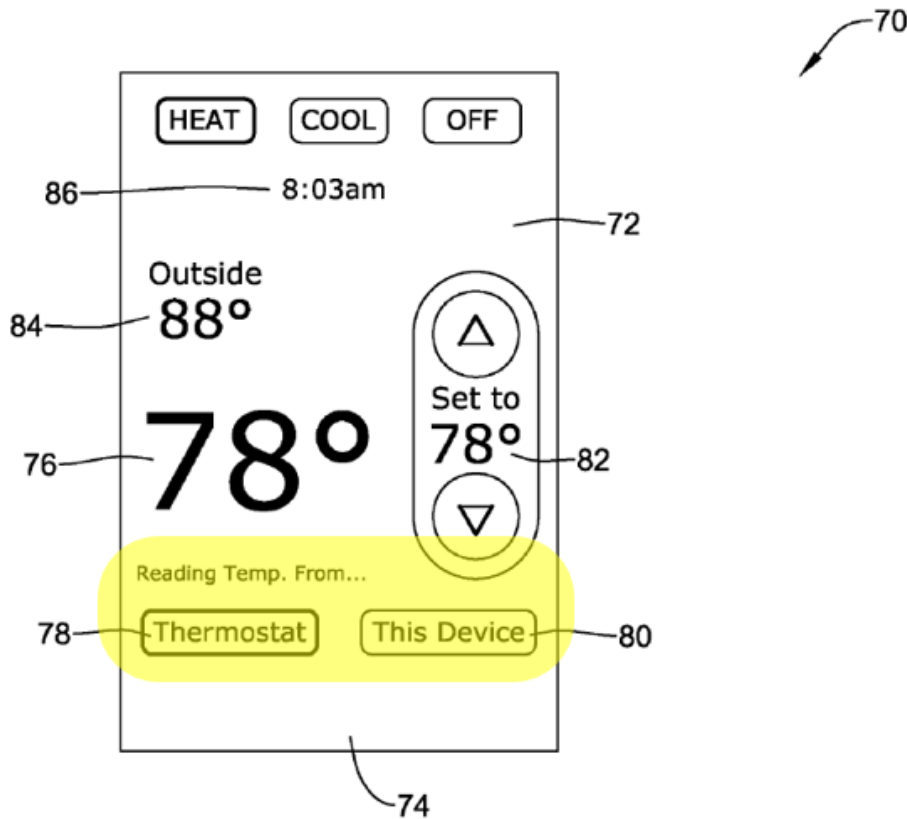


Figure 4C

- 8:62-9:52 (“[T]he touch screen 54 may also be able to set and/or indicate which temperature sensor (e.g. temperature sensor 18 or temperature sensor 24 of FIG. 1) is being used to control the comfort level of the building or structure. As illustrated, touch screen 74 may include an icon 78 for indicating when the temperature sensor 18 of the HVAC controller 12 is controlling, and an icon 80 for indicating when the temperature sensor 24 of the remote controller 14 is controlling. To indicate which device is controlling, the icon corresponding to the controlling device may include a

bold outline, as illustrated by bold outline around icon 80, or may be highlighted or indicated in any other manner, as desired. ... [¶] As illustrated in FIG. 4A..., the temperature sensor 24 of the remote controller 14 is currently being used to control the comfort level of the building or structure. When a condition, such as a predetermined condition or a combination of predetermined conditions, is detected, the temperature control may be automatically switched to use the temperature sensor of the HVAC controller 12.... A data exchange between the HVAC controller 12 and the remote controller 14 may take place during this time period. [¶] In some cases, it may take a period of time for the remote controller 14 to communicate with the HVAC controller 12 and to upload and/or download updated data. The updated data can include any suitable data including updated set points, updated sensed temperature readings, updated sensed humidity readings, updated system status information, updated operational data and/or other data, as desired.... [¶] As indicated in FIG. 4C, when the remote controller 14 has uploaded the operational information from the HVAC controller 12, the remote user interface 74 may display a similar display 72 as shown in FIG. 4A, with the change of icon 78 indicating that the temperature sensor 18 of the HVAC controller 12 is now controlling

instead of the remote controller temperature sensor 24. Also, and in some cases, updated setpoint, sensed temperature, sensed humidity, system status and/or other data may also be displayed. [¶] In some embodiments, when the HVAC controller 12 determines that the condition is no longer detected, ... control may be automatically switch back to the remote controller temperature sensor 24. When switching control back to the remote controller temperature sensor 24, as shown in FIG. 4D, a progress bar 88 and icon 80 may be displayed on the remote user interface 74 as described above.”)

- **9:65-67** (“at block 82, the control module 22 of the HVAC controller 12 may determine if a predetermined condition (or combination of predetermined conditions) has been detected.”)
- **See also Figs. 4A-4D.**

185. See my discussions for elements [7.c]-[7.e]. In addition, Stoner teaches that its remote controller has a display that shows the identity of the sensor being used for the control of the HVAC system (e.g., whether the sensor data currently controlling the HVAC system comes from the remote controller or the HVAC controller). Stoner, 8:62-66. The HVAC controller uses a predetermined condition (or a combination of multiple predetermined conditions) to determine when and

whether to switch the sensor providing data based on which the HVAC system is controlled; when the system switches the sensor that is controlling the system with a different sensor (e.g., from the HVAC controller sensor to the remote controller sensor, or vice versa), the remote controller receives the corresponding operational information update from the HVAC controller, determines which sensor is now in control based on this received operational information, and displays the determination for the user. Stoner, 9:11-42, 9:65-67. Thus, Stoner discloses that the remote controller determines which sensor data is in control at the HVAC controller.

(d) Element [7.g]

186. **Element [7.g] recites “communicate the stored sensor data corresponding the sensor data in control to the second automation component.”**

This element is met by McFarland for the reasons discussed in Section IX.A.2(o).

187. **To the extent additional disclosure of “sensor data in control” is required, Stoner discloses communicating the sensor data corresponding the sensor data in control to the second automation component** (e.g., communicate “a temperature sensed by [the] temperature sensor” and “updated sensed temperature readings,” where the HVAC controller “use[s] the temperature sensed by the remote controller 14 to control the comfort level,” and where the HVAC remote controller’s “temperature sensor ... is now controlling”). *See, e.g., Stoner* (emphasis added):

- **4:14-27** (“Alternatively, or in addition, wireless interface 20 may be configured to communicate with wireless interface 26 of the remote controller 14. For example, wireless interface 20 may be configured to communicate with wireless interface 26 of the remote controller 14 to send and/or receive a signal corresponding to, for example, the temperature sensed by temperature sensor 24... Wireless interface 20 may also be coupled to the control module 22 to provide information corresponding to the temperature sensed by, for example, temperature sensor 24.”)
- **4:46-50** (“The remote controller 14 may sense an ambient temperature adjacent to the remote controller 14 and relay the temperature to the HVAC controller 12. The control module 22 may then use the temperature sensed by the remote controller 14 to control the comfort level.”)
- **9:11-52** (As illustrated in FIG. 4A..., the temperature sensor 24 of the remote controller 14 is currently being used to control the comfort level of the building or structure. When a condition, such as a predetermined condition or a combination of predetermined conditions, is detected, the temperature control may be automatically switched to use the temperature sensor of the HVAC controller 12.... A data exchange between the HVAC controller 12 and the remote controller 14 may take place during this time

period. [¶] In some cases, it may take a period of time for the *remote controller 14 to communicate with the HVAC controller 12 and to upload and/or download updated data. The updated data can include* any suitable data including updated set points, *updated sensed temperature readings, updated sensed humidity readings, updated system status information, updated operational data and/or other data,* as desired.... [¶] As indicated in FIG. 4C, *when the remote controller 14 has uploaded the operational information from the HVAC controller 12, the remote user interface 74 may display a similar display 72 as shown in FIG. 4A, with the change of icon 78 indicating that the temperature sensor 18 of the HVAC controller 12 is now controlling instead of the remote controller temperature sensor 24.* Also, and in some cases, updated setpoint, sensed temperature, sensed humidity, system status and/or other data may also be displayed. [¶] In some embodiments, *when the HVAC controller 12 determines that the condition is no longer detected, ... control may be automatically switch back to the remote controller temperature sensor 24.* When switching control back to the remote controller temperature sensor 24, as shown in FIG. 4D, a progress bar 88 and icon 80 may be displayed on the remote user interface 74 as described above.”)

188. *See* my discussions for elements [7.c]-[7.f] above. In addition, Stoner teaches wirelessly transmitting the sensor data collected by the sensor included in the remote controller to the HVAC controller. Stoner, 4:14-27. The remote controller's sensor data is in control when the data collected by the remote controller's sensor is used as the basis to determine the HVAC system's behavior. Accordingly, when the remote controller communicates stored sensor data that has been collected by the remote controller's sensor to the HVAC controller (as disclosed by McFarland, *see* [7.g] in Section IX.A.2(o)), this is a communication of stored sensor data that corresponds to the sensor data in control at the HVAC controller as claimed. *See* Stoner, 4:46-50, 9:21-30.

189. As discussed for [7.e]-[7.f] and in Section IX.C.1, a POSITA would have been motivated to modify McFarland's automation component with Stoner's remote controller teachings, yielding this element.

(e) Claims [8]-[10]

190. Claims [8]-[10] recite the same limitations as claims [2]-[4], except that they depend on claim [7] instead of claim [1]. These claims are therefore disclosed by McFarland for the reasons provided in my discussions in Sections IX.A.2(h)-(j).

(f) Claim [11]

191. Claim [11] recites “The automation component of claim 7, wherein the computer readable instructions are further programmed to: communicate all of the stored sensor data corresponding to the received status information to the second automation component.” This claim is met by McFarland for the reasons that I explained in Section IX.A.2(q).

192. To the extent additional disclosure of this element is required, Stoner further discloses communicating sensor data corresponding to the received status information to the second automation component (e.g., receiving “operational information” identifying that the remote controller’s temperature sensor “is now controlling,” and communicating “sensed temperature readings”). See, e.g., Stoner (emphasis added):

- 4:14-27 (“Alternatively, or in addition, wireless interface 20 may be configured to communicate with wireless interface 26 of the remote controller 14. For example, wireless interface 20 may be configured to communicate with wireless interface 26 of the remote controller 14 to send and/or receive a signal corresponding to, for example, the temperature sensed by temperature sensor 24... Wireless interface 20 may also be coupled to the control module 22 to provide information corresponding to the temperature sensed by, for example, temperature sensor 24.”)

- **4:46-50** (“The remote controller 14 may sense an ambient temperature adjacent to the remote controller 14 and relay the temperature to the HVAC controller 12. The control module 22 may then use the temperature sensed by the remote controller 14 to control the comfort level.”)
- **9:21-30** (“A data exchange between the HVAC controller 12 and the remote controller 14 may take place during this time period. In some cases, it may take a period of time for the remote controller 14 to communicate with the HVAC controller 12 and to upload and/or download updated data. The updated data can include any suitable data including updated setpoints, updated sensed temperature readings, updated sensed humidity readings, updated system status information, updated operational data and/or other data, as desired.”)

193. Stoner teaches that the remote controller wirelessly communicates sensor data it has collected to the HVAC controller. Stoner, 4:14-27. When the remote controller’s sensor data is in control of the system, as determined by the use of one or more predetermined conditions and indicated by the receipt of operational information in the form of status information, the remote controller communicates all stored sensor data (which includes current and prior readings of the sensed value, as disclosed by McFarland, *see* [11] in Section IX.A.2(q)) that corresponds to the

received status information, thus meeting the claim limitation. *See* Stoner, 4:46-50, 9:21-30. A POSITA would have been motivated to apply these teachings for the same reasons discussed in [7.e]-[7.g] and Section IX.C.1.

3. Stoner’s Further Disclosures of Claims 1-5, 13-16, 20-21

194. As discussed previously for Grounds 1-2, McFarland anticipated and/or renders obvious claims 1-5, 7-11, and 20-21, and McFarland in view of Kates-089 renders obvious claims 13-16. To the extent additional disclosures are required for elements reciting sensor control information (for example, element [1.e]), sensor data in control (for example, element [13.f]), and/or first communication (for example, element [20.d]), Stoner further teaches these elements as discussed for element [7.e]. And as explained for that element and in Sections IX.C.1-2, a person having ordinary skill in the art would have been motivated to modify McFarland with Stoner’s teachings with an expectation of success to, e.g., advantageously simplify and improve a user’s ability to control the system.

195. As I discussed for element [7.e], the operational information that Stoner discloses is received by the remote controller includes “updated system status information, updated operational data, and/or other data” that the remote controller uses to determine and display the sensor that is controlling the automation system; therefore, Stoner discloses the claimed status data of [7.e], where Stoner’s status data

indicates at least which of either the HVAC controller or the remote controller is controlling the processes of the system at a particular time. A person having ordinary skill in the art would have been motivated to modify McFarland with these teachings from Stoner to advantageously allow the automation system to be monitored and controlled remotely, to improve user convenience, and to use sensor data that accurately represents the conditions of occupied locations, since measurements made by the remote controller better reflect conditions at the location of the user carrying or moving the remote controller.

196. These same disclosures from Stoner that I discussed with respect to [7.e] also further disclose elements [1.e], [13.f], and [20.d]. With respect to [1.e], Stoner's disclosure of operational information received by the remote controller discloses "control information related to sensor data in control" as required by claim element [1.e] because this operational information identifies the sensor data that the HVAC controller is using to control HVAC services; that is, for example, information about whether data from the HVAC controller's sensor or the remote controller's sensor is used to determine the control of the HVAC system. Stoner, 9:11-42; *see also* Section IX.C.2(b).

197. Similarly, with respect to [13.f], Stoner's operational information discloses "sensor data in control" as recited in this element because it identifies the

sensor data that is controlling the HVAC controller by its source; e.g., whether the data in control is the data sensed by the HVAC controller or the remote controller. Stoner, 9:11-42; *see also* Section IX.C.2(b).

198. Finally, with respect to [20.d], Stoner's disclosure of operational information also discloses a "first communication" from the second automation component (e.g., the HVAC controller) to the first automation component (e.g., the remote controller) because the remote controller receives a communication from the HVAC controller that identifies the source of the sensor data that is currently controlling the HVAC controller. Stoner, 9:11-42; *see also* §IX.C.2(b). Because the HVAC controller sends the first communication, this claim element is met.

