



US00RE45574E

(19) **United States**
(12) **Reissued Patent**
Harter

(10) **Patent Number:** **US RE45,574 E**
(45) **Date of Reissued Patent:** **Jun. 23, 2015**

(54) **SELF-PROGRAMMABLE THERMOSTAT**

FOREIGN PATENT DOCUMENTS

(75) Inventor: **Robert J. Harter**, La Crosse, WI (US)

CA
EP

2202008 A1 10/1998
0196069 A2 10/1986

(73) Assignee: **Honeywell International Inc.**,
Morristown, NJ (US)

(Continued)

OTHER PUBLICATIONS

(21) Appl. No.: **13/551,543**

Erickson, et al. "Energy Efficient Building Environment Control Strategies Using Real-Time Occupancy Measurement," ACM Workshop on Embedded Sensing Systems for Energy Efficiency in Buildings, 2009, pp. 19-24.

(22) Filed: **Jul. 17, 2012**

Related U.S. Patent Documents

(Continued)

Reissue of:

(64) Patent No.: **7,784,704**
Issued: **Aug. 31, 2010**
Appl. No.: **11/704,414**
Filed: **Feb. 9, 2007**

Primary Examiner — Ljiljana Ciric

Assistant Examiner — Alexis Cox

(74) Attorney, Agent, or Firm — Seager Tufte & Wickhem LLC

(51) **Int. Cl.**
G05D 23/32 (2006.01)
F24F 11/00 (2006.01)
G05D 23/00 (2006.01)

(57) **ABSTRACT**

(52) **U.S. Cl.**
CPC **F24F 11/00** (2013.01); **F24F 2011/0063**
(2013.01); **F24F 2011/0065** (2013.01); **F24F**
2011/0064 (2013.01)

A hybrid manual/programmable thermostat for a furnace or air conditioner [offers the simplicity of a manual thermostat while providing the convenience and versatility of a programmable one. Initially, the hybrid thermostat appears to function as an ordinary manual thermostat; however, it privately observes and learns] *that is configured to learn from a user's manual temperature [setting habits] settings and [eventually programs] program itself accordingly. [If users begin changing their preferred temperature settings due to seasonal changes or other reasons, the thermostat continues learning] The thermostat may be configured to learn and [will] adapt to [those changes as well. For ease of use, the thermostat does not require an onscreen menu as a user interface. In some embodiments, the thermostat can effectively program itself for temperature settings that are set to occur at particular times daily or just on weekends, yet the user is not required to enter the time of day or the day of the week] a user's manual temperature settings over time.*

(58) **Field of Classification Search**
USPC 236/46 R, 46 C, 1 C, 44 C
See application file for complete search history.

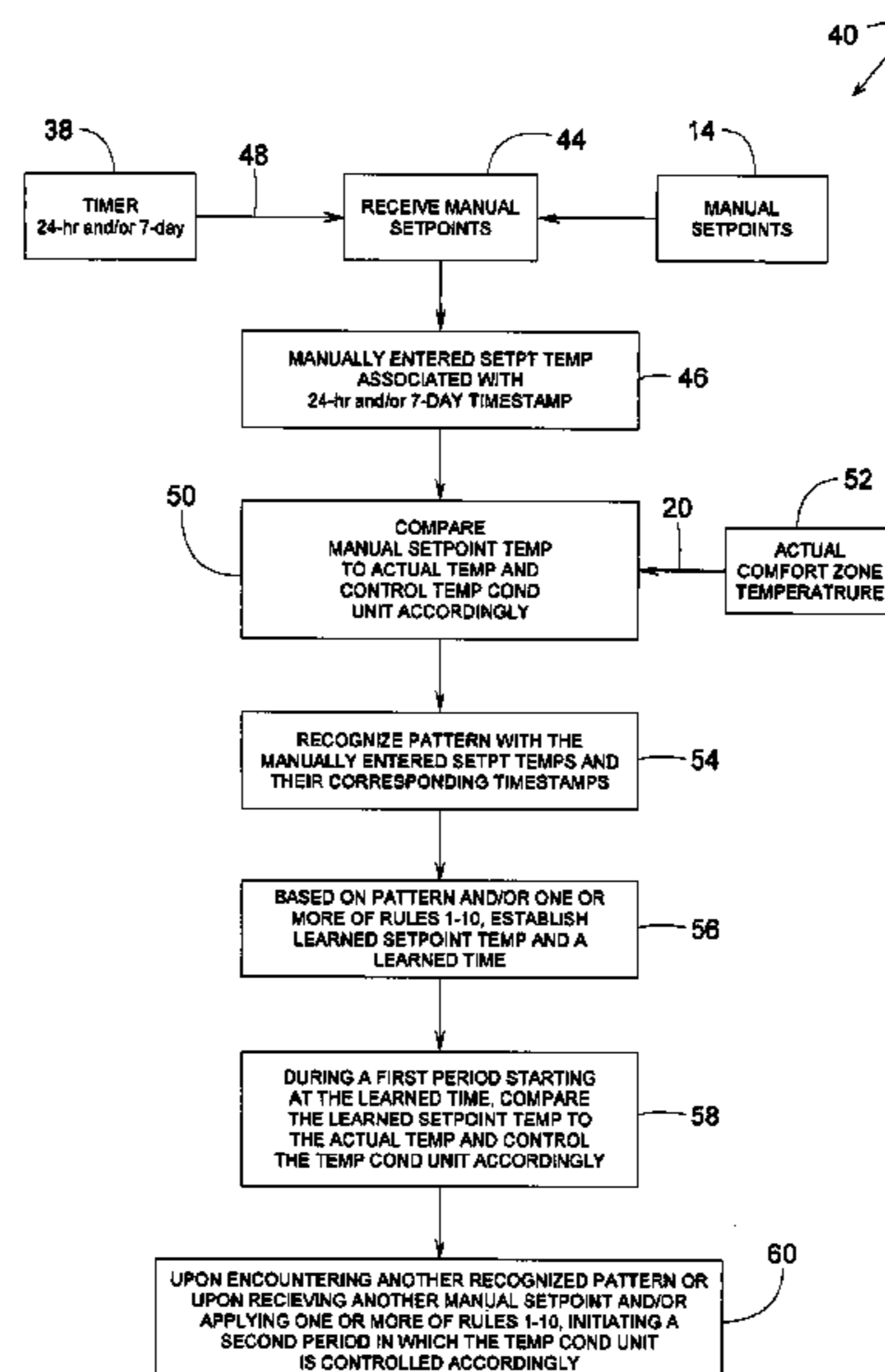
(56) **References Cited**

U.S. PATENT DOCUMENTS

2,202,008 A 5/1940 Ittner
4,032,867 A 6/1977 Engeler et al.

(Continued)

17 Claims, 3 Drawing Sheets



(56)

