

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ECOBEE TECHNOLOGIES ULC
Petitioner

v.

ROSEN TECHNOLOGIES LLC
Patent Owner

IPR2023-01455
Patent No. RE40,437

PETITION FOR INTER PARTES REVIEW

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environmental conditions sensed by the environmental
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PETITIONER’S EXHIBITS

Exhibit	Description
1001	U.S. Reissue Patent No. 40,437 (“RE’437 patent”)
1002	Declaration of David M. Auslander
1003	Curriculum Vitae of David M. Auslander
1004	U.S. Patent No. 5,341,988 (“Rein”)
1005	U.S. Patent No. 7,168,627 (“Kates”)
1006	Prosecution History Excerpts of U.S. Patent Application No. 11/804,324 (“’324 application”)
1007	Prosecution History Excerpts of U.S. Patent Application No. 10/995,574 (“’574 application”)
1008	U.S. Patent No. 7,058,477 (“’477 patent”)
1009	U.S. Patent No. 5,395,042 (“Riley”)
1010	Texas Instruments TMS370 Microcontroller Family Application Book
1011	Microchip PIC16C5X EPROM/ROM-Based 8-bit CMOS Microcontroller Series
1012	Texas Instruments TMS320C1x Digital Signal Processors
1013	U.S. Patent No. 4,407,447 (“Sayegh”)
1014	U.S. Patent No. 4,294,404 (“Gajjar”)
1015	Plaintiff’s Patent Rule 3-1 And 3-2 Disclosures, <i>Rosen Technologies LLC v. ecobee Technologies ULC d/b/a ecobee</i> , Case No. 2-23-cv-00033 (EDTX)
1016	Exhibit A to Plaintiff’s Patent Rule 3-1 And 3-2 Disclosures, <i>Rosen Technologies LLC v. ecobee Technologies ULC d/b/a ecobee</i> , Case No. 2-23-cv-00033 (EDTX)

1017	Lin et al., <i>Multi-Sensor Single-Actuator Control of HVAC Systems</i> , Proceedings of the Second International Conference for Enhanced Building Operations (October 2002)
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CLAIM LISTING

1[Pre] An occupancy response system with a central control device adapted to control space conditioning equipment affecting a conditioned space, the central control device located at a single physical location in one of multiple rooms comprising the conditioned space, where remote sensors are located in physical locations substantially apart from the central control device, the improvement comprising:

[1]A) two or more environmental sensors adapted to measure a local environmental condition and generate signals indicating its value;

[1]B) two or more occupancy sensors adapted to detect occupancy of space around an environmental sensor and generate signals indicating occupancy;

[1]C) either the central control device and one or more of the remote sensors or two or more of the remote sensors each comprise an environmental sensor and an occupancy sensor;

[1]D) a central processor for the central control device including: 1) a central processing unit; 2) a real time clock; 3) a memory coupled to said central processing unit for storing a central control program and data, said data including at least one of the values of the environmental conditions sensed by the environmental sensors; and 4) an input/output unit coupled to the central processing unit, to the space conditioning equipment for issuing

control signals thereto, and to a reception interface adapted to receive signals representing environmental conditions at a remote sensor;

[1]E) a remote processor for each of the remote sensors including a central processing unit, a real time clock, a memory coupled to said central processing unit for storing a transmission control program, and an input/output unit coupled to the central processing unit and to a transmissions interface adapted to send to the central control device signals representing environmental conditions from a coupled environmental sensor; and

[1]F) for the central control device or remote sensors having environmental sensors and occupancy sensors, their input/output units further including a sensor input coupled to an environmental sensor and an occupancy input coupled to an occupancy sensor;

[1]G) the control programs causing a coupled central processing unit to selectively:

1) detect occupancy or vacancy of a nearby space from signals from a coupled occupancy sensor;

[1G)]2) read current signals from a coupled environmental sensor and transmit them for storage in the memory of the central control device only if occupancy is detected;

- [1G)]3) for the central control program, calculate an average of the received environmental sensor values and use the average result as a control value which is compared with a setpoint stored in the memory of the central control program to determine actuation of the space conditioning equipment.
2. The system of claim 1 wherein averaging of received environmental sensor values is calculated by simple averaging or a weighted averaging depending on relative spaces of occupied rooms.
 3. The system of claim 2 wherein a display and a user interface are coupled with the input/output unit of the central processing device so the central control program causes a display of averaging methods for averaging received environmental sensor values.
 4. The system of claim 3 wherein the central control program further causes a display indicating that a user may select an averaging method through the user interface and thereafter accepting user input selecting one of the averaging methods.
 5. The system of claim 1 wherein the space conditioning equipment comprises zone control means so that only occupied rooms have their space affected by the space conditioning equipment.
- 6[Pre] An occupancy response system with a central control device adapted to control space conditioning equipment affecting a conditioned space, the

central control device located at a single physical location in one of multiple rooms comprising the conditioned space, where remote sensors are located in physical locations substantially apart from the central control device, the improvement comprising:

- [6]A) one or more environmental sensors adapted to measure a local environmental condition and generate signals indicating its value;
- [6]B) one or more occupancy sensors adapted to detect occupancy of space around an environmental sensor and generate signals indicating occupancy;
- [6]C) either the central control device and one or more of the remote sensors or two or more of the remote sensors each comprise an environmental sensor and an occupancy sensor;
- [6]D) a central processor for the central control device including: 1) a central processing unit; 2) a real time clock; 3) a memory coupled to said central processing unit for storing a central control program and data, said data including at least one of the values of the environmental conditions sensed by the environmental sensors; and 4) an input/output unit coupled to the central processing unit, to the space conditioning equipment for issuing control signals thereto, and to a reception interface adapted to receive signals representing environmental conditions at a remote sensor;

- [6]E) a remote processor for each of the remote sensors including a central processing unit, a real time clock, a memory coupled to said central processing unit for storing a transmission control program, and an input/output unit coupled to the central processing unit and to a transmissions interface adapted to send to the central control device signals representing environmental conditions from a coupled environmental sensor; and
- [6]F) for the central control device or remote sensors having environmental sensors and occupancy sensors, their input/output units further including a sensor input coupled to an environmental sensor and an occupancy input coupled to an occupancy sensor;
- [6]G) the control programs causing a coupled central processing unit to selectively:
- 1) detect occupancy or vacancy of a nearby space from signals from a coupled occupancy sensor;
 - [6G)]2) read current signals from a coupled environmental sensor and a coupled occupancy sensor and transmit them for storage in the memory of the central control device so that values of environmental conditions are associated with their source of occupied or unoccupied rooms;
 - [6G)]3) for the central control program, calculate an average of the received environmental sensor values and use the average result as a control value

which is compared with a setpoint stored in the memory of the central control program to determine actuation of the space conditioning equipment.

7. The system of claim 6 wherein averaging of received environmental sensor values is calculated by simple averaging or a weighted averaging where environmental condition values from occupied rooms are given substantially more value than those of vacant rooms.
8. The system of claim 6 wherein where occupancy sensors include infra-red motion detectors.
9. The system of claim 6 wherein environmental sensors include temperature sensors and humidity sensors.
10. The system of claim 7 wherein a display and a user interface are coupled with the input/output unit of the central processing device so the central control program causes a display of averaging methods for averaging received environmental sensor values.
11. The system of claim 10 wherein the central control program further causes a display indicating that a user may select an averaging method through the user interface and thereafter accepting user input selecting one of the averaging methods.

12. The system of claim 6 wherein the space conditioning equipment comprises zone control means so that only occupied rooms have their space affected by the space conditioning equipment.

I. MANDATORY NOTICES

A. Real Party-In-Interest (37 C.F.R. § 42.8 (b)(1))

Petitioner certifies that the real-parties-in-interest for this petition are ecobee Technologies ULC, ecobee Ltd., and Generac Holdings Inc.

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

U.S. Patent No. RE40,437 (“the RE’437 patent”) is currently involved in the following proceedings:

- *Rosen Technologies LLC v. ecobee Technologies ULC d/b/a ecobee*, Case No. 2-23-cv-00033 (EDTX)
- *Rosen Technologies LLC v. Resideo Technologies, Inc.*, Case No. 6-22-cv-00131 (WDTX)

C. Counsel and Service Information (37 C.F.R. § 42.8(b)(3) and (4))

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Service information for lead and backup counsel is provided in the designation of lead and backup counsel, above. Petitioner consents to electronic service by email at the following email address: ecobee-IPRs@Venable.com.

D. Payment of Fees Under 37 C.F.R. §§ 42.15(a) & 42.103

The required fees are submitted herewith in accordance with 37 C.F.R. §§ 42.103(a) and 42.15(a). If any additional fees are due during this proceeding, the Office is authorized to charge such fees to Deposit Account No. 22-0261. Any overpayment or refund of fees may also be deposited in this Deposit Account.

I. INTRODUCTION

ecobee Technologies ULC (“Petitioner”) requests *inter partes* review (“IPR”) of claims 1-12 of U.S. Patent No. RE40,437 (Ex. 1001) pursuant to 35 U.S.C. §§ 311-19. The RE’437 patent is subject to pre-AIA 35 U.S.C. §§ 102 and 103.

The RE’437 patent relates to “a thermostat system incorporating a central control device receiving remote environmental sensing data from remote sensors.” Ex. 1001, 1:11-13. Conventionally, remote sensors were known to control HVAC systems. Temperature sensors had been used with remote thermostatic controllers in order to determine when to actuate the system to maintain a temperature setpoint in a conditioned space. Ex. 1002, ¶¶28-30. It was also known to use occupancy sensors so that the system could, e.g., operate different setpoint programs depending on whether the space was occupied or not. The RE’437 patent acknowledges that remote sensors were known. Ex. 1001, 1:45-48.

The RE’437 patent purports to introduce the idea of averaging sensor data so as to control the system based on the averaged value rather than a value reported from any one particular sensor. Ex. 1001, 2:14-19. But even that idea was well known. Ex. 1004, 24:4-23 (“controller 58 averages the temperature data from the three sensors, and compares that average to a setpoint”); Ex. 1002, ¶¶31-34.

Absent any advancement in the field, the RE'437 patent presents independent claims (claims 1 and 6) that recite a laundry list of well-known features including: a central control device for controlling an HVAC, remote environmental sensors, remote occupancy sensors, and processing units for the various devices, which processing unit include conventional CPUs, memories, and input/output units. Independent claim 6, as contrasted with claim 1, requires that values of environmental conditions be stored in a memory such that the “values ... are associated with their source of occupied or unoccupied rooms.” However, it was known that, upon detecting occupancy, remote sensors send a packet of data containing an identifier that identifies the information source and the readings. Ex. 1004, 21:19-34 (“Each time a relevant data packet 86 is received, data files associated with the particular zone sensor 58 or personal comfort sensor 110 are updated . . .”). That association allows the system to know which rooms are occupied and those room’s current conditions. Ex. 1002, ¶35. Thus, the claimed subject matter is not new.

Independent claim 1 is distinguishable from claim 6 in that it requires that signals from environmental sensors be sent “only” if occupancy is detected. In the counterpart litigation, Patent Owner asserts claim 1 against thermostatic controllers that transmit the environmental sensor data upon various triggers, including at regular intervals of time. *See* Ex. 1015; Ex. 1016, 3-6; 34-41. Thus, Patent Owner

uses a broad construction of “only,” in which “only if occupancy is detected” means “when occupancy is detected.” Ex. 1016, 38. This Petition establishes that claim 1 is unpatentable under both Patent Owner’s interpretation of “only,” as well as narrower interpretations. In particular, the Petition establishes it was known to enter various levels of suspension of operation of HVAC systems during different periods of vacancy (e.g., a room is empty, over a weekend for office buildings, etc.). For prolonged vacancy, systems were known to completely suspend operations and to restart upon the detection of someone entering the premise. This is established by the Kates and Riley references. Such system inactivity has long been used to conserve power, both with respect to the power consumed by HVAC systems and the local thermostats (which may be battery operated). Ex. 1002, ¶36. For instance, Riley describes various levels of suspension of operations, including, after a prolonged period of vacancy, suspending HVAC operations completely until a sensor detects that the space has become occupied. Ex. 1009, 24:17-52.

Thus, as established below, the claims are unpatentable.

II. GROUNDS FOR STANDING UNDER 37 C.F.R. § 42.104(a)

The RE’437 patent is available for *inter partes* review and neither Petitioner nor any real-party-in-interest is barred or estopped from requesting review. This Petition is being filed within one year of Petitioner being served with an infringement complaint.

III. IDENTIFICATION OF CHALLENGES UNDER 37 C.F.R. § 42.104(b) AND RELIEF REQUESTED

A. Grounds for the Challenged Claims

Petitioner requests review of claims 1-12 of the RE'437 patent on the grounds set forth below.

Ground	Claim(s)	Basis for Unpatentability
1	1-12	Obvious ¹ over U.S. Patent No. 5,341,988 (“Rein”) in view of U.S. Patent No. 7,168,627 (“Kates”)
2	1-12	Obvious over Rein in view of U.S. Patent No. 5,341,988 (“Riley”)

IV. SUMMARY OF THE RE'437 PATENT

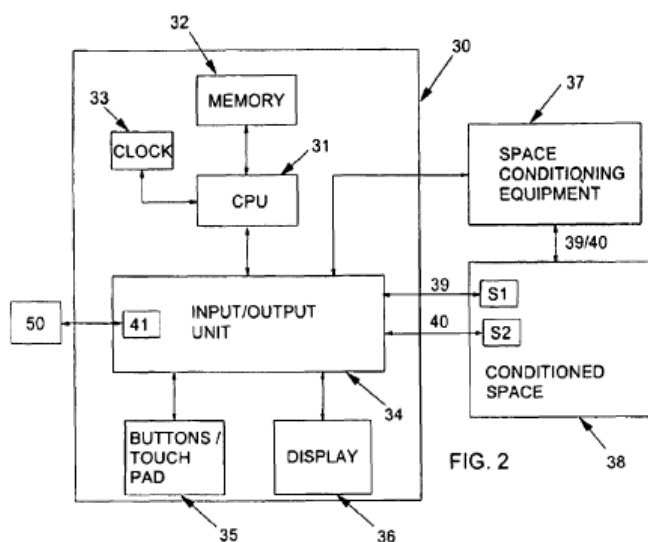
A. Background

The RE'437 patent is directed to controlling space conditioning equipment (heating and/or cooling equipment) utilizing thermostats. Ex. 1001, 1:10-26. As the RE'437 patent acknowledges, prior thermostat systems have taken advantage of rapid advances in electronic and integrated circuit technology. *Id.*, 1:27-45. It was known to utilize thermostat systems with processors that run control programs and that communicate with a central device that controls HVAC equipment. *Id.*,

¹ Petitioner is aware of no secondary considerations that would affect the analysis. Ex. 1002, ¶269.

1:46-64; Ex. 1002, ¶¶29-34. It was also known to divide the conditioned space into “zones.” *Id.*, 1:65-67. One or more rooms may constitute a zone within a conditioned space. *Id.*, 1:65-67, 4:66-67; Fig. 1.

The system of the RE’437 patent utilizes a zone thermostat with processor 30 to provide signals from sensors at that thermostat to a central control device (which has processor 50). *Id.*, 5:9-58.



Id., Fig. 2.

The RE’437 patent admits that the componentry of both the zone thermostat and central control device were known in the art. *Id.*, 1:17-64; Ex. 1002, ¶31.

B. Claimed Subject Matter

The RE’437 patent contains 15 claims, of which claims 1 and 6 are independent. Both independent claims recite an occupancy response system with a central control device for controlling space conditioning equipment, which device

includes standard elements such as a CPU, a real time clock, a memory and an input/output unit. Ex. 1002, ¶35. The independent claims also recite remote sensors, where each remote “sensor” comprises an environmental sensor and an occupancy sensor. The remote sensors also include standard processors that include a CPU, a clock, a memory, and an input/output unit. *Id.*, ¶60. Also, as claimed, an average of the environmental sensor values is compared to the stored setpoint.