D. Grounds 5-8: McFarland (Claims 1-5, 7-11, 20-21) and McFarland in View of Stoner (Claims 1-5, 7-11, 20-21), Kates-089 (Claims 13-16), and Stoner and Kates-089 (Claims 1-5, 7-11, 20-21), further in view of Ahmed-629 (All Challenged Claims)

199. As I discussed in Grounds 1-4 above, McFarland anticipates and/or renders obvious claims 1-5, 7-11, and 20-21, and in view of Stoner and/or Kates-089, renders obvious claims 1-5, 7-11, 13-16, and 20-21, each ground relying on McFarland's "combination" sensor that discloses a multi-sensor package meeting claim elements [1.a], [7.a], [13.a], and [20.a]. *See* IX.A.2(b), IX.A.2(l), and IX.A.2(s), IX.B.2(a). McFarland, [0043]. To the extent further disclosure of a multi-sensor package is required, Ahmed-629 additionally discloses a "MEMS sensor

suite” that is “a collection of MEMS sensors” that are “incorporated into a single substrate,” such as a single-substrate sensor combining two or more sensors including both “temperature and humidity” sensors. Ahmed-629, [0047]-[0048]. A “single-substrate” device describes a single device fabricated on a foundation “substrate” material to create an electrical device; a common example of such a device is a computer chip that is fabricated on a silicon substrate. A device, such as Ahmed-629’s sensor suite, incorporated into a “single substrate” is thus a single, integrated device. The sensor suite is part of a “wireless integrated network sensor” that embodies a “sensor module” “manufactured for use in ... HVAC sensing applications” included in a “building control network.” Ahmed-629, Fig. 2, [0002], [0011]-[0014], [0038], [0044], [0046], [0049], [0065]; *see also* [0045]-[0077].

200. Like McFarland, Kates-089, and Stoner, Ahmed-629 is in the same field of sensors, controls, and/or wireless communications, and is reasonably pertinent to the same problems identified in the ’282 of using wireless devices in a building automation system to avoid wiring and installation costs while maximizing power conservation to extend the operating life of the wireless device. Ahmed-629, [0002]-[0009], [0010] (“there is a need for a method and/or apparatus that reduces the costs associated with the sensing devices that are necessary for sensing conditions within a building control system”), [0014], [0055] (“The use of a MEMS-

based RF communication circuit allows for reduced power consumption”), [0064], [0067], [0072], [0135]; *see* Sections X.B.2, X.C.2 (discussing that McFarland, Kates-089, and Stoner are in the same field and reasonably pertinent to the same problems as the ’282 patent). A person having ordinary skill in the art would have been motivated to modify McFarland (alone and in view of Kates-089 and/or Stoner) with Ahmed’s teachings to implement McFarland’s combination sensor as a MEMS sensor suite on a single substrate, disclosing a multi-sensor module. This is the case for several reasons, detailed below.

201. First, McFarland teaches implementing its combination sensor using MEMS, which would have motivated a person having ordinary skill in the art to apply Ahmed-629’s teachings of MEMS sensor technology. McFarland, [0043] (“The sensor 209 may be a micro-electro mechanical sensors (“MEMS) or larger sensors for sensing any condition or parameter.”). I understand that Ahmed-629 was originally assigned to the same company as McFarland (Siemens), and teaches that its MEMS sensor suite on a single substrate may be implemented using commercially available products (e.g., “from Hygrometrics Inc.”) that were well-known and widely used. Ahmed-629, [0048]. Indeed, single-substrate sensors were generally well known before March 18, 2009. For example, WIPO International Application Publication WO 2007/036922 to Cummins, which I understand has been

designated as Exhibit 1038, discloses a “single chip wireless sensor” that “senses gas or humidity and temperature” that is “manufactured in a single process.” Ex. 1038, Abstract, 2. As another example, U.S. Patent Application Publication No. 2007/0026107 to Wang, which I understand has been designated as Exhibit 1039, discloses as “preferred” using “Sensirion sensors ... which are a single chip relative humidity and temperature multi-sensor module.” Ex. 1039, [0042]. As another example, U.S. Patent Application Publication No. 2006/0071773 to Ahmed, which I understand has been designated as Exhibit 1037, discloses a “sensor module” as “includ[ing] a MEMs temperature sensor 702, a MEMs humidity sensor 704, a MEMs CO₂ sensor 706, and a MEMs NH₃ sensor 708.” Ex. 1037, [0082]. Therefore, a person having ordinary skill in the art would have been motivated to modify McFarland’s disclosed automation devices to include Ahmed-629’s teachings of well-known and commercially available products identified by Siemens, McFarland’s assignee, to be used for the same purpose: sensing multiple conditions while minimizing the need for more complex hardware.

202. Second, applying Ahmed-629’s teachings of a MEMS sensor suite would have been understood to advantageously simplify and reduce manufacturing complexity and save power, both of which would reduce operating costs. McFarland teaches that its disclosures may be implemented in a variety of building control

applications including, for “HVAC, environmental air quality, safety and security, fire, hazard prevention, or other processes.” McFarland, [0002], [0019], [0024], [0063]. Ahmed-629 teaches that its MEMS sensor suites, which include multiple different “selectable” MEMS sensors, are applicable to “heating, ventilation, air conditioning, fire safety, lighting, security and other systems or machinery of a building or facility.” Ahmed-629, [0002], [0049], [0054], [0056], [0069]. Ahmed-629 further provides that “[b]y incorporating different, selectable sensor capabilities, a single sensor module design may be manufactured for use in a large majority of HVAC sensing applications;” Ahmed-629 also provides that its device “reduces the costs associated with the sensing devices that are necessary for sensing conditions within a building control system.” Ahmed-629, [0010], [0049]. A person having ordinary skill in the art therefore would have been motivated to apply Ahmed-629’s teachings of a single-substrate sensor to McFarland’s teachings in order to advantageously reduce the associated design and manufacturing costs. Ahmed-629, [0007], [0010]. Moreover, it was well known that such integration of sensors also reduces power. *See id.*; Ex. 1038, 1-2 (describing its disclosed single-substrate sensor device as having “higher integration [that] generally results in lower power” and stating its derivation from “[o]ne of the main driving forces in the electronics

industry” which “is the desire to achieve greater integration of functionality so that production is more automated, and size and per-unit cost reduced”).

203. A person having ordinary skill in the art also would have had a reasonable expectation of success applying Ahmed-629’s teachings of a multi-sensor package to McFarland’s automation device (including when also applying Kates-089’s and/or Stoner’s teachings). Indeed, McFarland discloses that the sensor is a combination sensor that, specifically, “may be a [MEMS] or larger sensor[,],” and Ahmed-629 expressly discloses the details of—and even a commercially available source for—MEMS sensors that sense the same conditions that McFarland expresses interest in (*e.g.*, temperature, humidity, smoke, flow). McFarland, [0043]; Ahmed-629, [0047]-[0048]. Indeed, sensors, MEMS and non-MEMS, were well-understood by persons having ordinary skill in the art, as their designs of producing signals representative of conditions would have been easily integrated in most any processing system without undue experimentation. McFarland, Fig. 3, [0043]-[0047]. A person having ordinary skill in the art would therefore have found it obvious and straightforward to use the MEMS sensors taught by Ahmed-629 to sense environmental conditions.

204. Accordingly, each of the Challenged Claims is further obvious for the reasons set forth for Grounds 1-4, as further modified with Ahmed-629’s teachings

of a single-substrate MEMS sensor suite that is a multi-sensor package as required to meet the claim elements.

E. Ground 9: Kates-089 in View of Ahmed-629

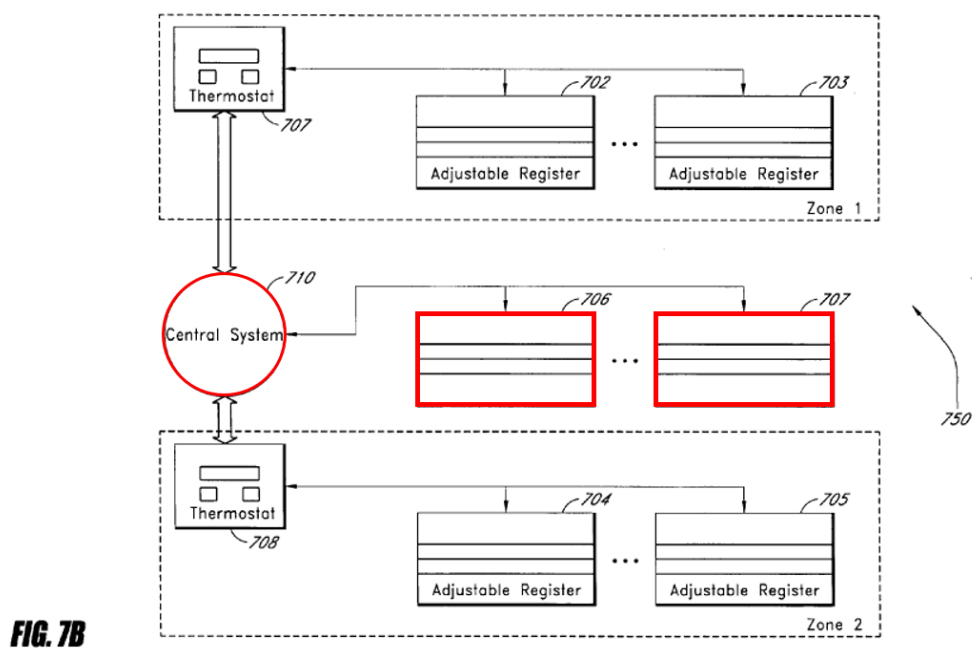
205. Kates-089 in view of Ahmed-629 alternatively further renders obvious claims [20]-[21]. I have summarized relevant teachings from Kates-089 and Ahmed-629 above in Sections IX.B and IX.D.

(a) Element [20.pre]

206. **Element [20.pre]** recites “A method for providing power saving wireless communication within a building automation system, the method comprising.” This element is met by Kates-089.

207. **Kates-089 discloses a method for providing power saving wireless communication** (e.g., “wireless communication” between ECRVs allows “power conservation” in a “zoned system” that “reduces energy consumption”) **within a building automation system** (e.g., “HVAC system” in “building structure”). *See, e.g.,* Kates-089 (emphasis added):

• **Fig. 7B:**



- **Fig. 16:**

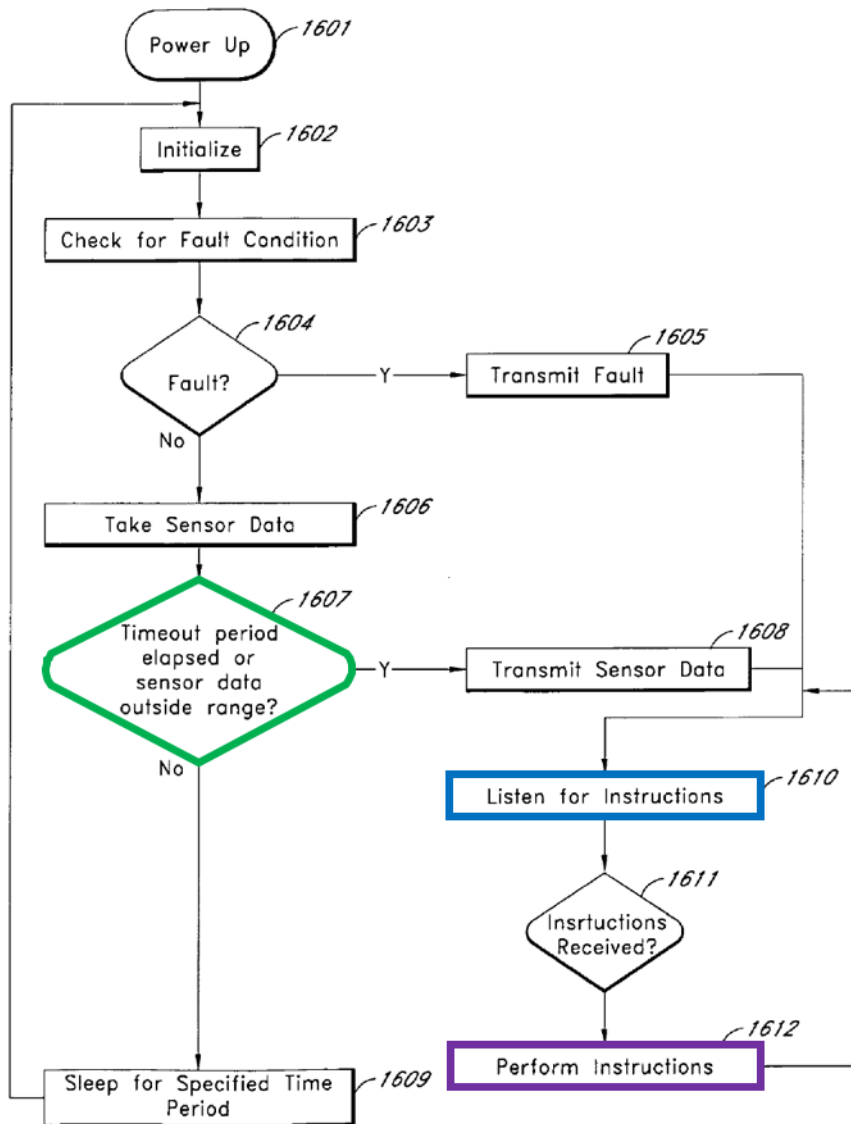


FIG. 16

- **Abstract** (“A zone thermostat for use in connection with an Electronically-Controlled Register vent (ECRV) that can be easily installed by a homeowner or general handyman is disclosed. The ECRV can be used to convert a non-zoned HVAC system into a zoned system. The ECRV can

also be used in connection with a conventional zoned HVAC system to provide additional control and additional zones not provided by the conventional zoned HVAC system. In one embodiment, the ECRV is configured have a size and form-factor that conforms to a standard manually-controlled register vent. In one embodiment, the zone thermostat is configured to provide thermostat information to the ECRV. In one embodiment, the zone thermostat communicates with a central monitoring system that coordinates operation of the heating and cooling zones.")

- [0008] ("In addition, a zoned system can sometimes allow the installation of smaller capacity equipment without compromising comfort. This reduces energy consumption by reducing wasted capacity.")
- [0009] ("The cost of installation is such that even though the zoned system is more efficient, the payback period on such systems is many years.")
- [0010] ("The system and method disclosed herein solves these and other problems by providing an Electronically-Controlled Register vent (ECRV) that can be easily installed by a homeowner or general handyman. The ECRV can be used to convert a non-zoned HVAC system into a zoned system. The ECRV can also be used in connection with a conventional zoned

HVAC system to provide additional control and additional zones not provided by the conventional zoned HVAC system.”)

- **[0014]** (“In one embodiment, one or more ECRVs in a zone communicate with a zone thermostat. The zone thermostat measures the temperature of the zone for all of the ECRVs that control the zone. In one embodiment, the ECRVs and the zone thermostat communicate by wireless communication methods, such as, for example, infrared communication, radio-frequency communication, ultrasonic communication, etc.”)
- **[0056]** (“FIG. 7B is a block diagram of a centrally-controlled zoned heating and cooling system 750 that is similar to the system 700 shown in FIG. 7A. In FIG. 7B, the central system 710 communicates with the zone thermostats 707, 708, the zone thermostat 707 communicates with the ECRVs 702, 703, the zone thermostat 708 communicates with the ECRVs 704, 705, and the central system 710 communicates with the ECRVs 706, 707. In the system 750, the ECRVs 702-705 are in zones that are associated with the respective zone thermostat 707, 708 that controls the respective ECRVs 702-705. The ECRVs 706, 707 are not associated with any particular zone thermostat and are controlled directly by the central system 710. One of ordinary skill in the

art will recognize that the communication topology shown in FIG. 7B can also be used in connection with the system shown in FIGS. 8 and 9.”)