References Cited

U.S. PATENT DOCUMENTS

4,223,831	A	9/1980	Szarka	6,769,482	B2	8/2004	Wagner et al.
4,316,577	A	2/1982	Adams et al.	6,814,299	B1	11/2004	Carey
4,335,847	A *	6/1982	Levine 236/46 R	6,824,069	B2	11/2004	Rosen
4,350,966	A	9/1982	Nelson	6,851,621	B1	2/2005	Wacker
4,408,711	A	10/1983	Levine	D506,150	S	6/2005	Backlund et al.
4,467,178	A *	8/1984	Swindle 392/449	D506,689	S	6/2005	Backlund et al.
4,469,274	A *	9/1984	Levine 236/46 R	6,951,306	B2	10/2005	DeLuca
4,531,064	A *	7/1985	Levine 307/66	7,000,849	B2	2/2006	Ashworth et al.
4,595,430	A	6/1986	Baker	7,014,336	B1	3/2006	Ducharme et al.
4,615,380	A	10/1986	Beckey	7,024,336	B2	4/2006	Salsbury
4,621,336	A	11/1986	Brown	7,028,912	B1	4/2006	Rosen
4,669,654	A	6/1987	Levine et al.	7,035,805	B1	4/2006	Miller
4,674,027	A	6/1987	Beckey	7,055,759	B2	6/2006	Wacker et al.
4,685,614	A	8/1987	Levine	7,083,109	B2	8/2006	Pouchak
4,751,961	A	6/1988	Levine et al.	7,108,194	B1	9/2006	Hankins, II
4,768,706	A	9/1988	Parfitt	7,109,970	B1	9/2006	Miller
5,005,365	A	4/1991	Lynch	7,111,788	B2	9/2006	Reponen
5,056,712	A *	10/1991	Enck 236/20 R	7,114,554	B2	10/2006	Bergman et al.
5,088,645	A *	2/1992	Bell 236/46 R	7,117,129	B1	10/2006	Bash et al.
5,115,967	A *	5/1992	Wedekind 236/46 R	7,140,551	B2	11/2006	de Pauw et al.
5,165,465	A *	11/1992	Kenet 165/11.1	7,141,748	B2	11/2006	Tanaka et al.
5,170,935	A *	12/1992	Federspiel et al. 236/44 C	7,142,948	B2	11/2006	Metz
5,192,020	A	3/1993	Shah	7,146,348	B2	12/2006	Geib et al.
5,192,874	A	3/1993	Adams	7,152,806	B1	12/2006	Rosen
5,211,332	A	5/1993	Adams	7,156,318	B1	1/2007	Rosen
5,224,649	A	7/1993	Brown	7,159,789	B2	1/2007	Schwendinger et al.
5,238,184	A	8/1993	Adams	7,159,790	B2	1/2007	Schwendinger et al.
5,240,178	A	8/1993	Dewolf et al.	7,181,317	B2	2/2007	Amundson et al.
5,255,975	A	10/1993	Adams	7,222,494	B2	5/2007	Peterson et al.
5,270,952	A	12/1993	Adams et al.	7,222,800	B2	5/2007	Wruck
5,294,047	A	3/1994	Schwer	7,225,054	B2	5/2007	Amundson et al.
5,303,612	A	4/1994	Odom et al.	7,258,280	B2	8/2007	Wolfson
5,361,983	A	11/1994	Bird	7,264,175	B2	9/2007	Schwendinger et al.
5,395,042	A	3/1995	Riley et al.	7,274,972	B2	9/2007	Amundson et al.
5,476,221	A	12/1995	Seymour et al.	7,287,709	B2	10/2007	Proffitt et al.
5,482,209	A	1/1996	Cochran et al.	7,299,996	B2	11/2007	Garrett et al.
5,485,954	A	1/1996	Guy et al.	7,302,642	B2	11/2007	Smith et al.
5,499,196	A	3/1996	Pacheco	7,333,880	B2	2/2008	Brewster et al.
5,555,927	A	9/1996	Shah	7,379,997	B2	5/2008	Ehlers et al.
5,603,451	A	2/1997	Helander et al.	RE40,437	E	7/2008	Rosen
5,611,484	A	3/1997	Uhrich	7,434,742	B2	10/2008	Mueller et al.
5,627,531	A	5/1997	Posso et al.	7,451,937	B2	11/2008	Flood et al.
5,673,850	A	10/1997	Uptegraph et al.	7,455,240	B2	11/2008	Chapman, Jr. et al.
5,690,277	A	11/1997	Flood	7,469,550	B2	12/2008	Chapman, Jr. et al.
5,720,176	A	2/1998	Manson et al.	7,509,753	B2	3/2009	Nicosia et al.
5,808,602	A	9/1998	Sellers et al.	7,552,030	B2	6/2009	Guralnik et al.
5,902,183	A	5/1999	D'Souza	7,558,648	B2	7/2009	Hoglund et al.
5,909,378	A	6/1999	De Milleville et al.	7,584,899	B2	9/2009	de Pauw et al.
5,931,378	A	8/1999	Schramm et al.	7,596,431	B1	9/2009	Forman et al.
5,943,917	A	8/1999	Truong et al.	7,600,694	B2	10/2009	Helt et al.
5,977,964	A	11/1999	Williams et al.	7,614,567	B2	11/2009	Chapman, Jr. et al.
6,062,482	A	5/2000	Gauthier et al.	7,624,931	B2	12/2009	Chapman, Jr. et al.
6,098,893	A	8/2000	Berglund et al.	7,634,504	B2	12/2009	Amundson
6,164,374	A	12/2000	Rhodes et al.	7,641,126	B2	1/2010	Schultz et al.
6,206,295	B1	3/2001	LaCoste	7,643,908	B2	1/2010	Quirino et al.
6,209,794	B1	4/2001	Webster et al.	7,644,869	B2	1/2010	Hoglund et al.
6,211,921	B1	4/2001	Cherian et al.	7,667,163	B2	2/2010	Ashworth et al.
6,213,404	B1	4/2001	Dushane et al.	7,693,582	B2	4/2010	Bergman et al.
6,216,956	B1	4/2001	Ehlers et al.	7,702,424	B2	4/2010	Cannon et al.
6,222,191	B1	4/2001	Myron et al.	7,703,694	B2	4/2010	Mueller et al.
6,286,764	B1	9/2001	Garvey et al.	7,778,734	B2	8/2010	Oswald et al.
6,298,285	B1	10/2001	Addink et al.	7,784,291	B2	8/2010	Butler et al.
6,349,883	B1	2/2002	Simmons et al.	7,784,704	B2	8/2010	Harter
6,351,693	B1	2/2002	Monie et al.	7,802,618	B2	9/2010	Simon et al.
6,356,204	B1	3/2002	Guindi et al.	7,845,576	B2	12/2010	Siddaramanna et al.
6,375,087	B1	4/2002	Day et al.	7,848,900	B2	12/2010	Steinberg et al.
6,453,687	B2	9/2002	Sharood et al.	7,854,389	B2	12/2010	Ahmed
6,502,758	B2	1/2003	Cottrell	7,904,830	B2	3/2011	Hoglund et al.
6,519,509	B1	2/2003	Nierlich et al.	7,913,825	B2	3/2011	Boyer
6,636,197	B1	10/2003	Goldenberg et al.	7,949,615	B2	5/2011	Ehlers et al.
6,641,055	B1	11/2003	Tiernan	8,010,237	B2	8/2011	Cheung et al.
6,644,557	B1	11/2003	Jacobs	8,019,567	B2	9/2011	Steinberg et al.
6,645,066	B2	11/2003	Gutta et al.	8,042,048	B2	10/2011	Wilson et al.
6,726,112	B1	4/2004	Ho	8,063,775	B2	11/2011	Reed et al.
6,741,158	B2	5/2004	Engler et al.	8,078,330	B2	12/2011	Brickfield et al.
				8,090,477	B1	1/2012	Steinberg
				8,131,497	B2	3/2012	Steinberg et al.
				8,180,492	B2	5/2012	Steinberg
				8,219,250	B2	7/2012	Dempster et al.

(56)