As discussed above, claim 6 requires that values of environmental conditions, transmitted when an occupancy sensor is triggered, be stored in a memory such that the “values...are associated with their source of occupied or unoccupied rooms.” Independent claim 1 requires that signals from environmental sensors be sent “only” if occupancy is detected.

C. Prosecution History

The RE’437 is a reissue of U.S. Patent No. 7,058,477 (“the ’477 patent”). Both the ’477 patent and the RE’437 patent were allowed without issuing any office actions. Ex. 1006; Ex. 1007. While Rein was of record during prosecution, the examiner did not rely or comment on it. Ex. 1006; Ex. 1007. Neither Riley nor Kates was of record.

The reissue application only amended three references in the '477 patent to a “real time” clock. Ex. 1006, Pg. 58 (“seeks to remove the modifier ‘real time’ from the clocks in the remote processors for the remote sensors”).

V. PRIOR ART

U.S. Patent No. 5,341,988 (“Rein”) (Ex. 1004) issued on August 30, 1994, and qualifies as prior art under pre-AIA 35 U.S.C. § 102(b).

U.S. Patent No. 7,168,627 (“Kates”) (Ex. 1005) was filed on October 6, 2004, and qualifies as prior art under at least pre-AIA § 102(e).

U.S. Patent No. 5,395,042 (“Riley”) (Ex. 1009) issued on March 7, 1995, and therefore qualifies as prior art under at least pre-AIA 35 U.S.C. § 102(b).

A. Rein

Rein describes a programmable communication system between air distribution controllers and temperature sensors in zones to be conditioned. Ex. 1004, 1:10-12; 3:41-44. Rein’s system sends information from sensors, such as environmental sensors (e.g., temperature, humidity, etc.) and occupancy sensors to a central device in order to aid in the operation of HVAC operations. *Id.*, 5:21-28 (“for monitoring environmental conditions such as temperature”). Rein’s zone sensors 58 and comfort sensors 110 (collectively, remote sensors) communicate with central receiver 66, which works in conjunction with corresponding controller(s) 68 to determine proper HVAC operations. *Id.*, 11:42-52; 12:39-52.

Rein also describes different modes of operation depending on whether a space is occupied or not. Ex. 1004, 9:67-10:14; 12:54-65; 22:38-50; 23:58-24:53; 25:6-32; Ex. 1002, ¶¶51-58.

B. Kates

Kates' system controls HVAC equipment by utilizing sensors to monitor conditions in zones in a conditioned space. Ex. 1005, 2:1-3:14; 4:26-36; 10:13-37; 11:65-12:2. Kates' sensors measure environmental conditions and occupancy of a space, and send the information to a central device to aid in HVAC operations. *Id.*; Ex. 1002, ¶¶56-57.

Kates describes that “[a] zoned system allows more control over the indoor environment because the occupants can decide which areas to heat or cool and when. With a zoned system, the occupants can program each specific zone to be active or inactive depending on their needs. Ex. 1002, ¶59. For example, the occupants can set the bedrooms to be inactive during the day.” Ex. 1005, 1:39-45. Kates' system uses occupancy sensors to control the system differently based on whether a zone is occupied or vacant. *Id.*, 2:63-3:14; 8:39-42.

C. Riley

Riley's system transmits conditions from temperature, occupancy, and humidity sensors, in various spaces (e.g., rooms), to a base station. Ex. 1009, 1:5-11; 2:32-54; 3:3-36; 4:25-49; 15:55-68; 19:2-30; 24:17-26:28. Riley's system may

be programmed to maximize energy efficiency when spaces are unoccupied. *Id.*, 2:32-54; 3:3-36; 8:16-20; 9:2-12. One unoccupied mode allows the temperature to drift from the preferred, occupied setpoint. *Id.*, 8:10-20; 25:3-10. After a prolonged period of vacancy, the system will suspend operations completely until a sensor detects that the space has become occupied. *Id.*, 24:17-52; Ex. 1002, ¶192.

VI. CLAIM CONSTRUCTION UNDER 37 C.F.R. § 42.104(b)(3)

The Patent Trial and Appeal Board applies the standard set forth in *Phillips v. AWH Corp.*, 415 F.3d 1303, 1327 (Fed. Cir. 2005) (holding that words of a claim “are generally given their ordinary and customary meaning”).

A. “Only”

Claim 1 ([1G]2)) recites “causing a coupled central processing unit to selectively . . . read current signals from a coupled environmental sensor and transmit them for storage...**only** if occupancy is detected.” In the counterpart litigation, Patent Owner alleges infringement by devices that transmit signals from environmental sensors at regular intervals, as well as when an override command is provided. Patent Owner interprets “only” to mean “when.” Ex. 1016, 38 (“when occupancy is detected”). Accordingly, for purposes of this proceeding, the Petition

applies Patent Owner’s understanding of “only,” as well as a more restrictive interpretation of “only,” which is addressed below.²

B. “Zone Control Means”

Claims 5 and 12 recite “zone control means,” which triggers 35 U.S.C. § 112, ¶6. The claimed “zone control means” functions “so that only occupied rooms have their space affected by the space conditioning equipment.”

The specification is not clear on the corresponding structure for this recitation. Under one interpretation, the central control device, and associated elements, serve as the zone control means. Ex. 1001, 4:9-18 (“The *central control device can act to* average temperatures to calculate a control value and at the same time divert substantially all conditioned air *only to the occupied rooms.*”)³. In that scenario, as articulated in claim 1, the corresponding structures are the CPU, clock, memory, and input/output unit (which use averaging in controlling the system). *Id.*, 2:23-26; 5:9-34. Under another interpretation, the “zone control means” refer to the duct dampers. *Id.*, 4:9-18 (“It is a feature of some modern thermostat systems to control *duct dampers* or diverters so that conditioned air from air handlers and

² Petitioner reserves the right to present an alternative construction in the counterpart litigation.

³ Emphasis added throughout.

fans is directed *only to certain rooms* of a conditioned space.”). Both interpretations are addressed in the Grounds below.

VII. ARGUMENTS

A. Level of Ordinary Skill in the Art

A person of ordinary skill in the art (“POSA”) would have a bachelor’s degree in engineering, computer science, or a comparable field, with 2-3 years’ experience in temperature controls, embedded control systems, electronic thermostats, or HVAC controls, or similarly relevant industry experience, with relevant experience substituting for education and vice versa. Ex. 1002, ¶¶23-25. Nevertheless, Petitioner submits that the claims are obvious in view of any reasonable definition of a POSA.

B. Ground 1: Claims 1-12 are Obvious over Rein and Kates

Claims 1-12 recite known features that are described and/or suggested by Rein and Kates. Ex. 1002, ¶49. Rein discloses “a wireless communication system between the air distribution controllers and the zone temperature sensors in the zone to be controlled.” Ex. 1004, 1:10-12. Rein’s system sends information from environmental sensors (e.g., temperature) and occupancy sensors, to a central device (central receiver 66 alone or in combination with controller 68 and/or building automation system 76) in order to control HVAC operations. *Id.*, 5:21-28; 13:14-18; 14:17-15:11, 24:26-30; 9:50-56. Rein’s environmental sensors can be

associated with (i) local thermostatic controllers in different rooms of the conditioned space and (ii) comfort sensor devices that a user may keep at a particular position within a room. *Id.*, 2:33-43. The sensor information may be used to maintain setpoint programming (i.e., the conditioned space is kept around a specified temperature). The sensor information is transmitted to the central device when there is a change of state of the system. *Id.*, 5:21-32; 9:6-20 (“after a change of state”); 13:59-61; 17:39-43; 23:15-38; 8:28-34; 8:55-57; 25:35-47; Figs. 17, 21. An occupancy sensor indicates a change of state from unoccupied to occupied. *Id.*, 16:49-53, Ex. 1002, ¶¶50-54, 63, 65.

With respect to claim 1, while Rein describes occupancy sensors and transmitting signals from environmental sensors after a general change of state, it does not explicitly state that the system “read[s] current signals from a coupled environmental sensor and transmit[s] them for storage . . . **only** if occupancy is detected.” While this feature would have been obvious from Rein under Patent Owner’s interpretation and under narrower constructions, the principle is also suggested by Kates. Ex. 1002, ¶¶65-69.

In Kates’ system, information is transmitted from sensors to a central device for HVAC control operations in limited circumstances. Ex. 1002, ¶57. Kates teaches that environmental sensors transmit condition information when occupancy is detected. Ex. 1005, 2:63-3:14; 4:26-36; 10:20-37; 11:65-12:2. Specifically,

when an occupancy sensor detects occupancy in a room, a signal is transmitted to a central control device in order to employ the correct programming intended for an occupied room. *Id.* Kates also teaches that it is preferable to place HVAC systems in an “inactive” state when a zone is unoccupied. Ex. 1005, 1:39-45 (“can program each specific zone to be active or inactive depending on their needs. For example, the occupants can set the bedrooms to be inactive during the day.”). When a zone is once again occupied, the system activates and transfers, at least, environmental sensor data. *Id.*, 2:63-3:1-14; 4:26-36; 10:20-37; 11:65-12:2. Indeed, Kates explains that occupancy is used to determine how to operate HVAC in certain zones. *Id.*, 1:39-45. (“A zoned system allows more control over the indoor environment because the occupants can decide which areas to heat or cool and when.”). Thus, Kates suggests transmission of environmental sensor signals only upon the detection of occupancy, under any interpretation. Ex. 1002, ¶¶58-62.

Rein and Kates are in the same field (HVAC control systems), such that a POSA would have appreciated that operations and features from one system would lend themselves to use in the other. *Id.*, ¶¶70-72.

A POSA would have appreciated that the transmission of environmental signals only upon occupancy detection would be useful to the system in Rein. In particular, Rein already teaches (i) the use of occupancy sensors, (ii) different programming during occupied vs. unoccupied modes of operation (e.g., shutting

off at night, but allowing for switching back to an occupied mode (Ex. 1004, 9:67-10:14)), and (iii) transmitting sensor data upon a change in state of the room (Ex. 1004, 9:6-20). Like Rein, Kates strives to save battery life in the remote sensors and that the overall system preferably goes into a low power state during an unoccupied period to conserve energy. Thus, in view of Kates, it would have been obvious to perform transmission of environmental data only upon detection of a change from an unoccupied state to an occupied state. Ex. 1002, ¶¶56-68. This would allow a system operating in an unoccupied mode (when people are not in the building) to operate in a low power mode and to switch to an occupied mode automatically when a person enters the relevant zone. In this way, the system can re-activate and send environmental conditions, such as temperature, so that the HVAC system can determine current conditions and, thus, what actions are needed to reach the occupied setpoint. Specifically, for the system to know what action to take to reach an occupied set point, it would need to know current conditions in the zone. Therefore, there would have been a clear motivation to combine the teachings. Ex. 1002, ¶¶66-67.

With respect to claims 1 and 6, while Rein does not expressly state CPUs in its remote sensors (e.g., zone sensor 58) have connected memories that stores transmission control programs for transmitting sensor data, the same would have been obvious. In general, a POSA would have appreciated that CPUs

conventionally included memories in order to be able to store their programs and perform the tasks required of them, and Rein explains that the “objective” of zone sensor 58 is “to responsively communicate information and to react to changes in zone conditions.” Ex. 1004, 8:39-9:13; 15:29-57. That teaching would have suggested a memory with a program for accomplishing that objective. Moreover, Kate further suggests this feature. In particular, Kates teaches program instructions executed by the remote sensor systems, which instructions includes data transmission steps. Ex. 1005, 11:39-12:14. Thus, a POSA would have found it obvious to combine the teachings of Rein and Kates to ensure that the CPU of the remote sensor system, which monitors and transmits sensor data, uses a memory for storing the program instructions for executing transmission operations. Ex. 1002, ¶¶60-62, 68.

A POSA would have had a reasonable expectation of success in making the combination given the similarity of the systems and the fact that the combination would require simply using programming and conventional hardware intended for HVAC control in a system that has occupancy detection features. *Id.*, ¶70.

Thus, the features of claims 1-12 would have been obvious over the combination of Rein and Kates for the reasons set forth below.

a) **Claim 1**

- 1) **1[Pre] An occupancy response system with a central control device adapted to control space conditioning equipment affecting a conditioned space, the central control device located at a single physical location in one of multiple rooms comprising the conditioned space, where remote sensors are located in physical locations substantially apart from the central control device, the improvement comprising:**

To the extent the preamble is limiting, Rein describes an occupancy response system in the form of a system that uses occupancy sensors and wireless communications to control HVAC equipment. Ex. 1004, 1:10-12; 9:6-8. Rein's zone sensors 58 (and personal comfort sensors) communicate local information pertaining to the zones (e.g., different rooms of the building) and react to changes in zone conditions. *Id.*, 9:6-8. A central control device (central receiver 66⁴ alone or in combination with controller 68 and/or building automation system 76) controls space conditioning equipment (e.g., HVAC equipment). *Id.*, 10:24-68;

⁴ Central receiver 66 receives sensor data from remote devices. Central receiver 66 works in conjunction with controller 68 and/or building automation system 76 so that the operations are implemented. To the extent that Patent Owner argues that the claimed central control device must be a single device, a POSA would have appreciated that it would have been obvious to implement central receiver 66, controller 68, and building automation system 76 as one central controller. Ex. 1002, 74-76. Reliance on central receiver 66 in this Petition should be understood to be a reliance on that device in combination with controller 68 and/or system 76.

11:7-9; 11:46-49; 12:27-38; 13:14-45; 14:17-15:11; 9:50-56; *see* Ex. 1005, 8:63-9:8; 10:31-59; Fig. 8; Ex. 1002, ¶¶74-76.

The zone sensors 58 (and comfort sensors 110) preferably comprise of a number of individual sensors, such as occupancy sensors used to transmit signals indicating occupancy to the central device. *Id.*, 6:10-11; 10:24-38; 11:42-52; 12:39-47; Fig. 21. Rein's remote sensors transmit information to central receiver 66, which checks the data for validity, stores it, and makes it readable for controller 68 in order to control HVAC operations in that zone. *Id.*, 12:21-13:33; 23:15-57. Controller 68 receives signals from multiple zone sensors 58. *Id.*, 10:62-68; Ex. 1002, ¶77.

Central receiver 66 is located at a single physical location in one room of multiple rooms comprising the conditioned space, as shown in Figs. 3 and 5. Ex. 1004, Figs. 3, 5; 11:7-13; 11:42-52; 13:46-50. Figure 5 of Rein shows a conditioned space as multiple rooms bounded by outside walls. *Id.*, 13:46-50; Ex. 1002, ¶78.

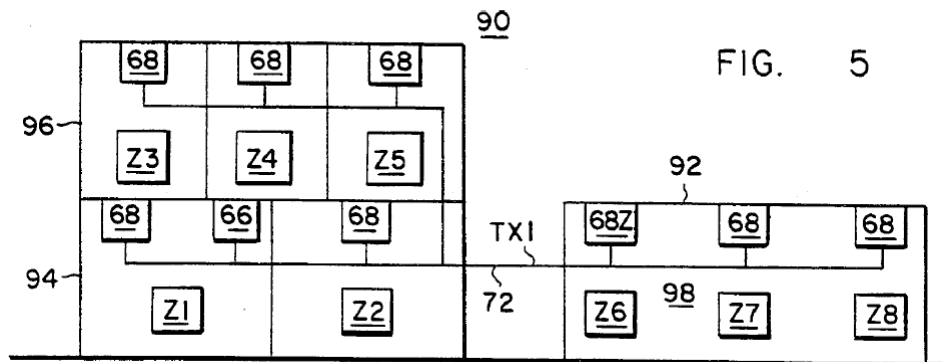
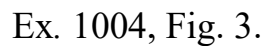


Figure 3 shows central receiver 66 above a drop ceiling 88 in one of multiple rooms comprising the conditioned space. *Id.*, 11:7-52; 13:3-9. A POSA would have appreciated that central receiver 66 could be placed at any position within the room. Ex. 1002, ¶79.



