

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GOOGLE LLC

Petitioner

v.

ECOFACTOR, INC.

(record) Patent Owner

Inter Partes Review No.: (Unassigned)

Patent No. 8,596,550

PETITION FOR INTER PARTES REVIEW

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TABLE OF EXHIBITS

Exhibit No.	Description
1001	U.S. Patent No. 8,596,550 (“the ’550 patent”).
1002	Declaration of David M. Auslander.
1003	C.V. of David M. Auslander.
1004	U.S. Patent App. Pub. 2004/0117330 (“Ehlers ’330”).
1005	U.S. Patent App. Pub. 2005/0040250 A1 (“Wruck”).
1006	<i>Exhibit number not used.</i>
1007	<i>Exhibit number not used.</i>
1008	File History of Application No. 12/778,052.
1009	U.S. Patent App. Pub. 2005/0171645 (“Oswald”).
1010	U.S. Patent No. 5,934,554 (“Charles”).
1011	U.S. Patent No. 6,029,092 (“Stein”).
1012	ITC Inv. No. 337-TA-1258, Order No. 18, Construing the Terms of the Asserted Claims of the Patents at Issue (Sept. 1, 2021).
1013	<i>ecobee, Inc. v. EcoFactor, Inc.</i> , 1-21-cv-00323 (D. Del.), Answer (May 5, 2021).
1014	<i>ecobee, Inc. v. EcoFactor, Inc.</i> , 1-21-cv-00323 (D. Del.), Scheduling Order (October 14, 2021).
1015	Horan, T, <i>Control Systems and Applications for HVAC/R</i> , Prentice-Hall, Inc., 1997.
1016	Levenhagen, J, <i>HVAC Control and Systems</i> , McGraw-Hill, Inc., 1993.

1017	U.S. Patent No. 8,751,186 B2 (“the ’186 patent”).
1018	Excerpt from McDaniel, G, <i>IBM Dictionary of Computing</i> , McGraw-Hill, Inc., 1993, p. 165.
1019	U.S. Patent No. 7,784,704 (“Harter”).
1020	Excerpt from <i>Dictionary of Scientific and Technical Terms</i> , 5th ed., McGraw-Hill, Inc., 1994, p. 62.
1021	Excerpt from <i>The Industrial Electronics Handbook</i> , Irwin, J.D. ed. CRC Press and IEEE Press, 1997, pp. 59-60.
1022	<i>Exhibit number not used.</i>
1023	Comparison Document – ecobee Petition filed in IPR2022-00983 vs. Present Petition

I. INTRODUCTION

Petitioner respectfully requests *inter partes* review under 35 U.S.C. § 311 of claims 1-16 of U.S. Pat. No. 8,596,550 (“the ’550 patent”).

II. SUMMARY OF THE ’550 PATENT

A. The Claimed Subject Matter

The ’550 patent relates to controlling climate control systems, such as heating and cooling (“HVAC”) systems. (Ex. 1001, Abstract, 1:18-2:18, 3:48-67, 4:8-32)(Ex. 1002, ¶28). HVAC systems have, for decades, been controlled by thermostats. (Ex. 1001, 1:18-2:17)(Ex. 1002, ¶29). Thermostats are typically wall-mounted units with internal temperature sensors, which allow a user to set a target temperature. (Ex. 1002, ¶29). The target temperature, or “setpoint,” is compared against the actual temperature, and the HVAC system is essentially switched on or off to maintain the setpoint temperature. (Ex. 1002, ¶29).

“Programmable thermostats have been available for more than 20 years,” as the ’550 patent notes. (Ex. 1001, 1:18-19). They “offer two types of advantages” over non-programmable devices. (Ex. 1001, 1:19-41)(Ex. 1002, ¶30). First, “programmable thermostats can save energy ... because they automate the process of reducing conditioning during times when the space is unoccupied, or while occupants are sleeping, and thus reduce energy consumption.” (Ex. 1001, 1:19-25). Second, “programmable thermostats can also enhance comfort.... For example.... A programmable thermostat allows homeowners to anticipate [a] desired result by

programming a pre-conditioning of the home. So, for example, if the homeowner gets out of bed at 7 AM, setting the thermostat to change from the overnight setpoint of 64 degrees to 70 at 6 AM can make the house comfortable when the consumer gets up.” (Ex. 1001, 1:26-41).

According to the ’550 patent, however, “all of the advantages of a programmable thermostat depend on the match between the preferences of the occupants and the actual settings employed.” (Ex. 1001, 1:45-47)(Ex. 1002, ¶31). “If the temperatures programmed into a thermostat do not accurately reflect the preferences of the occupants, those occupants are likely to resort to manual overrides of the programmed settings.” (Ex. 1001, 1:64-67)(Ex. 1002, ¶31).

The ’550 patent discusses “adapting to signaling from occupants in the form of manual temperature changes and incorporating the information contained in such gestures into long-term programming.” (Ex. 1001, 2:10-12)(Ex. 1002, ¶32). In other words, the ’550 patent suggests detecting user-initiated manual changes to temperature settings (e.g., programmed setpoints) and then using that information to make changes to long-term programming of a thermostat. (Ex. 1002, ¶32). It also discusses using inside temperature, outside temperature, and other factors in the programming. (Ex. 1001, 2:12-17, 5:17-34)(Ex. 1002, ¶32). As the ’550 patent notes, such calculations might involve the rate at which an HVAC system heats or

cools a building to reach or maintain a setpoint at the desired time. (Ex. 1001, 5:5-40, 3:48-67, claim 17)(Ex. 1002, ¶32).

However, these features were already known in the field. The difference between the indoor and outdoor temperature was known to affect the rate at which a building loses or gains heat. (Ex. 1002, ¶¶33-34). For example, on a hot summer afternoon, a building will gain heat (incur a rise in temperature) faster than on a cool day, placing greater demand on the air conditioning system on a hot day. (Ex. 1002, ¶34). Similarly, on a cold winter day, the building will lose heat more quickly than on a warmer day, placing greater demand on the heating system. (Ex. 1002, ¶34). The ability of the HVAC system to change the temperature of the house (and thus affect the rate of change of temperature) was known to depend on the outside temperature. (Ex. 1002, ¶34).

One common prior art application of this principle relates to, for example, “setback and recovery” schedules. Such schedules change the setpoint of a thermostat at different times of day, in order to save energy when the building is unoccupied. (Ex. 1002, ¶¶33, 35). For example, a workplace thermostat could be programmed during the winter to have a daytime (8 AM to 5 PM) setpoint of 70° F, and an evening setpoint of 50 F (when the building is expected to be unoccupied). Allowing the building to cool down to 50 F in the evening is called “setback,” while heating the building back up to 70 F in the morning is called “recovery.” (Ex. 1002,

¶35). As discussed below, the time needed for recovery was known to be calculated based on the rate of change possible given, *e.g.*, the outside temperature.

It was also known to use user-initiated manual changes to temperature settings to improve thermostat programming and reduce the need for users to make manual setpoint adjustments. For instance, Ehlers, discussed below, explains that the system may perform “set point pattern change tracking,” where manual changes by the user may be tracked and utilized (with artificial learning and execution routines) in order to improve the operation of a thermostat control system. (Ex. 1004, ¶¶0268, 0308, 0309)(Ex. 1002, ¶37). It was also known that the manner of detecting a change in temperature was a matter of design choice (*e.g.*, which mathematical construct and/or programming operation), as discussed in more detail below. (Ex. 1002, ¶37)

Thus, the claims of the ’550 patent simply recite a combination of well-known HVAC control features. (Ex. 1002, ¶36). Independent claim 1 of the ’550 patent reads as follows:

1. A method for detecting manual changes to the setpoint for a thermostatic controller comprising:

accessing stored data comprising a plurality of internal temperature measurements taken within a structure and a plurality of outside temperature measurements relating to temperatures outside the structure;

using the stored data to predict a rate of change of temperatures inside the structure in response to at least changes in outside temperatures;

calculating with one or more computer processors, scheduled programming of the thermostatic controller for one or more times based on the predicted rate of change, the scheduled programming comprising at least a first automated setpoint at a first time;

generating with one or more computer processors, a difference value based on comparing an actual setpoint at the first time for said thermostatic controller to the first automated setpoint for said thermostatic controller;

detecting a manual change to the first automated setpoint by determining whether said actual setpoint and said first automated setpoint are the same or different based on said difference value; and

logging said manual change to a database associated with the thermostatic controller.

(Ex. 1001, claim 1).

Independent claim 9 of the '550 patent reads as follows:

9. A method for incorporating manual changes to the setpoint for a thermostatic controller into long-term programming of said thermostatic controller comprising:

accessing stored data comprising a plurality of internal temperature measurements taken within a structure and a plurality of outside temperature measurements relating to temperatures outside the structure;

using the stored data to predict a rate of change of temperatures inside the structure in response to at least changes in outside temperatures;

calculating scheduled programming of setpoints in the thermostatic controller based on the predicted rate of change, the scheduled programming comprising at least a first automated setpoint at a first time and a second automated setpoint at a second time;

comparing the actual setpoint at the first time for said thermostatic controller to the first automated setpoint for said thermostatic controller; detecting a manual change to the first automated setpoint by determining whether said actual setpoint and said first automated setpoint are the same or different;

changing the second automated setpoint at the second time based on at least one rule for the interpretation of said manual change.

(Ex. 1001, claim 9).

B. Prosecution History

The application that would become the '550 patent was filed on May 11, 2010. (Ex. 1001). The application claimed priority to U.S. Provisional Patent Application No. 61/215999, which was filed on May 12, 2009. (Ex. 1001).

IDENTIFICATION OF CHALLENGE

III. STATEMENT OF PRECISE RELIEF REQUESTED

Petitioner respectfully requests that claims 1-16 of the '550 patent be canceled based on the following grounds:

Ground 1: Claims 1-16 are obvious over Ehlers in view of Wruck.

Ground 2: Claims 9-16 are obvious over Ehlers in view of Wruck and Harter.

IV. CLAIM CONSTRUCTION

A. Stipulated Constructions

This Petition should be considered using claim constructions Patent Owner itself agreed to in the ITC investigation captioned *Certain Smart Thermostat Systems*.¹ (Ex. 1012, 16-17). “In an inter partes review proceeding, a claim of a patent ... shall be construed using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b) ...” 37 C.F.R. § 42.100(b).

'550 Patent Term	Stipulated Construction
“compare”/“comparing”	“analyze/analyzing to determine one or more similarities or differences between”
“rate of change of temperatures inside the structure”	“the difference between inside temperature measurements divided by

¹ There, claim 9 was found invalid under 35 U.S.C. § 112. Claim 1 was not asserted.

	the span of time between the measurements”
“setpoint”	“a temperature setting for a thermostat to achieve or maintain”
“automated setpoint”	“a computer-calculated temperature setting for a thermostat to achieve or maintain”
“difference value based on comparing an actual setpoint at the first time for said thermostatic controller to the first automated setpoint for said thermostatic controller”	“a value indicating the difference between at least one of the actual setpoints at the first time and the first automated setpoint for the thermostatic controller”

B. “database”

The ’550 patent describes multiple databases stored on a “database structure 300,” as shown in Fig. 5. (Ex. 1001, 4:33-42, 5:55-58). A POSITA would have understood that a database, in the context of the ’550 patent, is a collection of data stored on a data structure, where multiple databases can be stored on one data structure. (Ex. 1002, ¶43)(Ex. 1018, 165). Further, the plain and ordinary meaning of database is “an organized collection of data.” (Ex. 1002, ¶43)(Ex. 1018, 165).

V. DETAILED EXPLANATION OF REASONS FOR UNPATENTABILITY

Ground 1. Claims 1-16 are obvious over Ehlers in view of Wruck.

Claims 1-16 are obvious under pre-AIA 35 U.S.C. § 103(a) over U.S. Pat. App. Pub. 2004/0117330 (“Ehlers”)(Ex. 1004) in view of U.S. Pat. Pub. 2005/0040250 (“Wruck”)(Ex. 1005).

A. Effective Prior Art Dates

Ehlers was published on June 17, 2004, and is therefore prior art under pre-AIA 35 U.S.C. § 102(b).

Ehlers was not of record during the prosecution of the application leading to the '550 patent, although a different Ehlers (U.S. Pat. No. 7,130,719 (“Ehlers ’719”)), from a different patent family and having a different disclosure, was cited in a 78-reference IDS. (Ex. 1008, p. 253). Ehlers ’719 was not discussed on the record by the Examiner or Applicant. *See Weber, Inc. v. Provisur Technologies, Inc.*, IPR2019-01467, Paper 7 at 10 (PTAB Feb. 14, 2020).

