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(54) **SELF-PROGRAMMABLE THERMOSTAT**

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(57) **ABSTRACT**

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.*

17 Claims, 3 Drawing Sheets

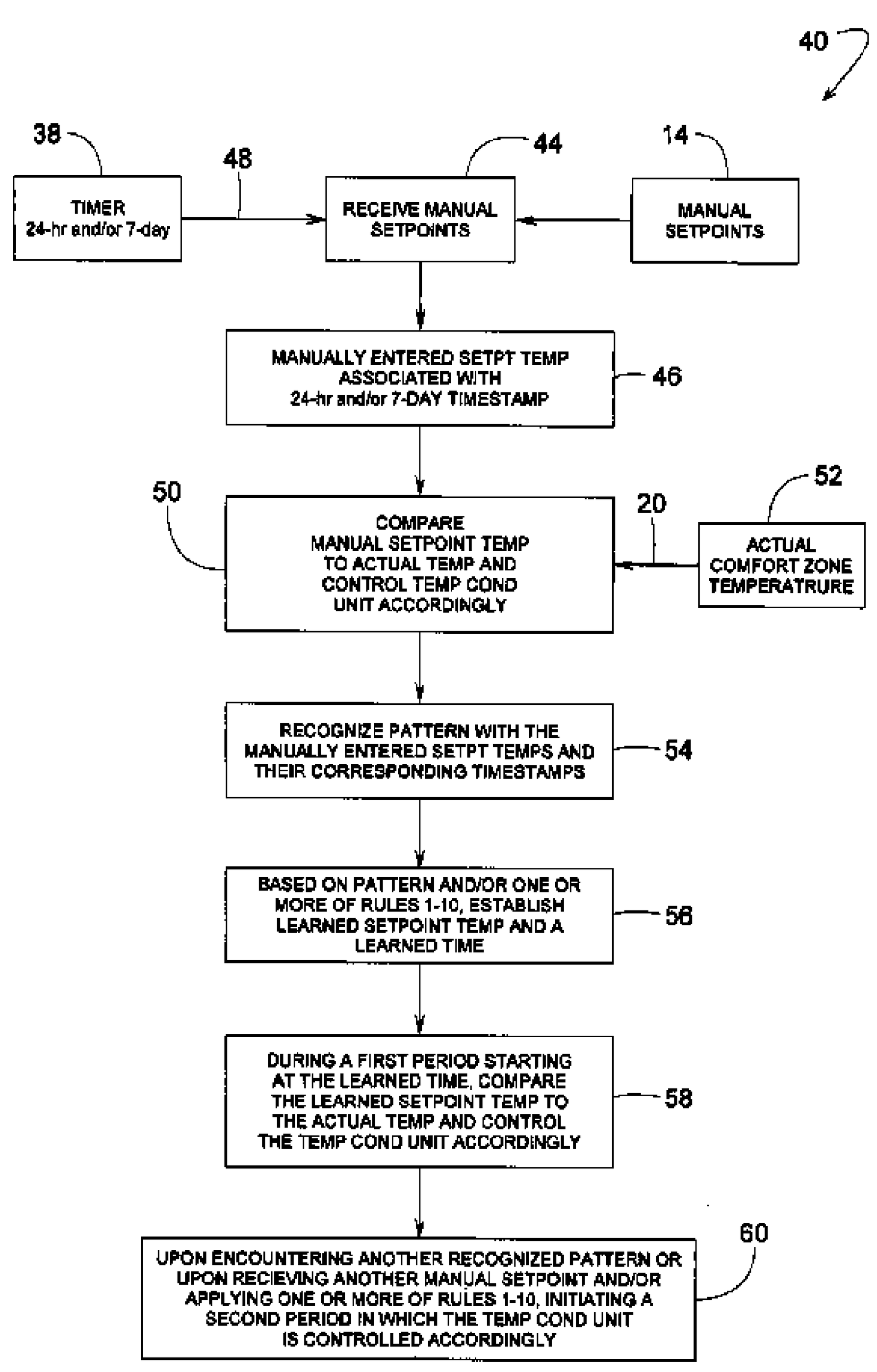