18

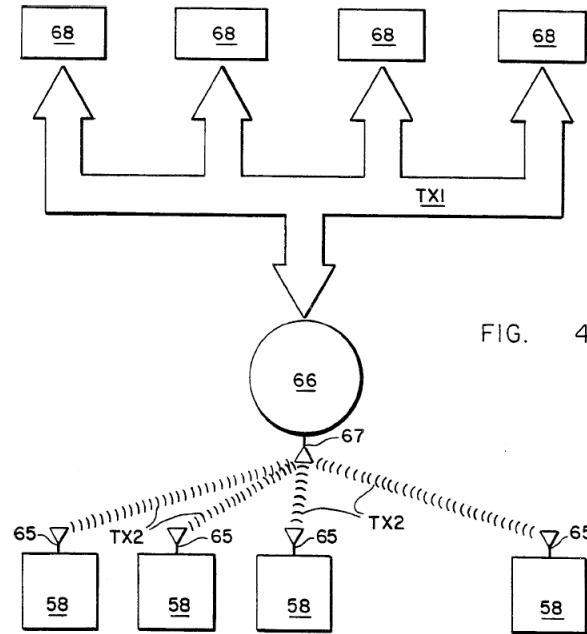
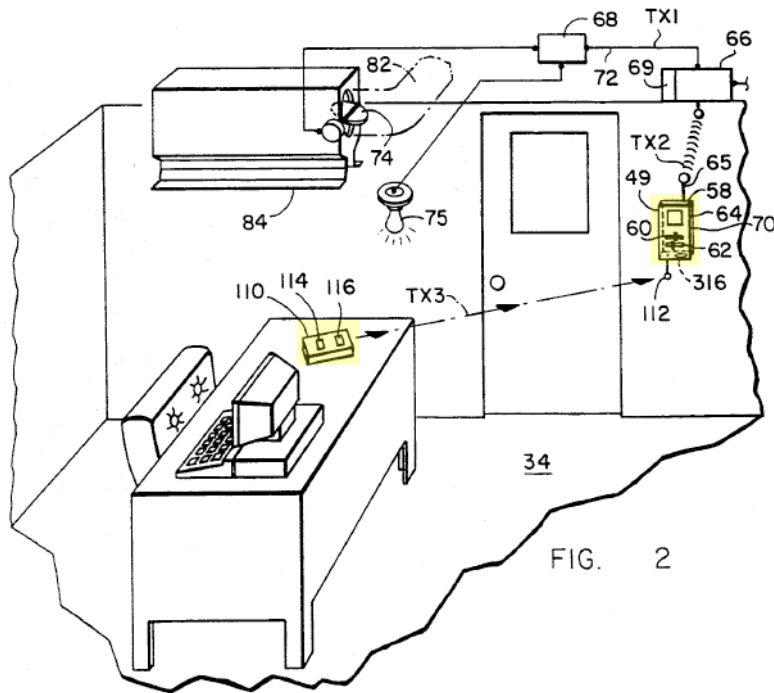


FIG. 4

Ex. 1004, Fig. 4.

Rein's remote sensors (zone sensors 58 and comfort sensors 110) are located in physical locations (e.g., rooms) substantially apart from central receiver 66 (and controller(s) 68). Even when in the same room as receiver 66, the sensors may communicate wirelessly with central receiver 66, such that they are physically spaced from that receiver (and controller(s) 68). Ex. 1002, ¶81.

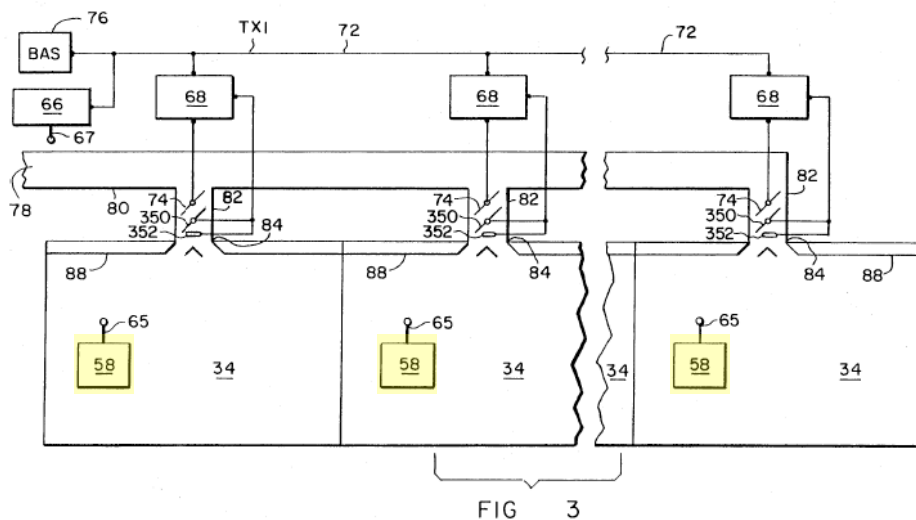
Figure 2 shows zone sensor 58 located on a wall and communicating wirelessly with central receiver 66 via communication medium TX2. *Id.*, 11:42-52. Personal comfort sensor 110 also communicates wirelessly with the central receiver 66 through the zone sensor 58. *Id.*, 15:48-64; 16:9-18; 16:54-64; Ex. 1002, ¶82.



Ex. 1004, Fig. 2.

In Fig. 3, zone sensors 58 are in different rooms than the central receiver 66.

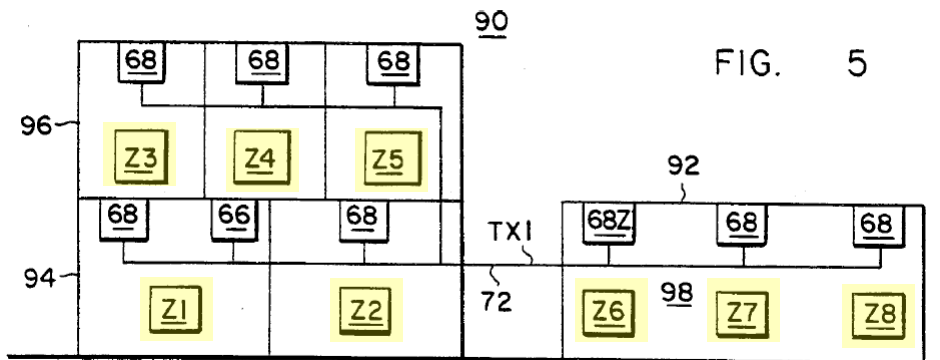
Id., 12:39-47; 13:3-9; Ex. 1002, ¶¶79.



Ex. 1004, Fig. 3.

An objective of Rein's system is to be able to retrofit to existing HVAC systems and eliminate physical connections between zone sensors and an air handler controller. *Id.*, 1:54-57; 2:35-38. Rein uses central receiver 66 to format the data received from sensors so that the appropriate controller 68 generates a control signal to actuate the HVAC equipment in a zone. *Id.*, 9:21- 10:38. A POSA would have appreciated utilizing a single device to both receive sensor data and directly transmit control signals to actuate HVAC equipment to be a design choice, as well as a choice among a limited number of known options. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 415-419 (2007); Ex. 1002, ¶¶83-84. Kates describes the use of a "central system." Ex. 1005, 8:63-9:8; 10:31-59; Figs. 8, 13.

Figure 5 also shows zone sensors 58 (which are designated as Z1-Z8 in Fig. 5) in different rooms. Ex. 1004, 13:46-65 ("zone sensors Z1 through Z8"); Ex. 1002, ¶78.



Ex. 1004, Fig. 5.

- 2) [1]A) two or more environmental sensors adapted to measure a local environmental condition and generate signals indicating its value;

Rein describes multiple zone sensors 58 (each including multiple individual sensors) as shown below in Fig. 21. Ex. 1004, 7:49-50; 8:28-38; 9:6-8; 9:57-62; 11:50-52; Ex. 1002, ¶85.

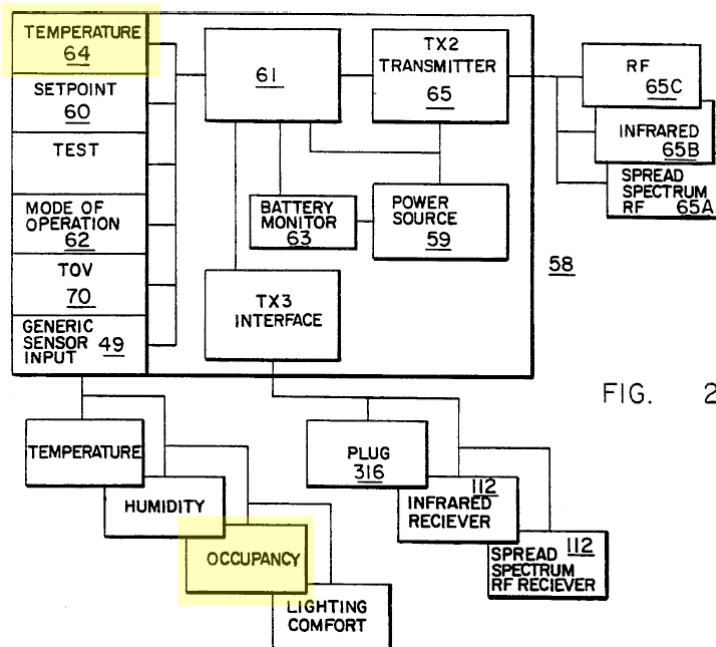


FIG. 21

Ex. 1004, Fig. 21.

In particular, each zone sensor 58 includes a temperature sensor 64 and any one of a number of other sensors. *Id.*, Fig. 21; 4:55-57 (“sensor for sensing environmental conditions”); 8:28-57; 9:6-8; 23:26-29; 25:38-47. Thus, each zone sensor 58 preferably comprises at least one environmental sensor (e.g., temperature sensor). Different sensors 58 are provided for different conditioned zones. *Id.*,

11:50-52; 12:27-47; 13:46-57; 15:16-25; 21:10-16. Thus, Rein teaches two or more environmental sensors measuring a local environmental condition. *Id.*, Figs. 5, 21; 12:45-47; Ex. 1002, ¶86.

Each temperature sensor 64 (of zone sensor 58) generates signals indicative of the sensed temperature, which are transmitted to central receiver 66. Ex. 1004, 9:13-29 (“the zone sensor 58 uses the wireless transmitter 65 to transmit a wireless signal to a receiver portion 67 of a central receiver 66”); 24:62-66; 25:38-47. A POSA would have understood that temperature sensors operate by measuring the temperature around the sensor and generating a signal indicating the value of that temperature. Ex. 1002, ¶¶87-88. Indeed, Rein explains that the “sensors provide information to” a controller 68 via a central receiver 66. Ex. 1004, 22:24-37. In fact, Rein uses the data to determine which temperature has “the largest deviation from the setpoint,” indicating that the sensor data indicates the temperature value. *Id.*, 22:24-41; 24:62-66 (“provide a sensed signal value for transmission”).

Rein also describes comfort sensors 110, which include, at least, temperature sensor 352, as shown below with respect to Fig. 22. *Id.*, Fig. 22; 15:41-50; 16:34-42; 16:44-53; 17:16-19; 23:26-29; 25:35-47. Ex. 1002, ¶89.

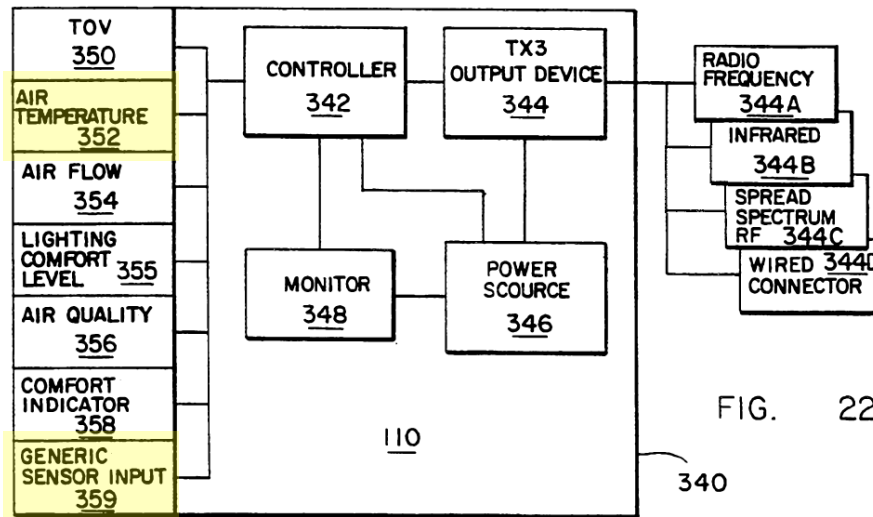


FIG. 22

Ex. 1004, Fig. 22.

Comfort sensors 110 monitor local conditions and transmit that data (through zone sensors 58) to central receiver 66. *Id.*, 15:47-50. As shown in Fig. 2, comfort sensors 110 and zone sensors 58 may be used together in one room. Ex. 1002, ¶90.

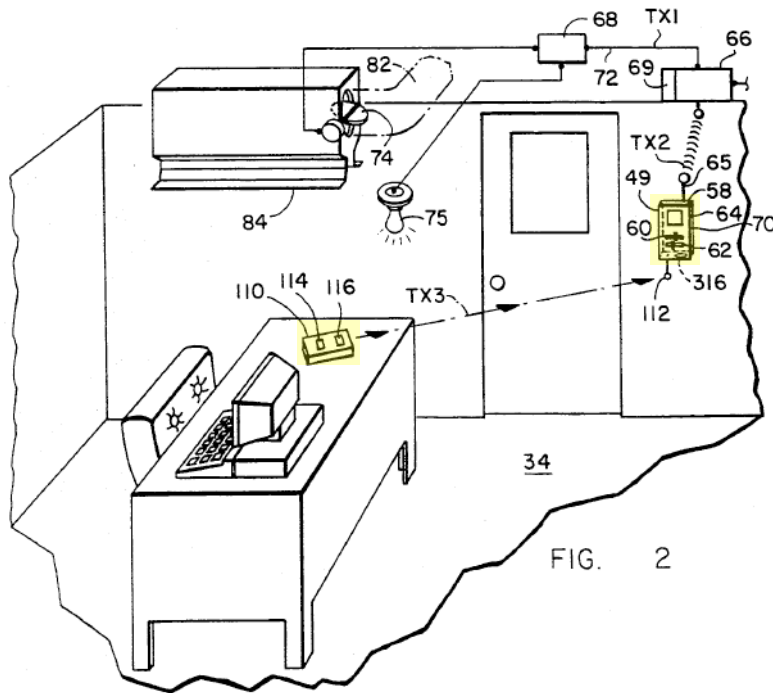


FIG. 2

Id., Fig. 2.

Comfort sensors 110 may be provided for different zones of the space. *Id.*, Fig. 2, 15:47-50; 17:16-19; 21:10-16 (“zone data packet 86 from one of a plurality of ... sensors 58 and ... sensors 110.”). Thus, this claim element is met by the environmental sensors in zone sensors 58 and/or comfort sensors 110. Ex. 1002, ¶91.

3) [1]B) two or more occupancy sensors adapted to detect occupancy of space around an environmental sensor and generate signals indicating occupancy,

As discussed above, zone sensors 58 include multiple individual sensors, as shown respect to Fig. 21. Ex. 1002, ¶92.