References Cited

U.S. PATENT DOCUMENTS

8,239,922 B2 8/2012 Sullivan et al.
 8,280,536 B1 10/2012 Fadell et al.
 8,442,695 B2 5/2013 Imes et al.
 8,452,457 B2 5/2013 Matsuoka et al.
 8,510,255 B2 8/2013 Fadell et al.
 2002/0005435 A1 1/2002 Cottrell
 2003/0034898 A1 2/2003 Shamoon et al.
 2003/0040842 A1 2/2003 Poth
 2003/0042320 A1 3/2003 Decker
 2004/0027271 A1 2/2004 Schuster et al.
 2004/0034484 A1 2/2004 Solomita, Jr. et al.
 2004/0055446 A1 3/2004 Robbin et al.
 2004/0149478 A1 8/2004 Staiger
 2004/0249479 A1 12/2004 Shorrock
 2004/0256472 A1 12/2004 DeLuca
 2004/0260427 A1 12/2004 Wimsatt
 2004/0262410 A1 12/2004 Hull
 2005/0040247 A1 2/2005 Pouchak
 2005/0119766 A1 6/2005 Amundson et al.
 2005/0128067 A1 6/2005 Zakrewski
 2005/0189429 A1 9/2005 Breeden
 2005/0204997 A1 9/2005 Fournier
 2005/0280421 A1 12/2005 Yomoda
 2006/0079983 A1 4/2006 Willis
 2006/0186214 A1 8/2006 Simon et al.
 2006/0196953 A1 9/2006 Simon et al.
 2007/0045430 A1 3/2007 Chapman et al.
 2007/0045433 A1 3/2007 Chapman et al.
 2007/0045444 A1 3/2007 Gray
 2007/0050732 A1 3/2007 Chapman
 2007/0057079 A1 3/2007 Stark
 2007/0158442 A1 7/2007 Chapman et al.
 2007/0158444 A1 7/2007 Naujok et al.
 2007/0173978 A1 7/2007 Fein
 2007/0225867 A1 9/2007 Moorer et al.
 2007/0227721 A1 10/2007 Springer et al.
 2007/0228183 A1 10/2007 Kennedy et al.
 2007/0241203 A1 10/2007 Wagner et al.
 2007/0257120 A1 11/2007 Chapman et al.
 2007/0278320 A1 12/2007 Lunacek et al.
 2008/0006709 A1 1/2008 Ashworth et al.
 2008/0015742 A1 1/2008 Kulyk et al.
 2008/0054082 A1 3/2008 Evans et al.
 2008/0191045 A1 8/2008 Harter
 2008/0219227 A1 9/2008 Michaelis
 2008/0223136 A1 9/2008 Yakabe et al.
 2008/0245480 A1 10/2008 Knight et al.
 2008/0290183 A1 11/2008 Laberge et al.
 2008/0317292 A1 12/2008 Baker et al.
 2009/0001180 A1 1/2009 Siddaramanna et al.
 2009/0057424 A1 3/2009 Sullivan et al.
 2009/0112335 A1 4/2009 Mehta et al.
 2009/0140056 A1 6/2009 Leen
 2009/0140057 A1 6/2009 Leen
 2009/0143916 A1 6/2009 Boll et al.
 2009/0171862 A1 7/2009 Harrod et al.
 2009/0195349 A1 8/2009 Frader-Thompson et al.
 2009/0215534 A1 8/2009 Wilson et al.
 2009/0216380 A1 8/2009 Kolk
 2009/0254225 A1 10/2009 Boucher et al.
 2009/0259713 A1 10/2009 Blumrich et al.
 2009/0271042 A1 10/2009 Voysey
 2009/0283603 A1 11/2009 Peterson et al.
 2009/0312999 A1 12/2009 Kasztenny et al.
 2010/0019051 A1 1/2010 Rosen
 2010/0025483 A1* 2/2010 Hoeynck et al. 236/1 C
 2010/0026229 A1 2/2010 Williams
 2010/0052576 A1 3/2010 Steiner et al.
 2010/0070084 A1 3/2010 Steinberg et al.
 2010/0070085 A1 3/2010 Harrod et al.
 2010/0070086 A1 3/2010 Harrod et al.
 2010/0070089 A1 3/2010 Harrod et al.
 2010/0070096 A1 3/2010 Rauscher et al.
 2010/0070234 A1 3/2010 Steinberg et al.
 2010/0070907 A1 3/2010 Harrod et al.

2010/0084482 A1 4/2010 Kennedy et al.
 2010/0106305 A1 4/2010 Pavlak et al.
 2010/0107070 A1 4/2010 Devineni et al.
 2010/0107076 A1 4/2010 Grohman et al.
 2010/0198425 A1 8/2010 Donovan
 2010/0211224 A1 8/2010 Keeling et al.
 2010/0262298 A1 10/2010 Johnson et al.
 2010/0262299 A1 10/2010 Cheung et al.
 2010/0280667 A1 11/2010 Steinberg
 2010/0289643 A1 11/2010 Trundle et al.
 2010/0308119 A1 12/2010 Steinberg et al.
 2010/0318227 A1 12/2010 Steinberg et al.
 2010/0324437 A1 12/2010 Freeman et al.
 2010/0327766 A1 12/2010 Recker et al.
 2011/0015798 A1 1/2011 Golden et al.
 2011/0015802 A1 1/2011 Imes
 2011/0035060 A1 2/2011 Oswald
 2011/0046756 A1 2/2011 Park
 2011/0046782 A1 2/2011 Fixell
 2011/0046792 A1 2/2011 Imes et al.
 2011/0046805 A1 2/2011 Bedros et al.
 2011/0046806 A1 2/2011 Nagel et al.
 2011/0054710 A1 3/2011 Imes et al.
 2011/0077896 A1 3/2011 Steinberg et al.
 2011/0153089 A1 6/2011 Tiemann et al.
 2011/0173542 A1 7/2011 Imes et al.
 2011/0185895 A1 8/2011 Freen
 2011/0196539 A1 8/2011 Nair et al.
 2011/0224838 A1 9/2011 Imes et al.
 2011/0288905 A1 11/2011 Mrakas
 2011/0307103 A1 12/2011 Cheung et al.
 2012/0065935 A1 3/2012 Steinberg et al.
 2012/0066168 A1 3/2012 Fadell et al.
 2012/0085831 A1 4/2012 Kopp
 2012/0131504 A1 5/2012 Fadell et al.
 2012/0158350 A1 6/2012 Steinberg et al.
 2012/0165993 A1 6/2012 Whitehouse
 2012/0221151 A1 8/2012 Steinberg
 2012/0245740 A1 9/2012 Raestik et al.
 2013/0103622 A1 4/2013 Matsuoka et al.
 2013/0274928 A1 10/2013 Matsuoka et al.

FOREIGN PATENT DOCUMENTS

JP S59-106311 6/1984
 JP H1-252850 10/1989
 WO 2011072332 A1 6/2011

OTHER PUBLICATIONS

Allen, R., et al., "Real-Time Earthquake Detection and Hazard Assessment by Alarms Across California," Geophysical Research Letters, vol. 36, L00B08, pp. 1-6, 2009.
 Honeywell, "Prestige Product Data," Honeywell Internaitonal Inc., 2012, 126 pages.
 Nordman, B., et al., "Using Existing Networks for Energy Purposes," In Proceesing of the First ACM Workshop on Embedded Sensing Systems for Energy-Efficiency in Buildings, ACM, 2009, 2 pages.
 Cisco Systems, White Paper, "Wi-Fi Based Real-Time Location Tracking: Solutions and Technology," Cisco Systems, Inc., 2006, 6 pages.
 White Rodgers Model 1F81-261 Installation and Operatinf Instructions, White-Rodgers, Emerson Electric Co., 2010, 8 pages.
 Mozer, M., et al., "The Neurothermostat: Predictive Optimal Control of Residential Heating Systems," Adv. In Neural Info. Proc. Systems 9, pp. 953-959, Cambdridge, MA MIT Press, 1997.
 Scott, J., et al., "PreHeat: Controlling Home Heating Using Occupancy Prediction," In Proceedings of the 13th International Conference on Ubiquitous Computing, pp. 281-291, ACM, 2011.
 Melfi, R., et al., "Measuring Building Occupancy Using Existing Network Infrastructure," In Green Computing Conference and Workshops (IGCC), 2011 International, pp. 1-8, IEEE, 2011.
 Akhlaghinia, M., et al., "Occupancy Monitoring in Intelligent Environment Through Integrated Wireless Localizing Agents," In 2009 IEEE Symposium on intelligent Agetns, Piscataway, NJ, USA, vol. 30, 2009, 7 pages.

(56)