- [0075] (“Although the listen block 1403 can be implemented to use relatively little power, a sleep block can be implemented to use even less power. FIG. 15 is a flowchart showing one embodiment of an instruction and sensor data loop process 1500 for an ECRV or zone thermostat. The process 1500 begins at a power-up block 1501. After power up, the process proceeds to an initialization block 1502. After initialization, the process advances to a "sleep" block 1503 wherein the ECRV or zone thermostat sleeps for a specified period of time. When the sleep period expires, the process advances to a wakeup block 1504 and then to a decision 1505. In the decision block 1505, if a fault is detected, then a transmit fault block 1506 is executed. The process then advances to a sensor block 1507 where sensor readings are taken. After taking sensor readings, the process advances to a listen-for-instructions block 1508. If an instruction has been received, then the process advances to a "perform instruction" block 1510; otherwise, the process returns to the sleep block 1503.”)
- [0077] (“The process flows shown in FIGS. 14-16 show different levels of interaction between devices and different levels of power conservation in the

ECRV and/or zone thermostat. One of ordinary skill in the art will recognize that the ECRV and zone thermostat are configured to receive sensor data and user inputs, report the sensor data and user inputs to other devices in the zone control system, and respond to instructions from other devices in the zone control system. Thus the process flows shown in FIGS. 14-16 are provided for illustrative purposes and not by way of limitation. Other data reporting and instruction processing loops will be apparent to those of ordinary skill in the art by using the disclosure herein.”)

- [0078] (“In one embodiment, the ECRV and/or zone thermostat “sleep,” between sensor readings. In one embodiment, the central system 710 sends out a “wake up” signal. When an ECRV or zone thermostat receives a wake up signal, it takes one or more sensor readings, encodes it into a digital signal, and transmits the sensor data along with an identification code.”)
- [0084] (“In one embodiment, the ECRVs, zone thermostats, central system, etc., communicate on a 900 MHz frequency band. This band provides relatively good transmission through walls and other obstacles normally found in and around a building structure. In one embodiment, the ECRVs and zone thermostats communicate with the central system on bands above and/or below the 900 MHz band. In one embodiment, the ECRVs and zone

thermostats listen to a radio frequency channel before transmitting on that channel or before beginning transmission. If the channel is in use, (e.g., by another device such as another central system, a cordless telephone, etc.) then the ECRVs and/or zone thermostats change to a different channel. In one embodiment, the sensor, central system coordinates frequency hopping by listening to radio frequency channels for interference and using an algorithm to select a next channel for transmission that avoids the interference. In one embodiment, the ECRV and/or zone thermostat transmits data until it receives an acknowledgement from the central system that the message has been received.")

- [0086] ("In one embodiment, the controller 401 reads the sensors 406, 407, 416 at regular periodic intervals. In one embodiment, the controller 401 reads the sensors 406, 407, 416 at random intervals. In one embodiment, the controller 401 reads the sensors 406, 407, 416 in response to a wake-up signal from the central system.")
- [0094] ("In one embodiment, the central system uses predictive modeling to calculate an amount of vent opening for each of the ECRVs 702-705 to reduce the number of times the vents are opened and closed and thereby reduce power usage by the actuators 409.")

- [0103] (“As described above, in one embodiment, the algorithm used in the calculation block 1902 is configured to predict the ECRV opening needed to bring each zone to the desired temperature based on the current temperature, the available heating and cooling, the amount of air available through each ECRV, etc. The calculating block uses the prediction model to attempt to calculate the ECRV openings needed for relatively long periods of time in order to reduce the power consumed in unnecessarily by opening and closing the register vents. In one embodiment, the ECRVs are battery powered, and thus reducing the movement of the register vents extends the life of the batteries.”)

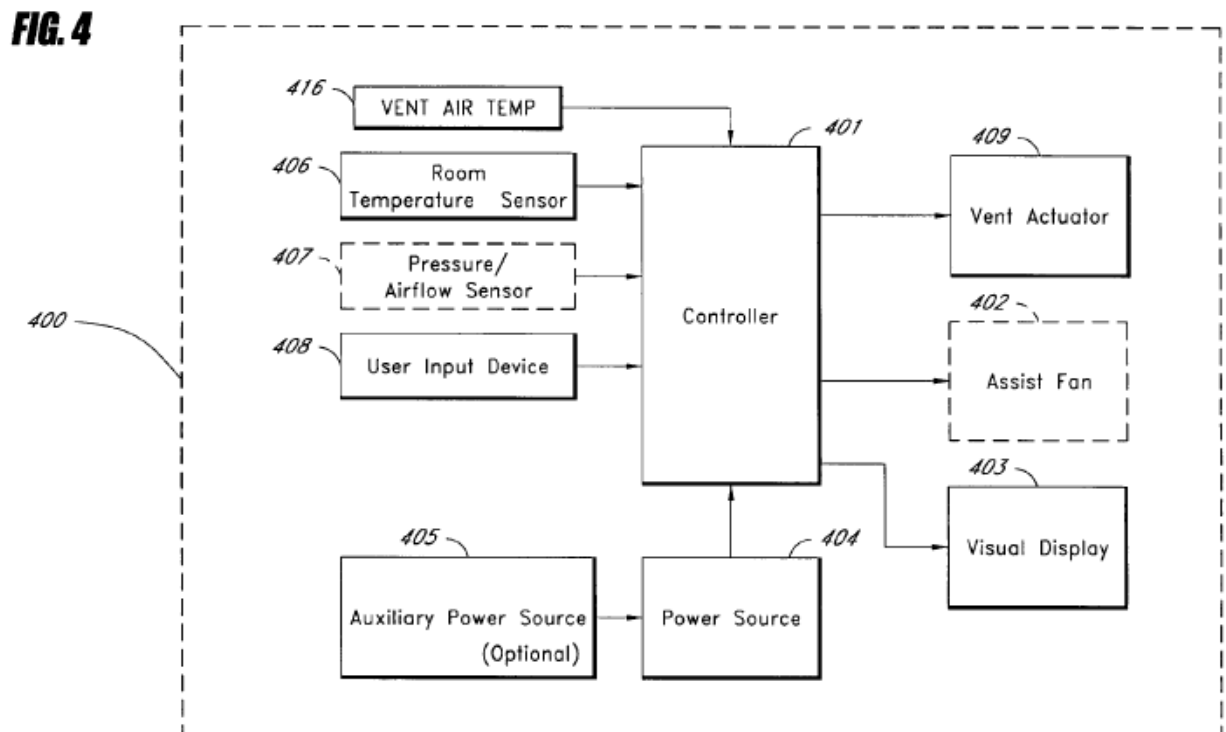
208. Kates-089’s teaches that its ECRVs, which are configured to “communicate by wireless communication,” convert an HVAC system into a zoned system that “reduces energy consumption by reducing wasted capacity.” Kates-089, [0008], [0014]. The result is a system that “is more efficient,” as shown, for example, in Fig. 7B. Kates-089, [0009].

(b) Element [20.a]

209. **Element [20.a]** recites “scanning sensor data associated with each of a plurality of sensors contained within a multi-sensor package of a first automation component.” This element is met by Kates-089 in view of Ahmed-629.

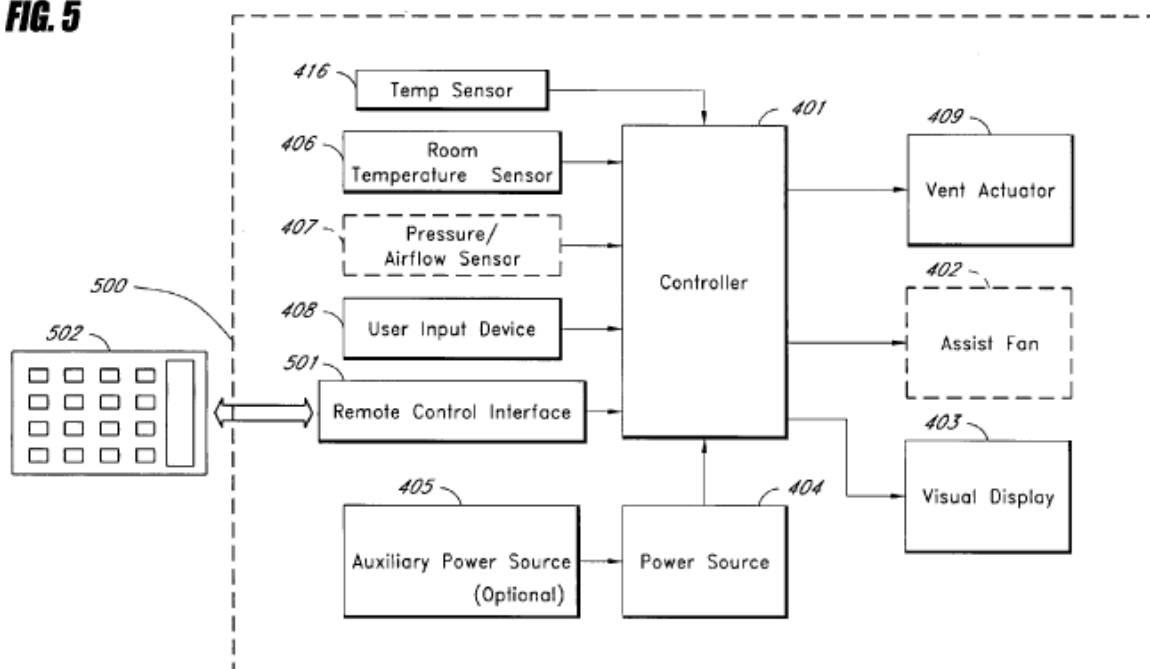
210. **Kates-089 discloses scanning sensor data associated with each of a plurality of sensors** (e.g., “sensor readings are taken ... from one or more sensors” during a “reporting loop process”) **of a first automation component** (e.g., “ECRV” that includes “air pressure and/or airflow sensor,” “humidity sensor,” and “temperature sensors”). *See, e.g., Kates-089 (emphasis added):*

- **Fig. 4:**



- Fig. 5:

FIG. 5



- **Fig. 10:**

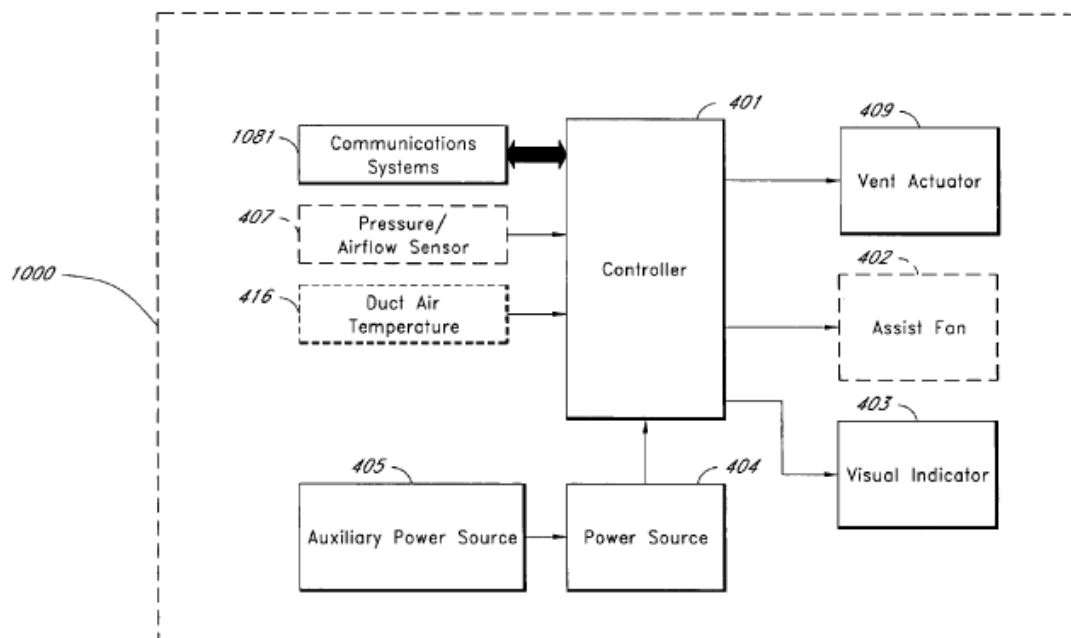


FIG. 10

- **Fig. 16:**

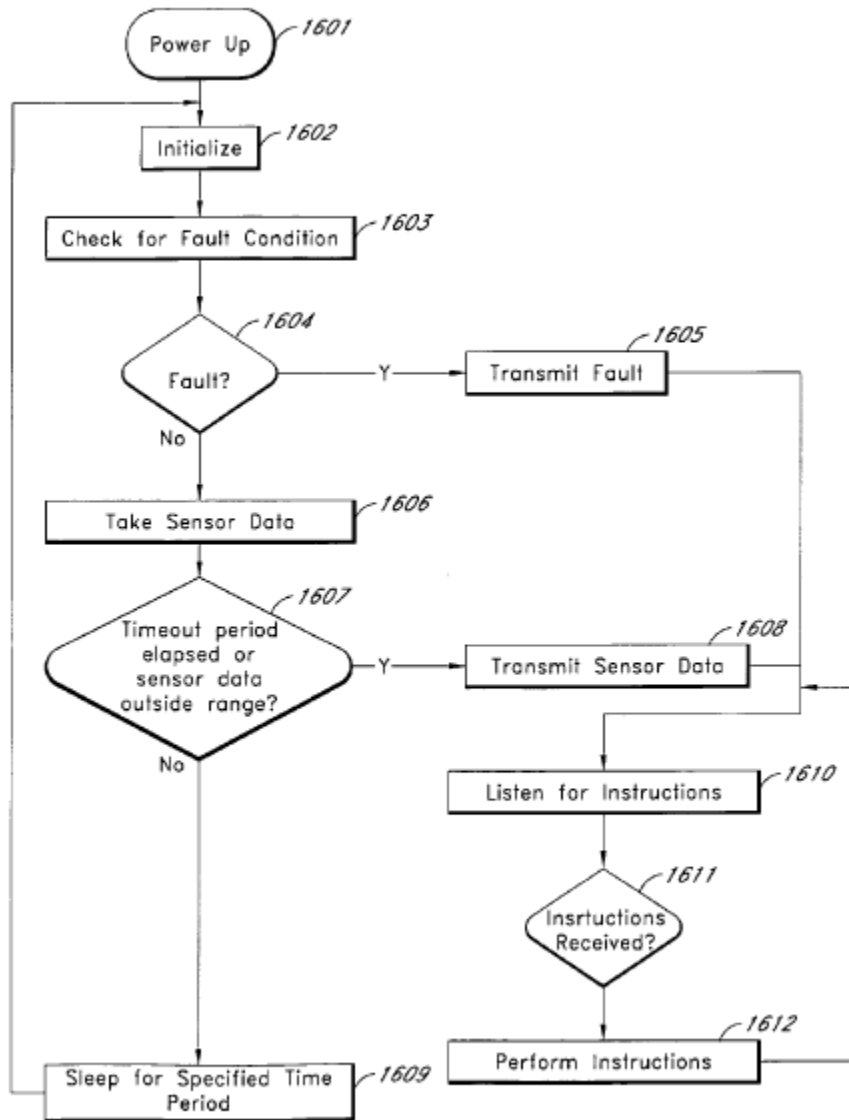


FIG. 16

- [0041] (“FIG. 4 is a block diagram of a self-contained ECRV 400, which is one embodiment of the ECRV 300 shown in FIGS. 3A and 3B and the ECRV shown in FIG. 18. In the ECRV 400, a temperature sensor 406 and a

temperature sensor 416 are provided to a controller 401. ... An optional sensor 407 is provided to the controller 401. In one embodiment, the sensor 407 includes an air pressure and/or airflow sensor. In one embodiment, the sensor 407 includes a humidity sensor.”)