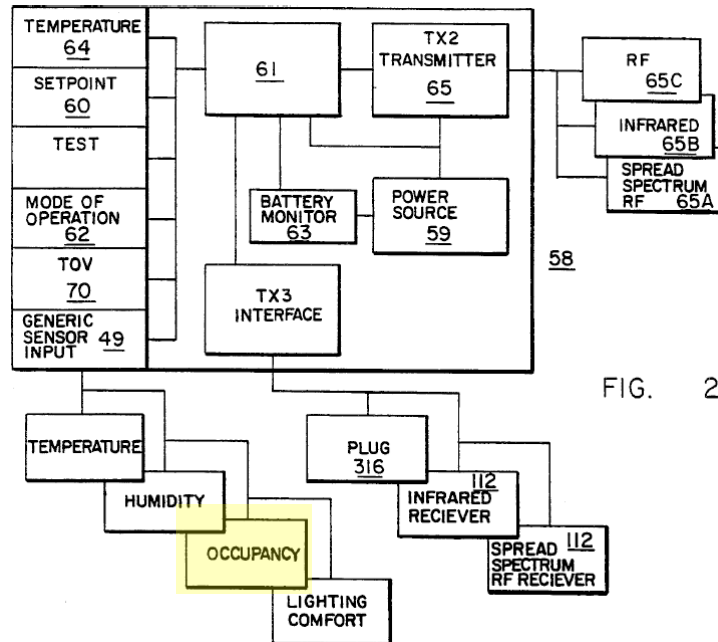


FIG. 21

Ex. 1004, Fig. 21.

In particular, each zone sensor 58 includes temperature sensor 64 and a generic sensor input 49, to which various sensors may be coupled, including an occupancy sensor, such that both a temperature sensor and occupancy sensor monitor the area around zone sensor 58. *Id.*, Fig. 21; 8:28-34; 8:55-57; 9:6-8; 23:26-29; 25:35-47; Ex. 1002, ¶93.

Rein also describes that different modes of operation are used, depending on whether a zone is occupied or unoccupied, which suggests a reason to track the occupied/unoccupied state of different rooms. Ex. 1004, 9:57-10:14. As discussed with respect to limitation [1]A), Rein teaches that zone sensors 58 are provided in different zones of the conditioned space. *Id.*, Figs. 3, 5; 11:50-52; 12:27-38; 12:45-47; 13:46-57; 15:16-25; 21:10-16. A POSA would understand Rein to suggest the

use of multiple occupancy sensors. *Id.*, Figs. 5, 21; 12:45-47; Ex. 1002, ¶94-95.

As discussed above, Rein also describes the use of multiple comfort sensors 110, which themselves may include occupancy sensors. Ex. 1004, Fig. 22; 16:48-53; 25:35-47. Therefore, Rein suggests using multiple occupancy sensors.

Rein suggests generating signals. Figures 6 and 13 illustrate example contents of data packets 86 sent from zone sensors 58. Although not depicted in Figs. 6 and 13, when an occupancy sensor is coupled to a zone sensor 58, the “packet [] indicates the occupied/unoccupied status.” *Id.*, 16:48-53; 9:67-10:14; 15:58-16:9; 16:44-64; 25:38-47; Figs. 21, 22; Ex. 1002, ¶96.

FIG. 6

86

MESSAGE TYPE	86T
ZONE SENSOR	86A
AIR TEMPERATURE	86B
SET POINT, HEATING	86C
SET POINT, COOLING	86D
MODE (HEAT, COOL)	86E
BATTERY STATUS	86F
TIMED OVERRIDE	86G

Ex. 1004, Fig. 6.

Comfort sensors 110 may also include occupancy sensors (through generic sensor input 359) that generate signals indicating occupancy. *Id.*, Fig. 22; 15:41-50; 16:34-53; 17:16-19; 23:26-29; 25:35-47; Ex. 1002, ¶97.

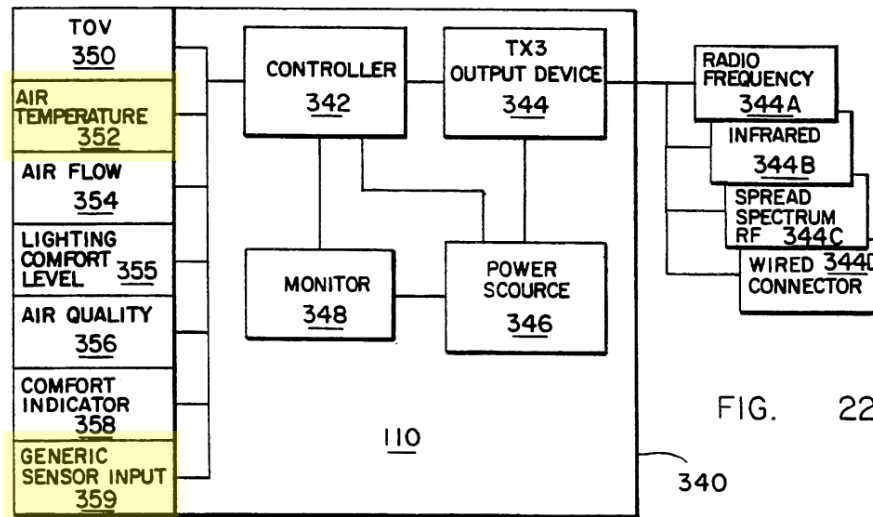


FIG. 22

Ex. 1004, Fig. 22.

As shown in Fig. 9, signals indicating the occupied/unoccupied status of the area monitored by comfort sensors 110 are included in data packet 100, when an occupancy sensor is connected (generic sensor input). *Id.*, 16:48-53.

FIG 9 100

MESSAGE TYPE	100T
PERSONAL COMFORT SENSOR	100A
AIR TEMPERATURE	100B
AIR FLOW	100C
AIR QUALITY	100D
COMFORT INDICATOR TOO WARM TOO COLD	100E
BATTERY STATUS	100F
TIMED OVERRIDE	100G
LIGHTING COMFORT LEVEL	100H
GENERIC SENSOR INPUT	100I

Id., Fig. 9.

Thus, Rein describes that occupancy sensors generate the claimed signals.

Ex. 1002, ¶¶98-99.

In addition, Kates also describes occupancy sensors that generate signals indicating occupancy. Ex. 1005, 2:63-3:14; 4:26-36; 10:20-37; 11:65-12:2. When occupancy is detected by an occupancy sensor, Kates transmits a signal to a central device indicating that the space is occupied. *Id.*; Ex. 1002, ¶100.

- 4) [1]C) either the central control device and one or more of the remote sensors or two or more of the remote sensors each comprise an environmental sensor and an occupancy sensor,**

By use of the term “either,” this claim limitation can be met by a suggestion of “two or more of the remote sensors each compris[ing] an environmental sensor and an occupancy sensor.”

As established above, each of Rein’s (remote) zone sensors 58 preferably comprises both an environmental sensor (temperature sensor 64) and an occupancy sensor. Ex. 1002, ¶¶101-102. Ex. 1004, Fig. 21; 8:28-9:8; 23:26-29; 25:38-47; 16:48-53.

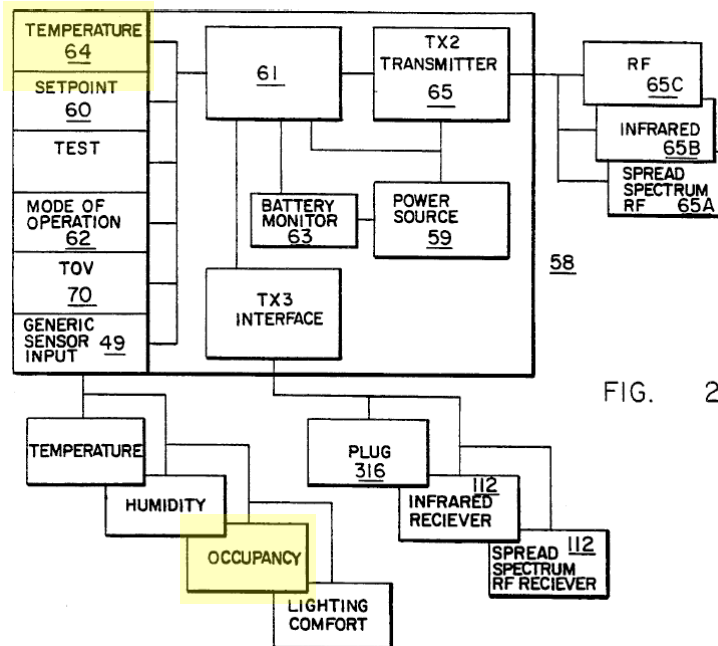
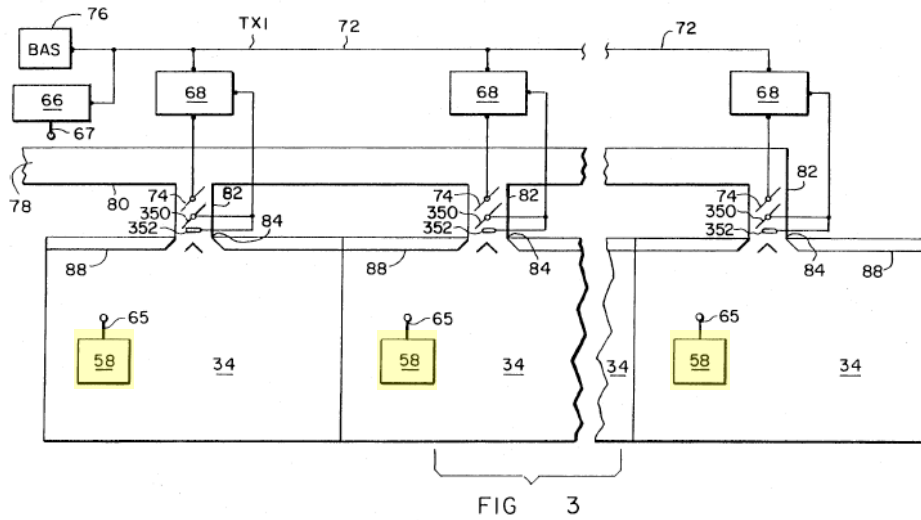


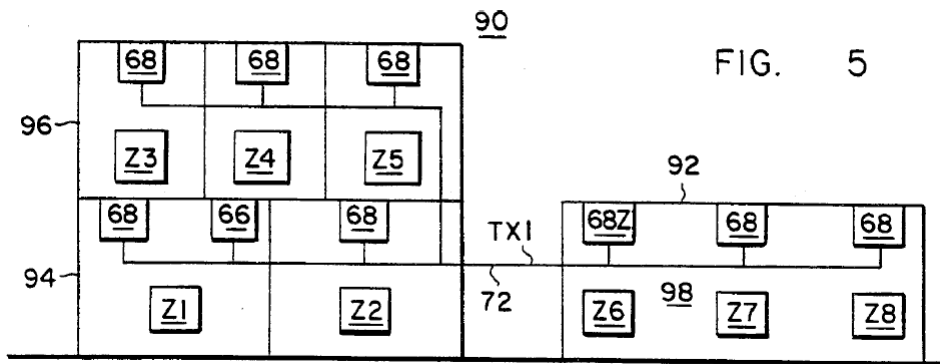
FIG. 21

Id., Fig. 21.

As discussed with respect to limitation [1]A), Rein teaches that multiple zone sensors 58 are provided across zones. *Id.*, 11:50-52; 12:27-47; 13:46-57; 15:16-25; 21:10-16. Zone sensors 58 are remotely positioned for the reasons discussed above with respect to the preamble. *Id.*, 1:39-42; 13:24-28; Ex. 1002, ¶103.



Ex. 1004, Fig. 3.



Id., Fig. 5.

As also discussed above, Rein describes comfort sensors 110, which may include a temperature sensor and an occupancy sensor (connected to generic sensor input 359), as shown in Fig. 22 (below).

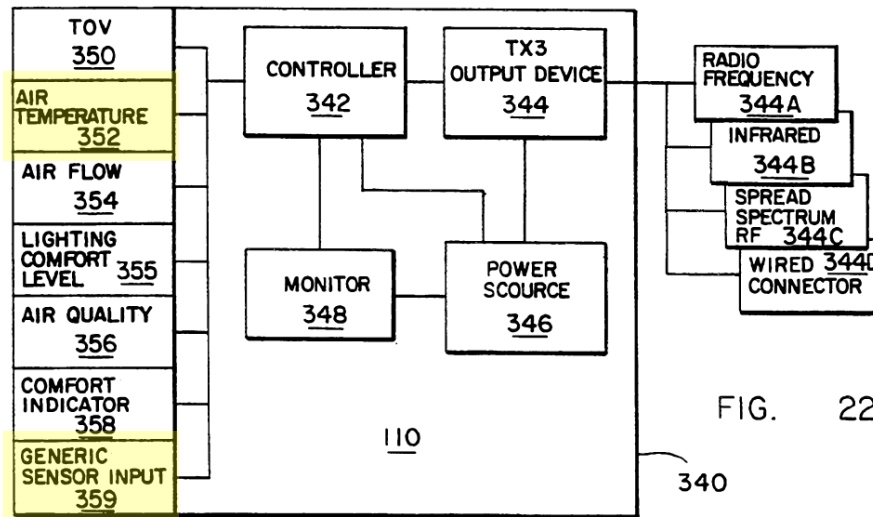


FIG. 22

Id., Fig. 22.

Therefore, Rein teaches this element through the use of multiple zone sensors 58 and comfort sensors 110, each of which comprises an environmental sensor and an occupancy sensor. Ex. 1002, ¶¶104-105.

- 5) [1]D) a central processor for the central control device including: 1) a central processing unit; 2) a real time clock; 3) a memory coupled to said central processing unit for storing a central control program and data, said data including at least one of the values of the environmental conditions sensed by the environmental sensors; and 4) an input/output unit coupled to the central processing unit, to the space conditioning equipment for issuing control signals thereto, and to a reception interface adapted to receive signals representing environmental conditions at a remote sensor;

As discussed above, Rein describes a system where sensors transmit signals to central receiver 66, which stores it in memory and provides it to, at least,

controller 68 to control the HVAC equipment. Ex. 1004, 9:6-56; 10:39-11:6; Ex. 1002, ¶106.

Rein's central processor is the collection of the CPU, real-time clock, memory, and the input/output unit, which would be expected elements of a computer. Rein's central receiver 66, at least, includes a CPU (data controller 362). Ex. 1004, Figs. 4, 8, 23; 7:53-54; 9:17-56 ("The central receiver 66 preferably includes a conventional microprocessor data controller 362 . . ."); 12:45-47; 15:14-18; 15:47-50; Ex. 1002, ¶¶107-109.

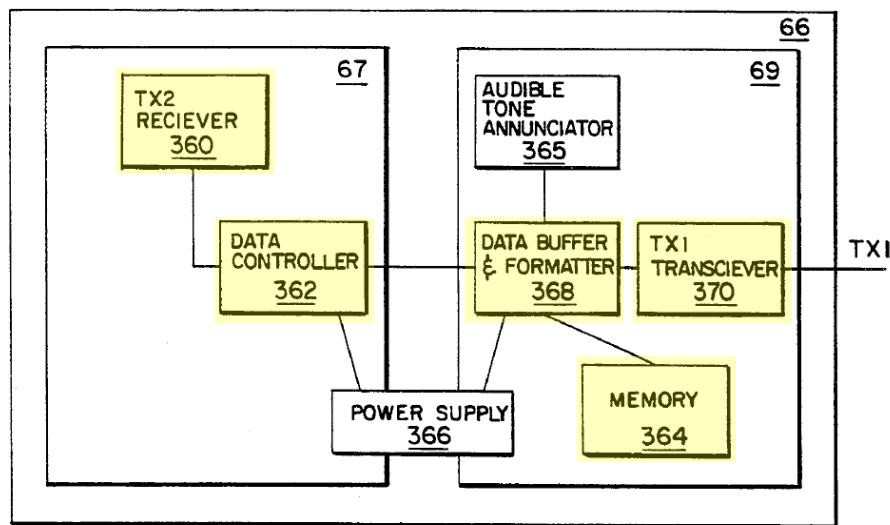


FIG. 23

Ex. 1004, Fig. 23.