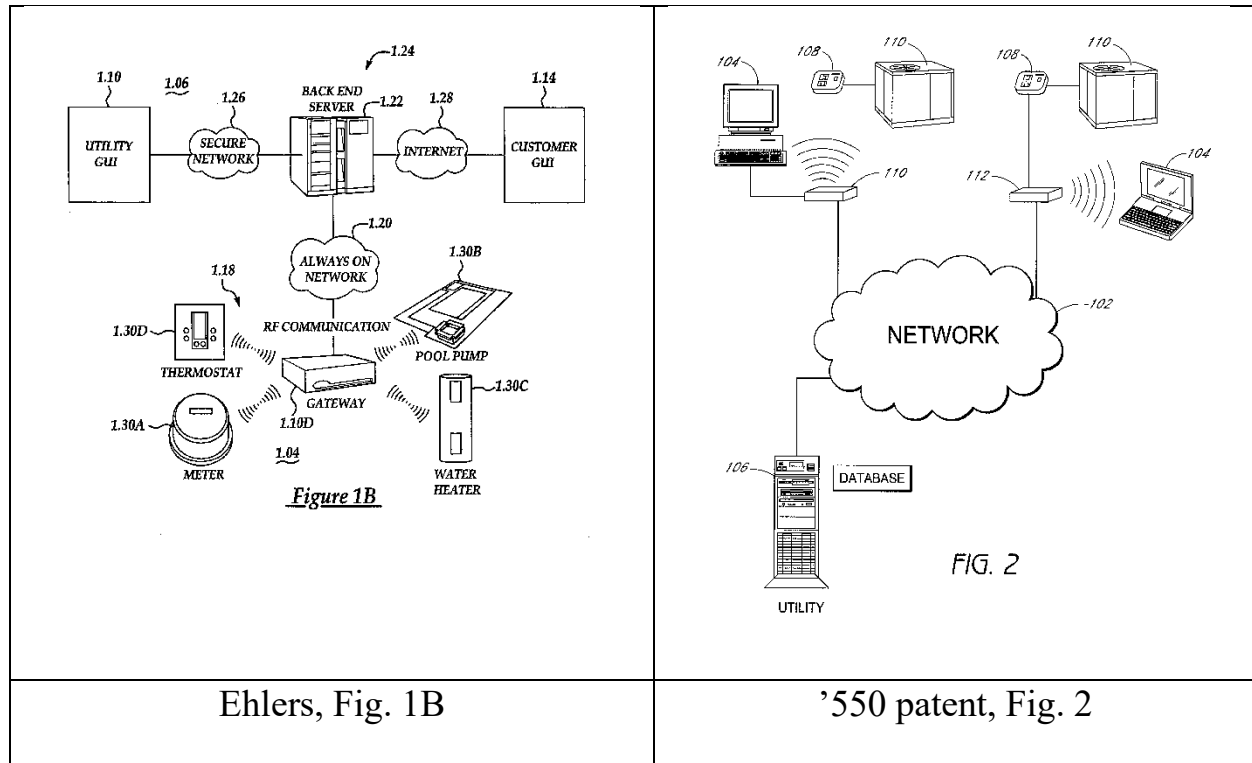
Wruck was published on February 24, 2005 and is therefore prior art under at least pre-AIA 35 U.S.C. § 102(b). Wruck was not of record during the prosecution of the application leading to the '550 patent.

B. Overview of the Ground

While Ehlers suggests all elements of the claims, Wruck reinforces the obviousness cases with respect to, at least, the limitations directed to “detecting a manual change” using a “difference value,” as described in more detail below. Wruck also describes other features of the claim.

1. Overview of Ehlers

Ehlers is similar to the '550 patent. (Ex. 1004, Fig. 1B, ¶¶0072-0079, 0099)(Ex. 1002, ¶50). Shown below are Fig. 1B of Ehlers (left side), compared with Fig. 2 of the '550 patent (right side):



(Ex. 1004, Fig. 1B, ¶¶0072-0079)(Ex. 1002, ¶50). In both systems there are conditioned spaces having thermostats. (Ex. 1004, ¶0076)(Ex. 1001, 3:48-67, 4:8-32)(Ex. 1002, ¶51). The thermostats in each system are connected to gateways, specifically gateway 1.10D in Ehlers (Ex. 1004, ¶¶0061-0062) and gateways 112 in the '550 patent. (Ex. 1001, 3:48-67, 7:54-61)(Ex. 1002, ¶51). The gateways connect the thermostats in each system over networks to servers. (Ex. 1004, ¶¶0072-0073)(Ex. 1001, 3:48-67)(Ex. 1002, ¶51).

Both systems collect and store information relevant to the conditioning of a building. (Ex. 1004, ¶¶0088, 0151, 0268-0309)(Ex. 1001, 4:33-42)(Ex. 1002, ¶52).

In Ehlers, for example:

“[T]he system 1.02 may have the ability to sense the current indoor temperature and could be enhanced to include at a minimum, humidity sensing, outside temperature, ... dew point and local weather forecast data or encoded signals”

(Ex. 1004, ¶0088)(Ex. 1002, ¶52).

Ehlers’s thermostat uses various scheduled temperature set points for the HVAC system, which are manually changeable by a user. (Ex. 1004, ¶¶0012, 0013, 0153-0160, 0228, 0239, 0244, 0253-0256, 0278, 0281, 0308-0309, 0316-0324, 0320). A user can also “override” a scheduled setpoint. (Ex. 1004, ¶¶0116, 0118, 0156, 0316, 0354, Fig. 4C)(Ex. 1002, ¶53).

Ehlers also teaches using rates of changes in temperatures, including calculating the rate at which inside temperature changes at any given outside temperature (“thermal gain rate”) for a given setpoint, in order to predict how long it will take for the HVAC system to heat or cool the building from one setpoint to another. (Ex. 1004, ¶¶0253-0254, 0256, 0295, Fig. 3D)(Ex. 1002, ¶54). Ehlers can use this thermal gain rate to “compute[] the required effective set point offset needed to keep the HVAC cycle run time at [a] specified trigger level.” (Ex. 1004, ¶0256). Thus, by utilizing effect thermal gain rate has on HVAC run time, the system of

Ehlers determines what future setpoint would minimize run time. (Ex. 1004, ¶0256)(Ex. 1002, ¶54).

Ehlers also teaches detecting and implementing a user's manual changes to a setpoint. (Ex. 1004, ¶0242 (“the system 3.08 manages comfort for the customer site 1.04 by learning from the user's inputs or adjustments to the system 3.08 to change or modify indoor air temperature”), ¶0243 (controls are “modified as needed based on the user's changes to the set point at the thermostat 1.30D” and that a “control algorithm [] learn[s] the user's individual preferences and over time, eliminat[es] the need for the site 1.04 occupant to make any changes”))(Ex. 1002, ¶55).

Ehlers further teaches that its system performs “set point pattern change tracking,” in which the system tracks and learns from a user's changes to setpoints. (Ex. 1004, ¶¶0268, 0308, 0309)(Ex. 1002, ¶56). Thus, Ehlers describes that its system detects manual changes to HVAC setpoints, and uses such changes to alter the HVAC setpoint control algorithms, as claimed in the '550 patent. (Ex. 1004, ¶¶0242-0243, 0268, 0308, 0309)(Ex. 1002, ¶57).

2. Overview of Wruck

Wruck teaches a system that allows a wireless device such as a PDA to control a thermostat. (Ex. 1005, ¶¶0002-0005)(Ex. 1002, ¶58). The thermostat can be programmed with a schedule to save energy, as shown, for example, in Figs. 9G and 9I of Wruck, reproduced here:

Figure 9G
Figure 9I

(Ex. 1005, Figs. 9G and 9I, ¶¶0098)(Ex. 1002, ¶58). As shown in the figures, the user can enter times of the day when periods of occupancy and non-occupancy begin (Fig. 9G and Fig. 9I), and associated heating and cooling setpoints. (*Id.*). Thus, Wruck teaches a system with “scheduled programming of the thermostatic controller,” similar to that of the ’550 patent. (Ex. 1002, ¶58).

Wruck further teaches that the user can temporarily override scheduled setpoints. (Ex. 1005, ¶¶0005, 0014-0015, 0104, 0125, 0150, 0198, 0231, Figs. 14s-14z, 20b, Tables 28, 31, 36)(Ex. 1002, ¶59). This can be accomplished, for example, by pressing the up and down keys on the thermostat. (Ex. 1005, Table 36, Table 38, items 96 and 97, ¶0150)(Ex. 1002, ¶59).

Wruck further explains that manual changes may be detected using a “delta” between an actual temporary setpoint and a scheduled setpoint. Specifically, Wruck teaches that if the user enters a new “temporary setpoint,” that new, user-entered

setpoint will be displayed on the thermostat if it is different from the scheduled setpoint, as shown in Table 28 of Wruck, reproduced in relevant part below, with highlighting added:

TABLE 28

Thermostat Data	Display	Display Dependency	Report Text Description	Comments
version.major	A		FirmwareVersion: 0.0.19	
version.minor				
version.bug				
version.comVer	V		ComVersion: 1	
version.rePgmVer	V		ReProgrammerVersion:	
status3.subBaseType	A		SubBaseID: T7350D, 3H3C	
subBase.connected	V		CommunicatingSubBase: Yes	
statusAnalog.spaceTemp	A		RoomTemperature: 75 F.	
statusAnalog.dischTemp	D	configured	DischargeAirTemp: 105 F.	config.dischAirSensor
statusAnalog.spaceHumidity	D	configured	Room RH: 33%	config.humiditySensor
statusAnalog.oDTemp	D	configured	OutdoorAir: 25 F.	config.oDAirSensor
statusAnalog.remoteSetPtOffset	D	configured	RemoteSetPtOffset: 2 F.	config.remoteSetPoint
statusAnalog.temporarySetPt	D	value < > 0	TemporarySetPt: 76 F.	Display actual temporary setpoint if Delta value < > 0

(Ex. 1005, Table 28, ¶¶110)(Ex. 1002, ¶¶60). Wruck describes checking whether the difference between the temporary setpoint and the scheduled setpoint is not equal to zero, and if so, to display the temporary setpoint. (Ex. 1002, ¶¶61).

3. Overview of the Combination

As noted above, Ehlers teaches and/or suggests all of the features of claims 1-16.² With respect to claimed features directed to “detecting a manual change” using a “difference value,” Ehlers describes generating an automatic thermostatic control schedule, having automated setpoints. (Ex. 1004, ¶¶0231-0234, 0239)(Ex. 1002, ¶¶62). Ehlers further teaches adjusting its schedule by “learning” from a user’s setpoint changes that depart from the schedule. (Ex. 1004, ¶0242 (“system 3.08

² Petitioners rely upon the combination out of an abundance of caution.

manages comfort for the customer site 1.04 by learning from the user's inputs or adjustments to the system 3.08 to change or modify indoor air temperature. This learning process alters the operation of the system 3.08, freeing the customer from having to make changes to manage the indoor environmental condition.”))(Ex. 1002, ¶62).

Based on Ehlers alone, it would have been obvious to determine a “difference value” (as claimed) based on comparing an actual setpoint (at a first time) to a first automated setpoint. (Ex. 1002, ¶63). This would have allowed the system to determine whether a manual change occurred, how far off the automated setpoints were from the user's desired setpoint, and to eliminate cases where manual changes were made that resulted in no difference between the user's setpoint and the automated setpoint (*e.g.*, where the user increases and then decreases the setpoint by one degree). (Ex. 1002, ¶63). Indeed, for Ehlers' system to “learn” from user changes to the setpoint, it would be helpful to know what the difference was between the automated setpoint and the actual setpoint. Moreover, forming a difference value simply means subtracting one value from another, which was well-understood in the relevant timeframe. (Ex. 1002, ¶63).