- [0051] (“The ECRV 500 includes the power sources 404, 405, the controller 401, the fan 402, the display 403, the temperature sensors 406, 416, the sensor 407, and the user input device 408.”)
- [0064] (“The ECRV 1000 includes the power sources 404, 405, the controller 401, the fan 402, the display 403, and, optionally the temperature sensors 416 and the sensor 407, and the user input device 408.)
- [0076] (“FIG. 16 is a flowchart showing one embodiment of an instruction and sensor data reporting loop process 1600 for an ECRV or zone thermostat. The process 1600 begins at a power-up block 1601. After power up, the process proceeds to an initialization block 1602. After initialization, the process advances to a check fault block 1603. If a fault is detected then a decision block 1604 advances the process to a transmit fault block 1605; otherwise, the process advances to a sensor block 1606 where sensor readings are taken. The data values from one or more sensors are evaluated, and if the sensor data is outside a specified range, or if a timeout period has

occurred, then the process advances to a transmit data block 1608;

otherwise, the process advances to a sleep block 1609.”)

- [0086] (“In one embodiment, the controller 401 reads the sensors 406, 407, 416 at regular periodic intervals. In one embodiment, the controller 401 reads the sensors 406, 407, 416 at random intervals. In one embodiment, the controller 401 reads the sensors 406, 407, 416 in response to a wake-up signal from the central system.”)
- [0097] (“In one embodiment, the sensors 407 in the ECRVs include airflow and/or air velocity sensors. Data from the sensors 407 are transmitted by the ECRV to the central system. The central system uses the airflow and/or air velocity measurements to determine the relative amount of air through each ECRV. Thus, for example, by using airflow/velocity measurements, the central system can adapt to the relatively lower airflow of smaller ECRVs and ECRVs that are situated on the duct further from the HVAC blower than ECRVs which are located closer to the blower (the closer ECRVs tend to receive more airflow).”)

211. Kates-089 discloses that its disclosed ECRV includes sensors 406 and 416, which measure temperature, and sensor 407, which measures “air pressure,” “airflow,” and “humidity.” Kates-089, [0041]. During a “sensor data reporting loop

process,” “sensor readings are taken ... from one or more sensors” by, e.g., “the controller 401.” Kates-089, [0076], [0086].

212. **Ahmed-629 further discloses the sensors contained within a multi-sensor package** (“the sensor suite 42 is a collection of MEMS sensors incorporated into a single substrate,” *see* §IX.D).

213. A person having ordinary skill in the art would have been motivated to modify Kates-089 with Ahmed’s teaching of a “collection of MEMS sensors incorporated into a single substrate” and reasonably expected success for the same reasons explained in Section X.D for McFarland; namely, Kates-089’s similar compatibility and ability to benefit from the reduced costs and power savings. Kates-089 teaches that its system utilizes a plurality of sensors; thus, a person having ordinary skill in the art would have understood the Kates-089 system to be compatible with Ahmed-629’s teachings of a collection of MEMS sensors on single substrate. Moreover, Kates-089 recognizes that it is advantageous to ensure that “less energy is wasted” by, for example, utilizing systems that are “more efficient”; incorporating Ahmed-629’s collection of sensors would have been understood to further facilitate energy efficiency. Kates-089, [0007]-[0010], [0050], [0075]-[0076], [0094], [0101].

(c) Element [20.b]

214. Element [20.b] recites “identifying changed sensor values within the sensor data.” This element is met by Kates-089.

215. Kates-089 discloses identifying changed sensor values within the sensor data (e.g., “if the sensor data is outside a specified range ... then the process advances to a transmit data block,” otherwise, “the process advances to a sleep block”). See, e.g., Kates-089 (emphasis added):

- [0076] (“FIG. 16 is a flowchart showing one embodiment of an instruction and sensor data reporting loop process 1600 for an ECRV or zone thermostat. The process 1600 begins at a power-up block 1601. After power up, the process proceeds to an initialization block 1602. After initialization, the process advances to a check fault block 1603. If a fault is detected then a decision block 1604 advances the process to a transmit fault block 1605; otherwise, the process advances to a sensor block 1606 where sensor readings are taken. The data values from one or more sensors are evaluated, and if the sensor data is outside a specified range, or if a timeout period has occurred, then the process advances to a transmit data block 1608; otherwise, the process advances to a sleep block 1609.”)
- [0107] (“In one embodiment, the ECRVs report sensor data (e.g., duct temperature, airflow, air velocity, power status, actuator position, etc.) to the

central system and/or the zone thermostats at regular intervals. In one embodiment, the ECRVs report sensor data to the central system and/or the zone thermostats whenever the sensor data fails a threshold test (e.g., exceeds a threshold value, falls below a threshold value, falls inside a threshold range, or falls outside a threshold range, etc.).”)

216. Kates-089 discloses that its ECRV are configured to “report sensor data to the central system and/or the zone thermostats whenever the sensor data fails a threshold test.” Kates-089, [0107]. Transmission of sensor data occurs only upon detecting the failure of a threshold test; a change in sensor values causes the ECRV to “transmit data.” Kates-089, [0076], [0107]. If the sensor values have not changed, the ECRV returns to a “sleep block.” *Id.*

(d) Element [20.c]

217. **Element [20.c]** recites “receiving a first communication from a second automation component in communication with the first automation component and the building automation system.” This element is met by Kates-089.

218. **Kates-089 discloses receiving a first communication** (e.g., during a “listen block ... where the ECRV ... listens for instructions,” receive a “request instruction”) **from a second automation component in communication with the first automation component and the building automation system** (e.g., from

component in “central system” that “communicates with the ECRVs” within the building automation system, *see* [20.pre]). *See, e.g.,* Kates-089 (emphasis added):

- **Fig. 7B:**

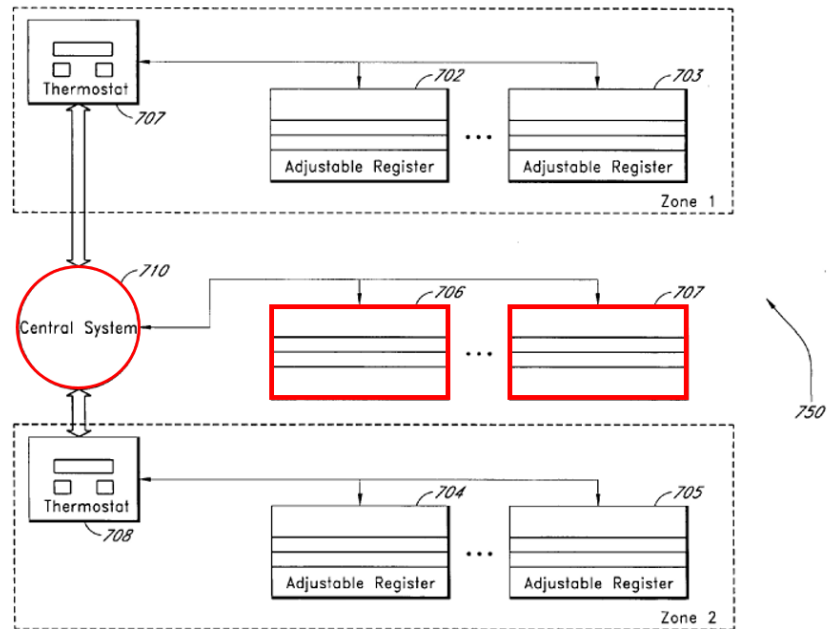


FIG. 7B

- [0010] (“The system and method disclosed herein solves these and other problems by providing an Electronically-Controlled Register vent (ECRV) that can be easily installed by a homeowner or general handyman. The ECRV can be used to convert a non-zoned HVAC system into a zoned system. The ECRV can also be used in connection with a conventional zoned HVAC system to provide additional control and additional zones not provided by the conventional zoned HVAC system.”)

- [0056] (“FIG. 7B is a block diagram of a centrally-controlled zoned heating and cooling system 750 that is similar to the system 700 shown in FIG. 7A. In FIG. 7B, the central system 710 communicates with the zone thermostats 707, 708, the zone thermostat 707 communicates with the ECRVs 702, 703, the zone thermostat 708 communicates with the ECRVs 704, 705, and the central system 710 communicates with the ECRVs 706, 707.”)
- [0076] (“After transmitting in the transmit fault block 1605 or the transmit sensor data block 1608, the process advances to a listen block 1610 where the ECRV or zone thermostat listens for instructions. If an instruction is received, then a decision block advances the process to a perform instruction block 1612; otherwise, the process advances to the sleep block 1609. After executing the perform instruction block 1612, the process transmits an “instruction complete message” and returns to the listen block 1610.”)
- [0077] (“The process flows shown in FIGS. 14-16 show different levels of interaction between devices and different levels of power conservation in the ECRV and/or zone thermostat. One of ordinary skill in the art will recognize that the ECRV and zone thermostat are configured to receive sensor data and user inputs, report the sensor data and user inputs to other devices in the

zone control system, and respond to instructions from other devices in the zone control system.”)

- [0078] (“In one embodiment, the ECRV and/or zone thermostat “sleep,” between sensor readings. In one embodiment, the central system 710 sends out a “wake up” signal. When an ECRV or zone thermostat receives a wake up signal, it takes one or more sensor readings, encodes it into a digital signal, and transmits the sensor data along with an identification code.”)
- [0079] (“In one embodiment, the ECRV is bi-directional and configured to receive instructions from the central system. Thus, for example, the central system can instruct the ECRV to: perform additional measurements; go to a standby mode; wake up; report battery status; change wake-up interval; run self-diagnostics and report results; etc.”)
- [0080] (“In one embodiment, the ECRV provides two wake-up modes, a first wake-up mode for taking measurements (and reporting such measurements if deemed necessary), and a second wake-up mode for listening for commands from the central system. The two wake-up modes, or combinations thereof, can occur at different intervals.”)

- [0090] (“In one embodiment, the central system queries the ECRVs by sending instructions to one or more of the ECRVs 702-705 instructing the ECRV to transmit its duct temperature.”)
- [0104] (“In one embodiment, the zone thermostats report zone temperatures to the central system and/or the ECRVs at regular intervals. In one embodiment, the zone thermostats report zone temperatures to the central system and/or the ECRVs after the zone temperature has changed by a specified amount specified by a threshold value. In one embodiment, the zone thermostats report zone temperatures to the central system and/or the ECRVs in response to a request instruction from the central system or ECRV.”)
- [0105] (“In one embodiment, the zone thermostats report setpoint temperatures and zone priority values to the central system or ECRVs in response to a request instruction from the central system or ECRVs.”)
- [0107] (“In one embodiment, the ECRVs report sensor data to the central system and/or the zone thermostats in response to a request instruction from the central system or zone thermostat.”)

219. Kates-089 discloses that the ECRV “listens for instructions.” Kates-089, [0076]. As shown in Fig. 7B, one such instruction is received as a

communication when the “Central System 710” communicates with one or more ECRVs (as indicated by the arrows in the figure), to, e.g., issue a “request instruction” for sensor data like temperature. Kates-089, Fig. 7B, [0090], [0107]. As further shown in Fig. 7B, in addition to communicating with ECRVs, central system 710 also communicates with zone thermostats 707-708, and so central system 710 is in communication with the building automation system.

(e) Element [20.d]

220. **Element [20.d] recites “communicating a portion of the identified changed sensor values associated with the first communication received from the second automation component.”** This element is met by Kates-089.

221. **Kates-089 discloses communicating a portion of the identified changed sensor values (e.g., “report sensor data to the central system”) associated with the first communication received from the second automation component (e.g., in response to “request instruction from the central system”).** *See, e.g.,* Kates-089 (emphasis added):

- **Fig. 16:**

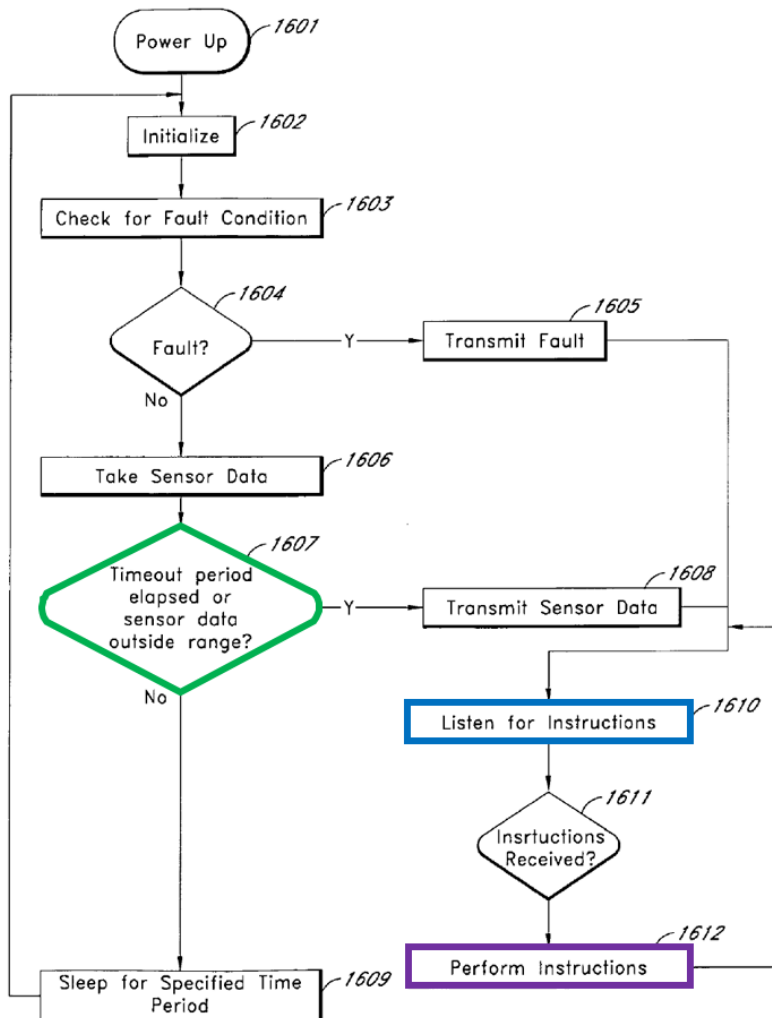


FIG. 16

- [0076] (“FIG. 16 is a flowchart showing one embodiment of an instruction and sensor data reporting loop process 1600 for an ECRV or zone thermostat. The process 1600 begins at a power-up block 1601. After power up, the process proceeds to an initialization block 1602. After initialization, the process advances to a check fault block 1603. If a fault is detected then a

decision block 1604 advances the process to a transmit fault block 1605; otherwise, the process advances to a sensor block 1606 where sensor readings are taken. The data values from one or more sensors are evaluated, and if the sensor data is outside a specified range, or if a timeout period has occurred, then the process advances to a transmit data block 1608; otherwise, the process advances to a sleep block 1609. After transmitting in the transmit fault block 1605 or the transmit sensor data block 1608, the process advances to a listen block 1610 where the ECRV or zone thermostat listens for instructions. If an instruction is received, then a decision block advances the process to a perform instruction block 1612; otherwise, the process advances to the sleep block 1609. After executing the perform instruction block 1612, the process transmits an “instruction complete message” and returns to the listen block 1610.”)