The CPU (controller 362) may be a TMS 320C14 microcontroller⁵, which includes a clock. Ex. 1004, 9:32-35. A POSA would have understood that CPUs use clocks, and that the clocks are often real-time clocks. Ex. 1002, ¶109. Indeed, the RE’437 patent admits that this feature was known in the prior art. Ex. 1001, 1:32-38. Also, a POSA would have found the use of real-time clocks obvious inasmuch as the prior art control devices allow for the programming of setpoint scheduling, which are based on times of the day. Ex. 1004, 14:58-15:4; 21:27-34; Ex. 1005, 3:12-24; 8:38-42. A real-time clock is just a clock that can account for calendar time. Ex. 1002, ¶110.

Central receiver 66 also includes memory 364 coupled to the data controller 362. Ex. 1004, 9:17-20; Fig. 23. Memory 364 stores data used in the operation of the system. *Id.*, 9:5-56 (“provided to store such data”); 12:21-38. As discussed above, a POSA would have appreciated that one could use one central control device to receive data from sensors and generate the corresponding control signals to actuate HVAC equipment. Ex. 1002, ¶¶111;113-114.

Controller 68 also includes controller logic unit 404, message encoder/decoder 402, and memory 408. Rein describes that data, instructions, and

⁵ Ex. 1012, 11; 20-26; 36-37; 41-46.

algorithms used to determine proper actuation of the HVAC equipment are stored in the memory 408 of controller 68. Ex. 1004, 5:33-44; 10:39-54; Ex. 1002, ¶112.

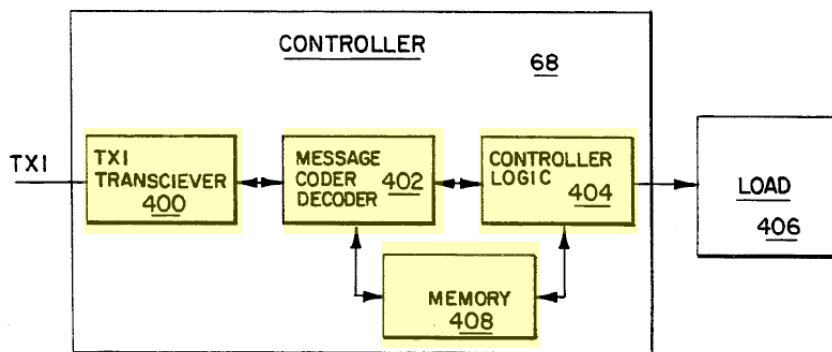


FIG. 24

Id., Fig. 24.

Also, Kates describes a central system (710, 810, 910) that communicates with zone thermostats, stores a computer program for executing the HVAC functions, and controls the HVAC equipment. Ex. 1005, 8:63-9:8; 10:38-59; 14:49-65. A POSA would have appreciated that central devices for controlling HVAC systems, as described in Rein and Kates, would be expected to contain programs for allowing for the control of the HVAC functions, which functions are described throughout Rein and Kates. Ex. 1002, ¶¶112-114.

Rein's sensor data, transmitted from zone sensor 58 and/or comfort sensor 110 to central receiver 66, is stored in a memory when received. Ex. 1004, 9:40-45; 21:19-34 ("Each time a relevant data packet 86 is received, data files

associated with the particular zone sensor 58 or personal comfort sensor 110 are updated . . .”); Ex. 1002, ¶115.

Regarding the claimed input/output unit, in addition to being a known computer component, central receiver 66 includes an input/output unit in the form of a receiver portion 67 and a translator portion 69 that respectively utilize a TX2 Receiver 360 and a TX1 Transceiver 370 for sending and receiving signals to/from sensors, controllers 68, and the HVAC equipment. Ex. 1004, Fig. 23; 9:21-40; 9:45-50. TX2 Receiver 360 and TX1 Transceiver 370 are coupled to data controller 362. *Id.* TX1 Transceiver transmits the signals to the controller 68 via the TX1 communication medium. *Id.*, 9:21-56. TX2 Receiver 360 receives data transmitted from the sensors. *Id.*; Ex. 1002, ¶116.

Thus, Rein describes and/or suggests this limitation. Ex. 1002, ¶117.

- 6) **[1]E) a remote processor for each of the remote sensors including a central processing unit, a clock, a memory coupled to said central processing unit for storing a transmission control program, and an input/output unit coupled to the central processing unit and to a transmissions interface adapted to send to the central control device signals representing environmental conditions from a coupled environmental sensor; and,**

Each zone sensor 58 includes a remote processor in the form of a collection of a CPU, clock, memory, and input/output unit. Specifically, zone sensors 58

include microprocessor 61. Ex. 1004, 8:28-51. A POSA would have understood that a microprocessor suggests a CPU. Ex. 1002, ¶118.

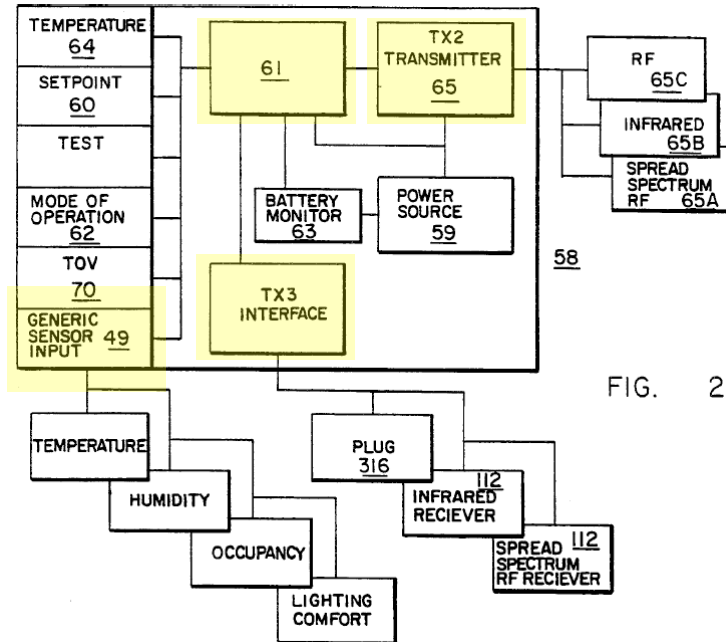
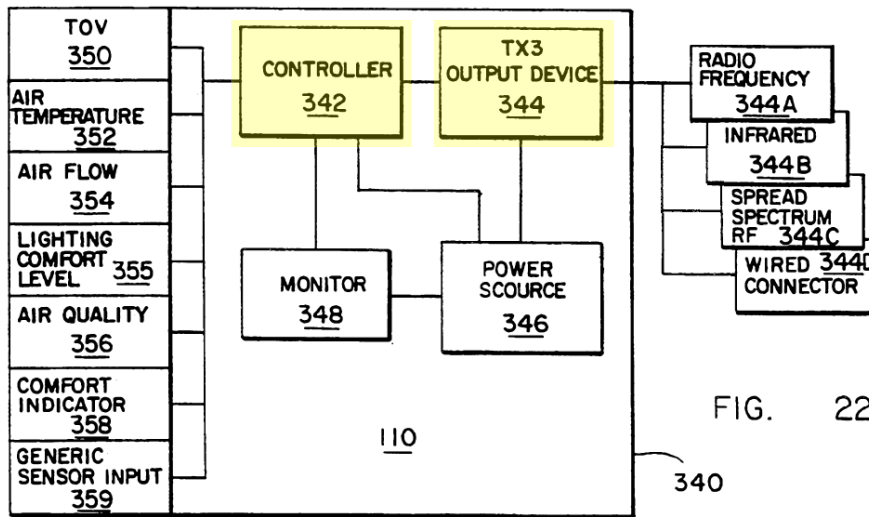


FIG. 21

Ex. 1004, Fig. 21.

Also, comfort sensor 110 includes the requisite elements. Comfort sensor 110 includes a CPU in the form of a microprocessor controller 342. *Id.*, 15:29-35; Ex. 1002, ¶119.



Ex. 1004, Fig. 22.

Rein's microprocessors would be understood to include clocks. Rein's microprocessor 61 includes a hardware timer interrupt, which a POSA would understand is connected to a clock for performing actions based on timing signals. *Id.*, 8:48-59. Additionally, signals may be transmitted at timed intervals, which a POSA would understand would be measured using a clock. *Id.*, 8:48-9:3; 23:15-52; Ex. 1002, ¶120. And, the RE'437 patent admits that this feature was known in the art. Ex. 1001, 1:32-38.

A POSA would understand that microprocessor 61 of zone sensor 58 includes an input/output unit coupled to the CPU and transmission interfaces (e.g., TX3 Interface and TX2 Transmitter 65). Ex. 1002, ¶121. TX2 Transmitter 65 is an interface that sends signals representing environmental conditions from a coupled environmental sensor to central receiver 66. Ex. 1004, 9:6-56; 12:45-47.

A POSA would have understood it to be obvious that controller 342 of personal comfort sensor would also include an input/output unit. Ex. 1002, ¶122. For comfort sensor 110, TX3 output device transmits signals representing environmental conditions from a coupled environmental sensor to the central receiver 66 through a zone sensor 58. Ex. 1004, 15:29-35; 16:14-33; 16:54-65; 18:19-21; 23:52-57.

While Rein does not expressly describe that there is a memory connected to the CPU in zone sensor 58 or comfort control sensor 110 or that such memory stores the transmission control program, a POSA would have understood the same to be obvious. Ex. 1002, ¶123. First, a POSA would have appreciated that CPUs conventionally include memories in order to store their programs and perform the tasks required of them. Second, the stated “objective” of zone sensor 58 and comfort control sensor 110 is “to responsively communicate information and to react to changes in zone conditions.” Ex. 1004, 8:39-9:13; 15:29-57. As would have been appreciated by a POSA, in order to track the sensor data and determine when to transmit the same to central receiver 66, it would have been obvious that each CPU would have had an associated memory that stores program instructions for such transmission control.

Regarding such programming, as discussed below with respect to claim limitation [1G)]2), Rein teaches that zone sensors 58 operate by transmitting upon

detection of a change of state (e.g., detection of occupancy) and a programming command (e.g., user programming instructions via setup tool 320). *Id.*, 23:15-24:24; Fig. 17. Zone sensor 58 also includes a timer for triggering transmission of signals to central receiver 66. *Id.*, 21:19-34. A POSA would have found it obvious for these functions to be executed in the zone sensor 58 by a program that controls transmission. Ex. 1002, ¶124.

Furthermore, Kates teaches instruction loops that are executed by the zone thermostats, including data transmission steps performed by the zone thermostat to ensure proper transmission. Ex. 1005, 11:39-12:14. A POSA would have found the storage and use of such instructions to control of transmission to be obvious. Kates also suggests inclusion of a clock in the zone thermostats, inasmuch as zone thermostats include a program step that listens for instructions and, if none are received (in some amount of time), returns to a sleep mode, which suggests a clock for tracking time. *Id.*, 11:52-58; 11:15-19; Ex. 1002, ¶¶125-127.

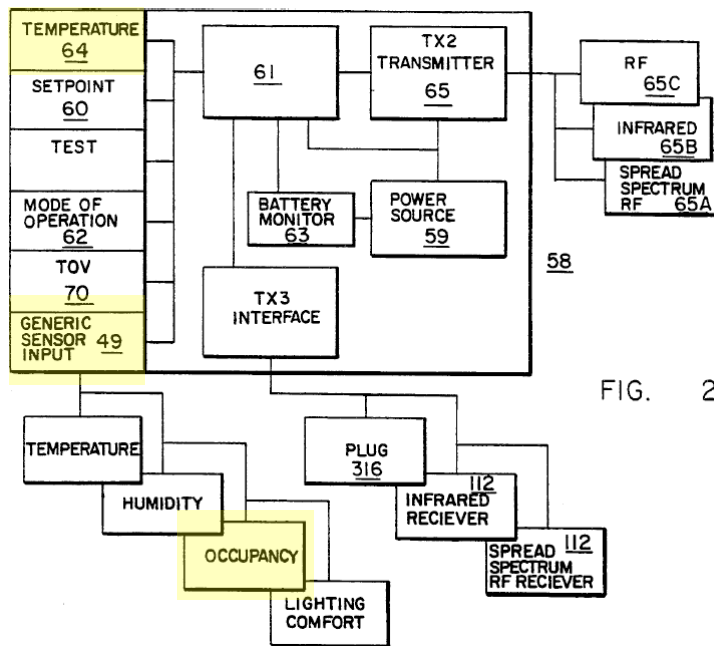
Thus, the combination of Rein and Kates suggest this limitation.

- 7) **[1]F) for the central control device or remote sensors having environmental sensors and occupancy sensors, their input/output units further including a sensor input coupled to an environmental sensor and an occupancy input coupled to an occupancy sensor,**

As discussed above, Rein describes that zone sensors 58 and comfort sensors 110 include environmental sensors and occupancy sensors. Those

sensors would have been understood to have corresponding sensor inputs. Ex. 1002, ¶128.

Regarding “occupancy input,” zone sensors 58 and comfort sensors 110 respectively include a generic sensor input 49 and a generic sensor input 359. *Id.*, ¶129; Ex. 1004, Figs. 21, 22; 8:33-57; 25:38-42. Zone sensors 58 and comfort sensors 110 also include, respectively, temperature sensor inputs 64 and 352.⁶



Id., Fig. 21.

⁶ Rein labels both the temperature sensor and its input with the same reference numeral. *Id.*, 8:27-57; 15:41-47.

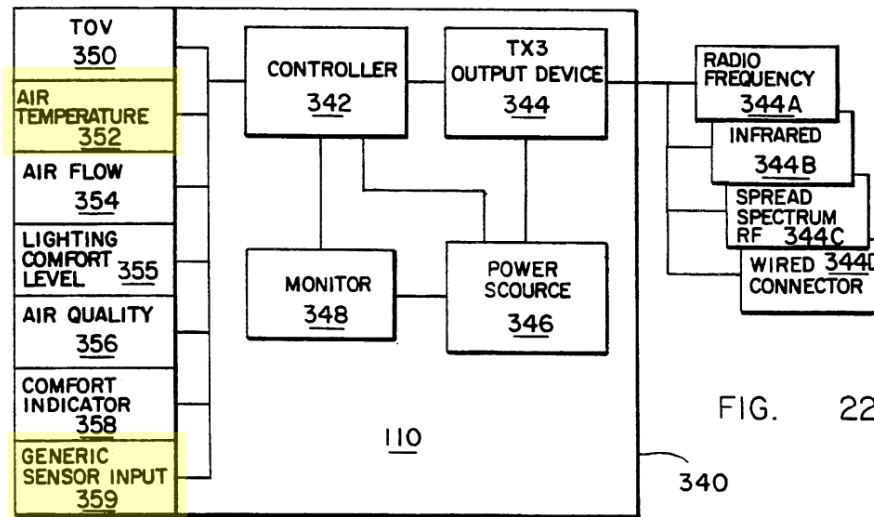


FIG. 22

Id., Fig. 22.

- 8) [1]G) the control programs causing a coupled central processing⁷ unit to selectively: 1) detect occupancy or vacancy of a nearby space from signals from a coupled occupancy sensor;

As described with respect to limitation [1]B) and [1]C), Rein's zone sensors 58 and comfort sensors 110 selectively detect occupancy or vacancy of a space using coupled occupancy sensors. Ex. 1004, 9:67-10:3; 16:48-53 ("packet 100 indicates the occupied/unoccupied status 110i of the area being monitored by the occupancy sensor"); 10:6-11 ("switch 70 acts as an on/off toggle to 10 indicate occupancy or unoccupancy"). The nearby space may be the room in which the sensor is located. Ex. 1002, ¶130.

⁷ The specification of the RE'437 patent indicates that the coupled processor affected by this control program is a processor associated with a remote sensor. Ex. 1001, 2:23-27; 6:25-60.