References Cited

OTHER PUBLICATIONS

- Aprilaire Electronic Thermostats, "User's Manual Installation and Programming," Dec. 2000.
- Braeburn, "Premier Series Programmable Thermostats," pp. 1-20, 2011.
- Braeburn, "Premier Series Universal Auto Changeover 5300," pp. 1-15, 2009.
- Carrier, "SYSTXCCUIZ01-V Infinity Control Installation Instructions," pp. 1-20, 2012.
- Carrier, "TB-PAC TB-PHP Base Series Programmable Thermostats Installation Instructions," 8 pages, 2012.
- Davis, Gray, "Buildings End-Use energy Efficiency; Alternatives to Compressor Cooling," California Energy Commission, 80 pages, Jan. 2000.
- Deleeuw, Scott., "Ecobee WiFi enabled Smart Thermostat Part 2: The Features review," pp. 1-7, Dec. 2, 2011.
- Ecobee, "Smart Si Thermostat User Manual," 44 pages, 2012. EB-SmartSiUM-01rev1.
- Ecobee, "Smart Thermostat User's Manual," 20 pages, 2010. UM-STAT-106-R4.
- Fountain, M. et al., "Comfort control for short-term occupancy," Center for the Built Environment, UC Berkeley, 15 pages, Publicized Jan. 14, 1994.
- Goa, Ge et al., "The Self-Programming Thermostat: Optimizing Set-back Schedules based on Home Occupancy Patterns," BuildSys—09, 6 pages, Nov. 3, 2009.
- Honeywell, "Installation Guide VisionPRO TH8000 Series," pp. 1-11, 2012. 69-2693-01.
- Honeywell, "Operating Manual FocusPRO TH6000 Series," pp. 1-24, 2011. 69-1921EFS-03.
- Honeywell, "Perfect Climate Comfort Center control systems," pp. 1-44, 2001. 68-0173-3.
- Honeywell, "T8611G Chronotherm IV Deluxe Programmable Heat Pump Thermostat Installation Instructions," pp. 1-24, 1997. 69-1406-1.
- Honeywell, "THX9321 Prestige 2.0 and THX9421 Prestige IAQ 2.0 with EIM," 160 pages, 2012. 68-0311-02.
- Lennox, "homeowner's manual ComfortSense 5000 Series."
- Lennox, "Homeowner's Manual icomfort Touch Thermostat," pp. 1-20, Dec. 2010. 506053-01.
- Lennox, "Owner's Guide, ComfortSense 5000 Series Models L5711U and L5732U Programmable Touch Screen Thermostats," p. 1-32, Feb. 2008. 506067-01.
- Lu, Jiakang et al., "The Smart Thermostat: Using Occupancy Sensors to Save Energy in Homes," 14 pages, SenSys '10, Nov. 3-5, 2010.
- LuxPro, "Instruction Manual LuxPro PSPU732T," 48 pages, Before 2013. PSPU732T Manual.
- Network Thermostat, "Nex/X WiFi Thermostat," 2 pages, 2013.
- Robertshaw, "9620 Digital Programmable Thermostat User's Manual," pp. 1-14, 2001. 110-732E.
- Robertshaw, "9801i2, 9825i2 Deluxe Programmable Thermostats," pp. 1-36, Jul. 17, 2006.
- Trane, "ComfortLink II Installation Guide", pp. 1-20, Mar. 2011. 18-HD64D1-1.
- Trane, "TCONT600AF11MA Programmable Comfort Control, Installation Instructions," pp. 1-14, 2006. Pub. No. 18-HD25D20-3.
- Trane, "Trane communicating Thermostats for Fan Coil Control, User Guide," pp. 1-32, May 2011. BAS-SVU12A-EN.
- Trane, "Trane communicating Thermostats for Heat Pump Control," pp. 1-32, May 2011. BAS-SVU10A-EN.
- Venstar, "Residential Thermostat T5800 Owner's Manual and Installation Instructions", Revision 5b, 63 pages, before 2013. P/N88-860.
- Washington State University Extension Energy Program, "Electric Heat Lock Out on Heat Pumps," pp. 1-3, Apr. 2010.
- White Rodgers, "Emerson Blue Wireless Comfort Interface 1F98EZ-1621," Emerson Climate Technologies, 28 pages, before 2013. Part No. 37/7236-A.
- Bay Controls LLC. "Bayweb Thermostat Model BW-WT2 Owner's Manual," Revision 1.8, 31 pages. Nov 2, 2011. Document # BW-WT4-2DOC.
- Honeywell, "CT8775A,C The Digital Round(™) Non-Programmable thermostats," Honeywell International Inc. 20 pages, 2004. 69-1676-1.
- Mozer, "The Neural Network House: An Environment that Adapts to its Inhabitants," University of Colorado Department of Computer Science. AAA1. pp. 110-114. 1998. AAA1 Technical Report SS98-02-017.
- Mozer, "Lessons from an Adaptive House," University of Colorado Department of Computer Science. 58 pages. <http://www.cs.colorado.edu/~mozer/adaptive-house>, downloaded Nov. 7, 2011.
- "Nest Learning Thermostat Efficiency Simulation White Paper," 22 pages, Oct. 21, 2011. 6 sections.
- "Quad Six Magic-Stat(®) Thermostat MS2000 Manual 88-610M_0_001986," 40 pages, 1986. 090051B 88610M.
- Ecobee, "Introducing the new Smart Si Thermostat," 7 pages, prior to Jul. 17, 2012.
- Ecobee, "Smart Thermostat," 6 pages, 2011.
- Lennox, "Homeowner's Manual ComfortSense 5000 Series," 32 pages, Feb. 2008.
- Lennox, "Homeowner's Manual ComfortSense 7000 Series," pp. 1-15, May 2009.
- Venstar, "Commercial Thermostats T2900, Owner's Manual," pp. 1-26.2, Apr. 2008.
- VisionPRO TH8000 Series Installation Guide, Honeywell International Inc., 2012, 12 pages.
- VisionPRO Wi-Fi Programmable Thermostat Model TH8320WF, Honeywell International Inc., 2012, 48 pages.
- Braeburn, "Braeburn Premier Series Programmable Thermostats, Model 5200," 11 pages, 2011.
- Braeburn, "Braeburn Premier Series Universal Auto Changeover Up to 3 Heat/2 Cool Heat Pump, or 2 Heat/2 Cool Conventional Thermostat, Model 5300, Installer Guide," 10 pages, 2009. <http://ambientdevices-myshopify.com/products/energy-joule>, "Ambient Devices—Energy Joule," 1 page, printed Dec. 4, 2013. <http://www.icy.nl/en/consumer/products/clever-thermostat-pro>, "Clever Thermostat Pro-ICY," Overview, 1 page, printed Dec. 4, 2013. <http://ambientdevices.com/about/energy-devices>, "Ambient Products," 2 pages, 2013.
- Honeywell, "VisionPro TH8000 Series Touchscreen Programmable Thermostat," Operating Manual, 32 pages, 2011. <http://www.icy.nl/en/consumerproducts/clever-thermostat>, "The Clever Thermostat—ICY," 1 page, printed Dec. 4, 2013. <http://www.icy.nl/en/consumerproducts/clever-thermostat>, "The Clever Thermostat—ICY," Features, 1 page, printed Dec. 4, 2013.
- ICY, "ICY Timer Thermostat Connection to District Heating, Honeywell VC8015 en VC8615," 1 page, downloaded Dec. 4, 2013. "ICY 18xx Timer-Thermostats," User Manual and Installation Guide, 1 page, 2009. <http://www.icy.nl/en/consumerproducts/clever-thermostat>, "The Clever Thermostat—ICY," Overview, 1 page, printed Dec. 4, 2013. <http://www.duurzaamthuis.nl/review-slimme-thermostat-icy>, "Review Slimme Thermostaat ICY," 5 pages, Feb. 17, 2011.
- Network Thermostat, "Network Thermostat RP32-WiFi, Wi-Fi Thermostat," 2 pages, 2012.
- Network Thermostat, "Network Thermostat RP32 Universal Programmable Communicating Thermostat, Installation and Programming Instructions," 6 pages, downloaded Dec. 5, 2013.
- California Energy Commission, "Buildings End-Use Energy Efficiency, Alternatives to Compressor Cooling," 80 pages, Jan. 2000.