Furthermore, it would have been obvious based on Wruck and the knowledge of a POSITA to use a difference value between a user's manually-entered setpoint and an automated setpoint to detect the manual setpoint change. A POSITA would

have understood from Ehlers that comparing entered and automated setpoints would be beneficial to the described “learning from the user’s inputs or adjustments to the system 3.08 to change or modify indoor air temperature.” (Ex. 1004, ¶0242)(Ex. 1002, ¶64). A POSITA further would have known that, in computer systems, a standard way to compare two numbers (e.g. two numerical setpoints) was by subtracting one from the other. (Ex. 1021, 60)(Ex. 1002, ¶64). Indeed, this would be a simple mathematical operation to provide the relevant information. Wruck provides an example of how the manually entered setpoint override may be determined—by comparing a user desired setpoint with a calculated setpoint—such that if the difference in setpoints is not equal to zero, the system may display the new setpoint. (Ex. 105, Table 28, ¶0110)(Ex. 1002, ¶65). Further, to determine whether a value is not equal to zero, it would have been obvious to first determine what value is being compared to zero.

C. *Graham* Factors

The level of ordinary skill encompassed a (1) Bachelor’s degree in engineering, computer science, or a comparable field of study, and (2) at least five years of (i) professional experience in building energy management and controls, or (ii) relevant industry experience. Additional relevant industry experience may compensate for lack of formal education or vice versa.. (Ex. 1002, ¶¶23-25).

The scope and content of the prior art are discussed throughout the Ground.

The differences between the prior art and the claims are discussed in the “Overview of the Combination” and in the claim mapping, below.

Petitioner is not aware of any secondary considerations that would make an inference of non-obviousness more likely.

D. Reasonable Expectation of Success

A POSITA in the relevant timeframe would have had a reasonable expectation of success in implementing the combination (as described with particularity below in the claim mapping section) of Ehlers and Wruck. (Ex. 1002, ¶¶67). As Dr. Auslander explains, the art was relatively predictable in the relevant timeframe (early 2009). (Ex. 1002, ¶67). A POSITA would have been able to make any necessary modifications to implement this Ground. (Ex. 1002, ¶67). This is discussed in more detail in the claim mapping section, where appropriate.

E. Analogous Art

Ehlers and Wruck are in the same field as the '550 patent (building energy management and controls). (Ex. 1001, 1:18-2:17, 3:48-67, claim 1)(“An apparatus for detecting manual changes to the setpoint for a thermostatic controller comprising....”)(Ex. 1004, Abstract, Title)(Ex. 1005, Abstract, Title, ¶¶0002-0008)(Ex. 1002, ¶68). Specifically, these references address controlling heating and cooling systems, implementation of setpoints, and HVAC control in view of outdoor temperatures. (Ex. 1001, claim 1, Abstract, 1:18-2:17, 3:48-67, 4:62-5:40)(Ex. 1005,

Abstract, ¶¶0062, 0120, 0183)(Ex. 1004, ¶¶0090, 0092, 0095, 0137, 0141, 0145, 0147, 0167, 0182, 0204, 0239, 0244-0247, 0252-0256 and ¶¶0078-0082)(Ex. 1002, ¶69). *See Wyers v. Master Lock Co.*, 616 F.3d 1231, 1238 (Fed. Cir. 2010).

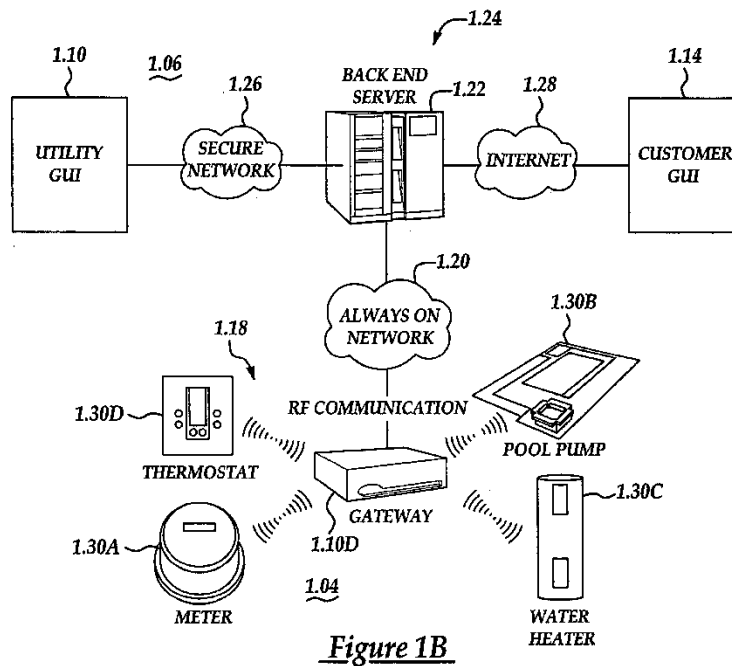
F. Claim Mapping

INDEPENDENT CLAIM 1

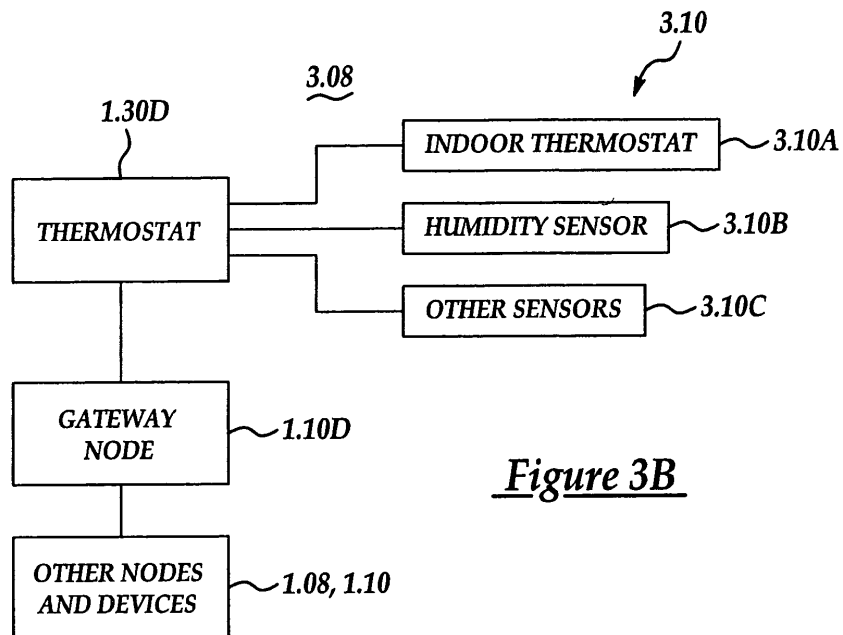
“1[a]. A method for detecting manual changes to the setpoint for a thermostatic controller comprising:”

Ehlers in view of Wruck renders obvious a method for detecting manual changes to the setpoint for a thermostatic controller. (Ex. 1002, ¶¶71).

First, Ehlers teaches a system that involves managing a thermostatic controller, such as the thermostat of a house. (Ex. 1004, Abstract, ¶¶0090, 0092, 0191, 0084, 0190)(*See also* Ex. 1004, ¶¶0150, 0229, 0066, 0090, 0138, 0141, 0150, 0192, 0204, 0254, 0263, Fig. 2E). The overall system is depicted in Figure 1B below:



(Ex. 1004, Fig. 1B)(Ex. 1002, ¶72). Another exemplary configuration of a portion of Ehlers' system (system 3.08) is illustrated in Figure 3B, reproduced below:



(Ex. 1004, Fig. 3B)(Ex. 1002, ¶73). Ehlers teaches that “the system 1.02 is designed to provide monitoring and control of major loads, e.g., total electric load, HVAC systems, ...” (Ex. 1004, ¶¶0088, 0095, 0141, 0224, 0231, 0242, 0256, Fig. 1B, Fig. 3B)(Ex. 1002, ¶74).

As can be seen in Figures 1B and 3B, Ehlers’s system contains a thermostatic controller (*e.g.*, thermostat device 1.30D). (Ex. 1004, ¶¶0076, 0088, 0141, 0149, 0223, 0229, 0224 (“thermostat 1.30D is an advanced thermostatic control device”))(Ex. 1002, ¶75).

“[T]hermostat 1.30D” may also “form[] part of a temperature and environmental sensing and control system 3.08.” (*See, e.g.*, Ex. 1004, Fig. 3B, ¶0229). “Based on the sensed data, the thermostat 1.30D controls other devices 1.08 to manage air quality.” (Ex. 1004, ¶¶0088, 0229, 0230, 0231, 0232, 0234, 0256)(Ex. 1002, ¶76).

Ehlers’s thermostatic controller contains various manually changeable temperature set points for the HVAC system. (*See, e.g.*, Ex. 1004, ¶¶0153-0160, 0253-0256, 0281, 0320, 0116, 0118, 0316, 0354, Fig. 4C)(Ex. 1002, ¶77).

Ehlers explains that “[i]n one aspect of the invention, the system 3.08 manages comfort for the customer site 1.04 by learning from the user’s inputs or adjustments to the system 3.08 to change or modify indoor air temperature.” (Ex. 1004, ¶0242, 0243)(Ex. 1002, ¶78). Ehlers further teaches that its system also performs “set point

pattern change tracking,” where set point changes initiated by the occupant are stored in relationship to outside weather conditions “for use with ... artificial intelligence learning and execution routines.” (Ex. 1004, ¶¶0268, 0308, 0309)(Ex. 1002, ¶78). A POSITA would recognize that tracking and learning from the user’s changes suggests the detecting of when a user has changed the setpoint. (Ex. 1002, ¶79)(Ex. 1004, ¶¶0242-0243 (“[t]his learning process alters the operation of the system 3.08, freeing the customer from having to make changes to manage the indoor environmental condition”)).

Furthermore, Wruck discloses that if the user enters a new “temporary setpoint,” it will be displayed on the thermostat if the new user-entered setpoint is different from the scheduled setpoint. (Ex. 1005, Table 28, ¶0110)(Ex. 1002, ¶80).

“[1b] accessing stored data comprising a plurality of internal temperature measurements taken within a structure and a plurality of outside temperature measurements relating to temperatures outside the structure;”

Ehlers’s discloses and/or suggests this limitation. Ehlers’s system includes “indoor air temperature sensor 3.10A,” which takes internal temperature measurements taken within a structure. (Ex. 1004, ¶0230)(Ex. 1002, ¶81). Ehlers explains that “various data elements are *stored* within the system 1.02.” (Ex. 1004, ¶0268). “[T]he data may be stored in gateway node 1.10D” or in other nodes in the system. (Ex. 1004, ¶¶0268, 0085)(*see also* Ex. 1004, ¶0268 (“each node 1.10 ...

includes ... memory 2.04”))(see also Ex. 1004, ¶¶0244, 0253, 0268, 0295)(Ex. 1002, ¶81).

As detailed under element [1c], below, Ehlers’s system measures inside temperature over time and calculates various thermal gain rates which represent how the temperature inside the structure changes in response to a different outdoor temperature, given different initial starting setpoint temperatures. (Ex. 1002, ¶82). For example, Ehlers’s Figure 3D, reproduced below, depicts actual inside temperature measurement data, which were recorded every 4 minutes. (Ex. 1004, ¶¶0253, 0256, Fig. 3D)(3.12A depicts measured inside temperatures associated with a set point of 72° F and an outside temperature of 99° F)(Ex. 1002, ¶82).

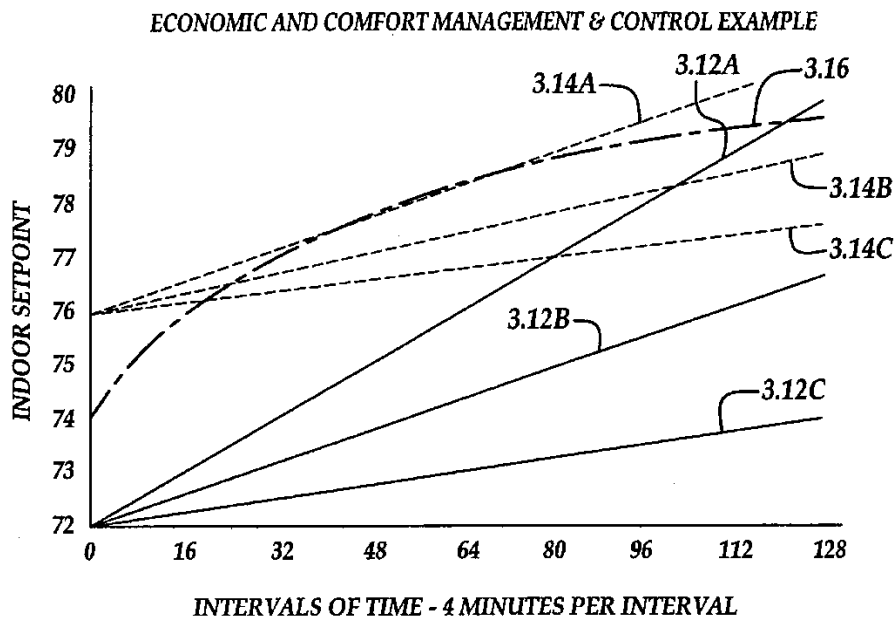


Figure 3D

(Ex. 1004, Fig. 3D)(Ex. 1002, ¶82).