Also, Rein suggests that remote sensor 58 and comfort sensor 110 execute programming used to control occupancy detection (as well as temperature detection). Ex. 1004, 8:39-9:13; 15:29-57; *see* limitation [1]E), above. Rein also teaches that the remote sensors append occupancy detection signals to their data packets 86, 100. *Id.*, 16:48-53. As discussed above, the references teach and/or suggest that the central devices and remote sensors have their own processors and memories for executing programs required for operation. *Id.*, 9:56-10:14. Rein also discloses programming that works to awaken remote sensors from a sleep mode (*id.*, 5:53-57), which relates to a remote sensor's reading of an occupancy sensor's signal. Rein teaches that, when occupancy is detected, as discussed with respect to limitations [1]B) and [1G)]2), a signal indicating occupancy or vacancy is generated by the occupancy sensor. *Id.*, 16:44-64. As would have been appreciated by a POSA, this detection and transmission would have been performed in connection with the programming for the particular mode of operation in the system (e.g., if in an unoccupied mode, detecting occupancy and informing the HVAC system of such a change to the occupancy of the room). Ex. 1002, ¶¶131-132.

Kates also describes that the programming of the central device and the remote sensors operate to execute a zone control program stored in the central device that involves detecting occupancy. Ex. 1005, 2:63-3:24; 10:21-59.

Occupancy detection triggers a change in the mode of operation of the system and consequently of the HVAC equipment. *Id.* Kates' system brings zones to an occupied setpoint when it is detected that the space has become occupied. *Id.*, 2:63-3:11; 4:26-36; 10:20-37; 11:65-12:2. This operation, as a POSA would have appreciated, happens in connection with the programming for transmission in the remote sensor and the programming for HVAC control in the central controller. Ex. 1002, ¶¶133-134.

- 9) **[1G)]2) read current signals from a coupled environmental sensor and transmit them for storage in the memory of the central control device only if occupancy is detected;**

As discussed above with respect to limitation [1]A), Rein describes reading and transmitting signals from a temperature sensor to the central receiver 66. In Rein, data from signals transmitted to central receiver 66 by the remote sensors are stored in a memory when received by central receiver 66. Ex. 1004, 9:40-45; 21:19-34 (“Each time a relevant data packet 86 is received, data files associated with the particular zone sensor 58 or personal comfort sensor 110 are updated . . .”); Ex. 1002, ¶135.

As discussed in the Claim Construction section above, Petitioner applies, at least, Patent Owner's implied claim interpretation from the counterpart litigation. Specifically, the term “only” in this understanding means “when,” and allows for transmitting sensor signals upon other triggers (e.g., regular time intervals and

override commands). In addition, the latter part of this section establishes that the limitation would have been obvious in view of any reasonable interpretation of “only.” Ex. 1002, ¶136.

For context, Rein teaches that zone sensors 58 and comfort sensors 110 read current signals from temperature sensors and occupancy sensors. Ex. 1004, 9:57-62 (“this data packet 86 includes . . . the current zone temperature 86B . . .”); 12:21-33; 15:47-50; 16:48-53; 25:35-47. In Rein, transmission of current sensor readings from the temperature sensor may occur at a regular interval set in the programming (e.g., “every five minutes”) and at the time of an override of the programming (e.g., an override of setpoint programming). *Id.*, Fig. 17; 23:15-57. Thus, other than at an override or expiration of an interval period, sensor data is not sent. Ex. 1002, ¶137. As also established, Rein’s system tracks whether a zone is occupied or not and indicates that the HVAC operates differently when the building is unoccupied (e.g., late at night) as compared to when it is occupied. Ex. 1004, 9:6-8; 9:67-10:14; 15:58-16:9; 16:48-64; 25:38-47.

Rein also teaches efficiency in power consumption, describing that zone sensor 58 or personal comfort sensor 110 may (i) go into a sleep mode that uses minimal power and (ii) be woken up by a signal, after which the awoken sensor reads the temperature in the zone from the included temperature sensor. *Id.*, 8:48-53; 19:18-25; 23:15-47. Rein suggests sending data when occupancy is detected

because the system will operate differently when the zone/building is occupied vs. unoccupied. *Id.*, 9:67-10:14; Ex. 1002, ¶138. Rein’s sensor use is intended to “responsively communicate information and react to changes in zone conditions.” Ex. 1004, 4:4-7; 5:23-32; 8:27-32; 9:6-8. However, Rein does not explicitly describe reading and transmitting environmental sensor data when occupancy is detected.

Kates describes a system for controlling HVAC systems based on the readings from remote sensors, including environmental and occupancy sensors. Ex. 1005, 2:63-3:14; 4:26-36; 10:20-37; 11:65-12:2. Kates uses occupancy to determine how to operate HVAC in certain zones. Ex. 1002, ¶139. Kates explains that “[a] zoned system allows more control over the indoor environment because the occupants can decide which areas to heat or cool and when. With a zoned system, the occupants can program each specific zone to be active *or inactive* depending on their needs. For example, the occupants can set the bedrooms *to be inactive during the day*.” Ex. 1005, 1:39-45.

Kates explains that when an occupancy sensor detects occupancy, a signal is transmitted to a central device so that the system switches to programming for the occupied mode. *Id.*, 2:63-3:11; 4:26-36; 10:20-37; 11:65-12:2. Because Kates teaches that (i) the system may be rendered inactive when a room is not being used and (ii) it is preferable to send signals from the remote sensors upon a change in

occupancy in order to switch to an occupied mode, a POSA would have understood that it would have been obvious to operate Rein's system similarly. Indeed, in order to know the manner in which to operate the HVAC system to effectuate the occupied setpoint programming, the system would need to know current conditions for the room. Ex. 1002, ¶¶140-141.

Thus, a POSA would have understood that Rein's data packets would be transmitted only upon the detection of occupancy. Rein's data packets include not only the sensor data from the occupancy sensor, but also the current readings from the environmental sensors. Ex. 1004, 14:6-23; 16:34-53. At the very least, a POSA would have found it obvious to send the "current" readings inasmuch as the sensor readings are used to control the system and sending past readings would not allow the system to provide controls useful for the current environmental conditions of the room. Ex. 1002, ¶142.

For these reasons, a POSA would have understood this limitation to be obvious in view of Rein and Kates, at least under Patent Owner's apparent construction of "only." Ex. 1002, ¶143.

In addition, a POSA would also have found this limitation obvious in view of narrower interpretations of "only." Specifically, Rein teaches that environmental sensor data may be sent at set intervals and upon override (e.g., manual change of mode) commands. And Kates indicates that such sensor

readings may be sent upon a sensor detecting an occupied state in a zone/room.

This presents a finite number of known options such that selecting any one of these options for use in an HVAC control system would have been obvious. Ex. 1002, ¶¶144-145. Further, Rein and Kates acknowledge the need to save battery life in the remote sensors and that the system overall preferably goes into a low power state during an unoccupied period (to conserve energy). Rein describes that when a building is not occupied, such as late at night, it is preferable to be in an unoccupied state. Ex. 1004, 9:67-10:3. Kates also explains that it is preferable to have HVAC systems go “inactive” during periods when the zone is unoccupied. Ex. 1005, 1:39-45.

While Rein explains that remote sensors may transmit sensor data at regular intervals, a POSA would also understand that during extended unoccupied periods in which a building or zone is empty (and “inactive”) not transmitting at all would save power and battery life for remote sensors. Ex. 1002, ¶¶146-148. Rein also notes the energy savings associated with sleep and dormant states. Ex. 1004, 5:53-57; 8:51-53; 15:37-41; 23:46-47. And, because the point of the extended inactive period is due to vacancy, a POSA would also understand to use Kates’ teaching that, upon the detection of occupancy, the system would wake up and transmit data (such as Rein’s data packets) in order to trigger the switch to an occupied mode. This would be a simple design preference using known options taught in Rein and

Kates. Even if sending data at regular intervals may be preferred by some, obviousness does not require the most preferable option. *In re Fulton*, 391 F.3d 1195, 1200 (Fed. Cir. 2004) (the “law does not require that a particular combination must be the preferred, or the most desirable, combination described in the prior art in order to provide motivation”).

Thus, a POSA would have found this limitation to have been obvious under even a narrower construction of “only,” such as when the system is completely inactive to save even more power (e.g., regular interval data is not sent). Ex. 1002, ¶149.

- 10) [1G)]3) for the central control program, calculate an average of the received environmental sensor values and use the average result as a control value which is compared with a setpoint stored in the memory of the central control program to determine actuation of the space conditioning equipment.**

Rein’s system calculates and uses a temperature average from readings from multiple remote environmental sensors. Ex. 1004, 2:21-25; 22:38-50; 23:58-24:24. The averaged value is then compared to a stored setpoint in order to determine whether to actuate the HVAC equipment. *Id.*, 24:4-23 (“the zone setpoint 86C or 86D [may] be used as a master setpoint 104G for comparison with averaged or weighted temperature information from a plurality of zones”); 18:41-51; 22:38-50; 23:58-24:24. In this manner, the system is able to account for the fact that different sensors in different locations read different temperatures, some which

may lead to actuation of the HVAC and some which may not lead to actuation.

Using an average allows the system to create a temperature value to be compared to the setpoint value in making the determination as to whether to actuate the HVAC (e.g., to provide cool air). Ex. 1002, ¶¶55,150.

b) Claim 2

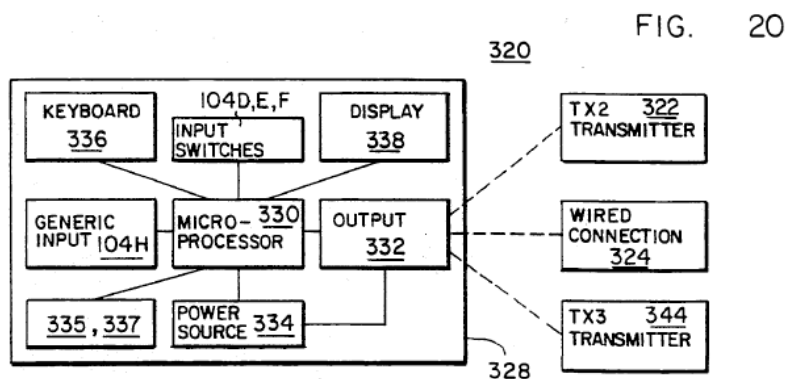
- 1) The system of claim 1 wherein averaging of received environmental sensor values is calculated by simple averaging or a weighted averaging depending on relative spaces of occupied rooms.**

As discussed with respect to limitation [1G)]3), Rein describes using an average reading from environmental sensors. Ex. 1004, 2:21-25; 22:38-50; 23:58-24:24. This may involve a simple average or the application of weighted averages. *Id.*, 24:4-23 (“comparison with averaged or weighted temperature information from a plurality of zones”); 18:41-51. When using weighted averages, Rein describes that the weights can be applied differently depending on which zone is being monitored. *Id.*, 23:58-24:24. Therefore, Rein suggests that the system may simply average the temperature from all sensors or apply a weighted average depending on the different zones comprising the conditioned space. Ex. 1002, ¶151.

c) **Claim 3**

- 1) **The system of claim 2 wherein a display and a user interface are coupled with the input/output unit of the central processing device so the central control program causes a display of averaging methods for averaging received environmental sensor values.**

Figure 20 shows a setup tool 320. Rein describes that a user may program the system utilizing a setup tool 320, which includes a keyboard 336, a display 338, an output 332 and a number of input switches 104(D-F). Ex. 1004, 24:54-25:32. The setup tool 320 communicates with the central receiver 66 on the TX2 communication medium via the TX2 transmitter. *Id.*, Fig. 20; 24:54-25:32. Ex. 1002, ¶152.



Ex. 1004, Fig. 20.

Using the setup tool 320, a user may input commands that indicate via e.g., data packet 104, that data, such as the temperature, from certain zones should be averaged. *Id.*, 23:15-31 (“receipt of command packet 104 from setup tool 320”); 9:47-56; 23:58-24:24; 25:6-9; 5:33-44. Different methods of averaging are

discussed with respect to claim 2 above. Also, the data packet 104 resulting from the user programming through setup tool 320 includes instructions as to the manner of averaging data from different zones. *Id.*, 23:58-24:24; 24:54-25:32.

This suggests that the user inputs commands concerning the averaging through an interface that includes display 338, such that the options would be displayed to the user. Indeed, the user would be expected to indicate how to weight the sensors. At the very least, displaying the same for user selection would have been obvious.

Id., 18:4-51; 22:34-50; 3:47-52. Ex. 1002, ¶153.

d) Claim 4

- 1) The system of claim 3 wherein the central control program further causes a display indicating that a user may select an averaging method through the user interface and thereafter accepting user input selecting one of the averaging methods.**

See claim 3. Ex. 1002, ¶154.

e) Claim 5

- 1) The system of claim 1 wherein the space conditioning equipment comprises zone control means so that only occupied rooms have their space affected by the space conditioning equipment.**

The possible constructions of “zone control means” are set forth in the Claim Construction section. Under one interpretation, the corresponding structures in the specification are the structures associated with the central processor (i.e., CPU, clock, memory, input/output unit). For that interpretation, the corresponding

structures in the prior art have already been addressed in connection with claim 1 above (*see* limitation [1]D)). Ex. 1002, ¶155. Also, averaging is discussed with respect to claim 1. *See* Claim Construction section.

The other interpretation is that the corresponding structures are the duct dampers. Ex. 1001, 4:9-18. Rein teaches dampers 74 that control the flow of air to certain areas of the space. Ex. 1004, 10:15-68; 11:42-52; 12:34-38; 13:12-22; 14:64-68; 5:58-6:9; claim 9. Kates also describes the use of dampers to control the flow of air to different zones/rooms so that unoccupied rooms are not heated or cooled. Ex. 1005, 2:63-3:14; 4:26-36; 4:62-5:32; 6:5-27; 8:53-58; 9:1-3; 10:13-37; 13:60. In particular, Kates explains that “[t]he sensors can detect where and when heated or cooled air is needed. The sensors send information to a central controller that activates the zoning system, adjusting motorized dampers in the ductwork and sending conditioned air only to the zone in which it is needed.” Ex. 1005, 1:13-45. Kates describes dampers included in its “Electronically-Controlled Register Vent (ECRV).” Ex. 1005, 2:1-60; 15:15-23. Thus, a POSA would have understood that controlled dampers, as taught by Kates, would be used to prevent conditioned air from being sent to unoccupied rooms. *Id.*, 1:39-45.⁸ Thus, Kates suggests the claimed zone control means.

⁸ This practice was well known in the field. Ex. 1002, ¶¶156-158 (citing Ex. 1013, 6:11-16; 2:40-3:10; Ex. 1014, 6:42-48).

f) Claim 6

1) 6[Pre] An occupancy response system ... comprising:

See claim 1[Pre]. Ex. 1002, ¶159.

2) [6]A) two or more environmental sensors adapted ...;

See claim [1]A). Id., ¶160.

3) [6]B) two or more occupancy sensors adapted ...,

See claim [1]B). Id., ¶161.

**4) [6]C) ... two or more of the remote sensors each
comprise ...,**

See claim [1]C). Id., ¶162.

**5) [6]D) a central processor for the central control
device including ...;**

See claim [1]D). Id., ¶163.

**6) [6]E) a remote processor for each of the remote
sensors including ...; and,**

See claim [1]E). Id., ¶164.

**7) [6]F) for the central control device or remote sensors
... their input/output units further including ...,**

See claim [1]F). Id., ¶165.

8) [6]G) the control programs causing ... 1) ...;

See claim [1G)]1). Id., ¶166.