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FIG. 1

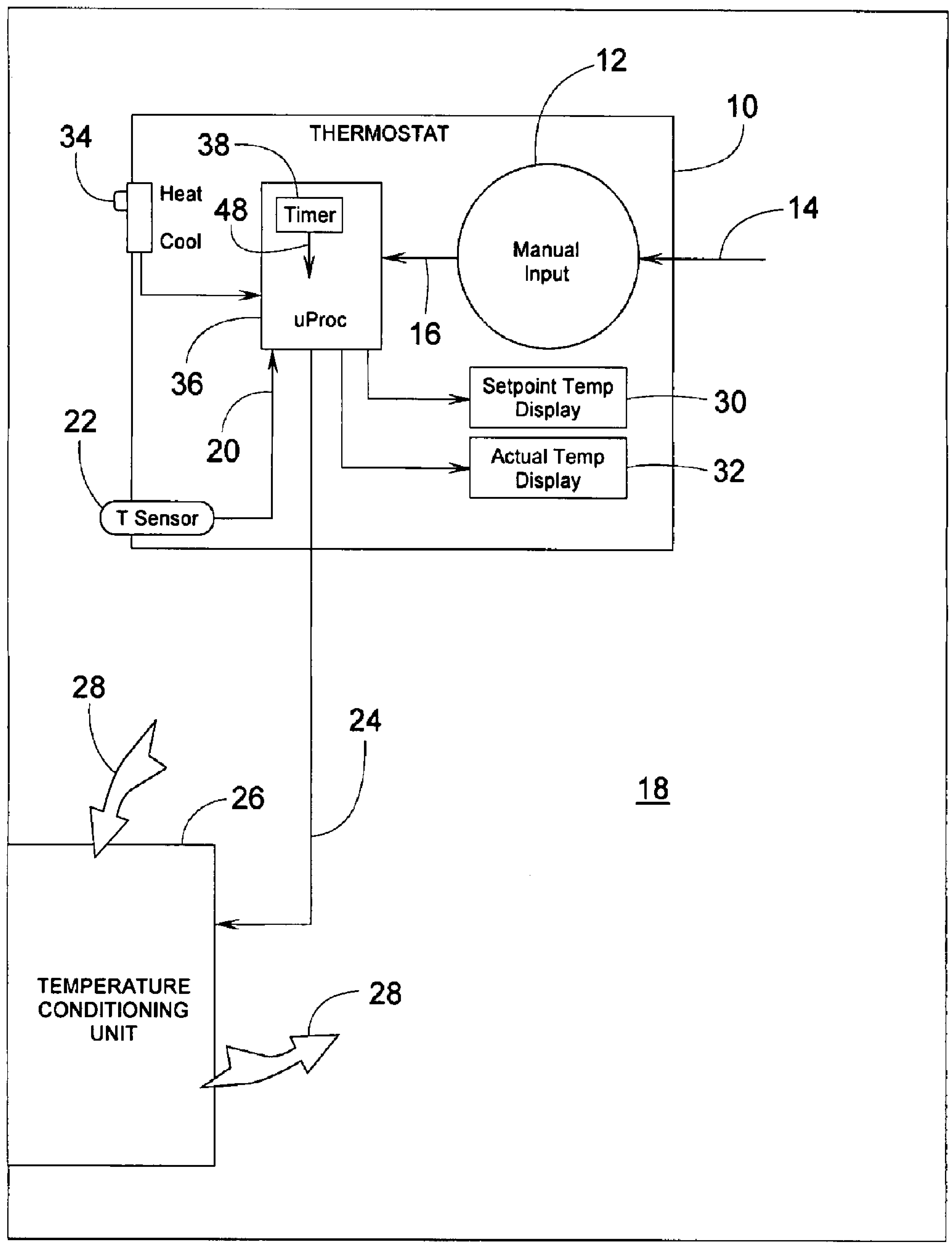

12
10
THERMOSTAT
34
38
Heat
48
Timer
Cool
Manual
Input
14
uProc
16
36
Setpoint Temp
Display
30
22
20
Actual Temp
Display
32
T Sensor
28
24
26
18
TEMPERATURE
CONDITIONING
UNIT
28