* cited by examiner

FIG. 1

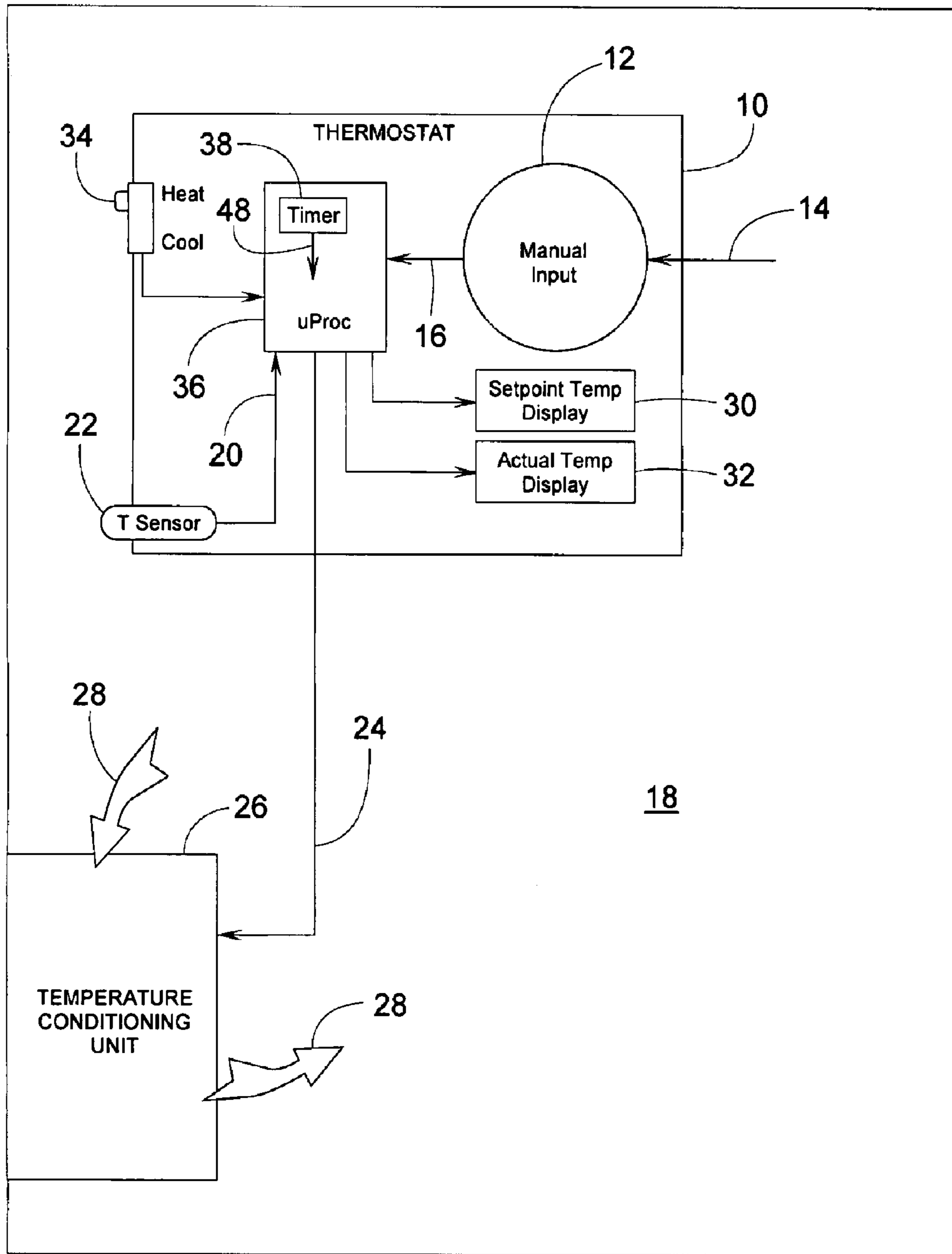


FIG. 2

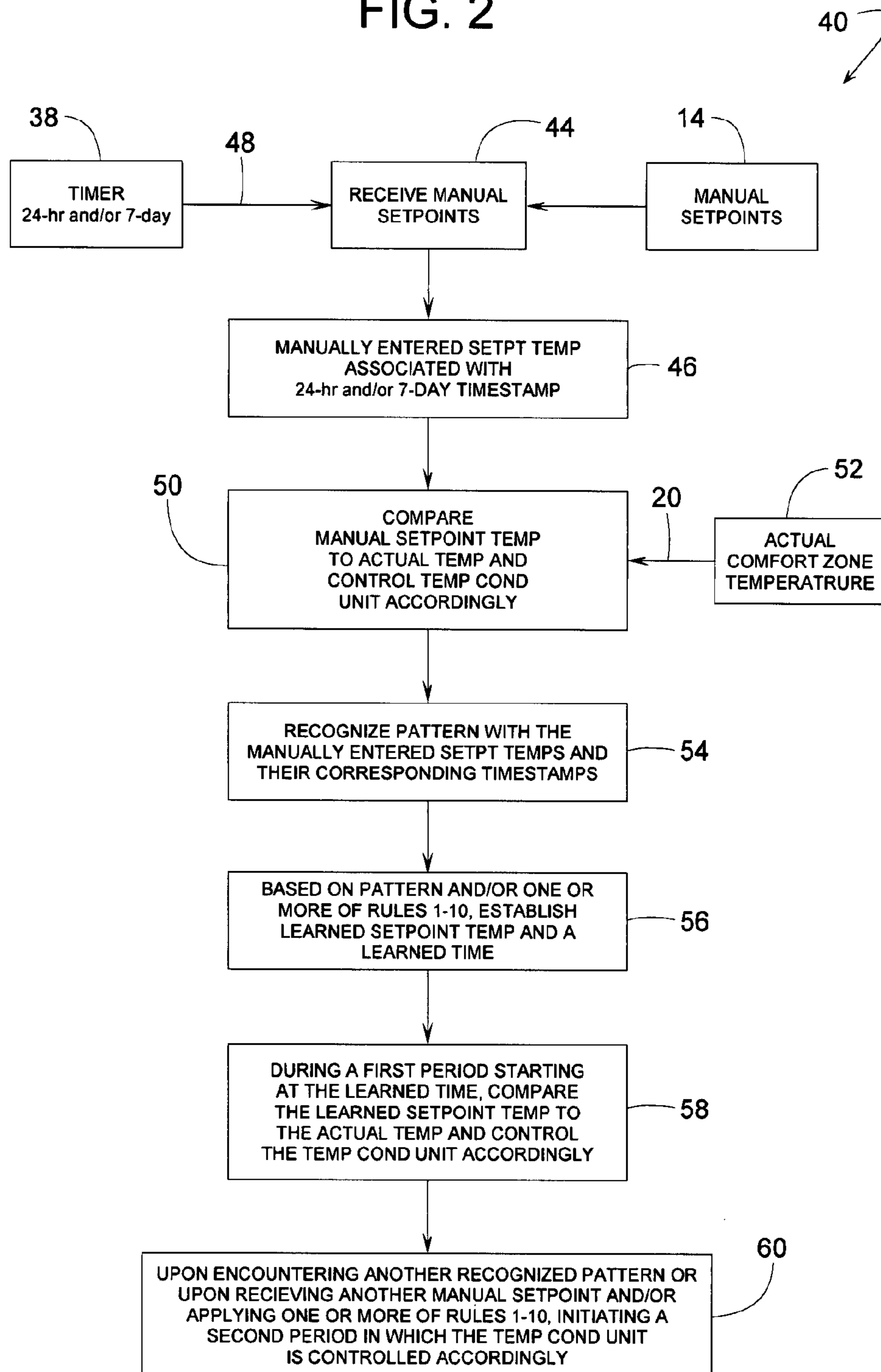
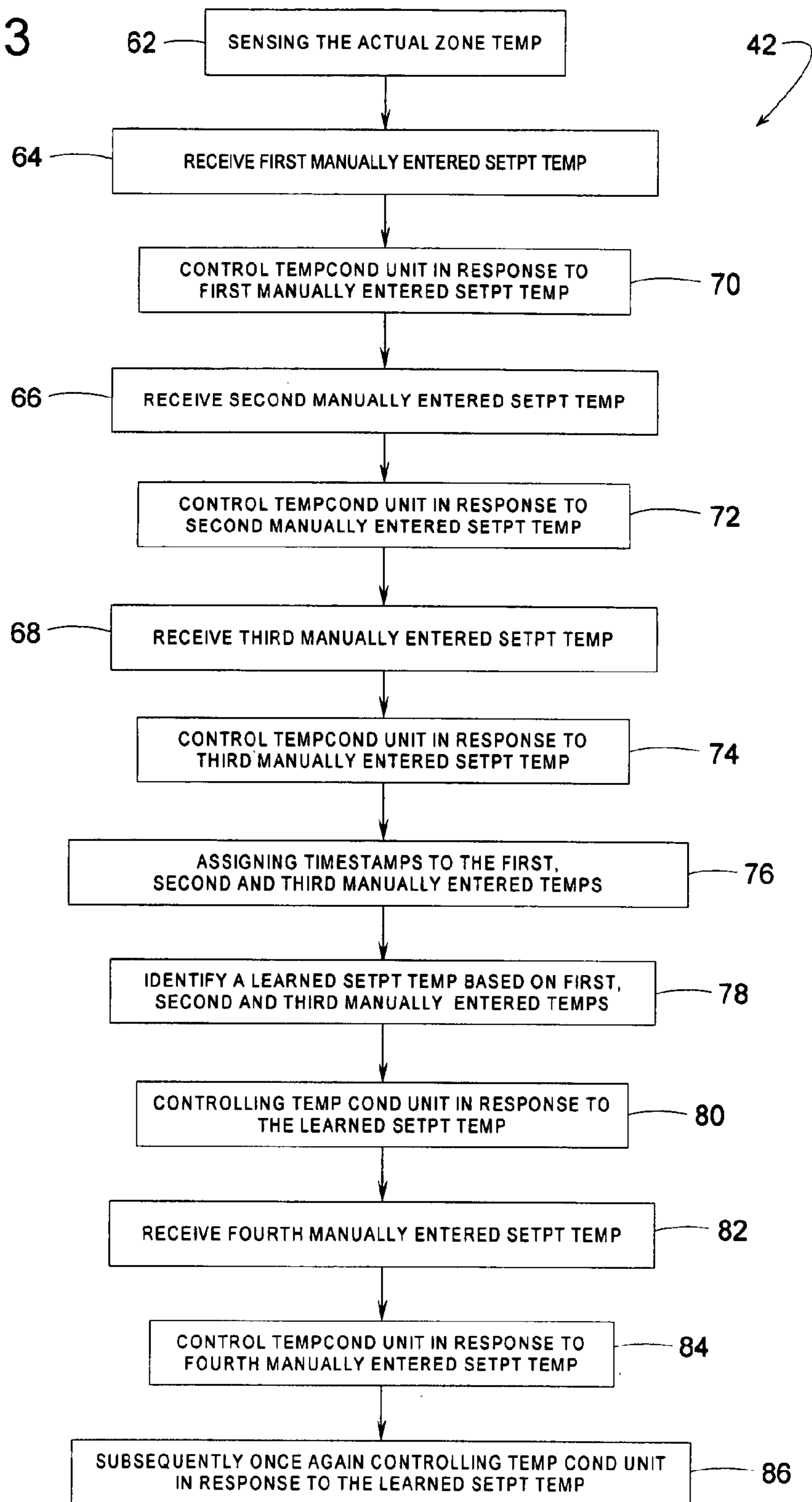


FIG. 3



SELF-PROGRAMMABLE THERMOSTAT

Matter enclosed in heavy brackets [] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue; a claim printed with strikethrough indicates that the claim was canceled, disclaimed, or held invalid by a prior post-patent action or proceeding.