Ehlers' system also permits a user to "view or generate a variety of reports to view historical information about their homes," including "[d]aily temperature reports displaying temperature and setpoints in, e.g., 15-minute intervals" and "[m]onthly temperature reports." (Ex. 1004, ¶¶0123-0125)(*see also* Ex. 1004, ¶0283). Thus, Ehlers suggests accessing stored data comprising a plurality of internal temperature measurements. (Ex. 1004, ¶¶0253, 0256, Fig. 3D, Fig. 3E)(Ex. 1002, ¶83).

Ehlers's system also provides access to stored data comprising a plurality of temperature measurements from outside the structure. Specifically, the system includes "sensors 3.10C for measuring and/or sensing ... outside temperature." (Ex. 1004, ¶¶0230, 0088). Ehlers also discloses storing "[w]eather information and history data including at a minimum outside temperature lows and highs." (Ex. 1004, ¶0293)(Ex. 1002, ¶84). Ehlers also computes and stores a "[c]omputed thermal recovery time for heating and cooling adjusted to compensate for the external temperature." (Ex. 1004, ¶0295)(Ex. 1002, ¶84).

Furthermore, Figure 3D of Ehlers depicts inside temperature measurement data, taken "for different outside temperatures," as discussed with regards to claim element [1c]. (Ex. 1004, ¶¶0253, 0256, Fig. 3D). A POSITA would have understood it was obvious to access store outside temperature measurements relating to

temperatures outside the structure so as to, for example, facilitate the calculation of thermal gain rates and thermal recovery rates by allowing the system to access stored outside temperature information, as called for in Ehlers. (Ex. 1002, ¶85).

Wruck further discloses providing a status report that may include such data as “space temperature” and “outside air temperature.” (Ex. 1005, ¶0105, Table 25)(Ex. 1002, ¶86).

Thus, both Ehlers and Wruck describe accessing data comprising plural internal and external temperatures. (Ex. 1002, ¶87).

“[1c] using the stored data to predict a rate of change of temperatures inside the structure in response to at least changes in outside temperatures;”

Ehlers’s system 3.08 uses the stored data, including outside temperatures, to derive a thermal gain rate, which represents a rate of change in temperature inside the structure (*e.g.*, a home). (Ex. 1002, ¶88). Ehlers explains this process as follows:

“[T]he system 3.08 tracks and learns about the thermal gain characteristics of the home 2.18. To do this, the system 3.08 tracks the thermal gain rate of the home 2.18 for each set point selected over time by the customer.”

(Ex. 1004, ¶0253)(Ex. 1002, ¶88). This process is depicted in Fig. 3D of Ehlers, reproduced below:

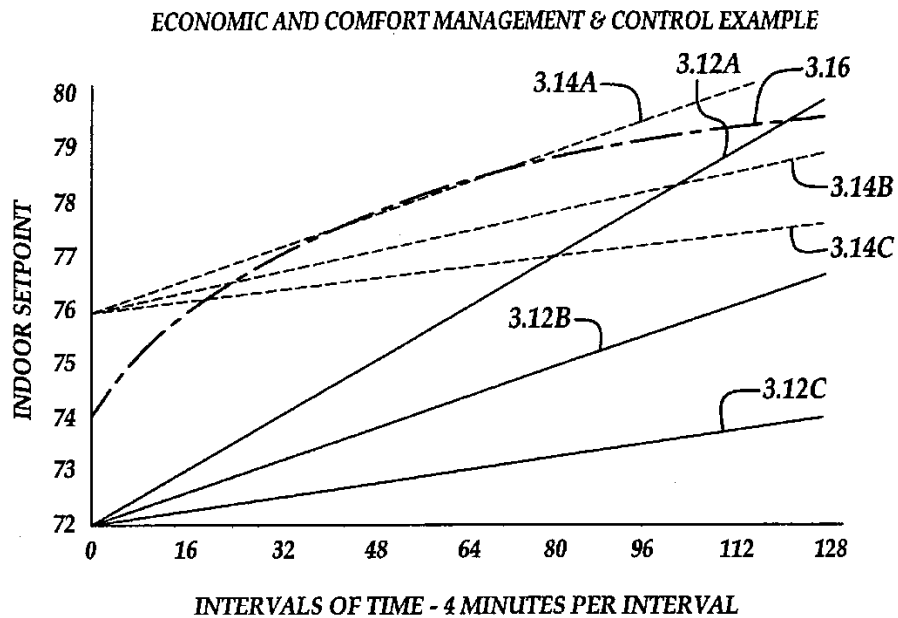


Figure 3D

(Ex. 1004, Fig. 3D)(Ex. 1002, ¶89). Ehlers explains Figure 3D as follows:

“With reference to FIG. 3D, a thermal gain table for two set points is illustrated. FIG. 3d shows two set points for the home 2.18 that the thermostat 1.30D has recorded. The first set point for which data is available is 72 degrees F. The three trends illustrated as lines 3.12A, 3.12B, and 3.12C plot the thermal rate of gain in the site 1.04 for different outside temperatures This illustration is used to show the impact the set point versus outside temperature differential has over the thermal gain rate in the home 2.18.”

(Ex. 1004, ¶0253)(see also Ex. 1004, ¶0254)(“Since the outside temperature varies continuously during a typical day, the rate of thermal gain and the HVAC run times also vary in accordance with these changes.”)(Ex. 1002, ¶90).

The “rate of thermal gain,” or “thermal gain rate,” in Ehlers is the rate of change in temperature inside the structure (for a given outside temperature), which is depicted by the slope of the lines depicted in Figure 3D (the difference between inside temperature measurements divided by the span of time between the measurements). (See Ex. 1004, ¶¶0253, 0256, Fig. 3E, Fig. 3G)(depicting use of “thermal gain rate per hour”)(Ex. 1002, ¶91).

Ehlers depicts this “thermal gain rate” in, for example, Figure 3E, reproduced below:

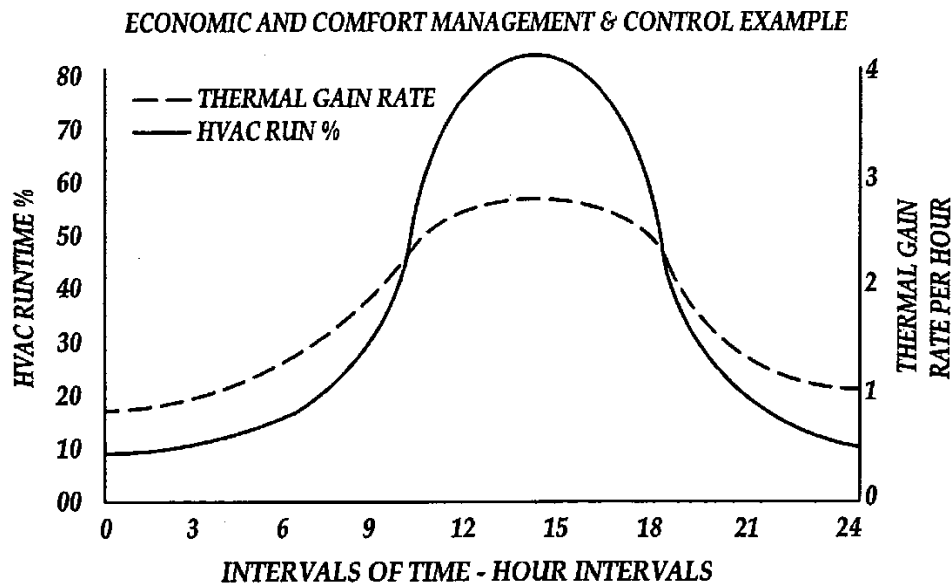


Figure 3E

(Ex. 1004, Fig. 3E)(Ex. 1002, ¶92). Figure 3E depicts the thermal gain rate (in degrees F per hour) over the course of one day where “the set point of the system 3.08 was set at a fixed point for the entire day.” (Ex. 1004, ¶0254)(Ex. 1002, ¶92).

According to Ehlers, “[this] illustration depicts that as the outside temperature rises and the differential between the indoor set point and the outside temperature increase, [sic] the thermal gain causes the HVAC system to cycle more frequently.” (Ex. 1004, ¶0254)(Ex. 1002, ¶92). Thus, even if the setpoint remains the same during the day, the thermal gain rate (and the inside temperature) changes over the course of the day due to variations in the outside temperature. (Ex. 1002, ¶92). Ehlers also computes and stores a “[c]omputed thermal recovery time for heating and cooling adjusted to compensate for the external temperature” (Ex. 1004, ¶0295)(Ex. 1002, ¶92).

Accordingly, Ehlers measures the temperature inside the structure over time, and calculates various thermal gain rates which represent how the temperatures inside the structure change in response to changes in outside temperatures, given different setpoint temperatures. (Ex. 1002, ¶93). Ehlers discloses determining “the difference between inside temperature measurements divided by the span of time between the measurements.” (Ex. 1002, ¶93). These thermal gain rates are in response to at least changes in outside temperatures because the thermal gain rates are calculated for different outside temperatures and vary with outside temperature. (Ex. 1004, ¶¶0253-0254)(Ex. 1002, ¶93).

Ehlers uses this data to predict changes in temperature inside the structure in response to at least changes in outside temperatures in connection with certain

energy management functions. (Ex. 1002, ¶94). As a first example of this, the thermal gain rate is used to determine a new offset temperature in order to save energy. (Ex. 1004, ¶0256)(Ex. 1002, ¶94). In so doing, Ehlers predicts that the thermal gain rate it computed in the past represents a speed at which temperatures inside the structure will change in response to changes in outside temperatures at the current time or at a future time. (Ex. 1002, ¶94). Ehlers then uses this prediction to determine what future setpoint would not increase HVAC run time over a future period of time to “compute[] [a] required effective setpoint offset.” (Ex. 1004, ¶0256)(Ex. 1002, ¶94).

As a second example, Ehlers teaches that the thermal gain rates can be used to predict recovery time. (Ex. 1002, ¶95). Predicting recovery time allows the system to turn on the HVAC system at the appropriate time, and thus achieve the “occupied” temperature setting by the time people are present. (Ex. 1004, ¶0246)(Ex. 1002, ¶95). For example, the system will try to achieve a certain temperature by a certain time (*e.g.*, the user wants the home to be at 70 F by 6 PM). (Ex. 1004, ¶0246). Ehlers teaches storing:

Computed thermal recovery time for heating and cooling adjusted to compensate for the external temperature This computed factor is used to more accurately compute the recovery time for thermal gain or loss when combined with the average normalized thermal gain or loss for the site 1.04.

(Ex. 1004, ¶¶0268, 0295). Here, the thermal gain rate is used to predict changes in temperature inside the structure in response to at least changes in outside temperatures to determine when to begin the recovery process. (Ex. 1002, ¶95).

As a third example, Ehlers uses thermal gain rates to control inside temperature to balance occupant comfort with energy savings. (Ex. 1002, ¶96). The system can use the “thermal gain rate in the site” to control the “ramping rate at which the system 3.08 would permit the temperature to rise within the site 1.04 as it moved from one set point to a higher or lower one to achieve economic benefit.” (Ex. 1004, ¶0255, Fig. 3F)(Ex. 1002, ¶96). Here too, the system predicts that the indoor temperature will rise at a certain rate in view of changes in outside temperatures and controls the behavior of the system accordingly. (Ex. 1002, ¶96).

Ehlers does not explicitly state that the disclosed system uses the stored data comprising a plurality of internal temperature measurements taken within a structure and a plurality of outside temperature measurements to compute the disclosed thermal gain rates. (Ex. 1002, ¶97). However, a POSITA would understand that such temperature data would obviously be stored in order for it to be tracked over time and then used to perform the disclosed computations. (Ex. 1002, ¶97)(*see also* claim element [1b] analysis). Indeed, Ehlers provides that information in, for instance, Fig. 3D (shown above).