- 9) [6G)]2) read current signals from a coupled environmental sensor and a coupled occupancy sensor and transmit them for storage in the memory of the central control device so that values of environmental conditions are associated with their source of occupied or unoccupied rooms;

As discussed with respect to limitation [1G)]2), Rein teaches that zone sensors 58 and comfort sensors 110 read current signals from a temperature sensor 64 and an occupancy sensor. Ex. 1004, 9:57-62; 12:21-33; 15:47-50; 16:48-53; 25:35-47 (“the current zone temperature 86B . . .”). As discussed above with respect to limitation [1]E), each zone sensor 58 and comfort sensor 110 includes a CPU that reads signals from the individual sensors included in those devices. Rein describes that an objective of zone sensors 58 and comfort sensors 110 is to “responsively communicate information and react to changes in zone conditions.” *Id.*, 4:4-7; 5:23-32; 8:27-32; 9:6-8. The contents of the signals sent from zone sensor 58 and comfort sensor 110 are shown, in part, in Figs. 6 and 9, respectively. What is sent, as detailed above, includes values/data related to the current temperature and the occupancy state. Ex. 1002, ¶¶167-168. In addition, Rein explains that both zone sensor 58 and comfort sensor 110 transmit in their respective packets an identifier that associates the data with the sending device (and, thus, corresponding zone). Ex. 1004, Fig. 5, 6, and 9; 13:34-14:23 (“zone sensor identification code 86A”); 16:34-42 (“personal

comfort identification code 100A”); 16:54-65. As also discussed above, the zone sensors may be associated with individual rooms. *Id.*, 8:27-36; 11:50-52.

Rein describes that each controller 68 connected to central receiver 66 stores in its memory 408 the identifier 86A (and related information) of zone sensors 58 that are designated to it. *Id.*, 10:55-68. Also, central receiver 66 maintains an internal list of valid zone sensors 58 to use in verifying the validity of transmissions it receives. *Id.*, 12:54-13:2. This allows the signals transmitted by zone sensors 58 to the central receiver 66 to reach the appropriate controller 68 to control HVAC equipment for a specific zone. *Id.*, 10:58-11:6. Ex. 1002, ¶169.

Once received by the central receiver 66 and validated, data from signals sent by zone sensors 58 (or comfort sensors 110) is stored in memory 364. Ex. 1004, Fig. 23; 9:40-45 (“A memory device 364 is provided to store such information as valid transactions and lists of valid message transmitters,”). After being validated, the various data are stored in, at least, memory 364. *Id.*, 12:26-33; 22:65-67; 23:4-6. Indeed, Rein explains that “[e]ach time a relevant data packet 86 is received, data files *associated* with the particular zone sensor 58 or personal comfort sensor 110 are updated” *Id.*, 21:19-34. In this manner, the data/values from each packet are associated, in memory 364, with the identity of zone sensor 58 or comfort sensor 110 that transmitted them and, thus, the data is associated

with the room in which that sensor is located. *Id.*, 9:57-62; 12:21-26; 14:6-13; 16:34-37. Ex. 1002, ¶170.

As discussed above, zone sensors 58 also preferably generate signals indicating occupancy. Ex. 1004, Fig. 21; 16:48-53; 25:35-47. Thus, a POSA would have understood that the occupancy signals are also included in data packet 86 and stored in its memory in association with the corresponding zone sensor 58. *Id.*, Fig. 21; 25:35-47; 16:44-53. Ex. 1002, ¶171.

10) [6G)]3) for the central control program, calculate an average

See claim [1G)]3). Ex. 1002, ¶172.

g) Claim 7

See claim 2. *Id.*, ¶173.

h) Claim 8

1) The system of claim 6 wherein where occupancy sensors include infra-red motion detectors.

While Rein describes that remote sensors may transmit information using infrared, Rein does not explicitly state that its occupancy sensors use infrared. Nevertheless, a POSA would have readily appreciated that an obvious choice for an occupancy sensor was an infrared sensor. Infrared motion detectors have long been utilized in the field to detect occupancy. *Id.*, ¶174. Indeed, Kates describes that occupancy sensors used in its system may comprise infrared sensors. Ex. 1005,

10:12-24 (“The occupant sensor 1201, such as, for example, an infrared sensor, motion sensor, ultrasonic sensor, etc. senses when the zone is occupied.”). Thus, this limitation would have been obvious in view of Kates.

i) Claim 9

1) The system of claim 6 wherein environmental sensors include temperature sensors and humidity sensors.

As discussed above with respect to claim 1, Rein describes remote sensors that include multiple individual sensors, including temperature sensors. Ex. 1004, 4:55-57 (“sensor for sensing environmental conditions”); 8:28-38; 9:6-8; 9:57-62; 15:41-50; 16:34-42; 17:16-19; 23:26-29.

Rein also describes that humidity sensors may be attached to zone sensors 58, comfort sensors 110, or the setup tool 320 via the generic sensor input to measure humidity in an area. *Id.*, 25:35-47; 24:62-66; 16:44-48 (“a humidity sensor (not shown)”). As discussed throughout Ground 1, Rein teaches that multiple remote sensors may be utilized in a zone, any of which may include occupancy sensors and/or humidity sensors. Ex. 1002, ¶¶175-176.

Kates also demonstrates that humidity sensors can be included in zone thermostats along with temperature sensors (and occupancy sensors). Ex. 1005, 15:35-50; Ex. 1002, ¶177.

j) Claim 10

See claim 3. Ex. 1002, ¶178.

k) Claim 11

See claim 4. Id., ¶179.

l) Claim 12

See claim 5. Id., ¶180

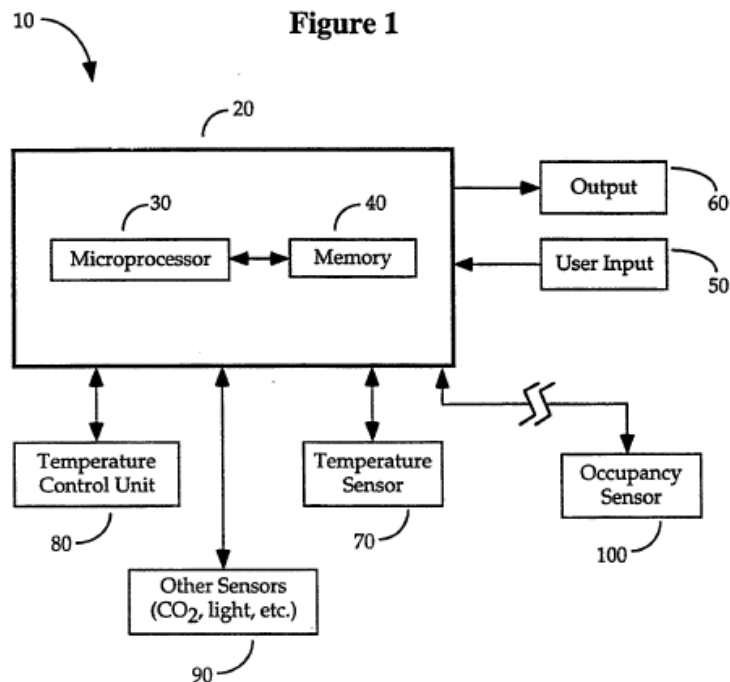
C. Ground 2: Claims 1-12 are Obvious Over Rein and Riley

As discussed above with respect to Ground 1, Rein describes a system that uses wireless communication between the HVAC controllers and temperature sensors in the zones, which description meets most limitations of the claims. Ex. 1004, 1:10-12. Notably, Rein’s system utilizes information from both environmental (e.g., temperature) and occupancy sensors to control HVAC operations. Rein utilizes central receiver 66 (along with, e.g., controller 68) to receive the data from sensors, store the data in memory, and actuate the HVAC equipment in response to the data. Ex. 1004, 9:21-10:38; Ex. 1002, ¶¶185-194.

As discussed above, Rein does not explicitly describe reading current signals from an environmental sensor and transmitting those signals for storage “only” upon the detection of occupancy, although such feature would have been obvious in view of Rein. In this Ground, Riley is relied upon to provide a more specific teaching of that feature.

Like Rein, Riley describes a control system for HVAC equipment in which remote sensors (e.g., remote sensor units 520-540) transmit information to a central

device (e.g., base stations 20, 510, 620, 800). Ex. 1002, ¶¶192-196; Ex. 1009, 25:11-53; Figs. 6, 7. Riley’s remote sensors “may include ... sensors ... for sensing temperature, occupancy, and other conditions such as light intensity and the presence of CO₂ or other gases.” *Id.*, 25:11-19; Fig. 1.



Id., Fig. 1.

When an occupancy sensor detects occupancy in a previously unoccupied room, signals are transmitted to a central control device so that the system may employ the correct setpoint programming intended for an occupied room. *Id.*, 2:31-54; 3:3-35; 4:30-49; 8:10-20; 9:4-12; 19:2-30; 24:17-52; 25:3-53. As discussed above, Rein teaches that its system may be a retrofit system with a central receiver 66 (in combination with controller(s) 68 and/or system 76) that may be utilized with existing HVAC equipment. Thus, Rein and Riley are both in the same field

and both describe and/or suggest central controllers. Moreover, a POSA would have appreciated that utilizing a single central device to both receive sensor data and control HVAC equipment to be a simple design choice. Ex. 1002, ¶197.

As discussed above, in Rein the occupancy sensor data would be sent in a packet together with the current environmental sensor data. Ex. 1004, 9:67-10:14; 15:58-16:9; 16:44-64; 25:38-47; Figs. 9, 13. Also as discussed above in Ground 1, while Rein does not expressly state that a data packet is transmitted upon a remote sensor detecting occupancy, the same is suggested. Specifically, Rein describes using different programming for occupied and unoccupied modes. In order for a system to switch to the occupied mode and reach the setpoint for that mode, a POSA would have appreciated that the detection would lead to the transmission of the occupancy signal along with the current environmental data. Ex. 1002, ¶198. This would allow the system to determine what action to take, if any, to reach the setpoint for the occupied mode. Indeed, Rein describes that the occupancy signal is transmitted along with the current temperature. Ex. 1004, 9:67-10:14; 16:44-64; 25:38-47; Figs. 6, 9, 13. Riley teaches that, whenever occupancy is detected, the base station is notified—with an indication of the current temperature—so that it may implement the setpoint programming for the occupied mode.

Riley describes what was conventionally known in the field regarding the use of occupied and unoccupied modes in HVAC systems. Specifically, it was

long known that, when a space was occupied, it was preferable to keep the setpoint at the user's preferred target temperature and, when the space was unoccupied, to let the temperature in the room to drift away from setpoint in order to conserve energy. Ex. 1009, 8:10-20. In such operations, the unoccupied mode often allowed the temperature to drift from the target setpoint by a certain amount, so that the system could get back to the target in a reasonable amount of time. *Id.* Riley also describes alternatives in which system operations can be suspended completely for, at least, prolonged periods of vacancy. Ex. 1009 at 24:17-52 ("the system may be programmed to suspend operations after a predetermined large period of time, ***until reset manually or when someone returns into the space***"). During that full suspension of operations, no transmissions of environmental data would be sent, as would have been appreciated by the POSA based on the plain language in Riley, inasmuch as such data would not be needed during a full suspension of operations (e.g., there no longer is a target setpoint to maintain), and a purpose of suspension of operations is to conserve energy, including the battery power of the remote sensors. Ex. 1004, 23:45-47 ("Going 'dormant' is a method of conserving a non-renewable power source 59 such as a battery 59."); 8:39-43; Figs. 6, 9. Ex. 1002, ¶¶199-200.

Once a signal indicating occupancy is received by the base station, operation resumes and environmental conditions are transmitted to the base station. Ex.

1009, 24:17-52 (“a temporary suspension of operation altogether, until operation is again triggered by someone reentering the space.”). As a POSA would have understood, the environmental conditions are transmitted upon occupancy detection because the system resumes operations to reach the target setpoint and the current temperature of the space would be needed in order for the system to know what to do (e.g., blow hot or cold air). Ex. 1002, ¶201. And, as already established, Rein teaches sending environmental data with the packet containing the occupancy information.

While Riley describes a full suspension of operations, it adds that the suspension may be accompanied by “absolute boundaries, such as 40° F to 100° F” as an option for climates that are likely to experience extreme weather. Ex. 1009, 24:24-56. However, Riley offers this as an option and a POSA would have understood that the same is not required for climates (or times of the year) that do not experience extreme temperatures. Ex. 1002, ¶202.

A POSA would have appreciated that suspending operations during prolonged vacant states—in which no data needs to be transmitted (e.g., no interval data)—would be useful to the system in Rein (or any HVAC system using occupancy sensors), in order to further conserve energy. Ex. 1009, 24:16-24 (“to provide further savings of energy”). Ex. 1002, ¶203. Indeed, Rein describes the intention to use energy “in the most efficient manner.” Ex. 1004, 17:16-38; 9:67-

10:16 (“unoccupancy”). Therefore, there would have been a clear motivation to combine the teachings. Also, a POSA would have had a reasonable expectation of success in making the combination given the similarity of the systems and the fact that the combination would require simply programming a different mode of operation in similar equipment. Ex. 1002, ¶203. Moreover, Riley provides more detail on the specifics of operations in an unoccupied mode called for in Rein.

With the combination, the system in Rein would enter a mode in which data would only be sent to a central controller once the system is awakened by occupancy detection, as taught in Riley. Ex. 1002, ¶204. In particular, Rein already teaches (i) the use of occupancy sensors, (ii) different programming during occupied vs. unoccupied modes of operation (Ex. 1004, 9:67-10:14), and (iii) transmitting sensor data upon a change in state of the room (Ex. 1004, 9:6-20). This would allow a system operating in an unoccupied mode (when people are not in the building), to switch to an occupied mode automatically when a person enters the relevant zone. In this way, the system can re-activate and begin sending environmental conditions, such as temperature, so that the HVAC system can determine current conditions and, thus, what needs to be done to reach the normal occupied setpoint.

Thus, the features of claims 1-12 would have been obvious over the combination of Rein and Riley for the reasons set forth below, including under either any construction of “only.” Ex. 1002, ¶¶205-209.

a) Claim 1

1) 1[Pre] An occupancy response system ... comprising:

See Ground 1, claim 1[Pre]; *see* Ex. 1009, 2:31-54; 3:3-35; 4:30-49; 8:10-20; 9:4-12; 19:2-30; 24:17-52; 25:3-26:3; Figs. 1, 6, 7, 8; Ex. 1002, ¶¶211-212.

2) [1]A) two or more environmental sensors adapted ...;

See Ground 1, claim [1]A); *see* Ex. 1009, 2:31-54; 4:25-49; 7:29-8:7; 15:55-68; 16:11-34; 24:59-64; 24:68-25:2; 25:11-26:3; Figs. 1, 6, 7, 8; Ex. 1002, ¶¶213-214.

3) [1]B) two or more occupancy sensors adapted ...,

See Ground 1, claim [1]B); *see* Ex. 1009, 2:31-54; 3:3-35; 4:30-49; 8:10-20; 9:4-12; 19:2-30; 24:17-52; 25:3-53; Figs. 1, 6, 7, 8; Ex. 1002, ¶¶215-216.

4) [1]C) ... two or more of the remote sensors each comprise ...,

See Ground 1, claim [1]C); *see* Ex. 1009, 2:31-54; 3:3-35; 4:25-49; 7:29-8:7; 8:10-20; 25:3-26:3; Figs. 1, 6, 7, 8; Ex. 1002, ¶¶217-218.

- 5) **[1]D) a central processor for the central control device including: 1) a central processing unit; 2) a real time clock; 3) a memory coupled to said central processing unit for storing a central control program and data, said data including at least one of the values of the environmental conditions sensed by the environmental sensors; and 4) an input/output unit coupled to the central processing unit, to the space conditioning equipment for issuing control signals thereto, and to a reception interface adapted to receive signals representing environmental conditions at a remote sensor;**

See Ground 1, claim [1]D); *see* Ex. 1009, 2:31-3:35; 4:9-49; 9:3-12; 25:54-26:28; 27:15-37; Figs. 1, 6, 8; Ex. 1002, ¶¶219-220.

Notably, Riley also teaches a central processor for a central control device (base stations 20/510/620/800). Ex. 1009, 3:3-15; 25:11-65. The claimed central processor would be understood from the fact that Riley uses a control device includes a microcontroller that “can be any one of a number of commercially available microcontrollers, such as the Texas Instruments TMS 370 Series microcontroller,” which a POSA would have understood to suggest each of a CPU, real-time clock, memory, and input/output units.⁹ *Id.*, 4:9-24; 25:54-65; Ex. 1002, ¶¶220-222. Riley’s base station has “control programs stored in memory to implement the functions of the invention and to control the ... [H]VAC[.]” Ex. 1009, 2:31-48. The inputs and outputs are suggested in, at least, Fig. 1.