FIELD OF THE INVENTION

The subject invention generally pertains to a room or building thermostat and more specifically to a method of programming such a thermostat, wherein the thermostat can in effect program itself for various daily and/or weekly temperature setpoints upon learning temperature setting habits of a user and can do such self-programming without ever knowing the actual time of day or day of the week.

BACKGROUND OF RELATED ART

Furnaces, air conditioners and other types of temperature conditioning units typically respond to a thermostat in controlling the air temperature of a room or other area of a building. Currently, thermostats can be classified as manual or programmable.

With manual thermostats, a user manually enters into the thermostat a desired temperature setpoint, and then thermostat controls the temperature conditioning unit to bring the actual room temperature to that setpoint. At various times throughout the day, the user might adjust the setpoint for comfort or to save energy. When operating in a heating mode, for instance, a user might lower the setpoint temperature at night and raise it again in the morning. Although manual thermostats are easy to understand and use, having to repeatedly adjust the setpoint manually can be a nuisance.

Programmable thermostats, on the other hand, can be programmed to automatically adjust the setpoint to predetermined temperatures at specified times. The specified times can initiate automatic setpoint adjustments that occur daily such as on Monday-Friday, or the adjustments might occur weekly on days such as every Saturday or Sunday. For a given day, programmable thermostats can also be programmed to make multiple setpoint adjustments throughout the day, such as at 8:00 AM and 11:00 PM on Saturday or at 6:00 AM and 10 PM on Monday through Friday. Such programming, however, can be confusing as it can involve several steps including: 1) synchronizing the thermostat's clock with the current time of day; 2) entering into the thermostat the current date or day of the week; and 3) entering various chosen days, times and setpoint temperatures. One or more of these steps may need to be repeated in the event of daylight savings time, electrical power interruption, change in user preferences, and various other reasons.

Consequently, there is a need for a thermostat that offers the simplicity of a manual thermostat while providing the convenience and versatility of a programmed thermostat.

SUMMARY OF THE INVENTION

An object of the invention is to provide an essentially self-programmable thermostat for people that do not enjoy programming conventional programmable thermostats.

An object of some embodiments of the invention is to provide a programmable thermostat that does not rely on having to know the time of day, thus a user does not have to enter that.

Another object of some embodiments is to provide a programmable thermostat with both daily and weekly occurring settings, yet the thermostat does not rely on having to know the day of the week, thus a user does not have to enter that.

Another object of some embodiments is to provide a programmable thermostat that does not rely on onscreen menus for programming.

Another object of some embodiments is to provide a thermostat that effectively programs itself as it is being used as a manual thermostat.

Another object of some embodiments is to provide a thermostat that automatically switches from a manual mode to a programmed mode when it recognizes an opportunity to do so.

Another object of some embodiments is to provide a thermostat that automatically switches from a programmed mode to a manual mode simply by manually entering a new desired setpoint temperature.

Another object of some embodiments is to observe and learn the temperature setting habits of a user and automatically program a thermostat accordingly.

Another object of some embodiments is to provide a self-programming thermostat that not only learns a user's temperature setting habits, but if those habits or temperature-setting preferences change over time, the thermostat continues learning and will adapt to the new habits and setpoints as well.

Another object of some embodiments is to minimize the number of inputs and actions from which a user can choose, thereby simplifying the use of a thermostat.

Another object of some embodiments is to provide a thermostat that can effectively self-program virtually an infinite number of setpoint temperatures and times, rather than be limited to a select few number of preprogrammed settings.

Another object of some embodiments is to provide a simple way of clearing programmed settings of a thermostat.

One or more of these and/or other objects of the invention are provided by a thermostat and method that learns the manual temperature setting habits of a user and programs itself accordingly.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic view of a thermostat controlling a temperature conditioning unit.

FIG. 2 shows an example of algorithm for a thermostat method.

FIG. 3 shows another example of algorithm for a thermostat method.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIGS. 1-3 show a thermostat **10** and a method for automatically programming it. Initially, thermostat **10** might first appear and function as an ordinary manual thermostat. Thermostat **10**, for instance, includes a manual input **12** (e.g., dial, keyboard, pointer, slider, potentiometer, pushbutton, etc.) that enables a user to manually enter a manual setpoint **14** that defines a manually entered setpoint temperature **16**. The manually entered setpoint temperature **16** is the user's desired target temperature for a comfort zone **18**. Upon comparing the manually entered setpoint temperature **16** to the comfort zone's actual temperature **20** (provided by a temperature sensor **22**), thermostat **10** provides an output signal **24** that controls a temperature conditioning unit **26** (e.g., furnace, heater, air conditioner, heat pump, etc.) to heat or cool air **28**

in comfort zone **18**, thereby urging the comfort zone's actual temperature **20** toward the manually entered setpoint temperature **16**.

A digital display **30** can be used for displaying the current setpoint temperature, and another display **32** can show the comfort zone's actual temperature. Displays **30** and **32** could be combined into a single display unit, wherein the combined display unit could show the current setpoint temperature and the zone's actual temperature simultaneously or in an alternating manner. Thermostat **10** might also include a selector switch **34** for manually switching between a cooling mode for cooling zone **18** and a heating mode for heating zone **18**. Items such as display **30**, selector switch **34**, manual input **12**, and output **24** are well known to those of ordinary skill in the art. One or more of such items, for example, can be found in a model CT8775C manual thermostat provided by Honeywell Inc. of Golden Valley, Minn.

Although thermostat **10** can operate as a regular manual thermostat by controlling unit **26** as a function of a differential between the actual zone temperature and the most recently entered manual setpoint temperature, thermostat **10** includes a microprocessor **36** (e.g., computer, CPU, firmware programmed chip, etc.) that enables thermostat **10** to observe the temperature setting habits of the user (e.g., person that manually enters setpoint temperatures into the thermostat). After several manual settings, microprocessor **36** may learn the user's preferred setpoint temperatures and timestamps them with the aide 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. Thus, thermostat **10** can begin operating as a programmed thermostat, rather than just a manual one.

Since a user's desired temperature setpoints and time preferences might change for various reasons, any manually entered setpoint temperature **16** overrides the currently active setpoint temperature regardless of whether the current setpoint temperature was manually entered or was automatically activated as a learned setpoint temperature. Once overridden, another learned setpoint temperature might later be activated at a learned time to return thermostat **10** back to its programmed mode. Thus, thermostat **10** is somewhat of a hybrid manual/programmable thermostat in that it can shift automatically between manual and programmed operation.

To assign timestamps **48** to manually entered setpoint temperatures, timer **38** can actually comprise one or more timers and/or counters. In some embodiments, for example, timer **38** includes a continuously running daily or 24-hour timer that resets itself every 24 hours. The time increments can be in minutes, seconds, or any preferred unit. In some cases, timer **38** is a continuously operating weekly or 168-hour timer that resets itself every seven days. The increments can be in days, hours, minutes, seconds, or any preferred unit. The weekly timer could also be a seven-increment counter that indexes one increment every 24 hours in response to a daily or 24-hour timer. Timer **38**, however, is not necessarily synchronized with the actual time of day or day of the week. Such synchronization preferably is not required; otherwise the user might have to manually enter or set the correct time and day of the week.