- [0079](“In one embodiment, the ECRV is bi-directional and configured to receive instructions from the central system. Thus, for example, the central system can instruct the ECRV to: perform additional measurements; go to a standby mode; wake up; report battery status; change wake-up interval; run self-diagnostics and report results; etc.”)

- [0090] (“In the systems 700, 750, 800, 900 (the centralized systems) the zone thermostats 707, 708 send room temperature and setpoint temperature information to the central system. In one embodiment, the zone thermostats 707, 708 also send temperature slope (e.g., temperature rate of rise or fall) information to the central system. In the systems where the thermostat 720 is provided to the central system or where the central system controls the HVAC system, the central system knows whether the HVAC system is providing heating or cooling; otherwise, the central system used duct temperature information provide by the ECRVs 702-705 to determine whether the HVAC system is heating or cooling. In one embodiment, ECRVs send duct temperature information to the central system. In one embodiment, the central system queries the ECRVs by sending instructions to one or more of the ECRVs 702-705 instructing the ECRV to transmit its duct temperature.”)
- [0107] (“In one embodiment, the ECRVs report sensor data (e.g., duct temperature, airflow, air velocity, power status, actuator position, etc.) to the central system and/or the zone thermostats at regular intervals. In one embodiment, the ECRVs report sensor data to the central system and/or the zone thermostats whenever the sensor data fails a threshold test (e.g.,

exceeds a threshold value, falls below a threshold value, falls inside a threshold range, or falls outside a threshold range, etc.). In one embodiment, the ECRVs report sensor data to the central system and/or the zone thermostats in response to a request instruction from the central system or zone thermostat.")

222. Kates-089 discloses that, in response to a “query” for the most recent sensor data in the form of a “request instruction,” e.g., for “additional measurements,” the ECRV will “perform [the] instructions” by reporting that most recent sensor data to the central system. Kates-089, [0076], [0079], [0090], [0107].

(f) Claim [21]

223. **Claim [21] recites “The method of claim 20, wherein identifying changed sensor values includes identifying changed sensor values as a function of a change-of-value threshold.”** This claim is met by Kates-089.

224. **Kates-089 discloses that identifying changed sensor values includes identifying changed sensor values as a function of a change-of-value threshold** (*see* [20.b]). *See, e.g.,* Kates-089 (emphasis added):

- **[0076]** (“If a fault is detected then a decision block 1604 advances the process to a transmit fault block 1605; otherwise, the process advances to a sensor block 1606 where sensor readings are taken. The data values from one or more sensors are evaluated, and if the sensor data is outside a

specified range, or if a timeout period has occurred, then the process advances to a transmit data block 1608; otherwise, the process advances to a sleep block 1609.”)

- **[0104]** (“[0104] In one embodiment, the zone thermostats report zone temperatures to the central system and/or the ECRV s at regular intervals. In one embodiment, the zone thermostats report zone temperatures to the central system and/or the ECRV s after the zone temperature has changed by a specified amount specified by a threshold value. In one embodiment, the zone thermostats report zone temperatures to the central system and/or the ECRVs in response to a request instruction from the central system or ECRV.”)
- **[0107]** (“In one embodiment, the ECRVs report sensor data (e.g., duct temperature, airflow, air velocity, power status, actuator position, etc.) to the central system and/or the zone thermostats at regular intervals. In one embodiment, the ECRVs report sensor data to the central system and/or the zone thermostats whenever the sensor data fails a threshold test (e.g., exceeds a threshold value, falls below a threshold value, falls inside a threshold range, or falls outside a threshold range, etc.). In one embodiment, the ECRVs report sensor data to the central system and/or the

zone thermostats in response to a request instruction from the central system or zone thermostat.”)

225. Kates-089 teaches a “threshold range” that is a change-of-value threshold because each sensor value is evaluated after it is read to determine whether the value “falls inside a threshold range, or outside a threshold range.” Kates-089, [0076], [0104], [0107]. If a sensor value fails this evaluation (e.g., “has changed by a specified amount specified by a threshold value”), then the sensor data is communicated to a central system. *Id.* Kates-089 thus discloses identifying which values should be transmitted using a change-of-value function; namely, a function that determines whether to communicate the sensor data based on whether the latest sensor reading has changed such that it falls inside or outside an acceptable threshold range.

X. SECONDARY CONSIDERATIONS

226. I have not seen any evidence in the prosecution history of the '282 patent or any related application that I considered of any arguments regarding secondary considerations exist. Nor have I seen any evidence that any such evidence would have a nexus to any of the Challenged Claims 1-5, 7-11, 13-16, and 20-21. Moreover, as shown above with respect to the prior art referenced in Section IX, any alleged solutions to problems or unexpected results in the '282 patent were already well known.

XI. CONCLUSION

227. In summary, I have concluded that the Challenged Claims 1-5, 7-11, 13-16, and 20-21 are anticipated and/or rendered obvious over the prior art references as discussed above. Specifically, in my opinion, for at least the reasons above, Challenged Claims 1-5, 7-11, 20-21 of the '282 patent are disclosed and rendered obvious as follows:

Ground	'282 Patent Claims	Anticipation or Obviousness	Prior Art References
1	1-5, 7-11, 20-21	Anticipated and obvious	McFarland (both disclosed and obvious)
2	13-16	Obvious	McFarland in view of Kates-089
3	1-5, 7-11, 20-21	Obvious	McFarland in view of Stoner
4	13-16	Obvious	McFarland in view of Stoner and Kates-089
5	1-5, 7-11, 20-21	Obvious	McFarland in view of Ahmed-629
6	13-16	Obvious	McFarland in view of Kates-089 and Ahmed-629
7	1-5, 7-11, 20-21	Obvious	McFarland in view of Stoner and Ahmed-629
8	13-16	Obvious	McFarland in view of Stoner, Kates-089, and Ahmed-629
9	20-21	Obvious	Kates-089 in view of Ahmed-629

228. To the extent it is argued that any further disclosure is required for an element in Challenged Claims 1-5, 7-11, 13-16, or 20-21 that I have identified as being disclosed, a person having ordinary skill in the art would certainly have found that element obvious to include based on the same explicit disclosure or inherent disclosures and analysis I have identified above.

229. I reserve the right to supplement my opinions in the future to respond to any arguments that Patent Owner or its expert(s) may raise and to take into account new information as it becomes available to me.

230. In signing this declaration, I recognize 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 also recognize that I may be subject to cross-examination in the 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.

231. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further 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.

Executed this March 6, 2023, in Dripping Springs, TX.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Dean Neikirk", with a long horizontal flourish extending to the right.

Dr. Dean P. Neikirk, Ph.D.

Appendix A

Dean P. Neikirk

Emeritus Professor, Emeritus Cullen Trust for Higher Education Professorship in Engineering
Department of Electrical and Computer Engineering
Cockrell School of Engineering
The University of Texas at Austin
Austin, TX 78712

Education:

Oklahoma State University (Physics and Mathematics; with Honors)	B.S.	1979
California Institute of Technology (Applied Physics)	M.S.	1981
California Institute of Technology (Applied Physics)	Ph.D.	1984

Professional Experience:

Assistant Professor, University of Texas at Austin, Jan. 1984 - Aug. 1988
Associate Professor, University of Texas at Austin, Sept. 1988- Aug. 1992
Full Professor, University of Texas at Austin, Sept. 1992-Jan. 2021
Associate Dean of Graduate Studies, Aug. 2014 – Jan. 2021
Emeritus Professor, Feb. 2021 - present

Honors and Awards:

- 1984 Marconi International Fellowship Young Scientist Award "for contributions to the development of millimeter wave integrated circuits especially in the areas of detectors and imaging arrays."
- Listed in the Second Edition of Who's Who in Frontiers of Science and Technology, 5th Edition of Who's Who in Technology Today, 1994 American Men & Women of Science; 1985 Outstanding Young Man of America, 1989 Outstanding Young Man of America; 7th Edition of Who's Who in Technology.
- 1984-85 Engineering Foundation Faculty Award, University of Texas at Austin Engineering Foundation Advisory Council.
- 1985-90 General Motors Foundation Centennial Teaching Fellowship, University of Texas at Austin.
- 1985-86 IBM Corporation Faculty Development Award
- 1986 National Science Foundation Presidential Young Investigator.

- 1987 Award for Outstanding Engineering Teaching by an Assistant Professor, College of Engineering, University of Texas at Austin.
- 1990-1992 Temple Foundation Endowed Faculty Fellowship (No. 1), University of Texas at Austin.
- 1992-present Cullen Trust for Higher Education Professorship in Engineering (No. 7), University of Texas.
- 1997 College of Engineering Award for Outstanding Teaching in the Department of Electrical and Computer Engineering, University of Texas at Austin.
- 2003 Department of Electrical and Computer Engineering Gordon T. Lepley IV Endowed Memorial Teaching Award, University of Texas at Austin.
- 2007 Lockheed Martin Aeronautics Company Award for Excellence in Engineering Teaching
 - each year since 1956, Lockheed Martin and its predecessor, has sponsored an award for excellence in engineering teaching to reward one College of Engineering faculty member for exceptional teaching. This prestigious award is given to a faculty member dedicating time and energy in abundance to teaching undergraduate and graduate students. As a result, his or her work leaves a mark of excellence on the entire College of Engineering. Nominations for this award are made by The University of Texas at Austin engineering students and faculty. Final selection is made by a committee composed the five most recent faculty recipients of the award and the student presidents of the Student Engineering Council (SEC) and the Graduate Engineering Council (GEC).
- 2015 Civitatis Award: The University of Texas at Austin Civitatis Award was established in 1997 to recognize outstanding faculty citizenship. The Civitatis Award is conferred upon a member of the faculty in recognition of dedicated and meritorious service to the University above and beyond the regular expectations of teaching, research, and writing. The award is made by the President upon the recommendation of the Faculty Council Executive Committee. Prof. Neikirk was nominated for the award for his “extensive, effective and distinguished service record to his department, college and [the] University of Texas.”

Vita for Dean P. Neikirk:

Dean P. Neikirk received the B.S. degree (1979) in physics from Oklahoma State University, and the M.S. (1981) and Ph.D. (1984) degrees in applied physics from the California Institute of Technology. He joined the faculty of The University of Texas at Austin in 1984, and is currently a Professor in the Department of Electrical and Computer Engineering, holding the Cullen Trust for Higher Education Professorship in Engineering (No. 7). Dr. Neikirk developed the first monolithic, high resolution focal plane detector array for use at wavelengths between 0.1 mm and 1 mm, and in 1984 received the Marconi International Fellowship Young Scientist Award "for contributions to the development of millimeter wave integrated circuits especially in the area of detectors and imaging arrays."

He has also been named a 1986 National Science Foundation Presidential Young Investigator.

Dr. Neikirk's research interests concentrated on the fabrication and modeling of electromagnetic and micromachined sensors and actuators. His work also included projects involving integrated circuit processing and the high frequency properties of transmission lines. His work concentrated on the use of advanced fabrication techniques, including silicon micromachining, for new device and sensor development. Dr. Neikirk developed the teaching laboratory for semiconductor device fabrication at The University of Texas at Austin, and was an active member of The University of Texas at Austin Microelectronics Research Center. Recently Dr. Neikirk's research project related to the development of new chemical sensors (an "electronic taste" sensor) was selected for a commercialization venture between the University of Texas and LabNow, Inc. Dr. Neikirk has also served as the Graduate Advisor of the Department of Electrical and Computer Engineering at UT-Austin, an Associate Chairman of the ECE Department, the Chair of the UT-Austin Graduate Assembly, the Chair of the UT-Austin Faculty Council, the Secretary of the General Faculty at UT-Austin, and as an Associate Dean of the University of Texas at Austin Graduate School.

Professional Societies:

Lifetime Senior Member, Institute of Electrical and Electronics Engineers
• Associate Editor for Solid State and VLSI Electronics, **IEEE Transactions on Education** (March 1991- Oct. 1994)

Commercialization of Technology:

Two companies have been founded based on technology developed by Dr. Neikirk's research group. In both cases the technology was developed at The University of Texas at Austin and licensed to start-ups.

From a University of Texas news release:

Firm commercializing University of Texas technology rounds up \$14 million venture capital investment (October 1, 2004)

AUSTIN, Texas—LabNow Inc. has received \$14 million in first-round venture investment for its point-of-care diagnostic system from the Soros Group, Austin Ventures and other investors.

The money will be used to develop the company's technology and to launch its initial product, CD4Now™, a point-of-care diagnostic tool for HIV/AIDS patients.

The device, which is based on technology developed at The University of Texas at Austin, quickly and accurately analyzes complex fluids such as blood.