FIG. 2

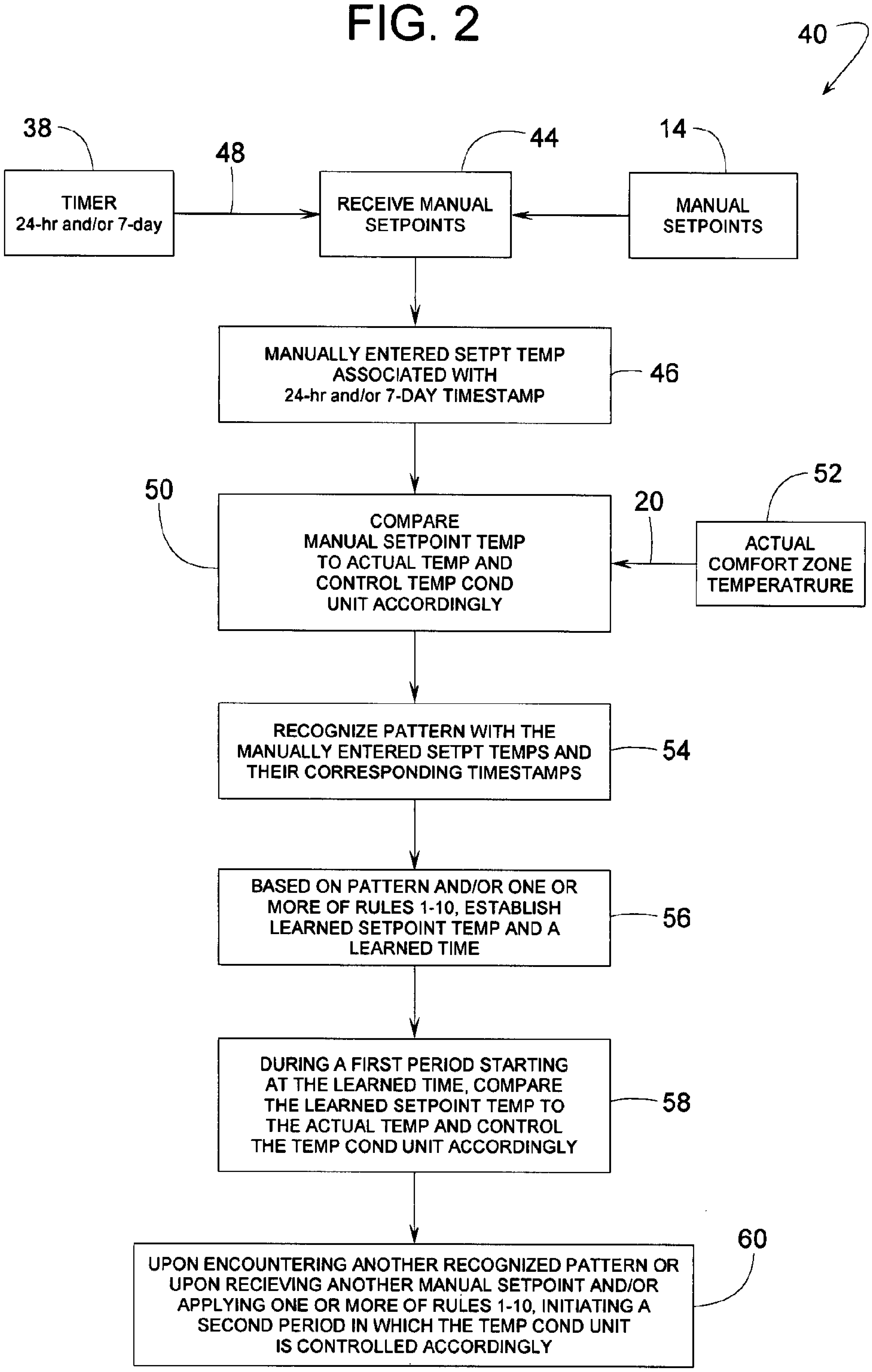
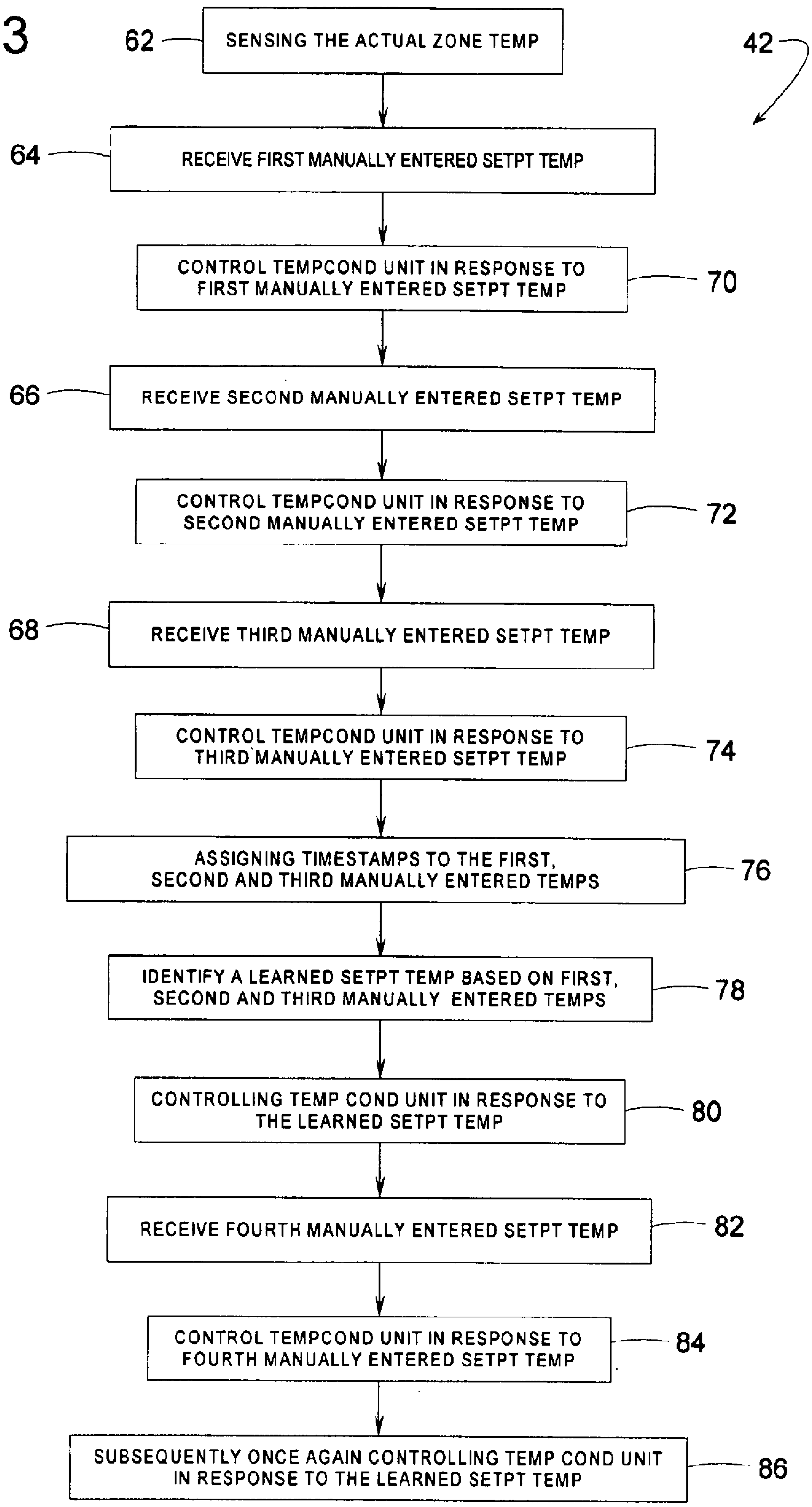