“[1d] calculating with one or more computer processors, scheduled programming of the thermostatic controller for one or more times based on the predicted rate of change, the scheduled programming comprising at least a first automated setpoint at a first time;”

As explained above under claim element [1c], Ehlers teaches that “the system 3.08” computes various thermal gain rates and then uses those thermal gain rates to perform various computations to manage the system. (See, e.g., Ex. 1004, ¶¶0252-0256). In doing so, the Ehlers’s system calculates scheduled setpoint programming of the programmable communicating thermostat for one or more times based on the predicted rate of change, the scheduled programming comprising one or more automated setpoints (or “a computer-calculated temperature setting for a thermostat to achieve or maintain”) for a first time. (Ex. 1002, ¶98).

As discussed above with respect to the second and third examples provided for claim element [1c], system 3.08 uses the thermal gain rates to predict recovery time and/or to control the “ramping rate at which the system 3.08 would permit the temperature to rise within the site 1.04 as it moved from one set point to a higher or lower one to achieve economic benefit.” (Ex. 1004, ¶¶0246, 0255, Fig. 3F)(Ex. 1002, ¶99). As Ehlers explains, recovery times can be calculated in connection with managing changes between setpoints for different occupancy modes. (Ex. 1004, ¶¶0246, 0119, 0319, 0324-0325)(See also, e.g., Ex. 1004, ¶0325)(“The thermostat scheduling panel 4.36 permits the customer to select the occupancy mode which will be used for various time periods during the day.”). For instance, a temperature can

be programmed to change from one setpoint to another automated setpoint in anticipation of people getting home from work. (Ex. 1002, ¶99). The programmed (computer-calculated) setpoint for when someone arrives home from work is an example of a first automated setpoint at a first time, as recited in claim 1. As discussed throughout this petition, in Ehlers, even a setpoint programmed by a user can be adjusted by the computer. (Ex. 1004, ¶0256)(Ex. 1002, ¶99). To perform this operation, Ehlers' system calculates the time at which "recovery" must begin in order to achieve an "occupied" setpoint (first automated setpoint) by the programmed (first) time. (Ex. 1004, ¶¶0246, 0119, 0319, 0324-0325)(Ex. 1002, ¶99). This type of programming can similarly be used to schedule multiple different setpoints scheduled for different times (*e.g.*, another automated setpoint for after the occupants have gone to bed). (Ex. 1002, ¶99).

As described in the first example under claim element [1c], system 3.08 also uses the thermal gain rate to calculate a future setpoint (or automated setpoint) which would not increase HVAC run time. (Ex. 1002, ¶100). Ehlers teaches that such calculations can be done pursuant to a "control program," where a calculated setpoint may be "offset" from a target setpoint by a few degrees in order to reduce run time. (Ex. 1004, ¶0256)(Ex. 1002, ¶100). This is done so that the run time of the system can be minimized, while the new "calculated" setpoint is reasonably close to what was originally targeted by the user. This control of the system constitutes

scheduled setpoint programming of the thermostat for one or more times based on the predicted rate of change. (Ex. 1004, ¶0256)(Ex. 1002, ¶100).

A POSITA would understand from Ehlers's disclosure that this calculation can be performed at the computers in any one of a number of nodes in the system. For example, the gateway node is a part of "system 3.08" and can be used to perform the claimed calculations. (See e.g., Ex. 1004, ¶¶0268, 0246, 0253-0256)(Ex. 1002, ¶101). Gateway nodes may be computers supplied by an energy company. (Ex. 1002, ¶101). Each node comprises a computer processor. (Ex. 1004, ¶¶0268)(Ex. 1002, ¶101). A POSITA would have had a reasonable expectation of success in implementing a system in which the claimed calculations are performed using, e.g., the gateway node because it would simply be a predictable variation using known technologies. (Ex. 1002, ¶101). Of course, such calculations could be performed locally by computers associated with the thermostats. (Ex. 1002, ¶101).

"[1e] generating with one or more computer processors, a difference value based on comparing an actual setpoint at the first time for said thermostatic controller to the first automated setpoint for said thermostatic controller; detecting a manual change to the first automated setpoint by determining whether said actual setpoint and said first automated setpoint are the same or different based on said difference value; and"

Ehlers in view of Wruck renders obvious these limitations. (Ex. 1002, ¶102). First, as set forth under claim element 1[a], Ehlers's system can detect a manual change to a setpoint. (Ex. 1004, ¶¶0242-0243, 0268, 0308, 0309)(Ex. 1002, ¶102).

A POSITA would have understood that in order to perform the disclosed functions—namely tracking and learning from the user’s changes to set points—Ehlers’s system would logically detect when a user has made a manual change to the setpoint. (Ex. 1002, ¶102). Ehlers also describes using the changed value in learning the user’s preferences. (Ex. 1004, ¶¶0308-0309).

Ehlers does not specify the precise manner in which its system detects when a user has manually changed the setpoint. (Ex. 1002, ¶103). However, it would have been obvious to determine what the difference is between the actual user setpoint and the first automated setpoint. (Ex. 1002, ¶103). To determine whether a difference exists, a POSITA would have understood that the values would be compared to detect what the difference is, if any. (Ex. 1002, ¶103). In fact, Ehlers’s system similarly uses a comparison between values to determine whether to take certain actions. (*See, e.g.*, Ex. 1004, ¶0215)(“In one embodiment, this decision may be based on a simple comparison between the actual cost and a predetermined value which may have been input by the customer.”)(Ex. 1002, ¶103).

Furthermore, Ehlers specifically teaches tracking user setpoint “changes” and “adjustments,” which suggest identifying a difference value to determine the magnitude of the change. (Ex. 1004, ¶¶0242-0243, 0268, 0308, 0309)(Ex. 1002, ¶104). It would have been obvious to a POSITA to determine the amount by which the user changed a setpoint (*e.g.*, +3 F or -2 F) in order to determine whether, and to

what extent, the user's manual entries caused the actual setpoint to differ from the automated setpoint. (*Id.*). Indeed, just knowing that the values were different, without knowing what the difference was, would not be particularly useful in learning the user's preference, as called for in Ehlers. Knowing the specific difference would have facilitated tracking and learning from patterns in changes made to setpoints of the HVAC system which are "initiated by the occupant," which then results in improved functionality of the system, as taught by Ehlers. (Ex. 1004, ¶¶0242-0243, 0268, 0308, 0309)(Ex. 1002, ¶104). As Ehlers explains, "[t]his learning process alters the operation of the system 3.08, freeing the customer from having to make changes to manage the indoor environmental condition." (Ex. 1004, ¶¶0242-0243)(Ex. 1002, ¶104).

Indeed, Wruck teaches that it was known to compare a user desired setpoint with a calculated setpoint in order to determine if the user has overridden the setpoint programming, and if the difference in setpoints is not equal to zero, display the temporary setpoint. (Ex. 1005, ¶0110)(Ex. 1002, ¶105). Wruck teaches to check whether the "Delta value" between the actual temporary setpoint and the scheduled setpoint is not equal to zero, and if so, to display the temporary setpoint, as shown in table 28, the relevant part of which is shown below, with highlighting added:

TABLE 28

Thermostat Data	Display	Display Dependency	Report Text Description	Comments
version.major	A		FirmwareVersion: 0.0.19	
version.minor				
version.bug				
version.commVer	V		ComVersion: 1	
version.rePgmVer	V		ReProgrammerVersion:	
status3.subBaseType	A		SubBaseID: T7350D, 3H3C	
subBase.connected	V		CommunicatingSubBase: Yes	
statusAnalog.spaceTemp	A		RoomTemperature: 75 F.	
statusAnalog.dischTemp	D	configured	DischargeAirTemp: 105 F.	config.dischAirSensor
statusAnalog.spaceHumidity	D	configured	Room RH: 33%	config.humiditySensor
statusAnalog.oDTemp	D	configured	OutdoorAir: 25 F.	config.oDAirSensor
statusAnalog.remoteStPtOffset	D	configured	RemoteSetPtOffset: 2 F.	config.remoteSetPoint
statusAnalog.temporarySetPt	D	value < > 0	TemporarySetPt: 76 F.	Display actual temporary setpoint if Delta value < > 0

(Ex. 1005, Table 28, ¶10110)(Ex. 1002, ¶105). Thus, Wruck tests for an actual change before displaying the setpoint. (Ex. 1002, ¶105). Moreover, by referring to a “Delta value” to ensure that the same is not equal to zero, a POSITA would have understood that Wruck teaches generating the actual difference between the automated setpoint and the actual user setpoint. (Ex. 1002, ¶106). Thus, to the extent subtracting one setpoint from another to obtain a “difference value” was not already obvious from Ehlers, it would thus be obvious to do so based on Wruck. (Ex. 1002, ¶106).

It would thus be obvious from Ehlers and Wruck to generate a difference value by comparing an actual setpoint at the first time for the thermostatic controller to a scheduled, automated setpoint for the thermostatic controller in order to determine whether they are the same or different from each other, and thus detect a manual change. (Ex. 1002, ¶107). Ehlers teaches tracking user setpoint changes to learn how

the user's desired setpoints differ from the automated setpoints. (Ex. 1004, ¶¶0242-0243, 0268, 0308, 0309)(Ex. 1002, ¶108). This suggests performing a comparison between the actual (user-entered) setpoint and automated setpoints, in order to determine whether and to what extent the user made a change. (Ex. 1002, ¶108). Furthermore, it would have been obvious based on the knowledge of a POSITA to form a difference value, because it was well-known that comparisons between two numbers can be performed by forming difference values in computer systems. (Ex. 1021, p. 60)(Ex. 1002, ¶108).

A POSITA seeking to compare two numbers to determine if a difference exists would understand that there are a small number of simple and predicable mathematical operations to do so. (Ex. 1002, ¶109). A simple subtraction operation would have been an obvious, known, and predictable manner of implementing Ehlers' and Wruck's systems. (Ex. 1002, ¶109). Calculating a difference value also identifies the magnitude of the user's change, which would further Ehlers' goal of determining how its algorithmically-generated setpoint deviates from the user's desired setpoint. (Ex. 1004, ¶¶0242-0243, 0268, 0308-0309)(Ex. 1002, ¶109). Wruck provides an example of forming such a difference value between a user-entered manual setpoint and a scheduled (automated) setpoint, thereby supporting the obviousness of the technique. (Ex. 1005, ¶0110, Table 28)(Ex. 1002, ¶109). Wruck describes detecting a manual change by a user by determining whether a user-

entered manual setpoint and a scheduled (automated) setpoint are the same or different based the difference value. (Ex. 1005, Table 28, ¶0110).

“[1f] logging said manual change to a database associated with the thermostatic controller.”

Ehlers renders obvious this claim element. (Ex. 1002, ¶110). Ehlers stores information regarding manual changes to the setpoint. As explained under claim element 1[a], Ehlers’ system can “learn from” and “modify” controls “based on the user’s changes to the set point at the thermostat 1.30D” and that a “control algorithm [] learn[s] the user’s individual preferences and over time, eliminat[es] the need for the site 1.04 occupant to make any changes.” (Ex. 1004, ¶¶0242-0243)(Ex. 1002, ¶110). Ehlers further teaches that its system also performs “[s]et point pattern change tracking, where the set point pattern is “stored by the system 1.02.” (Ex. 1004, ¶¶0268, 0308, 0309)(Emphasis added)(Ex. 1002, ¶110). A POSITA reviewing these disclosures would recognize that Ehlers stores and therefore logs information regarding when a user has made a manual change to the setpoint to a database associated with the thermostat. (Ex. 1002, ¶110). Moreover, it would be obvious to log such information in order to facilitate tracking and learning from patterns in changes made to setpoints of the HVAC system which are “initiated by the occupant,” which then results in improved functionality of the system, as taught by Ehlers. (Ex. 1004, ¶¶0242-0243, 0268, 0308, 0309)(Ex. 1002, ¶110). As Ehlers explains, “[t]his learning process alters the operation of the system 3.08, freeing the

customer from having to make changes to manage the indoor environmental condition.” (Ex. 1004, ¶¶0242-0243)(Ex. 1002, ¶110). In addition, Ehlers teaches storing data at any one of a number of nodes, with certain nodes being associated with a customer cite where the thermostat is located. (Ex. 1004, ¶¶ 0060, 0066-0069, 00171, 0268, 0085)(Ex. 1002, ¶111).