⁹ Ex. 1010, 5; 109-110; 172-177; 182-184; 205-239; 254-262.

- 6) [1]E) a remote processor for each of the remote sensors including a central processing unit, a clock, a memory coupled to said central processing unit for storing a transmission control program, and an input/output unit coupled to the central processing unit and to a transmissions interface adapted to send to the central control device signals representing environmental conditions from a coupled environmental sensor; and,

See Ground 1, claim [1]E), for the application of Rein to this feature.

Further, Riley describes that control programs stored in the microcontrollers of remote sensors (520) control their operation. Ex. 1009, 2:31-46; 25:20-32. The remote sensor may be controlled by a microcontroller such as Microchip's "programmable" PIC16C54, which was known to have a CPU, clock, memory, and input/output units.¹⁰ *Id.*, 25:20-32. The remote sensors in Riley's system include occupancy sensors that detect changes in occupancy. *Id.*, 2:31-54; 3:3-35; 4:30-49; 8:10-20. The remote sensors 520 are "programmed to work in cooperation" with base station (20/510/620/800). Remote sensors 520 transmit the changes in the occupancy of a space to a base station so that it may implement the appropriate occupied or unoccupied mode of operation utilizing its control programs. *Id.*, 2:31-54; 3:3-35; 4:30-49; 9:4-12; 25:3-53; Figs. 1, 2, 7. Riley also teaches that the manner in which occupancy detection is acknowledged may be changed via user

¹⁰ Ex. 1011, 3-5; 13-19; 39-45.

programming. *Id.*, 19:2-30. Thus, Riley teaches and/or Rein suggest storing programming to detect a change in occupancy and transmit a signal so as to control HVAC systems based on the same. Ex. 1002, ¶¶223-224.

**7) [1]F) for the central control device or remote sensors
... their input/output units further including ...,**

See Ground 1, claim [1]F); *see* Ex. 1009, 4:9-48; 25:11-53; Figs. 1, 7, 8. Ex. 1002, ¶¶225-226.

8) [1]G) the control programs causing a coupled central processing¹¹ unit to selectively: 1) detect occupancy or vacancy of a nearby space from signals from a coupled occupancy sensor;

See Ground 1, claim [1G)]1).

Further, Riley use of control programs to perform this function is discussed above with respect to elements [1]D) and [1]E). Ex. 1002, ¶¶227-228.

9) [1G)]2) read current signals from a coupled environmental sensor and transmit them for storage in the memory of the central control device only if occupancy is detected;

As discussed above with respect to limitation [1]A) in Ground 1, Rein describes reading signals from a temperature sensor and transmitting them to central receiver 66 (and controller 68). Rein also describes that data from each

¹¹ The specification of the RE'437 patent indicates that the coupled processor affected by this control program is a processor associated with a remote sensor. Ex. 1001, 2:23-27; 6:25-60.

signal transmitted to central receiver 66 by zone sensor 58 or comfort sensor 110 is stored in memory. Ex. 1004, 9:40-45; 21:19-34. Ex. 1002, ¶229.

As discussed in the Claim Construction section above, Patent Owner's implied claim interpretation in the counterpart litigation treats "only" as meaning "when," which would not preclude other triggers for sending sensor signals (e.g., regular intervals). Riley applies under Patent Owner's implied construction as well as a narrower construction of "only." Ex. 1002, ¶230.

As established in Ground 1, Rein teaches that zone sensors 58 and comfort sensors 110 read current signals from temperature sensors and occupancy sensors. Ex. 1004, 9:57-62, 12:21-33; 15:47-50; 16:48-53; 25:35-47. In Rein, transmission of current sensor readings from the temperature sensor may occur at regular intervals, at the time of an override that sets new programming, and upon a change of state which, as discussed in Ground 1, a POSA would appreciate may be generated by a change in occupancy. *Id.*, Fig. 17; 23:15-57. As also established, whether to use multiple options or to select one of those triggers would have been appreciated by a POSA to be a design choice, as well as a choice among a limited number of known options. *KSR Int'l*, 550 U.S. at 415-419. Notably, Rein describes unoccupied modes and sleep modes for conserving energy. Ex. 1004, 9:6-8; 9:67-10:14; 15:58-16:9; 16:48-64; 25:38-47. A POSA would have appreciated that the level of power conservation in an unoccupied mode may

depend on a number of considerations. For a home system, a POSA would understand that a homeowner may not want the unoccupied temperature level to stray too far from the occupied setpoint for quick recovery. Ex. 1002, ¶¶231-233. The needs of an office building over a weekend may be different, such that, for energy savings, the system may want to completely shut down. As Riley teaches, for prolonged periods of unoccupancy of a building, the system designer may opt to provide a more robust energy savings setting where HVAC operations are completely suspended. Riley articulates these different options. Ex. 1009, 3:3-35; 8:10-20; 9:4-12; 24:17-52; 25:3-53.

Riley is directed to a similar system for controlling HVAC systems based on the readings from remote sensors (including temperature and occupancy sensors). *Id.*, 2:31-54; 3:3-35; 4:30-49; 8:10-20; 9:4-12; 19:2-30; 24:17-52; 25:3-53. Like Rein, Riley describes that data transmitted from a remote sensor is stored in memory when received by the base station. *Id.*, 4:40-49; 9:3-12; 19:12-24. Riley also explains that occupancy is used to determine how to operate HVAC equipment in certain zones. *Id.*, 2:31-54; 3:3-35; 4:30-49; 8:10-20; 9:4-12; 19:2-30; 24:17-52; 25:3-19; 25:35-53; Ex. 1002, ¶234.

While Riley describes simple unoccupied modes in which the temperature of a space may be permitted to “drift” higher by a certain amount, it also describes more robust unoccupied modes in which the system may suspend operations

altogether. Ex. 1009, 3:3-15; 24:17-57. For instance, after “a week, the system could go into a temporary suspension of operation altogether.” *Id.*, 24:37-40; 24:53-55 (“cease or limit operation of the HVAC equipment”). Such operations “minimize[e] wasteful equipment operation when people are absent.” Ex. 1009, 25:3-10. Riley states that such a full suspension of operation may be accompanied by “absolute boundaries such as” 100° F, which Riley characterizes as a “prefer[ence]” where there is a need “to prevent heat or cold damage.” Ex. 1009, 24:37-45. A POSA would have understood whether or not to include such boundaries is an option that would depend on, e.g., the geographic location of the building. Ex. 1002, ¶¶235-236. For instance, a building in Nevada may benefit from being protected against extreme heat, where there would be no such concern for a building in, for example, San Francisco. Ex. 1009, 24:37-45. Absent such boundaries, a POSA would understand that no transmissions of sensor data would be employed inasmuch as all operations would have ceased and because the environmental sensors would conserve energy by entering a sleep mode. Ex. 1004, 8:51-53; 9:4-5; 15:37-41; 23:15-57; *see* Ex. 1009, 24:17-52; Ex. 1002, ¶236.

As Riley explains, when operations are altogether suspended after unoccupancy, “operation is again triggered by someone reentering the space.” Ex. 1009, 24:37-40. Thus, Riley teaches and/or suggests restarting operations, and thus sending environment data from the sensors, “only if occupancy is detected,”

as claimed. Riley also offers that the system may not restart “until reset manually or when someone reenters the space.” Ex. 1009, 24:46-52. As to the possible manual reset, under the Patent Owner’s implied construction, such a manual override to change modes would be exempted from the meaning of “only.” Also, Riley’s description pertains to the manual change of a mode (i.e., no longer in the unoccupied mode) such that, while in the unoccupied mode, there would be transmissions only upon occupancy detection. Ex. 1002, ¶237. Furthermore, whether to change the mode based on occupancy detection alone or upon either of occupancy detection or a manual mode change would be an obvious selection between a limited number of known options. Thus, a POSA would have understood that the “only” limitation would have at least been obvious from Riley under any reasonable interpretation. *Id.*, ¶238.

Once occupancy was detected, occupancy data and environmental sensor data would be transmitted to the central controller. Rein teaches this data being sent together. Ex. 1004, 9:67-10:14; 15:58-16:9; 16:44-64; 25:38-47; Figs. 9, 13. Indeed, as a POSA would have understood, in order to return to the setpoint for the occupied mode, it is preferable to send environmental sensor signals (particularly the current temperature) so that the central control system would know how to operate the HVAC system to effectuate the setpoint programming (e.g., should the system blow cold air or warm air). Ex. 1002, ¶¶239-240. Riley describes that the

first operation after detecting occupancy is to detect the current temperature, in order to compare that temperature to the target setpoint. Ex. 1009, 9:3-12. Thus, a POSA would have understood that Rein's data packets would be transmitted upon the detection of occupancy. Rein's data packets include not only the sensor data from the occupancy sensor, but also the current readings from the environmental sensors. Ex. 1004, 9:57-66; 14:6-23; 16:34-53. At the very least, a POSA would have found it obvious to send the "current" readings inasmuch as current sensor readings would aid in determining what to do to reach the setpoint for the occupied mode (e.g., should the system blow warm air or cool air to reach the setpoint).

For these reasons, a POSA would have understood this limitation to be obvious in view of Rein and Riley. Ex. 1002, ¶241.

10) [1G)]3) for the central control program, calculate an average

See Ground 1, claim [1G)]3). *Id.*, ¶242.

b) Claim 2

See Ground 1, claim 2. *Id.*, ¶243.

c) Claim 3

See Ground 1, claim 3. *Id.*, ¶244.

d) Claim 4

See Ground 1, claim 3. *Id.*, ¶245.

e) **Claim 5**

- 1) **The system of claim 1 wherein the space conditioning equipment comprises zone control means so that only occupied rooms have their space affected by the space conditioning equipment.**

See Ground 1, claim 5; *see* Ex. 1009, 3:13-35; 16:25-34; 24:17-52; Ex. 1002, ¶246.

As discussed with respect to Ground 1, Rein teaches dampers 74 that control the flow of air to certain areas of a space (and the use of averaging). Ex. 1004, 10:15-68; 11:42-52; 12:34-38; 13:12-22; 14:64-68; claim 9. Riley teaches that “[t]he base station controls the HVAC equipment to maximize energy savings by running the HVAC equipment at minimal levels when the space is not occupied.” Ex. 1009, 3:13-24. Riley also teaches that when a room has been unoccupied for a prolonged period of time, the system preferably ceases to condition that space at all. Ex. 1009, 24:17-52. Rein’s dampers would be understood allow for ceasing to send conditioned air to unoccupied spaces, such as when the HVAC controls multiple zones with one unit, such that the unit would be operated to condition the occupied space, but not the unoccupied space. Ex. 1002, ¶247.

Also, as discussed above with respect to element [1]D) in this Ground, both Rein and Riley together teach and/or suggest the structures of central processor of the central control device. Ex. 1002, ¶248.

f) Claim 6

1) 6[Pre] An occupancy response system ...;

See claim 1[Pre]; see Ground 1, claim 1[Pre]. Id., ¶249.

2) [6]A) two or more environmental sensors ...;

See claim [1]A); see Ground 1, claim [1]A). Id., ¶250.

3) [6]B) two or more occupancy sensors ...;

See claim [1]B); see Ground 1, claim [1]B). Id., ¶251.

4) [6]C) ... two or more of the remote sensors each comprise ...;

See claim [1]C); see Ground 1, claim [1]C). Id., ¶252.

5) [6]D) a central processor for the central control device including ...;

See claim [1]D); see Ground 1, claim [1]D). Id., ¶253.

6) [6]E) a remote processor for each of the remote sensors including ...; and,

See claim [1]E); see Ground 1, claim [1]E). Id., ¶254.

7) [6]F) for the central control device or remote sensors their input/output units further including ...,

See claim [1]F); see Ground 1, claim [1]F). Id., ¶255.

8) [6]G) the control programs causing ...1) ...;

See claim [1G)]1); see Ground 1, claim [1G)]1). Id., ¶256.

- 9) [6G)]2) read current signals from a coupled environmental sensor and a coupled occupancy sensor and transmit them for storage in the memory of the central control device so that values of environmental conditions are associated with their source of occupied or unoccupied rooms;

See Ground 1, claim [6G)]2).

Riley also describes associating the values of environmental conditions with their source of occupied or unoccupied rooms. Riley explains that remote sensors send a “remote sensor i.d.” to the base station so that the base station may distinguish transmissions received from different remote sensors. Ex. 1009, 26:4-28. Riley describes that the base station in the system receives occupancy status transmissions and temperature information from associated remote sensors in order to analyze temperature fluctuations in the corresponding space. *Id.*, 3:3-35. Indeed, the system “learns” about the space over time. Thus, the system is able, based on the transmissions and sensor identifiers, to store the values from temperature sensors in association with the space for the particular remote sensor providing the information. Ex. 1002, ¶¶258-259.

- 10) [6G)]3) for the central control program, calculate an average

See Ground 1, claim [1G)]3). *Id.*, ¶260.

g) Claim 7

See Ground 1, claim 2. *Id.*, ¶261.

h) Claim 8

See Ground 1, claim 8; *see* Ex. 1009, 4:35-39; 25:11-53. Ex. 1002, ¶¶262-263.

i) Claim 9

See Ground 1, claim 9; *see* Ex. 1009, 15:55-68; 25:11-53. Ex. 1002, ¶¶264-265.

j) Claim 10

See Ground 1, claim 3. Ex. 1002, ¶266.

k) Claim 11

See Ground 1, claim 4. *Id.*, ¶267.

l) Claim 12

See Ground 1, claim 5. *Id.*, ¶268.

VIII. DISCRETIONARY DENIAL IS NOT APPROPRIATE

In view of the Director’s recent guidance on *Fintiv*, the time to trial is not a dominating factor in the *Fintiv* analysis. *Memorandum for the Interim Procedure for Discretionary Denials in AIA Post-Grant Proceedings with Parallel District Court Litigation*, at 8 (June 21, 2022). Instead, a “compelling unpatentability challenge” is a more important consideration. *Id.* at 4. Such compelling evidence refers to a high likelihood of success on the merits for at least one claim.

Commscope Tech. LLC v. Dali Wireless, Inc., IPR2022-01242, Paper 23 at 3-4 (PTAB Feb. 27, 2023) (precedential). This case presents a compelling unpatentability challenge.

Also, this Petition challenges more claims than are asserted in the litigation. Specifically, the litigation only involves claims 1, 3, 6-10, and 12, while the Petition address claims 1-12. Thus, there is not complete overlap of issues.

Also, in the counterpart litigation, a motion to dismiss was filed and Patent Owner submitted an amended complaint. No answer has been filed to the amended complaint. While trial (based on the original complaint) is currently set for October 24, 2024, that may be significantly affected by the status of the case. Should Patent Owner present a *Fintiv* challenge based on the developments in the trial subsequent to the filing of this Petition, ecobee will seek to address the developments.

IX. CONCLUSION

Petitioner submits that claims 1-12 of the RE'437 patent are unpatentable and requests institution of *inter partes* review.

DATED: September 25, 2023

Respectfully submitted,

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X. CERTIFICATE OF SERVICE

The undersigned hereby certifies that the foregoing petition for *inter partes* review, together with all exhibits and other documents filed therewith, was served by Federal Express on September 25, 2023, on the Patent Owner's counsel of record at the United States Patent and Trademark Office having the following address:

Hankin Patent Law, APC
11414 Thurston Circle
Los Angeles, CA 90049

Date: September 25, 2023

/ Justin J. Oliver/ (Reg. No. 44,986)

XI. CERTIFICATE OF WORD COUNT

The undersigned hereby certifies that the foregoing petition for *inter partes* review contains 13,987 words according to the word processing program used to prepare it.

Date: September 25, 2023

/ Justin J. Oliver/ (Reg. No. 44,986)