40
38
48
44
14
TIMER
24-hr and/or 7-day
RECEIVE MANUAL SETPOINTS
MANUAL SETPOINTS
MANUALLY ENTERED SETPT TEMP ASSOCIATED WITH 24-hr and/or 7-DAY TIMESTAMP
46
50
20
52
COMPARE MANUAL SETPOINT TEMP TO ACTUAL TEMP AND CONTROL TEMP COND UNIT ACCORDINGLY
ACTUAL COMFORT ZONE TEMPERATRURE
RECOGNIZE PATTERN WITH THE MANUALLY ENTERED SETPT TEMPS AND THEIR CORRESPONDING TIMESTAMPS
54
BASED ON PATTERN AND/OR ONE OR MORE OF RULES 1-10, ESTABLISH LEARNED SETPOINT TEMP AND A LEARNED TIME
56
DURING A FIRST PERIOD STARTING AT THE LEARNED TIME, COMPARE THE LEARNED SETPOINT TEMP TO THE ACTUAL TEMP AND CONTROL THE TEMP COND UNIT ACCORDINGLY
58
60
UPON ENCOUNTERING ANOTHER RECOGNIZED PATTERN OR UPON RECIEVING ANOTHER MANUAL SETPOINT AND/OR APPLYING ONE OR MORE OF RULES 1-10, INITIATING A SECOND PERIOD IN WHICH THE TEMP COND UNIT IS CONTROLLED ACCORDINGLY