Further, a POSITA would have had reason to and have had a reasonable expectation of success in logging this information in a database associated with the thermostatic controller. For example, in association with the thermostat, Wruck discloses displaying (and it would be understood to also be storing) setpoint temperatures at Fig. 14P, and adjusting schedule programming and setpoints remotely, suggesting that it is beneficial to also store information relating to a manual change. (Ex. 1005, ¶0119). And a POSITA would have been motivated to use a database in order to facilitate storage and organization of the data regarding manual set point changes. (Ex. 1002, ¶112). Databases were widely used at the relevant time to store electronic information and could have been used predictably for that purpose with no unexpected results. (Ex. 1002, ¶112)(*citing* Exs. 1009; 1010; 1011). A number of databases were available in the relevant timeframe and were in use for HVAC control systems. (Ex. 1002, ¶112)(*citing* Ex. 1009, ¶¶0056-0059; Ex. 1010, Abstract, Fig. 2, 9:26-50; Ex. 1011, 1:64-66).

CLAIM 2

“2. A method as in claim 1 where said thermostatic controller operates a system for changing the air temperature in a structure.”

As set forth under claim element 1[a], Ehlers’s system contains a thermostatic controller in the form of thermostat 1.30D. (Ex. 1002, ¶113). Thermostat 1.30D operates a system for changing the air temperature in a structure by operating an HVAC system. (Ex. 1004, Abstract, ¶¶0088, 0090, 0092, 0150, 0191, 0084, 0190, 0231)(Ex. 1002, ¶¶113-114).

CLAIM 3

“3. A method as in claim 1 where said thermostatic controller operates a heating, ventilation and air conditioning system.”

As set forth under claims 1 and 2, Ehlers’s thermostat 1.30D operates an HVAC system. (Ex. 1004, Abstract, ¶¶0088, 0090, 0092, 0150, 0191, 0084, 0190, 0231) (Ex. 1002, ¶¶115-116).

CLAIM 4

“4. A method as in claim 1 where said thermostatic controller operates a heating, ventilation and air conditioning system in a single family residence.”

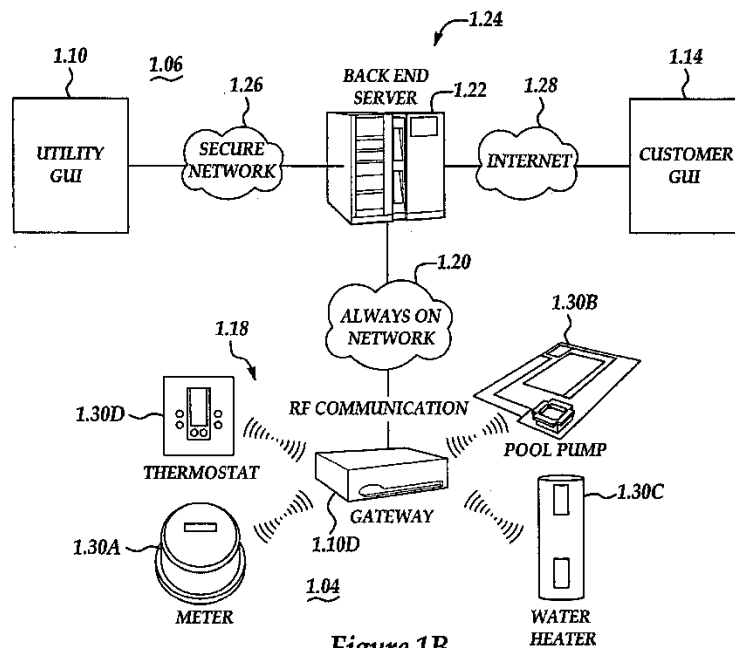
As set forth under claims 1-3, Ehlers’s thermostat 1.30D operates an HVAC system in a structure such as a “house” or “home.” (Ex. 1002, ¶117)(*see also* Ex. 1004, ¶0190)(describing “an example of the system 1.02 applied to a specific customer site, i.e., a residence or home 2.18”). It is obvious that the method be used

in a single family residence because a house or home is a common type of single family residence. (Ex. 1002, ¶118).

CLAIM 5

“5. A method as in claim 1 in which at least one remote processor is in communication with said thermostatic control device.”

Ehlers discloses and/or suggests this limitation. Ehlers teaches that the remote processor communicates with the thermostatic control (thermostat 1.30D) via a network RF communication. (Ex. 1002, ¶119). Figure 1B illustrates Ehlers’s system:



(Ex. 1004, Fig. 1B). As can be seen, thermostat 1.30D connects to gateway 1.10D (Ex. 1004, ¶¶0061-0062), which includes a remote processor. (Ex. 1002, ¶119). The gateway node 1.10D communicates with the thermostat 1.30D via a RF

communication network. (Ex. 1004, ¶¶0061-0062, 0072-0076, 0084, 0150, 0152-0153)(Ex. 1002, ¶119).

Wruck also discloses that the thermostat 11 may be connected via a network with a PDA 12, and that thermostat information may be transmitted on a network communications bus 84. (Ex. 1005, ¶¶0135, 0144)(Ex. 1002, ¶120).

CLAIM 6

“6. A method as in claim 5 in which said remote processor is not located in the same structure as said thermostatic controller.”

As set forth under claim 5, gateway node 1.10D is a remote processor. (Ex. 1002, ¶121). Ehlers teaches that the gateway node can be situated at a different location than the thermostat 1.30D (the thermostatic controller). (*See, e.g.*, Ex. 1004, ¶¶0181, 0182, 0202, 0257, 0266)(Ex. 1002, ¶121). For example, Ehlers explains that “[t]he gateway node ... could be a node which is part of an aggregate group of homes in a star network” and further teaches that nodes “may be located at a single customer site 1.04 or across multiple sites 1.04.” (Ex. 1004, ¶¶0202, 0181). In such a configuration, there is one gateway node for a group of sites and thus the gateway node is not located in the same structure as the thermostatic controller for a particular site. (Ex. 1002, ¶121). Is it also obvious for the gateway node to be located in a different structure from the thermostatic controller because it would simply be a predictable variation using known technologies. (Ex. 1002, ¶121).

CLAIM 7

“7. A method as in claim 5 in which said remote processor sets programming for said thermostatic controller.”

As set forth under claim element [1d], gateway node 1.10D is a remote processor, and it is obvious for the gateway node to calculate scheduled programming of the thermostatic controller by computing various thermal gain rates and then using those thermal gain rates to perform various computations to manage the system. (Ex. 1002, ¶122). For similar reasons, it is also obvious for the gateway node to set programming for thermostat 1.30D. (*See also* Ex. 1004, ¶¶0109, 0137, 0143, 0147, 0150, 0221)(Ex. 1002, ¶¶122-123).

CLAIM 8

“8. A method as in claim 1 in which said thermostatic controller is programmable”

As set forth under claim element 1[a], Ehlers’s system contains a programmable communicating thermostat in the form of thermostat device 1.30D, which is in communication with gateway node 1.10D via a network. (Ex. 1002, ¶124). The temperature set point of Ehlers’s HVAC system is manually changeable to a user’s desired temperature setpoint. (Ex. 1004, ¶¶0012, 0013, 0153-0160, 0228, 0239, 0244, 0253, 0254, 0255, 0256, 0281, 0308-0309, 0316-0324, 0320)(Ex. 1002, ¶125). A user can also “override” a scheduled setpoint, which is programmed. (Ex. 1004, ¶¶0116, 0118, 0156, 0316, 0354, Fig. 4C)(Ex. 1002, ¶125).

Indeed, Ehlers specifically describes that its communicating thermostat is programmable, where “with regard to the thermostat 1.30D, the customer may view current temperature, view current heating or cooling setpoint(s) ... resume scheduled heating or cooling setpoint(s).” (Ex. 1004, ¶¶0116, 0013, 0017, 0132, 0148–0160, 0171, 0251, 0316, 0335, Fig. 3A)(see Ex. 1001, 1:18-20)(Ex. 1002, ¶126). Wruck also discloses a programmable thermostat 11 that communicates with a PDA device. (Ex. 1005, ¶¶ 0062-0064, Fig. 2)(Ex. 1002, ¶127).

INDEPENDENT CLAIM 9

The limitations of claim 9 are similar in many respects to the limitations of claim 1. Relevant differences are addressed in the claim mapping below. (Ex. 1002, ¶128).

“9[a]. A method for incorporating manual changes to the setpoint for a thermostatic controller into long-term programming of said thermostatic controller comprising:”

As established above with respect to claim 1, the combination of Ehlers and Wruck renders obvious a method for “detecting” manual changes to the setpoint for a thermostatic controller for the reasons set forth above for claim 1. (Ex. 1002, ¶129). The combination also renders obvious a method for “incorporating” those manual changes into long-term programming, as recited in claim 9. (Ex. 1002, ¶129). Ehlers explains that “[i]n one aspect of the invention, the system 3.08 manages comfort for the customer site 1.04 by learning from the user’s inputs or adjustments to the system

3.08 to change or modify indoor air temperature.” (Ex. 1004, ¶0242)(*see also* Ex. 1004, ¶0243)(noting that controls are “modified as needed based on the user’s changes to the set point at the thermostat 1.30D” and that a “control algorithm [] learn[s] the user’s individual preferences and over time, eliminat[es] the need for the site 1.04 occupant to make any changes”)(Ex. 1002, ¶129). Ehlers further teaches that its system also performs “set point pattern change tracking to be used with ‘follow my lead’ artificial intelligence learning and execution routines.” (Ex. 1004, ¶¶0268, 0308, 0309)(Ex. 1002, ¶129).

Ehlers thus discloses not only detecting manual setpoint changes but also incorporating those changes into the long-term functioning of the system. (Ex. 1002, ¶130). As Ehlers explains, “[t]his learning process alters the operation of the system 3.08, freeing the customer from having to make changes to manage the indoor environmental condition.” (Ex. 1004, ¶¶0242-0243)(Ex. 1002, ¶130).

“[9b] accessing stored data comprising a plurality of internal temperature measurements taken within a structure and a plurality of outside temperature measurements relating to temperatures outside the structure;”

Ehlers renders this claim limitation obvious for the reasons set forth above for claim [1b]. (Ex. 1002, ¶131).

“[9c] using the stored data to predict a rate of change of temperatures inside the structure in response to at least changes in outside temperatures;”

Ehlers renders this claim limitation obvious for the reasons set forth above for claim [1c]. (Ex. 1002, ¶132).

“[9d] calculating scheduled programming of setpoints in the thermostatic controller based on the predicted rate of change, the scheduled programming comprising at least a first automated setpoint at a first time and a second automated setpoint at a second time;”

Ehlers renders this claim limitation obvious. For the reasons set forth above for claim [1d], the Ehlers system calculates scheduled programming of setpoints in the thermostatic controller based on the predicted rate of change, and so it is obvious that the scheduled programming would include a first automated setpoint (or “a computer-calculated temperature setting for a thermostat to achieve or maintain”) at a first time and a second automated setpoint at a second time. (Ex. 1002, ¶133).

For example, as discussed with respect to claim element [1c], the thermal gain rate is used to calculate a future, automated setpoint which would not increase HVAC run time. (Ex. 1002, ¶134). Ehlers teaches that such calculations can be done pursuant to a “control program,” where a calculated setpoint may be “offset” from a target setpoint by a few degrees in order to reduce run time, where the calculations are performed in a feedback loop “as the outside temperature rises.” (Ex. 1004, ¶0256)(Ex. 1002, ¶134). A POSITA would have understood that this continuous calculation of an automated setpoint over time, calculates a schedule comprising

multiple setpoints at particular future points in time (thus comprising at least a first automated setpoint at a first time and a second automated setpoint at a second time), and renders obvious calculating scheduled programming comprising at least a first automated setpoint at a first time and a second automated setpoint at a second time. (Ex. 1002, ¶134)

Also as discussed with respect to claim element [1c], the system 3.08 uses the thermal gain rates to predict recovery time and/or to control the “ramping rate at which the system 3.08 would permit the temperature to rise within the site 1.04 as it moved from one set point to a higher or lower one to achieve economic benefit.” (Ex. 1004, ¶¶0246, 0255, Fig. 3F)(Ex. 1002, ¶135). This ramping programming would be understood by a PHOSITA to comprise multiple different setpoints which can be scheduled to be used at different times. (Ex. 1004, ¶¶0246, 0119, 0319, 0324-0325)(Ex. 1002, ¶135).

For instance, Ehlers explains changing between different occupancy modes (e.g., home and away), where setpoints would be changed over time in accordance with the schedule. (Ex. 1004, ¶¶0244-00247)(Ex. 1002, ¶136).