Patents

1. US Patent 5,080,870: "Sublimating and Cracking Apparatus," Jan. 14, 1992; Inventors: B. G. Streetman, T. J. Mattord, D. P. Neikirk
2. US Patent 5,408,107: "Semiconductor Device Having Multiple Current-Voltage Curves and Zero-Bias Memory," April 18, 1995;
Inventors: Dean P. Neikirk and Kiran Kumar Gullapalli
3. US Patent 6,589,779: "General signaling protocol for chemical receptors in immobilized matrices," July 8, 2003;
Inventors: McDevitt; John T.; Anslyn; Eric V.; Shear; Jason B.; Neikirk; Dean P.
Assignee: Board of Regents, The University of Texas System (Austin, TX)
4. US Patent 6,602,702: "Detection system based on an analyte reactive particle," August 5, 2003
Inventors: McDevitt; John T. (Austin, TX); Anslyn; Eric V. (Austin, TX); Shear; Jason B. (Austin, TX); Neikirk; Dean P. (Austin, TX)

Assignee: The University of Texas System (Austin, TX)

5. US Patent 6,649,403: "Method of preparing a sensor array," November 18, 2003
Inventors: McDevitt; John T. (Travis, TX); Anslyn; Eric V. (Austin, TX); Shear; Jason B. (Austin, TX); Neikirk; Dean P. (Travis, TX)
Assignee: Board of Regents, The University of Texas Systems (Austin, TX)
6. US Patent 6,680,206, "Sensor arrays for the measurement and identification of multiple analytes in solutions," January 20, 2004
Inventors: McDevitt; John T. (Travis, TX); Anslyn; Eric V. (Austin, TX); Shear; Jason B. (Austin, TX); Neikirk; Dean P. (Travis, TX)
Assignee: Board of Regents, The University of Texas Systems (Austin, TX)
7. US Patent 6,713,298, "Method and apparatus for the delivery of samples to a chemical sensor array," March 30, 2004
Inventors: McDevitt; John T. (Travis, TX); Anslyn; Eric V. (Travis, TX); Shear; Jason B. (Travis, TX); Neikirk; Dean P. (Travis, TX)
Assignee: Board of Regents, The University of Texas System (Austin, TX)
8. US Patent 6,908,770, "Fluid based analysis of multiple analytes by a sensor array," June 21, 2005
Inventors: McDevitt; John T. (Austin, TX); Anslyn; Eric V. (Austin, TX); Shear; Jason B. (Austin, TX); Neikirk; Dean P. (Austin, TX)
Assignee: Board of Regents, The University of Texas System (Austin, TX)
9. US Patent 7,022,517, "Method and apparatus for the delivery of samples to a chemical sensor array," April 4, 2006, filed: July 14, 2000
Inventors: McDevitt; John T. (Austin, TX); Anslyn; Eric V. (Austin, TX); Shear; Jason B. (Austin, TX); Neikirk; Dean P. (Austin, TX); Borich; Damon V. (Austin, TX)
Assignee: Board of Regents, The University of Texas System (Austin, TX)
10. US Patent 7,316,899, "Portable sensor array system," January 8, 2008, filed: January 31, 2001
Inventors: McDevitt; John T. (Austin, TX); Anslyn; Eric V. (Austin, TX); Shear; Jason B. (Austin, TX); Neikirk; Dean P. (Austin, TX)
Assignee: Board of Regents, The University of Texas System (Austin, TX)
11. US Patent 7,491,552, "Fluid based analysis of multiple analytes by a sensor array," February 17, 2009, filed: January 20, 2005
Inventors: McDevitt; John T. (Austin, TX); Anslyn; Eric V. (Austin, TX); Shear; Jason B. (Austin, TX); Neikirk; Dean P. (Austin, TX)
Assignee: Board of Regents, The University of Texas System (Austin, TX)
12. United States Patent 7,651,868, "Method and system for the analysis of saliva using a sensor array," January 26, 2010, Filed: December 13, 2004

Inventors: McDevitt; John T. (Austin, TX), Anslyn; Eric V. (Austin, TX), Shear; Jason B. (Austin, TX), Neikirk; Dean P. (Austin, TX), Christodoulides; Nick J. (Austin, TX)

Assignee: The Board of Regents of The University of Texas System (Austin, TX)

13. United States Patent 8,101,431, "Integration of fluids and reagents into self-contained cartridges containing sensor elements and reagent delivery systems," January 24, 2012, Filed: December 22, 2004

Inventors: McDevitt; John T. (Austin, TX), Ballard; Karri L. (Pflugerville, TX), Floriano; Pierre N. (Austin, TX), Christodoulides; Nick J. (Austin, TX), Neikirk; Dean (Austin, TX), Anslyn; Eric (Austin, TX), Shear; Jason (Austin, TX)

Assignee: Board of Regents, The University of Texas System (Austin, TX)

14. United States Patent 8,105,849, "Integration of fluids and reagents into self-contained cartridges containing sensor elements," January 31, 2012, Filed: December 22, 2004

Inventors: McDevitt; John T. (Austin, TX), Ballard; Karri L. (Pflugerville, TX), Floriano; Pierre N. (Austin, TX), Christodoulides; Nick J. (Austin, TX), Neikirk; Dean (Austin, TX), Anslyn; Eric (Austin, TX), Shear; Jason (Austin, TX)

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15. United States Patent 8,257,967, "Method and system for the detection of cardiac risk factors," September 4, 2012, Filed: April 28, 2003

Inventors: McDevitt; John T. (Austin, TX), Anslyn; Eric V. (Austin, TX), Shear; Jason B. (Austin, TX), Neikirk; Dean P. (Austin, TX), Christodoulides; Nick J. (Austin, TX)

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16. United States Patent 9,291,586, "Passive wireless self-resonant sensor," March 22, 2016, Filing Date: May 5, 2013

Inventors: Neikirk, Dean P. (Austin, TX, US), Pasupathy, Praveenkumar (Austin, TX, US), Zhang, Sheng (Austin, TX, US), Leonhardt, Brad (Austin, TX, US), Ekerdt, John G. (Austin, TX, US), Korgel, Brian A. (Austin, TX, US), Holmberg, Vincent C. (Seattle, WA, US), Shipman, Catherine D. (Reston, TX, US), Bogart, Timothy D. (Oxford, GB), Chockla, Aaron (Chicago, IL, US)

Assignee: Board of Regents, The University of Texas System (Austin, TX, US)

17. United States Patent 9,581,559, "Corrosion detection sensor embedded within a concrete structure with a diffusion layer placed over the sacrificial transducer," February 28, 2017, Filing Date: August 14, 2014

Inventors: Neikirk; Dean P. (Austin, TX), Wood; Sharon L. (Austin, TX), Pasupathy; Praveenkumar (Austin, TX), Yosef; Ali Abu (Austin, TX)

Assignee: Board of Regents, The University of Texas System (Austin, TX)

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4. D. B. Rutledge, D. P. Neikirk, P.P. Tong, P.E. Young, W.A. Peebles, N.C. Luhmann, Jr., and R.J. Taylor, "Demonstration of a FIR Imaging System as a Multi-Channel Interferometer," 25th Ann. APS Meeting, Div. of Plasma Physics, Nov., 1983.
5. P.E. Young, N.C. Luhmann, Jr., R.J. Taylor, D. P. Neikirk, and D. B. Rutledge, 26th Annual Meeting of the Division of Plasma Physics, Boston, MA, Oct 29- Nov 2, 1984.
6. D.L. Brower, W.A. Peebles, S. Kim, R.L. Savage, Jr., T. Lehecka, N.C. Luhmann, Jr., J. Wagner, D. B. Rutledge, D. P. Neikirk, P.E. Young, and H.K. Park, "Recent advances in multichannel far-infrared collective scattering and interferometry systems," Eleventh Symposium on Fusion Engineering, Austin, TX, Nov. 18-22, 1985.
7. A.C. Campbell, V.P. Kesan, G.E. Crook, C.M. Maziar, D. P. Neikirk, and B. G. Streetman, "Capacitive Hysteresis Effects in 5.0nm single and double barrier AlAs Tunneling Structures," 8th Molecular Beam Epitaxy Workshop, Los Angeles CA, September 9-11, 1987.
8. A.C. Campbell, V.P. Kesan, G.E. Crook, D. P. Neikirk, and B. G. Streetman, "Capacitance Transient Analysis of GaAs/AlAs Tunneling Structures," 1988 Electronics Materials Conference, University of Colorado, Boulder, Colorado, June 22-24, 1988.
9. V.P. Kesan, A. Dodabalapur, D. P. Neikirk, and B. G. Streetman, "Influence of MBE Growth and Rapid Thermal Annealing Conditions on the Electrical Properties of Normal and Inverted AlGaAs/InGaAs Pseudomorphic HEMT Structures," IEEE 46th Annual Device Research Conference, June 20-22, 1988, Boulder, CO.

10. A. Dodabalapur, V.P. Kesan, T.R. Block, D. P. Neikirk, and B. G. Streetman, "Optical and Electrical Characteristics of Normal and Inverted AlGaAs/InGaAs Pseudomorphic HEMT Structures Processed by RTA," 9th Molecular Beam Epitaxy Workshop, West Lafayette, Indiana, September 21-23, 1988.
11. A. Sharif, D. P. Neikirk, and D.R. Diller, "Design and Fabrication of a Multi-Sensor Cryomicroscope Stage using VLSI Technology," Cryo 89, Charleston, SC, June 1989, published in **Physics in Medicine and Biology** 33.
12. A. Dodabalapur, V.P. Kesan, D. P. Neikirk, B. G. Streetman, M.H. Herman, and I.D. Ward, "Photoluminescence and Electoreflectance Characterization of Modulation-Doped Quantum Wells," Journal of Electronic Materials 18, July 1989, p. 51.
13. V.K. Reddy and D. P. Neikirk, "Influence of Growth Interruption on I - V Characteristics of AlAs/GaAs Double Barrier Resonant Tunneling Diodes," 11th Annual Molecular Beam Epitaxy Workshop, Austin TX, Sept. 16-18, 1991.
14. A.J. Tsao, V.K. Reddy, D.R. Miller, K.K. Gullapalli, and D. P. Neikirk, "The effect of barrier thickness asymmetries on the electrical characteristics of AlAs/GaAs double barrier resonant tunneling diodes," 11th Annual Molecular Beam Epitaxy Workshop, Austin TX, Sept. 16-18 1991.
15. T.R. Block, D. P. Neikirk, and B. G. Streetman, "MBE growth condition dependence of RHEED dampening and QW photoluminescence," Twelfth North American Conference on Molecular Beam Epitaxy, Ottawa, Canada, Oct. 12-14, 1992.
16. T.J. Mattord, D. P. Neikirk, A. Srinivasan, A. Tang, K. Sadra, Y.C. Shih, and B. G. Streetman, "Real time flux monitoring and feedback control of a valved arsenic source" Twelfth North American Conference on Molecular Beam Epitaxy, Ottawa, Canada, Oct. 12-14, 1992.
17. Y.C. Shih, D. P. Neikirk, and B. G. Streetman, "Effects of As flux on Si δ -doped GaAs," Twelfth North American Conference on Molecular Beam Epitaxy, Ottawa, Canada, Oct. 12-14, 1992.
18. Y. Kim and D. P. Neikirk, "Monolithically integrated optically interrogated pressure microsensor," **J. Acoust. Soc. Am.**, Vol. 92, No. 4 (pt. 2), October 1992, p. 2353.
19. O. Hartin, D. P. Neikirk, A. Anselm, and B. Streetman, "Memory Switching Simulation in Resonant Tunneling Devices," 1997 American Physical Society March Meeting, Kansas City, MO, March 17-21, Bulletin of the American Physical Society, Vol. 42, No. 1, 1997, p. 548.
20. O. Hartin and D. P. Neikirk, "Tight Binding Simulation of Memory Switching in Resonant Tunneling Devices," 1997 American Physical Society International Conference on Computational Physics, University of California, Santa Cruz, Aug. 25, 1997.

21. D. Neikirk, "Embedded Passive Sensors for State Monitoring," presented at NSF Workshop on Exploring the Uses of Autoadaptive Media in Geotechnical Earthquake Engineering, Austin, TX, January 10-12 2001.

22. Lavigne, John J.; Savoy, Steve; Best, Michael; Anslyn, Eric V.; Shear, Jason B.; McDevitt, John T.; Neikirk, Dean, "Toward the development of an 'electronic tongue'," Book of Abstracts, 219th ACS National Meeting, San Francisco, CA, March 26-30, 2000 (2000), AGFD-193.

23. Wood, Sharon; Neikirk, Dean, "Development of a passive sensor to detect cracks in welded steel construction," US-Japan Joint Workshop and Third Grantees Meeting, US-Japan Cooperative Research in Urban Earthquake Disaster Mitigation, Monbu-Kgagku-sho and The National Science Foundation, Seattle, August 15-16, 2001.

24. McCleskey, Shawn C.; Goodey, Adrian P.; Rodriguez, Marc D.; McDevitt, John T.; Anslyn, Eric V.; Neikirk, Dean P., "Development of a multi-component sensor array for the simultaneous detection of various analytes in solution," Abstracts of Papers, 222nd ACS National Meeting, Chicago, IL, United States, August 26-30, 2001.

D. Other Major Publications

V. Kesan and D. P. Neikirk, "Quantum Well Devices," **Microwaves and RF**, vol. 25, July 1986, pp. 93-97.

D. P. Neikirk, P. Cheung, M.S. Islam, and T. Itoh, "Optically Controlled Coplanar Waveguide Phase Shifters," **Microwave Journal**, Dec. 1989, pp. 77-88.

D. P. Neikirk, "Quantum Wells and Other Deep Subjects," **Discovery**, Vol. 11, No. 3, 1989, pp. 5-8.

S. M. Wentworth, J. M. Lewis, and D. P. Neikirk, "Antenna-Coupled Thermal Detectors of mm-Wave Radiation," **Microwave Journal**, Jan. 1993, pp. 94-103.

E. Book Chapter

D. B. Rutledge, D. P. Neikirk, and D. Kasilingam "Integrated- Circuit Antennas," in **Infrared and Millimeter Waves**, vol. 11, editor K.J. Button, 1984.

Nicolaos Christodoulides, Priya Dharshan, Jorge Wong, Pierre N. Floriano, Dean Neikirk and John T. McDevitt, "A Microchip-Based Assay for Interleukin-6," In: *Methods in Molecular Biology*, Volume 385: Microchip-Based Assay Systems, Humana Press, ISBN 978-1-58829-588-0 (Print) 978-1-59745-426-1 (Online), Copyright 2008, pages 131-144.

F. Technical Reports

C-K Tzuang, D. P. Neikirk, and T. Itoh, "Finite Element Analysis of Slow-Wave Schottky Contact Printed Lines," Microwave Laboratory Report No. 87-P-2, AFOSR Grant 86-0036, Feb., 1987.

D. P. Neikirk and T. Itoh, "Monolithic Phase Shifter Study," Microwave Laboratory Report No. 87-P-3, AFOSR Grant 86-0036, Jan., 1987.

V. P. Kesan and D. P. Neikirk, "Quantum Well Devices," Electrical Engineering Research Laboratory Report No. 87-P-8, Joint Services Electronics Program Research Contract AFOSR F49620-86-C-0045, August 7, 1987.

Stuart M. Wentworth and D. P. Neikirk, "High Frequency Characteristics of Tape Automated Bonding (TAB) Interconnects," Microwave Laboratory Report No. 87-P-7, August 26, 1987.

Stuart M. Wentworth and D. P. Neikirk, "Characterization of Tape Automated Bonding (TAB) Interconnects at High Frequency," Microwave Laboratory Report No. 87-P-9, October 23, 1987.

D. P. Neikirk and T. Itoh, "Monolithic Phase Shifter Study," Microwave Laboratory Report No. 90-P-1, Final Technical Report for AFOSR Grant 86-0036, Feb., 1990.

A. Mortazawi, D. Neikirk, and T. Itoh, "Microwave and millimeter wave oscillators and planar power combining structures for QWITT and Gunn diodes," Microwave Laboratory Report No. 90-P-4, Technical Report for ARO Grant DAAL03-88-K-0005 and JSEP Grant F49620-89-0044, Aug., 1990.

Oral Presentations

A. Professional Society Presentation

D. B. Rutledge and D. P. Neikirk, "Imaging Antenna Arrays," Invited Keynote Speakers, Sixth International Conference on Infrared and Millimeter Waves, Miami, Fl., Dec. 7-12, 1981.

D. P. Neikirk and D. B. Rutledge, "Advances in Microbolometers," Invited Keynote Speakers, Eighth International Conference on Infrared and Millimeter Waves, Miami, Fl., Dec. 12-17, 1983.