In the case where timer **36** comprises a weekly timer in the form of a 7-increment counter triggered by each 24-hour cycle of a daily timer, timestamp **48** might be a two-part number such as (X and Y) wherein X cycles from 1 to 7 as a weekly timer, and Y cycles from 0 to 1,439 (1,440 minutes per day) as a daily timer. In this case, a timestamp **48** might be (3 and 700) to indicate 700 minutes elapsed during day-3.

Whether day-3 represents Monday, Tuesday or some other day is immaterial, and whether the 700-minute represents 2:00 AM, 7:30 PM or some other time of day is also immaterial. As one way to provide a programmable thermostat that can operate independently of an actual time of day clock and to provide thermostat **10** with other functionality, microprocessor **36** can be firmware programmed to execute one or more of the following rules:

Rule-1—Upon 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.

Rule-2—Microprocessor **36** looks for patterns of manual setpoints, wherein each manual setpoint has a manually entered setpoint temperature and a timestamp **48**.

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). Such a daily pattern can then be assigned a learned daily setpoint temperature and a learned daily time. The learned daily setpoint temperature could be, for example, an average of the three similar manually entered setpoints temperatures or the most recent of the three. The learned daily time could be, for example, 20 minutes before the three similar timestamps. For future automatic settings, the 20 minutes might allow microprocessor **36** to activate the learned daily setpoint temperature before the user would normally want to adjust the setpoint.

A weekly pattern, for example, can be defined as three manual setpoints spaced 7 days apart (e.g., same X-value after one complete 7-day cycle) in which three similar manually entered setpoint temperatures (e.g., within 2° F. or 5° F. of each other) have similar timestamps **48** (e.g., each Y-value being within 90 minutes of each other). Such a weekly pattern can then be assigned a learned weekly setpoint temperature and a learned weekly time. The learned weekly setpoint temperature could be, for example, an average of the three similar manually entered setpoints temperatures spaced 7 days apart or the most recent of the three. The learned time could be, for example, 20 minutes before the three similar timestamps.

Rule-3—Automatically activate a learned daily setpoint temperature at its learned daily time (at its assigned Y-value), whereby thermostat **10** controls unit **26** based on the learned daily setpoint temperature and continues to do so until interrupted by one of the following: a) the user enters a manually entered setpoint temperature (adjusts the temp), b) another learned daily setpoint temperature becomes activated at its learned daily time, or c) a learned weekly setpoint temperature becomes activated at its learned weekly time.

Rule-4—Automatically activate a learned weekly setpoint temperature at its learned weekly time (at its assigned X and Y values), whereby thermostat **10** controls unit **26** based on the learned weekly setpoint temperature and continues to do so until interrupted by one of the following: a) the user enters a manually entered setpoint temperature (adjusts the temp), b) a learned daily setpoint temperature becomes activated at its learned daily time (but see Rule-5), or c) another learned weekly setpoint temperature becomes activated at its learned weekly time.

Rule-5—A weekly pattern overrides or supersedes a daily pattern if their assigned timestamps **48** are within a predeter-

5

mined period of each other such as, for example, within three hours of each other based on the Y-values of their timestamps.

Rule-6—If a user enters a manually entered setpoint temperature, thermostat **10** controls unit **26** in response to the manually entered setpoint temperature and continues to do so until interrupted by one of the following: a) the user enters another manually entered setpoint temperature (adjusts the temp), b) a learned daily setpoint temperature becomes activated at its learned daily time, or c) a learned weekly setpoint temperature becomes activated at its learned weekly time.

Rule-7—If a user enters two manually entered setpoint temperatures within a predetermined short period of each other, e.g., within 90 minutes of each other, the first of the two manual entries is disregarded as being erroneous and is not to be considered as part of any learned pattern.

Rule-8—If a learned daily setpoint temperature is activated at a learned time and is soon interrupted by the user entering a manually entered setpoint temperature within a predetermined short period (e.g., within 3 hours), and this occurs a predetermined number of days in a row (e.g., 3 days in a row as indicated by the X-value of timer **38**), then the daily pattern associated with the learned daily setpoint temperature is erased from the memory.

Rule-9—If a learned weekly setpoint temperature is activated at a learned time and is soon interrupted by the user entering a manually entered setpoint temperature within a predetermined short period (e.g., within 3 hours), and this occurs a predetermined number of weeks in a row (e.g., 2 weeks in a row as indicated by an additional counter that counts the cycles of the X-value of timer **38**), then the weekly pattern associated with the learned weekly setpoint temperature is erased from the memory.

Rule-10—Actuating switch **34** between cool and heat or actuating some other manual input can be used for erasing the entire collection of learned data.

Rules 1-10 might be summarized more concisely but perhaps less accurately as follows:

1) Assign timestamps **48** to every manually entered setpoint temperature.

2) Identify daily patterns (similar manually entered temperatures and times 3 days in a row), and identify weekly patterns (3 similar manually entered temperatures and times each spaced a week apart). Based on those patterns, establish learned setpoint temperatures and learned times.

3) Activate learned daily setpoints at learned times, and keep them active until the activated setpoint is overridden by the next learned setpoint or interrupted by a manually entered setpoint.

4) Activate learned weekly setpoints at learned times, and keep them active until the activated setpoint is overridden by the next learned setpoint or interrupted by a manually entered setpoint.

5) If a learned weekly setpoint and a learned daily setpoint are set to occur near the same time on given day, the learned daily setpoint is ignored on that day because the day is probably a Saturday or Sunday.

6) Whenever the user manually adjusts the temperature, the manually entered setpoint temperature always overrides the currently active setting. The manually entered setpoint remains active until it is interrupted by a subsequent manual or learned setting.

7) If a user repeatedly tweaks or adjusts the temperature within a short period, only the last manually entered setpoint temperature is used for learning purposes, as the other settings are assumed to be trial-and-error mistakes by the user.

8) If a user has to repeatedly correct a learned daily setpoint (e.g., correct it 3 days in a row), that learned setpoint is deleted

6

and no longer used. Using 3 days as the cutoff avoids deleting a good daily pattern due to 2 days of corrections over a weekend.

9) If a user has to repeatedly correct a learned weekly setpoint (e.g., correct it 2 weeks in a row), that learned setpoint is deleted and no longer used.

10) Switching between heating and cooling, for at least 5 seconds or so, deletes the entire collection of learned data.

To execute one or more of the aforementioned rules, microprocessor **36** could operate under the control of various algorithms, such as, for example, an algorithm **40** of FIG. 2, an algorithm **42** of FIG. 3, a combination of algorithms **40** and **42**, or another algorithm altogether.

Referring to the example of FIG. 2, a block **44** represents receiving a plurality of manual setpoints **14** that are manually entered at various points in time over a period, each of the manual setpoints **14** provides a manually entered setpoint temperature **16** that in block **46** becomes associated with a timestamp **48** via timer **38**. Timer **38** can run independently or irrespective of the actual time of day and irrespective of the actual day of the week. In blocks **50** and **52**, thermostat **10** controls unit **26** as a function of a differential between the actual zone temperature **20** and a currently active manually entered setpoint. In block **54**, microprocessor **36** recognizes patterns with the manually entered setpoints. Based on the patterns, in block **56** microprocessor **10** establishes learned setpoint temperatures and corresponding learned times. In block **58**, some time after controlling unit **26** in response to the manually entered setpoint temperatures (block **50**), automatically switching at the learned time to controlling the temperature conditioning unit in response to the learned setpoint temperature. This might continue until interrupted by block **60**, wherein microprocessor **36** encounters another recognized pattern or upon receiving another manual setpoint, at which point unit **26** is controlled in response thereto.

Referring to the example of FIG. 3, a block **62** represents microprocessor **36** receiving temperature feedback signal **20** from temperature sensor **22**. Sensor **22** could be incorporated within thermostat **10**, as shown in FIG. 1, or sensor **22** could be installed at some other location to sense the room temperature such as the temperature of air **28** entering unit **26**. Blocks **64**, **66** and **68** represent microprocessor **36** sequentially receiving first, second and third manually entered setpoint temperatures. Blocks **70**, **72** and **74** represent thermostat **10** controlling unit **26** at sequential periods in response to a differential between the comfort zone temperature and the various manually entered setpoint temperatures. Block **76** represents assigning timestamps **48** to the various manually entered setpoint temperatures. A block **78** represents microprocessor **36** identifying a learned setpoint temperature based on the first, second and third manually entered setpoint temperatures. In block **80**, thermostat **10** controls unit **26** in response to a differential between the learned setpoint temperature and the actual zone temperature. Block **82** represents subsequently receiving a fourth manually entered setpoint temperature. Block **84** represents controlling unit **26** in response to the fourth manually entered setpoint temperature. Some time after that, thermostat **10** returns to controlling unit **26** in response to the learned setpoint temperature, as indicated by block **86**.