“[9e]. comparing the actual setpoint at the first time for said thermostatic controller to the first automated setpoint for said thermostatic controller; detecting a manual change to the first automated setpoint by determining whether said actual setpoint and said first automated setpoint are the same or different;”

This limitation is broader than that set forth in claim element [1e]. Specifically, claim 9 does not require the use of a “difference value.” (Ex. 1002, ¶137). Ehlers in view of Wruck renders obvious this limitation for the reasons set forth above for claim element [1e]. (Ex. 1002, ¶137). For example, Wruck teaches to check whether the “Delta value” between the actual temporary setpoint and the scheduled setpoint is not equal to zero, and if so, to display the temporary setpoint. (Ex. 1005, Table 28, ¶0110)(Ex. 1002, ¶137).

“[9f]. changing the second automated setpoint at the second time based on at least one rule for the interpretation of said manual change.”

Ehlers renders obvious this claim limitation. (Ex. 1002, ¶138). As set forth under claim element 9[a], Ehlers not only detects manual setpoint changes but incorporates those changes into the functioning of the system. Ehlers specifically explains that “[t]his learning process alters the operation of the system 3.08, freeing the customer from having to make changes to manage the indoor environmental condition.” (Ex. 1004, ¶¶0242-0243)(Ex. 1002, ¶138). Ehlers thus teaches changing the operation of the HVAC system based on what it has “learn[ed] from the user’s inputs or adjustments to the system 3.08 to change or modify indoor air temperature.” (Ex. 1004, ¶¶0242-0243)(Ex. 1002, ¶138).

Ehlers also renders obvious changing the second automated setpoint at the second time based on at least one rule for the interpretation of the manual change.

(Ex. 1002, ¶139). When a first automated setpoint is compared to an actual setpoint and determined that a manual change has been implemented, a future second automated setpoint may be adjusted. (Ex. 1002, ¶139). It would be obvious to change automated setpoints calculated by the system in view of user's preferences as reflected in manual changes to the set point, in order to "free[] the customer from having to make changes to manage the indoor environmental condition." (Ex. 1004, ¶¶0242-0243)(Ex. 1002, ¶139).

Furthermore, by "learning from the user's inputs or adjustments to the system 3.08 to change or modify indoor air temperature", the system obviously provides a rule that interprets user manual setpoint change magnitudes as desired degrees of departure from the corresponding automated setpoints. (Ex. 1004, ¶¶0242-0243)(Ex. 1002, ¶140). In fact, Ehlers explains the use of "algorithm[s]" to learn the occupant's preferences (and adjust thereto in the future), and a POSITA would have understood that an algorithm is a set of rules. (Ex. 1004, ¶243)(Ex. 1020, p. 62).

Furthermore, as discussed with respect to claim element [9d], the system can compute multiple different setpoints which can be scheduled to be used at different times. (Ex. 1004, ¶0256)(Ex. 1002, ¶141). Ehlers explains that these can be, for example, home and away modes, where a first automated setpoint is used for an away mode and a second automated setpoint is used for the home mode (or *vice versa*). (Ex. 1004, ¶0244-0247). It would be obvious to change one or more of these

setpoints based on a user change to the setpoint according to one or more interpretive rules. (Ex. 1002, ¶141). Specifically, given Ehlers statement to learn a new pattern based on user changes to the thermostat, if a user changed a first setpoint corresponding to the home mode (at a first time) it would also be obvious to make such changes based on at least one rule for the interpretation of the manual change, in order to accommodate user preferences for a second time (*e.g.*, the next home mode automated setpoint) and to ensure that changes accurately reflect consistent consumer preferences, as opposed to more anomalous one-off changes made by the user. (Ex. 1002, ¶141)(Ex. 1004, ¶¶0242-0247). As one potential example, if a user exercises in her house on Monday afternoons, and accordingly, consistently adjusts the setpoint downwards to keep cool, the system may lower the next automated setpoint (second automated setpoint) for a Monday afternoon to allow the system to “exceed the cycle run time trigger level” and consume more energy on Monday afternoons in order to accommodate user comfort. (Ex. 1002, ¶142). The rule for the interpretation of the manual change, could be, for example, implement the change if the user has made the same setpoint adjustment (compared to a first automated setpoint) on the same day of the week more than three times in a row. (Ex. 1002, ¶142).

CLAIM 10

“10. A method as in claim 9 where said thermostatic controller operates a system for changing the air temperature in a structure.”

Ehlers in view of Wruck renders claim 10 obvious for the reasons set forth above for claim 2. (Ex. 1002, ¶143).

CLAIM 11

“11. A method as in claim 9 where said thermostatic controller operates a heating, ventilation and air conditioning system.”

Ehlers in view of Wruck renders claim 11 obvious for the reasons set forth above for claim 3. (Ex. 1002, ¶144).

CLAIM 12

“12. A method as in claim 9 where said thermostatic controller operates a heating, ventilation and air conditioning system in a single family residence.”

Ehlers in view of Wruck renders claim 12 obvious for the reasons set forth above for claim 4. (Ex. 1002, ¶145).

CLAIM 13

“13. A method as in claim 9 in which at least one remote processor is in communication with said thermostatic control device.”

Ehlers in view of Wruck renders claim 13 obvious for the reasons set forth above for claim 5. (Ex. 1002, ¶146).

CLAIM 14

“14. A method as in claim 13 in which said remote processor is not located in the same structure as said thermostatic controller.”

Ehlers in view of Wruck renders claim 14 obvious for the reasons set forth above for claim 6. (Ex. 1002, ¶147).

CLAIM 15

“15. A method as in claim 13 in which said remote processor sets programming for said thermostatic controller.”

Ehlers in view of Wruck renders claims 15 obvious for the reasons set forth above for claim 7. (Ex. 1002, ¶148).

CLAIM 16

“16. A method as in claim 9 in which said thermostatic controller is programmable”

Ehlers in view of Wruck renders claim 16 obvious for the reasons set forth above for claim 8. (Ex. 1002, ¶149).

Ground 2. Claims 9-16 are obvious over Ehlers in view of Wruck and Harter.

Claims 9-16 are obvious under pre-AIA 35 U.S.C. § 103(a) over U.S. Pat. App. Pub. 2004/0117330 (“Ehlers”)(Ex. 1004) in view of U.S. Pat. Pub. 2005/0040250 (“Wruck”)(Ex. 1005) and U.S. Pat. No. 7,784,704 (“Harter”)(Ex. 1019).

A. Effective Prior Art Dates

Harter was filed on February 9, 2007 and published on August 14, 2008 and is therefore prior art under at least pre-AIA 35 U.S.C. § 102(a) and (e).

Harter was of record during the prosecution of the application leading to the ’550 patent. Harter was not discussed on the record by the Examiner or Applicant. *See Weber, Inc. v. Provisur Technologies, Inc.*, IPR2019-01467, Paper 7 at 10 (PTAB Feb. 14, 2020)(Ex. 1002, ¶¶152-153).

B. Overview of the Ground

As discussed, while Ehlers suggests all elements of the claims, Wruck reinforces the obviousness cases with respect to, at least, the limitations directed to “detecting a manual change.” Furthermore, Harter reinforces the obviousness cases with respect to, at least, the limitations directed to “changing the second automated setpoint ... based on at least one rule,” as described in more detail below.

1. Overview of Ehlers

As discussed with respect to Ground 1, Ehlers discloses a thermostat that contains various scheduled temperature set points for the HVAC system, which are manually changeable by a user. (Ex. 1004, ¶¶0012, 0013, 0153-0160, 0228, 0239, 0244, 0253-0256, 0278, 0281, 0308-0309, 0316-0324, 0320).

Ehlers also teaches detecting and implementing a user’s manual changes to a setpoint. (Ex. 1004, ¶¶0242, ¶¶0243)(Ex. 1002, ¶¶155-156). Ehlers further teaches that its system performs “set point pattern change tracking,” in which the system tracks and learns from a user’s changes to setpoints. (Ex. 1004, ¶¶0268, 0308, 0309)(Ex. 1002, ¶¶156).

2. Overview of Wruck

As discussed with respect to Ground 1, Wruck teaches a thermostat that can be programmed with a schedule to save energy, where the user can enter times of

the day when period of occupancy and non-occupancy begin. (Ex. 1005, Figs. 9G and 9I, ¶0098)(Ex. 1002, ¶157).

Wruck further explains that manual changes may be detected using a “delta” between an actual temporary setpoint and a scheduled setpoint. (Ex. 1005, Table 28, ¶0110)(Ex. 1002, ¶158). Wruck describes checking whether the difference between the temporary setpoint and the scheduled setpoint is not equal to zero, and if so, to display the temporary setpoint. (Ex. 1002, ¶158).

3. Overview of Harter

Harter teaches a hybrid manual/programmable thermostat that allows users to manually enter temperature settings, where the thermostat “learns a user’s manual temperature setting habits and eventually programs itself accordingly.” (Ex. 1019, Abstract)(Ex. 1002, ¶159). The thermostat can be programmed with a schedule to permit automatic setpoint adjustments, where the thermostat “automatically switches from a programmed mode to a manual mode simply by manually entering a new desired setpoint temperature.” (Ex. 1019, 1:54-2:34)(Ex. 1002, ¶159).

Harter explains that “[a]fter several manual settings, microprocessor 36 may learn the user’s preferred setpoint temperatures and timestamps them with the aid of a timer 38. With one or more learned setpoint temperatures and timestamps 48, microprocessor 36 can begin anticipating the user’s desires and automatically adjust the thermostat’s setpoint temperatures accordingly.” (Ex. 1019, 3:11-27)(Ex. 1002,

¶160). Harter further teaches that the system may look for patterns of manual setpoints, where “[a] daily pattern, for example, can be defined as three consecutive days in which a series of three similar manually entered setpoint temperatures (e.g., within a predetermined deviation of perhaps 2° F. or 5° F. of each other) have similar daily timestamps 48 (e.g., each Y-value being within a predetermined deviation of perhaps 90 minutes of each other).” (Ex. 1019, 4:14-29)(Ex. 1002, ¶160). The system then assigns the daily pattern “a learned daily setpoint temperature and a learned daily time,” where “[f]or future automatic settings, the [learned daily time] might allow [the system] to activate the learned daily setpoint temperature before the user would normally want to adjust the setpoint.” (Ex. 1019, 4:14-29)(Ex. 1002, ¶160).

4. Overview of the Combination

As noted above, the combination of Ehlers and Wruck render obvious the features of claims 9-16. Ehlers describes adjusting its schedule by “learning” from a user’s setpoint changes that depart from the schedule. (Ex. 1004, ¶0242 (“system 3.08 manages comfort for the customer site 1.04 by learning from the user’s inputs or adjustments to the system 3.08 to change or modify indoor air temperature. This learning process alters the operation of the system 3.08, freeing the customer from having to make changes to manage the indoor environmental condition.”))(Ex. 1002, ¶161).

Ehlers also renders obvious changing an automated setpoint based on a rule for the interpretation of the detected manual change. (Ex. 1002, ¶162). The desired result of “learning” from user changes to the setpoint is to implement changes to the setpoint programming to improve user comfort and anticipate the user’s desired settings. (Ex. 1002, ¶162).

Harter provides more detail on the concept of adjusting a second automated setpoint based on a user’s manual adjustment to the setpoint. Thus, given that Ehlers already describes this concept, and Harter provides a more robust description of the operation, it would also have been obvious to rely upon Harter for the manner of changing a second automated setpoint based on a rule for the interpretation of the detected manual change. (Ex. 1002, ¶163). Harter discloses a method of learning a user’s setpoint patterns and adjusting scheduled programming accordingly, so that the user need not constantly adjust scheduled programming themselves, thus “offering the simplicity of a manual thermostat while providing the convenience and versatility of a programmed thermostat.” (Ex. 1019, 1:39-50).

C. *Graham* Factors

The level of ordinary skill is addressed above at Section V.C.

The scope and content of the prior art are discussed throughout the Ground.

The differences between the prior art and the claims are discussed in the “Overview of the Combination” and in the claim mapping, below.

Petitioner is not aware of any secondary considerations that would make an inference of non-obviousness more likely.