D. P. Neikirk, "Optically Controlled Coplanar Waveguide Millimeter Wave Phase Shifter," Tenth International Conference on Infrared and Millimeter Waves, Lake Buena Vista, Fl., Dec. 9-13, 1985.

D. P. Neikirk, "Picosecond Response of an Optically Controlled Millimeterwave Phase Shifter," Second Topical Meeting on Picosecond Electronics and Optoelectronics, Jan., 1987.

D. P. Neikirk, "Influence of Transit Time Effects on the Optimum Design and Maximum Oscillation Frequency of Quantum Well Oscillators," 12th International Conference on Infrared and Millimeter Waves, Dec. 14-18, 1987.

D. P. Neikirk, "Measurements of an Optically Controlled Coplanar Waveguide Phase-Shifter," 12th International Conference on Infrared and Millimeter Waves, Dec. 14-18, 1987.

D. P. Neikirk, "High Frequency Characterization of Tape-Automated Bonding Interconnects," 5th Annual Texas Regional Symposium, International Society of Hybrid Manufacturing, April 11, 1988.

D. P. Neikirk, "Time Dependent Simulation of the Quantum Well Injection Transit Time Diode," 13th International Conference on Infrared and Millimeter Waves, Dec. 5-9, 1988.

D. P. Neikirk, "Experimental Performance of a Periodically Illuminated Optically Controlled Coplanar Waveguide Phase Shifter," 13th International Conference on Infrared and Millimeter Waves, Dec. 5-9, 1988.

B. Invited Lectures

1. D. P. Neikirk, "Exotic Heterojunction Devices for Microwave Circuits," NSF Workshop on Future Research Opportunities in Electromagnetics, Arlington, TX., January 29-31, 1986.

2. D. P. Neikirk, "Optical Control of a Monolithic Millimeter Phase Shifter," ARO Workshop on Fundamental Issues in Millimeter and Submillimeter Waves, Los Angeles, Ca., Sept. 15-16, 1986.

3. Dean P. Neikirk, "Quantum Well Oscillators for Millimeter Wave Applications," 1987 Workshop on Compound Semiconductor Microwave Materials and Devices (WOCSEMMAD), Hilton Head Island, S.C., March 2-4, 1987.

4. S.M. Wentworth and D. P. Neikirk, "High Frequency Tape-Automated Bonding (TAB) Interconnect Characterization," IEEE 6th Annual VLSI and GaAs Packaging Workshop, Sept. 14-16, 1987.

5. D. P. Neikirk, "The quantum well injection transit time diode," Engineering Foundation Conference on Advanced Heterostructure Transistors, Keauhou-Kona, Hawaii, Dec. 5-10, 1988.
6. D. P. Neikirk, ""The High Frequency Characteristics of Tape Automated Bonding (TAB) Interconnects," presented to the Microelectronics and Computer Technology Corporation, April 19, 1989.
7. Dean P. Neikirk, "Impedance measurements of quantum well diodes for millimeter wave applications," 1990 Workshop on Compound Semiconductor Microwave Materials and Devices (WOCSEMMAD), San Francisco, CA., Feb. 12-14, 1990.
8. Dean P. Neikirk, "Twin-slot multi-layer substrate-supported antennas and detectors for terahertz imaging," First International Symposium on Space Terahertz Technology, University of Michigan, Ann Arbor, Mich., March 5-6, 1990.
9. Dean P. Neikirk, "Microwave and Millimeterwave Oscillators using Quantum Well Diodes," Joint IEEE MTT/ED Dallas Chapter meeting, Sept. 27, 1990.
10. Dean P. Neikirk, "Quantum Transport Simulations of Resonant Tunneling Diodes," 1991 Workshop on Compound Semiconductor Microwave Materials and Devices (WOCSEMMAD), Ft. Lauderdale, FL., Feb. 18-20, 1991.
11. Dean P. Neikirk, "The Application of Physics in Electrical Engineering (or is it Engineering in Physics?): Electromagnetics in Very High Frequency Semiconductor Devices," Physics Colloquium, Oklahoma State University, March 5, 1992.
12. D. P. Neikirk and B. G. Streetman, "MBE growth of multilayer heterostructures for photonic and high-speed electronic devices," Engineering Foundation Conference on High Speed Optoelectronic Devices and Circuits II, Banff, Alberta, Canada, Aug. 9-13, 1992.
13. L. T. Pillage, D. P. Neikirk, and R. Mercer, "Design automation techniques and algorithms for application specific electronic modules (ASEMs)," ARPA Electronic Packaging & Interconnect Principle Investigator Meeting, Marina del Ray, CA, Feb. 14-18, 1994.
14. D. P. Neikirk, "Micro-sensors - What happens when you make classical devices small?: Integrated Bolometric Radiation Detectors," Texas Instruments, Dallas, Texas, Oct. 20, 1994.
15. Dean P. Neikirk, "Micromachined sensors," Motorola Sensors Steering Committee, Albuquerque, New Mexico, March 28, 1995.
16. D. P. Neikirk, E. Tuncer, and B.-T. Lee, "The Use of Effective Internal Impedance Approximations in Lossy Transmission Line Modeling," *Progress in Electromagnetics*

Research Symposium PIERS 95, The University of Washington, Seattle, Washington, July 28, 1995.

17. D. P. Neikirk, M. S. Islam, and E. Tuncer, "Accurate Quasi-Static Modeling of Transmission Lines on Semiconducting Substrates," *Progress in Electromagnetics Research Symposium PIERS 95*, The University of Washington, Seattle, Washington, July 28, 1995.

18. D. P. Neikirk, "Impact of Finite Metal Conductivity on Inductance Extraction of Interconnects and Packages," Sematech meeting on Electrical Modeling Challenges Faced by Packaging Designers, Austin, Texas, Nov. 19, 1995.

19. D. P. Neikirk, "Micromachined Fabry-Perot Pressure Transducers," Hughes Research Laboratory, Malibu, California, Nov. 21, 1995.

20. D. P. Neikirk, "Classical Devices Made Small; or 'What's the big deal about little machines?'" , Manufacturing 2000, University of Texas at Austin, Feb. 23, 1996.

21. D. P. Neikirk, "Interconnect Inductance Modeling from DC to the Skin Effect Limit," Quad Designs, Camarillo, CA, July 10, 1996.

22. D. P. Neikirk, "Efficient Conductor Boundary Conditions in the dc to Skin Effect Limit," DARPA MAFET Program Review, Fairfax, VA, Oct. 27-31, 1997.

23. Micromachined Array-based Multi-analyte Chemical Sensors: Towards the Fabrication of an "Electronic Tongue" South, Texas Local Section of The Electrochemical Society Meeting, April 17, 1999.

24. D. P. Neikirk, "Resonant Chemical Surveillance Tags," IEEE Electron Device Chapter, Central Texas Section, September 25, 2008.

25. D.P. Neikirk, "Near Borehole Condition Sensing," Nanotechnology Conference and Trade Show - Nanotech 2009, Houston, TX May 3-7, 2009, Nanotech & Cleantech for Oil & Gas Session, (Session chair: Sean Murphy, Advanced Energy Consortium), May 5, 2009.

26. D.P. Neikirk, "Integrated Threshold Nanosensor Systems," Advanced Oil Consortium Microfabricated Sensors Workshop, Houston Research Center, Bureau of Economic Geology, University of Texas at Austin, September 8th-9th, 2010.

27. D. P. Neikirk, "Sensing systems for "harsh" environments," Engineering Challenges for Deepwater Drilling at the "U.S. Offshore Oil Exploration: Managing Risks to Move Forward," James A. Baker III Institute for Public Policy and PFC Energy, Rice University, Houston, TX, February 11, 2011.

C. Other Conference Presentations

Praveen Pasupathy, Mingxiang Zhuzhou, Shasi K. Munukutla, Dean P. Neikirk, and Sharon L. Wood, “Resonant Wireless Sensor Nets for Civil Infrastructure Health Monitoring,” 2009 National Science Foundation Division of Civil, Mechanical and Manufacturing Innovation (CMMI) Engineering Research and Innovation Conference, Honolulu, Hawaii, June 22-25, 2009.

Technical Consulting

Teltech Resource Network (1985-1993)
Ardex, Inc. (1986-88)
University and Polytechnic Grants Committee, Consultancy to examine Equipment Requirements for the Hong Kong University of Science and Technology, July, 1989
E. P. Hamilton Associates, (1987-90)
Burnett Company, Microwave Heating for Secondary Oil Recovery, July, 1990
Microelectronics and Computer Technology Corporation, June, 1990
Microelectronics and Computer Technology Corporation, Oct., 1994 - Sept., 1996
Baker-Hughes

University Committee Assignments

Departmental:

Graduate Student Financial Aid, Sept. 1984- Sept. 1987
Faculty Recruiting, Sept. 1984- Aug. 1985
Microelectronics Jr. Faculty Recruiting, Sept. 1985- Sept. 1987 (chairman)
ECE Safety Committee, Sept. 1985- Aug. 1993 (chairman, 1985-89)
ECE Electronics Shop Coordinating Committee, March 1986- Aug. 1993
Solid State Electronics Area Graduate Advisor, Aug. 1986- Aug. 89
ECE Space Allocation Committee, Sept. 1989-Aug. 1993 (chairman)
ECE Facilities Committee, Sept. 1993- Aug. 1996 (chairman)
ECE Areas Committee, Electromagnetics/Acoustics, Sept. 1993-present
ECE Ad Hoc Committee to Review the Undergraduate Curriculum, Jan. 1995- Aug. 1995
ECE World Wide Web Home Page Committee, Sept. 1995-Aug. 1996
ECE Ad Hoc Committee to Review the Undergraduate Curriculum, Jan. 1997- Aug. 1997
ECE Areas Committee, Materials and Quantum Electronics, Sept. 1993-present; chairman, Sept. 1996-present
Chair of ECE Graduate Studies Committee, May 1998-August 2006
ECE Chair's council, November 1999-2010
ECE Graduate Advisor, Sept. 1999- 2010
ECE Associate Chair, Sept. 2001-Dec. 2010
ECE peer Faculty Annual Review Committee, Sept. 2012-Aug. 2013

College:

Engineering Scholastic Appeals, Sept. 1984- Aug. 1985
Engineering Safety Committee, Sept. 1985- Aug. 1994 (chairman, Sept. 1989-Aug. 1994)

Aerospace Engineering Machine Shop, Sept. 1989-Aug. 1993
College Annual Report Quality Team, Jan. 1994- Aug. 1994
College Multimedia Committee, Sept. 1995-Aug. 2000
Equal Opportunity in Engineering (EOE) Program, 1995-Dec. 1996
Graduate Fellowship Review Committee, Sept. 2011-Aug. 2013

University:

Presidential Ad Hoc Committee on Research Infrastructure Enhancement, Jan. 1988 - Aug. 1994
Research Safety Advisory Committee, Oct. 1991-present (chairman, Sept. 1996-1999)
Ad Hoc Consultative Committee for the Selection of a Dean of the College of Engineering, Nov. 1995-May 1996
Faculty Building Advisory Committee, Sept. 1995-Aug. 2000; Aug. 2003-Aug. 2004
Ad Hoc Project Committee for Parking Garage # 4A, Sept. 1996-Aug. 2000
Faculty Council, Sept. 1996-Aug. 2000; Sept. 2002 - Aug. 2004
Faculty Advisory Committee on the Budget, Sept. 99 - Aug. 2000; Sept. 2008 – Aug. 2011 (vice chair Sept. 2009- Aug. 2010)
Graduate Assembly, April 1997- Aug. 2000; Sept. 2001 - Aug. 2008
Administrative sub-committee of GA, Sept. 1997-Aug. 1998; Sept. 2006-Aug. 2007
Academic sub-committee of GA, Sept. 1998-Aug. 2000; Sept. 2001-Aug. 2006; Sept. 2007-Aug. 2008
Chair, Graduate Assembly, 2004-2005
Academy of Distinguished Teachers selection committee, academic year 1999-2000
Outstanding Graduate Adviser selection committee, academic year 1999-2000
Outstanding Graduate Coordinator selection committee, academic year 1999-2000
Faculty Council, Sept. 2008 – Aug. 2012; Chair-elect Sept. 2009- Aug. 2010; Chair Sept. 2010- Aug. 2011; past chair: Sept. 2011-Aug. 2012
Faculty Council Executive Committee, Sept. 2009 – Aug. 2012
General Faculty Rules and Governance Committee, Sept. 2010 – Aug. 2015 (Chair, Sept. 2011 – Aug. 2013)
Ad Hoc Consultative Committee for the Selection of a Dean of the Graduate School, Nov. 2012 – Sept. 2012
Secretary of the General Faculty and Faculty Council, Sept. 2013 – Aug. 2015
Committee on Undergraduate Degree Program review, Sept. 2013 – Aug. 2015
Faculty Council Executive Committee, Sept. 2013 – Aug. 2015
Faculty Committee on Committees, *ex officio* member, Sept. 2013 – Aug. 2015

UT System:

Task Force on Doctoral Programs and Post-Doctoral Experience, Spring-Fall 2006

University of Texas System Faculty Advisory Council, Sept. 2009- Aug. 2011

State of Texas:

Texas Higher Education Coordinating Board Graduate Education Advisory Committee (GEAC), September 1, 2015 - August 31, 2018.