Although the invention is described with respect to a preferred embodiment, modifications thereto will be apparent to those of ordinary skill in the art. The scope of the invention, therefore, is to be determined by reference to the following claims:

The invention claimed is:

1. A thermostat method for a temperature conditioning unit, wherein the temperature conditioning unit helps control a temperature of a comfort zone, the method comprising:

receiving a first manually entered setpoint temperature, which is assigned a first timestamp;
controlling the temperature conditioning unit in response to the first manually entered setpoint temperature;
receiving a second manually entered setpoint temperature, which is assigned a second timestamp;
controlling the temperature conditioning unit in response to the second manually entered setpoint temperature;
receiving a third manually entered setpoint temperature, which is assigned a third timestamp;
controlling the temperature conditioning unit in response to the third manually entered setpoint temperature;
identifying a learned setpoint temperature based on the first manually entered setpoint temperature, the second manually entered setpoint temperature, and third manually entered setpoint temperature; and
controlling the temperature conditioning unit in response to the learned setpoint temperature; and wherein the first timestamp, the second timestamp, and the third timestamp are based on a 24-hour timer and all lie within a predetermined range of each other based on the 24-hour timer.

2. The thermostat method of claim 1, wherein first manually entered setpoint temperature, the second manually entered setpoint temperature, and third manually entered setpoint temperature all lie within 5° F. of each other.

3. The thermostat method of claim 1, further comprising: after controlling the temperature conditioning unit in response to the learned setpoint temperature, receiving a fourth manually entered setpoint temperature; and after receiving the fourth manually entered setpoint temperature, controlling the temperature conditioning unit in response to the fourth manually entered setpoint temperature.

4. The thermostat method of claim 3, further comprising: after controlling the temperature conditioning unit in response to the fourth manually entered setpoint temperature, returning to controlling the temperature conditioning unit in response to the learned setpoint temperature.

5. A thermostat method for a temperature conditioning unit, wherein the temperature conditioning unit helps control a temperature of a comfort zone, the method comprising:

receiving a first manually entered setpoint temperature, which is assigned a first timestamp;
controlling the temperature conditioning unit in response to the first manually entered setpoint temperature;
receiving a second manually entered setpoint temperature, which is assigned a second timestamp;
controlling the temperature conditioning unit in response to the second manually entered setpoint temperature;
receiving a third manually entered setpoint temperature, which is assigned a third timestamp;
controlling the temperature conditioning unit in response to the third manually entered setpoint temperature;
identifying a learned setpoint temperature based on the first manually entered setpoint temperature, the second manually entered setpoint temperature, and third manually entered setpoint temperature; and
controlling the temperature conditioning unit in response to the learned setpoint temperature; and wherein

the first timestamp, the second timestamp, and the third timestamp are based on a 168-hour timer and all lie within a predetermined range of each other based on the 168-hour timer.

6. A method for a temperature controller, wherein the temperature controller helps control a temperature conditioning unit of a comfort zone, the method comprising:

receiving a first manually entered setpoint temperature, which is assigned a first timestamp;
controlling the temperature conditioning unit in response to the first manually entered setpoint temperature;
receiving a second manually entered setpoint temperature, which is assigned a second timestamp;
controlling the temperature conditioning unit in response to the second manually entered setpoint temperature;
receiving a third manually entered setpoint temperature, which is assigned a third timestamp;
controlling the temperature conditioning unit in response to the third manually entered setpoint temperature;
identifying a learned setpoint temperature based on the first manually entered setpoint temperature, the second manually entered setpoint temperature, and third manually entered setpoint temperature;
controlling the temperature conditioning unit in response to the learned setpoint temperature; and

wherein the first timestamp, the second timestamp, and the third timestamp are based on a daily pattern and all lie within a predetermined range of each other based on the daily pattern; and

wherein the first timestamp, the second timestamp, and the third timestamp all lie within 90 minutes of each other based on the daily pattern.

7. A method for a temperature controller, wherein the temperature controller helps control a temperature conditioning unit of a comfort zone, the method comprising:

receiving a first manually entered setpoint temperature, which is assigned a first timestamp;
controlling the temperature conditioning unit in response to the first manually entered setpoint temperature;
receiving a second manually entered setpoint temperature, which is assigned a second timestamp;
controlling the temperature conditioning unit in response to the second manually entered setpoint temperature;
receiving a third manually entered setpoint temperature, which is assigned a third timestamp;
controlling the temperature conditioning unit in response to the third manually entered setpoint temperature;
identifying a learned setpoint temperature based on the first manually entered setpoint temperature, the second manually entered setpoint temperature, and third manually entered setpoint temperature;
controlling the temperature conditioning unit in response to the learned setpoint temperature;

wherein the first timestamp, the second timestamp, and the third timestamp are based on a daily pattern and all lie within a predetermined range of each other based on the daily pattern; and

wherein the controlling step controls the temperature conditioning unit in response to the learned setpoint temperature at a learned setpoint time, wherein the learned setpoint time is based on the first timestamp, the second timestamp, and/or the third timestamp on the daily pattern.

receiving a third manually entered setpoint temperature,
which is assigned a third timestamp;
controlling the temperature conditioning unit in response
to the third manually entered setpoint temperature;
identifying a learned setpoint temperature based on the 5
first manually entered setpoint temperature, the second
manually entered setpoint temperature, and/or the third
manually entered setpoint temperature if the first manu-
ally entered setpoint temperature, the second manually
entered setpoint temperature, and the third manually 10
entered setpoint temperature all fall within a tempera-
ture range that is less than 5 degrees F.;
controlling the temperature conditioning unit in response
to the learned setpoint temperature; and
wherein the first timestamp, the second timestamp, and the 15
third timestamp all lie within a predetermined range of
each other based on a weekly pattern.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : RE45,574 E
APPLICATION NO. : 13/551543
DATED : June 23, 2015
INVENTOR(S) : Harter

Page 1 of 1

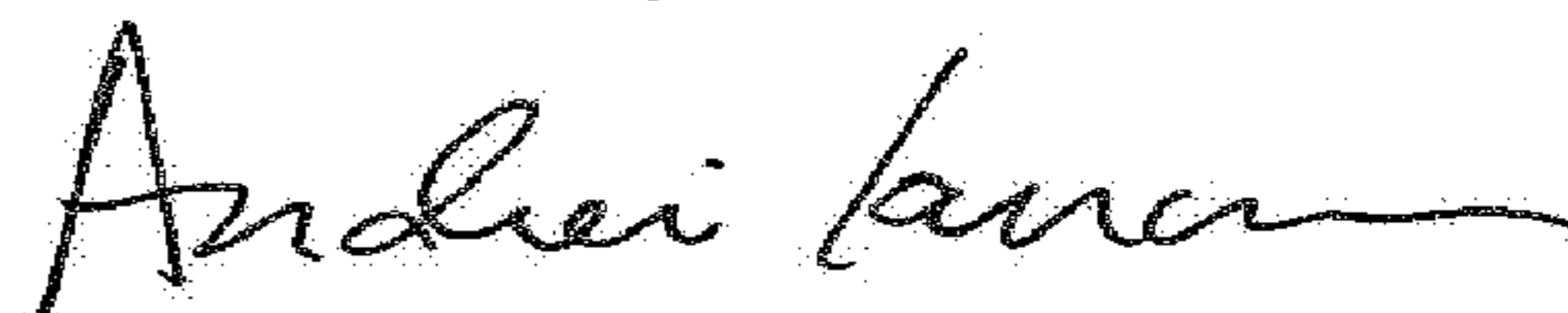
It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the Specification

Please insert at Line 9 (approx.) in Column 1 as follows:

--Notice: More than one reissue application has been filed for the reissue of U.S. Patent No. 7,784,704. The reissue applications are U.S. Reissue Patent Application Serial No. 14/714,535, filed on May 18, 2015, now U.S. Reissue Patent No. RE46,236 E, issued December 13, 2016, which is a continuation reissue application of U.S. Reissue Patent Application Serial No. 13/551,543 (the present application), filed on July 17, 2012, now U.S. Reissue Patent No. RE45,574 E, issued June 23, 2015.--

Signed and Sealed this
Fifth Day of June, 2018



Andrei Iancu
Director of the United States Patent and Trademark Office