D. Reasonable Expectation of Success

A POSITA in the relevant timeframe would have had a reasonable expectation of success in implementing the combination (as described with particularity below in the claim mapping section) of Ehlers, Wruck, and Harter. (Ex. 1002, ¶165). As Dr. Auslander explains, the art was relatively predictable in the relevant timeframe (early 2009). (Ex. 1002, ¶165). A POSITA would have been able to make any necessary modifications to implement this Ground. (Ex. 1002, ¶165). This is discussed in more detail in the claim mapping section, where appropriate.

E. Analogous Art

Ehlers, Wruck, and Harter are in the same field as the '550 patent (building energy management and controls). (Ex. 1001, 1:18-2:17, 3:48-67, claim 9)(“A method for incorporating manual changes to the setpoint for a thermostatic controller into the long-term programming of said thermostatic controller comprising....”)(Ex. 1004, Abstract, Title)(Ex. 1005, Abstract, Title, ¶¶0002-0008)(Ex. 1019, Abstract)(Ex. 1002, ¶166). Specifically, these references address controlling heating and cooling systems, implementation of setpoints, and HVAC control in view of outdoor temperatures. (Ex. 1001, claim 1, Abstract, 1:18-2:17, 3:48-67, 4:62-5:40)(Ex. 1005, Abstract, ¶¶0062, 0120, 0183)(Ex. 1004, ¶¶0090, 0092, 0095, 0137,

0141, 0145, 0147, 0167, 0182, 0204, 0239, 0244-0247, 0252-0256 and ¶¶0078-0082)(Ex. 1019, Fig. 1)(Ex. 1002, ¶167). See *Wyers v. Master Lock Co.*, 616 F.3d 1231, 1238 (Fed. Cir. 2010).

F. Claim Mapping

INDEPENDENT CLAIM 9

The claim mapping of claim 9 with respect to Ground 2 are similar in many respects to that of Ground 1. Relevant differences are addressed in the claim mapping below. (Ex. 1002, ¶169)

“9[a]. A method for incorporating manual changes to the setpoint for a thermostatic controller into long-term programming of said thermostatic controller comprising:”

Ehlers in view of Wruck and Harter renders claim element 9[a] obvious for the reasons set forth above for the same limitation in Ground 1. (Ex. 1002, ¶170).

“[9b] accessing stored data comprising a plurality of internal temperature measurements taken within a structure and a plurality of outside temperature measurements relating to temperatures outside the structure;”

Ehlers in view of Wruck and Harter renders claim element [9b] obvious for the reasons set forth above for the same limitation in Ground 1. (Ex. 1002, ¶171).

“[9c] using the stored data to predict a rate of change of temperatures inside the structure in response to at least changes in outside temperatures;”

Ehlers in view of Wruck and Harter renders claim element [9c] obvious for the reasons set forth above for the same limitation in Ground 1. (Ex. 1002, ¶172).

“[9d] calculating scheduled programming of setpoints in the thermostatic controller based on the predicted rate of change, the scheduled programming comprising at least a first automated setpoint at a first time and a second automated setpoint at a second time;

Ehlers in view of Wruck and Harter renders claim element [9d] obvious for the reasons set forth above for the same limitation in Ground 1. (Ex. 1002, ¶173).

“[9e]. comparing the actual setpoint at the first time for said thermostatic controller to the first automated setpoint for said thermostatic controller; detecting a manual change to the first automated setpoint by determining whether said actual setpoint and said first automated setpoint are the same or different;”

Ehlers in view of Wruck and Harter renders claim element [9e] obvious for the reasons set forth above for the same limitation in Ground 1. (Ex. 1002, ¶¶174-175).

“[9f]. changing the second automated setpoint at the second time based on at least one rule for the interpretation of said manual change.”

Ehlers renders obvious this claim limitation. (Ex. 1002, ¶176). As set forth in Ground 1, Ehlers not only detects manual setpoint changes and incorporates those changes into the functioning of the system. Ehlers specifically explains that “[t]his learning process alters the operation of the system 3.08, freeing the customer from having to make changes to manage the indoor environmental condition.” (Ex. 1004, ¶¶0242-0243)(Ex. 1002, ¶176). Ehlers thus teaches changing the operation of the HVAC system based on what it has “learn[ed] from the user’s inputs or adjustments

to the system 3.08 to change or modify indoor air temperature.” (Ex. 1004, ¶¶0242-0243)(Ex. 1002, ¶176).

Similarly, Harter explains that “[a]fter several manual settings, microprocessor 36 may learn the user’s preferred setpoint temperatures and timestamps them with the aid[] of a timer 38. With one or more learned setpoint temperatures and timestamps 48, microprocessor 36 can begin anticipating the user’s desires and automatically adjust the thermostat’s setpoint temperatures accordingly.” (Ex. 1019, 3:11-27)(Ex. 1002, ¶177).

Harter discloses how the system may look for patterns of manual setpoints, where “[u]pon receiving a manually entered setpoint temperature, microprocessor assigns an (X and Y) timestamp 48 to the manually entered setpoint temperature, wherein the timestamp indicates when the setpoint temperature was entered relative to other timestamps. The manually entered setpoint temperature and its timestamp 48 are stored in memory for later reference,” and “[m]icroprocessor 36 looks for patterns of manual setpoints, wherein each manual setpoint has a manually entered setpoint temperature and a timestamp 48.” (Ex. 1019, 4:4-13)(Ex. 1002, ¶177). Here, a POSITA would have understood that the manually entered setpoint temperature can be detected by comparing a first automated setpoint with the actual setpoint. (Ex. 1002, ¶177).

Harter further explains that “[a] daily pattern, for example, can be defined as three consecutive days in which a series of three similar manually entered setpoint temperatures (e.g., within a predetermined deviation of perhaps 2° F. or 5° F. of each other) have similar daily timestamps 48 (e.g., each Y-value being within a predetermined deviation of perhaps 90 minutes of each other).” (Ex. 1019, 4:14-29)(Ex. 1002, ¶178). The system then assigns the daily pattern “a learned daily setpoint temperature and a learned daily time,” where “[f]or future automatic settings, the [learned daily time] might allow [the system] to activate the learned daily setpoint temperature before the user would normally want to adjust the setpoint.” (Ex. 1019, 4:14-29)(Ex. 1002, ¶178). Here, a future (second) automated setpoint is changed to the learned temperature, based on the rule of “three consecutive days in which a series of three similar manually entered setpoint temperatures” are entered at a similar time. (Ex. 1002, ¶178). Thus, a manual change to a first automated setpoint at a first time is detected and then the system changes a second automated setpoint at a second time (e.g., for the next day) based on a programming rule related to the manual change. (Ex. 1002, ¶178).

Thus, Harter suggests changing an automated setpoint based on a rule for the interpretation of the detected manual change. (Ex. 1002, ¶179). Harter simply discloses a specific method for implementing the “learning” disclosed in Ehlers, and

explains that utilizing this method, that the user need not constantly adjust scheduled programming themselves. (Ex. 1019, 1:39-50).

CLAIM 10

“10. A method as in claim 9 where said thermostatic controller operates a system for changing the air temperature in a structure.”

Ehlers in view of Wruck and Harter renders claim 10 obvious for the reasons set forth above for the same limitation in Ground 1. (Ex. 1002, ¶180).

CLAIM 11

“11. A method as in claim 9 where said thermostatic controller operates a heating, ventilation and air conditioning system.”

Ehlers in view of Wruck and Harter renders claim 11 obvious for the reasons set forth above for the same limitation in Ground 1. (Ex. 1002, ¶181).

CLAIM 12

“12. A method as in claim 9 where said thermostatic controller operates a heating, ventilation and air conditioning system in a single family residence.”

Ehlers in view of Wruck and Harter renders claim 12 obvious for the reasons set forth above for the same limitation in Ground 1. (Ex. 1002, ¶182).

CLAIM 13

“13. A method as in claim 9 in which at least one remote processor is in communication with said thermostatic control device.”

Ehlers in view of Wruck and Harter renders claim 13 obvious for the reasons set forth above for the same limitation in Ground 1. (Ex. 1002, ¶183).

CLAIM 14

“14. A method as in claim 13 in which said remote processor is not located in the same structure as said thermostatic controller.”

Ehlers in view of Wruck and Harter renders claim 14 obvious for the reasons set forth above for the same limitation in Ground 1. (Ex. 1002, ¶184).

CLAIM 15

“15. A method as in claim 13 in which said remote processor sets programming for said thermostatic controller.”

Ehlers in view of Wruck and Harter renders claim 15 obvious for the reasons set forth above for the same limitation in Ground 1. (Ex. 1002, ¶185).

CLAIM 16

“16. A method as in claim 9 in which said thermostatic controller is programmable”

Ehlers in view of Wruck and Harter renders claim 16 obvious for the reasons set forth above for the same limitation in Ground 1. (Ex. 1002, ¶186).

VI. MANDATORY NOTICES

NOTICE OF LEAD AND BACKUP COUNSEL

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NOTICE OF THE REAL-PARTIES-IN-INTEREST

The real-party-in-interest for this petition is Google LLC.

NOTICE OF RELATED MATTERS

The '550 patent has been asserted in the following litigations:

- *Emerson Electric Co. v. EcoFactor, Inc.*, 1-21-cv-00317 (D. Del. Mar. 1, 2021) (voluntarily terminated);
- *Google, LLC f/k/a Google Inc. v. EcoFactor, Inc.*, 3-21-cv-01468 (N.D. Cal. March 1, 2021);
- *ecobee, Inc. v. EcoFactor, Inc.*, 1-21-cv-00323 (D. Del. March 2, 2021);
- *Carrier Global Corp. v. EcoFactor, Inc.*, 1-21-cv-00328 (D. Del. March 3, 2021) (voluntarily terminated);
- *EcoFactor, Inc. v. Google, LLC*, 6-22-cv-00350 (W.D. Tex. April 1, 2022) (voluntarily terminated);
- *Certain Smart Thermostat Systems, Smart HVAC Systems, Smart HVAC Control Systems, And Components Thereof*, Inv. No. 337-TA-1258 (“*Certain Smart Thermostat Systems*”) (terminated).

The following cases are pending before the Board involving the '550 patent:

- *ecobee Technologies, ULC., v. EcoFactor, Inc.*, IPR2022-00969.

- *ecobee Technologies, ULC., v. EcoFactor, Inc.*, IPR2022-00983.

This Petition is being submitted concurrently with a Motion for Joinder. Specifically, Petitioner requests institution and joinder with IPR2022-00983, which the Board instituted on November 15, 2022. Petitioner has spoken with counsel of record for ecobee, and ecobee does not oppose joinder to the IPR2022-00983 petition.

Whereas the present Petition is a “me-too” or “copycat” petition, wherein Petitioner agrees to assume a “passive understudy role,” the *General Plastic* factors are “effectively neutraliz[ed].” *Apple Inc. v. Uniloc 2017 LLC.*, IPR2018-00580, Paper 13 at 10 (Aug. 21, 2018). Therefore the present Petition should be granted.

NOTICE OF SERVICE INFORMATION

Please address all correspondence to the lead counsel at the addresses shown above. Petitioner consents to electronic service by email at: smith@smithbaluch.com; laughton@smithbaluch.com.

GROUND FOR STANDING

Petitioner hereby certifies that the patent for which review is sought is available for *inter partes* review, and that the Petitioner is not barred or estopped from requesting an *inter partes* review on the grounds identified in the petition. In this regard it is noted that the Petition is being accompanied by a joinder motion. Thus, the time limit for filing a Petition for *inter partes* review of 37 C.F.R. §

41.101(b) and 35 U.S.C. § 315(b) do not apply. 37 C.F.R. § 42.122(b); 35 U.S.C. § 315(b).

VII. CONCLUSION

Petitioner respectfully requests that claims 1-16 of the '550 patent be canceled.

Date: <u>December 15, 2022</u>	<u>/Matthew A. Smith/ (RN 49,003)</u> Matthew A. Smith SMITH BALUCH LLP 700 Pennsylvania Ave. SE Second Floor Washington, D.C. 20003 smith@smithbaluch.com <i>Counsel for Petitioner Google LLC</i>
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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 Priority Mail Express on December 15, 2022, on the Patent Owner's counsel of record at the United States Patent and Trademark Office having the following address:

Tanner IP, PLLC
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Courtesy copies of the above-mentioned documents were also provided to counsel of record for Patent Owner in IPR2022-00983 via email correspondence to the following recipients:

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CERTIFICATE OF WORD COUNT

The undersigned hereby certifies that the foregoing petition for inter partes review contains 12,891 words according to the word processing program used to prepare it.

Date: December 15, 2022

/Matthew A. Smith/
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