FIG. 3


42
62
SENSING THE ACTUAL ZONE TEMP
64
RECEIVE FIRST MANUALLY ENTERED SETPT TEMP
CONTROL TEMPCOND UNIT IN RESPONSE TO FIRST MANUALLY ENTERED SETPT TEMP
70
66
RECEIVE SECOND MANUALLY ENTERED SETPT TEMP
CONTROL TEMPCOND UNIT IN RESPONSE TO SECOND MANUALLY ENTERED SETPT TEMP
72
68
RECEIVE THIRD MANUALLY ENTERED SETPT TEMP
CONTROL TEMPCOND UNIT IN RESPONSE TO THIRD MANUALLY ENTERED SETPT TEMP
74
ASSIGNING TIMESTAMPS TO THE FIRST, SECOND AND THIRD MANUALLY ENTERED TEMPS
76
IDENTIFY A LEARNED SETPT TEMP BASED ON FIRST, SECOND AND THIRD MANUALLY ENTERED TEMPS
78
CONTROLLING TEMP COND UNIT IN RESPONSE TO THE LEARNED SETPT TEMP
80
RECEIVE FOURTH MANUALLY ENTERED SETPT TEMP
82
CONTROL TEMPCOND UNIT IN RESPONSE TO FOURTH MANUALLY ENTERED SETPT TEMP
84
SUBSEQUENTLY ONCE AGAIN CONTROLLING TEMP COND UNIT IN RESPONSE TO THE LEARNED SETPT TEMP
86

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 a 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 predetermined 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 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.

8. 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 set before the first timestamp, the second timestamp, and the third timestamp on the daily pattern.

9. 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 an average of the first manually entered setpoint temperature, the second manually entered setpoint temperature and the 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 all lie within a predetermined range of each other based on a daily pattern.

10. 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/or the third manually entered setpoint temperature if the first manually entered setpoint temperature, the second manually entered setpoint temperature, and the third manually entered setpoint temperature all fall within a temperature 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 third timestamp all lie within a predetermined range of each other based on a daily pattern.

11. 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 weekly pattern and all lie within a predetermined range of each other based on the weekly pattern; and

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

12. 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 weekly pattern and all lie within a predetermined range of each other based on the weekly 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 weekly pattern.

13. 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 weekly pattern and all lie within a predetermined range of each other based on the weekly 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 set before the first timestamp, the second timestamp, and the third timestamp on the weekly pattern.

14. 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 the 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 all lie within a predetermined range of each other based on a weekly pattern.

15. 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 an average of the first manually entered setpoint temperature, the second manually entered setpoint temperature and the 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 all lie within a predetermined range of each other based on a weekly pattern.

16. 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 weekly pattern and all lie within a predetermined range of each other based on the weekly pattern; and

wherein the identifying step identifies a learned setpoint temperature when the first manually entered setpoint temperature, the second manually entered setpoint temperature, and third manually entered setpoint temperature are within a predetermined deviation from one another.

17. 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/or the third manually entered setpoint temperature if the first manually entered setpoint temperature, the second manually entered setpoint temperature, and the third manually entered setpoint temperature all fall within a temperature 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 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

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