Evidence of Teaching Effectiveness

Senior Design Projects:

Umer Yousafzai and Venuka Jayatilaka, Spring 1994

Chris Eiting and Sonny Gonzalez, Spring 1994

David Lee and David Onsongo, Fall 1996

Dave Pyle and Aruna Murthy, Spring 1999

Hitesh Mehta and Edward Zhu, Spring 1999, "Giving the electronic tongue a sense of good taste: image analysis tools and GUI"

Gus Espinosa and Donnie Garcia, Spring 1999, "Design and Implementation of a Computer Interfacing Circuit to Control LED's for use with a Chemical Sensor"

Natthanant Pon Skulkaew and Prem Nainani, Spring 2001, "PC-based data acquisition and wireless transmission system"

Matthew Andringa and Allen Hall, Spring 2001, "Non-Invasive RFID Weld Inspection"

Michael Amalfitano and Sapun Parekh, Spring 2002, "Output circuitry for a transmitter used in an Electronic Structural Surveillance system"

Kunal Patel and Jacy Little, Spring 2002, "Swept, high frequency oscillator to work in an Electronic Structural Surveillance (ESS) system"

Dong Pak, Spring 2002, "Automated image-processing software of an electronic chemical sensor"

Rajesh Nerlikar, Jonathan Solomon, Spring 2003, "Wireless Data Acquisition System for Bluetooth-enabled RFID Readers"

Nola Li, Judith Chen, Maria Huang, Fall 2003, "Design and build a tuning network for a swept frequency reader used in structural health analysis"

Tuenlap (Daniel) Chan, Imranul Islam, Derek Choi, Spring 2004, "Design and build an RFID Interrogator Receiver"

John McKee and Terence Man, Spring 2007, "Improved Corrosion Sensors"

Abdulaziz Beayeyz, Sravan Bhagavatula, Rahul Mitra, Shasi Munukutla, Spyder Spann, Fall 2009, "Portable Corrosion Detector"

Jonathan Pham, Po-Han Wu, Josh Schulte, Pritesh Solanki, Mesele Bedasa, Spring 2011- Fall 2011, "Multi-Sensor Robotics Platform"

Raymund Lee, Simon Chow, Connor Landy, Kevin Woo, and Anirudh Kashyap, Fall 2012-Spring 2013, "Variable Frequency RFID Tag and Reader"

Javier Chacon, Joshua Poncik, Joshua Orozco, Sebastian Salomon, Yongcong Zou, Fall 2013-Spring 2014, "Environmental Sensor Monitoring Network"

Organized Classes Taught:

EE 363M Introduction to Microwaves, Spring 1984, # 16455
EE 396K VLSI Fabrication Techniques, Fall 1984, # 16255
EE 379K Integrated Circuit Fabrication, Spring 1985, # 16055
EE 396K VLSI Fabrication Techniques, Fall 1985, # 16275
EE 379K Integrated Circuit Fabrication, Fall 1985, # 16070
EE 396K VLSI Fabrication Techniques, Spring 1986, # 17680
EE 379K Integrated Circuit Fabrication, Spring 1986, # 17450
EE 396K VLSI Fabrication Techniques, Fall 1986, # 15245
EE 379K Integrated Circuit Fabrication, Fall 1986, # 15020
EE 396K VLSI Fabrication Techniques, Spring 1987, # 15205
EE 379K Integrated Circuit Fabrication, Spring 1987, # 14970
EE 396K VLSI Fabrication Techniques, Fall 1987, # 15010
EE 440 Integrated Circuit Fabrication, Fall 1987, # 14545
EE 363M Introduction to Microwaves, Spring 1988, # 14535
EE 396K VLSI Fabrication Techniques, Spring 1988, # 14865
EE 440 Integrated Circuit Fabrication, Spring 1988, # 14390
EE 396K VLSI Fabrication Techniques, Fall 1988, # 15165
EE 440 Integrated Circuit Fabrication, Fall 1988, # 14705
EE 363M Introduction to Microwaves, Spring 1989, # 14525
EE 396K VLSI Fabrication Techniques, Spring 1989, # 14855
EE 396K VLSI Fabrication Techniques, Fall 1989, # 15165
EE 440 Integrated Circuit Fabrication, Fall 1989, # 14705
EE 363M Introduction to Microwaves, Spring 1990, # 14050
EE 396K VLSI Fabrication Techniques, Spring 1990, # 14355, 14360
EE 440 Integrated Circuit Fabrication, Spring 1990, # 13915, 13920
EE 396K VLSI Fabrication Techniques, Fall 1990, # 14630, 14635
EE 440 Integrated Circuit Fabrication, Fall 1990, # 14200, 14205
EE 363M Introduction to Microwaves, Spring 1991, # 14365
EE 396K VLSI Fabrication Techniques, Spring 1991, # 14660, 14665, 14670
EE 440 Integrated Circuit Fabrication, Spring 1991, # 14220, 14225, 14230
EE 396K VLSI Fabrication Techniques, Fall 1991, # 14865, 14860
EE 440 Integrated Circuit Fabrication, Fall 1991, # 14425, 14430
EE 363M Introduction to Microwaves, Spring 1992, # 14270
EE 396K VLSI Fabrication Techniques, Spring 1992, # 14545, 14550, 14555
EE 440 Integrated Circuit Fabrication, Spring 1992, # 14130, 14135
EE 396K VLSI Fabrication Techniques, Fall 1992, # 15095, 15100, 15105
EE 440 Integrated Circuit Fabrication, Fall 1992, # 14670, 14675
EE 397K Microwave Devices, Spring 1993, # 14805
EE 396K VLSI Fabrication Techniques, Fall 1993, # 14800, 14805, 14810
EE 440 Integrated Circuit Fabrication, Fall 1993, # 14385, 14390
EE 363M Introduction to Microwaves, Spring 1994, # 14370
EE 396K VLSI Fabrication Techniques, Fall 1994, # 14365

EE 440 Integrated Circuit Fabrication, Fall 1994, # 13870
 EE 397K Electromagnetics in Packaging, Spring 1995, # 14555
 EE 396K VLSI Fabrication Techniques, Fall 1995, # 14765
 EE 440 Integrated Circuit Fabrication, Fall 1995, # 14260
 EE 397K Electromagnetics in Packaging, Spring 1996, # 14695
 EE 382M Simulation Methods in CAD/VLSI, Spring 1996, # 14500
 EE 396K VLSI Fabrication Techniques, Fall 1996, # 14535
 EE 440 Integrated Circuit Fabrication, Fall 1996, # 14090
 EE 382M Simulation Methods in CAD/VLSI, Spring 1997, # 14325
 EE 363M Introduction to Microwaves, Spring 1997, # 14120
 EE 396K VLSI Fabrication Techniques, Fall 1997, # 15315
 EE 440 Integrated Circuit Fabrication, Fall 1997, # 14820
 EE 363M Introduction to Microwaves, Spring 1998, # 14530
 EE 397K Microwave Devices, Spring 1998, # 14950
 EE 396K VLSI Fabrication Techniques, Fall 1998, # 15475
 EE 440 Integrated Circuit Fabrication, Fall 1998, # 14965
 EE 363M Introduction to Microwaves, Spring 1999, # 14825
 EE 397K Microwave Devices, Spring 1999, # 15260
 EE 396K VLSI Fabrication Techniques, Fall 1999, # 15340
 EE 440 Integrated Circuit Fabrication, Fall 1999, # 14820
 EE 363M Introduction to Microwaves, Spring 2000, # 14755
 EE 396K VLSI Fabrication Techniques, Fall 2000, # 15600
 EE 440 Integrated Circuit Fabrication, Fall 2000, # 15100
 EE 397K Micro-electromechanical Systems (MEMS), Spring 2001, #15170
 EE 396K VLSI Fabrication Techniques, Fall 2001, # 15725
 EE 440 Integrated Circuit Fabrication, Fall 2001, # 15230
 EE 397K Micro-electromechanical Systems (MEMS), Spring 2002, #15330
 EE 396K VLSI Fabrication Techniques, Fall 2002, # 16050
 EE 440 Integrated Circuit Fabrication, Fall 2002, # 15485
 EE 397K Microwave Devices, Spring 2003, # 15110
 EE 396K VLSI Fabrication Techniques, Fall 2003, # 15580
 EE 440 Integrated Circuit Fabrication, Fall 2003, # 15095
 EE 325 Electromagnetic Engineering, Spring 2004, # 14345
 EE 396K VLSI Fabrication Techniques, Fall 2004, # 16250
 EE 440 Integrated Circuit Fabrication, Fall 2004, # 15715
 EE 396K 26-Microelectromechanical Systems, Spring 2005, # 15690
 EE 396K VLSI Fabrication Techniques, Fall 2005, # 16455
 EE 440 Integrated Circuit Fabrication, Fall 2005, # 15930
 EE 396K VLSI Fabrication Techniques, Fall 2006, # 17040
 EE 440 Integrated Circuit Fabrication, Fall 2006, # 16430
 EE 325 Electromagnetic Engineering, Spring 2007, # 15765
 EE 396K VLSI Fabrication Techniques, Fall 2007, # 17425
 EE 440 Integrated Circuit Fabrication, Fall 2007, # 16770
 EE 396K-26 Microelectromechanical Systems, Spring 2008, # 16815
 EE 396K VLSI Fabrication Techniques, Fall 2008, # 17380
 EE 325 Electromagnetic Engineering, Spring 2009, # 16000

EE 396K-24 Microwave Devices, Spring 2010, # 16975
 EE 396K VLSI Fabrication Techniques, Fall 2010, # 17075, 17080, 17085, 17090
 EE 440 Integrated Circuit Fabrication, Fall 2010, # 16540, 16545, 16550, 16555
 EE 396K VLSI Fabrication Techniques, Fall 2011, # 17295, 17300, 17305, 17310
 EE 440 Integrated Circuit Fabrication, Fall 2011# 16760, 16765, 16770, 16775
 EE 396K 26-Microelectromechanical Systems, Spring 2012, #17070
 EE 396K VLSI Fabrication Techniques, Fall 2012, # 17185, 17190, 17195, 17200
 EE 440 Integrated Circuit Fabrication, Fall 2012, # 16640, 16645, 16650, 16665
 EE 363M Introduction to Microwaves, Spring 2013, # 16605
 EE 396K Ultra Large Scale Integrated Circuit Fabrication Techniques, Fall 2013, # 17425, 17430, 17435, 17440
 EE 440 Integrated Circuit Nanomanufacturing Techniques, Fall 2013, # 16790, 16795, 16800, 16805
 EE 396K-24 Microwave Devices. Spring 2014, #17440
 EE 396K Ultra Large Scale Integrated Circuit Fabrication Techniques, Fall 2014, #17525, 17530, 17535, 17540
 EE 440 Integrated Circuit Nanomanufacturing Techniques, Fall 2014, #16960, 16965, 16970, 16975
 EE 363M Microwave and Radio Frequency Engineering, Spring 2015, #16355
 EE 396K Ultra Large Scale Integrated Circuit Fabrication Techniques, Fall 2015, #16965, 16970, 16975
 EE 440 Integrated Circuit Nanomanufacturing Techniques, Fall 2015, #16480, 16485, 16490
 EE 363M Microwave and Radio Frequency Engineering, Spring 2016, #16550
 EE 396K Ultra Large Scale Integrated Circuit Fabrication Techniques, Fall 2016
 EE 440 Integrated Circuit Nanomanufacturing Techniques, Fall 2016
 EE 396K 26-Microelectromechanical Systems, Spring 2017
 EE 363M Microwave and Radio Frequency Engineering, Spring 2018, #15890
 EE 363M Microwave and Radio Frequency Engineering, Spring 2019, #16625
 EE 363M Microwave and Radio Frequency Engineering, Spring 2020, #16695

Continuing Education Courses Taught

"Microelectronics Fabrication - Chemical Aspects," with Isaac Trachtenberg,
 Continuing Engineering Studies, College of Engineering, The University of
 Texas at Austin, June 1-4, 1987.
 "Integrated Circuit Process & Design," with M. R. Mercer, Motorola short course,
 Continuing Engineering Studies, College of Engineering, The University of

Texas at Austin:

- Aug.-Sept., 1987
- Nov.-Dec., 1987
- Nov.-Dec., 1988
- March-April, 1989
- Aug.-Sept., 1989
- Nov.-Dec., 1989
- Feb.-March, 1990
- April, 1990
- Aug., 1990

"Integrated Circuit Processing and Design," with L. T. Pillage, Advanced Micro Devices short course, Continuing Engineering Studies, College of Engineering, The University of Texas at Austin:

- Oct.-Nov., 1990
- June-July, 1991

"Microelectronics Fabrication," for the Fellows of the Senior Service College Fellowship Program, Continuing Engineering Studies, College of Engineering, The University of Texas at Austin, yearly 1993-2003.

Appendix B

LIST OF MATERIALS CONSIDERED

1001	U.S. Patent No. 8,224,282
1003	File History of U.S. Patent No. 8,224,282
1005	U.S. Patent Application Publication No. 2004/0100394 to Hitt
1009	<i>Ollnova Technologies Ltd. v. Emerson Electric Co.</i> , 4:22-cv-01387 (E.D. Mo.) Defendants' Opening Claim Construction Brief (October 27, 2022)
1010	<i>Ollnova Technologies Ltd. v. Emerson Electric Co.</i> , 4:22-cv-01387 (E.D. Mo.) Plaintiff Ollnova Technologies Ltd.'s Responsive Claim Construction Brief (November 17, 2022)
1011	<i>Ollnova Technologies Ltd. v. Emerson Electric Co.</i> , 4:22-cv-01387 (E.D. Mo.) Defendants' Reply Claim Construction Brief (December 1, 2022)
1012	<i>Ollnova Technologies Ltd. v. Emerson Electric Co.</i> , 4:22-cv-01387 (E.D. Mo.) Plaintiff Ollnova Technologies Ltd.'s Sur-Reply Claim Construction Brief (December 15, 2022)
1013	<i>Ollnova Technologies Ltd. v. Emerson Electric Co.</i> , 4:22-cv-01387 (E.D. Mo.) Joint Claim Construction Statement (December 20, 2022)
1014	<i>Ollnova Technologies Ltd. v. Carrier Global Corp.</i> , 9:22-cv-80388 (S.D. Fla.) Plaintiff Ollnova Technologies Ltd.'s Opening Claim Construction Brief (November 4, 2022)
1015	<i>Ollnova Technologies Ltd. v. Carrier Global Corp.</i> , 9:22-cv-80388 (S.D. Fla.) Carrier Global Corp.'s Responsive Claim Construction and Indefiniteness Brief (November 18, 2022)
1016	<i>Ollnova Technologies Ltd. v. Carrier Global Corp.</i> , 9:22-cv-80388 (S.D. Fla.) Plaintiff Ollnova Technologies Ltd.'s Reply Claim Construction Brief (November 30, 2022)
1017	<i>Ollnova Technologies Ltd. v. Carrier Global Corp.</i> , 9:22-cv-80388 (S.D. Fla.) Joint Claim Construction Chart (December 5, 2022)

1023	<i>Ollnova Technologies Ltd. v. ecobee Technologies, ULC</i> , 2:22-cv-00072 (E.D. Tex.) P.R. 4-3 Joint Claim Construction and Prehearing Statement (January 10, 2023)
1025	<i>Ollnova Technologies Ltd. v. Emerson Electric Co.</i> , 4:22-cv-01387 (E.D. Mo.) Plaintiff's Preliminary Disclosure of Asserted Claims and Infringement Contentions (July 7, 2022)
1027	U.S. Patent Application Publication No. 2007/0242688 to McFarland
1028	U.S. Patent Application Publication No. 2006/0186214 to Simon
1029	U.S. Patent Application Publication No. 2006/0071089 to Kates
1030	U.S. Patent No. 8,276,829 to Stoner
1032	U.S. Patent No. 7,455,236 to Kates
1033	WIPO International Application Publication WO 1999/017477 to Kriz
1036	U.S. Patent Application Publication No. 2005/0268629 to Ahmed
1037	U.S. Patent Application Publication No. 2006/0071773 to Ahmed
1038	WIPO International Application Publication WO 2007/036922 to Cummins
1039	U.S. Patent Application Publication No. 2007/0026107 to Wang
1040	U.S. Patent No. 6,392,536 to Tice
1043	<i>Ollnova Technologies Ltd. v. Emerson Electric Co.</i> , 6:22-cv-00358-ADA (W.D. Tex.) Declaration of Erik De La Iglesia in Support of Plaintiff Ollnova Technologies Ltd.'s Responsive Claim Construction Brief
1044	<i>Ollnova Technologies Ltd. v. ecobee Technologies, ULC</i> , 2:22-cv-00072 (E.D. Tex.) Ollnova Technologies Ltd.'s Opening Claim Construction Brief (January 31, 2023)

1045	U.S. Provisional Patent Application No. 61/037,739
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