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(54) **METHOD AND APPARATUS PROVIDING SAFETY IMPROVEMENT FOR THERMOSTAT DEVICES THAT PROVIDE REMOTE CONTROL FEATURES**

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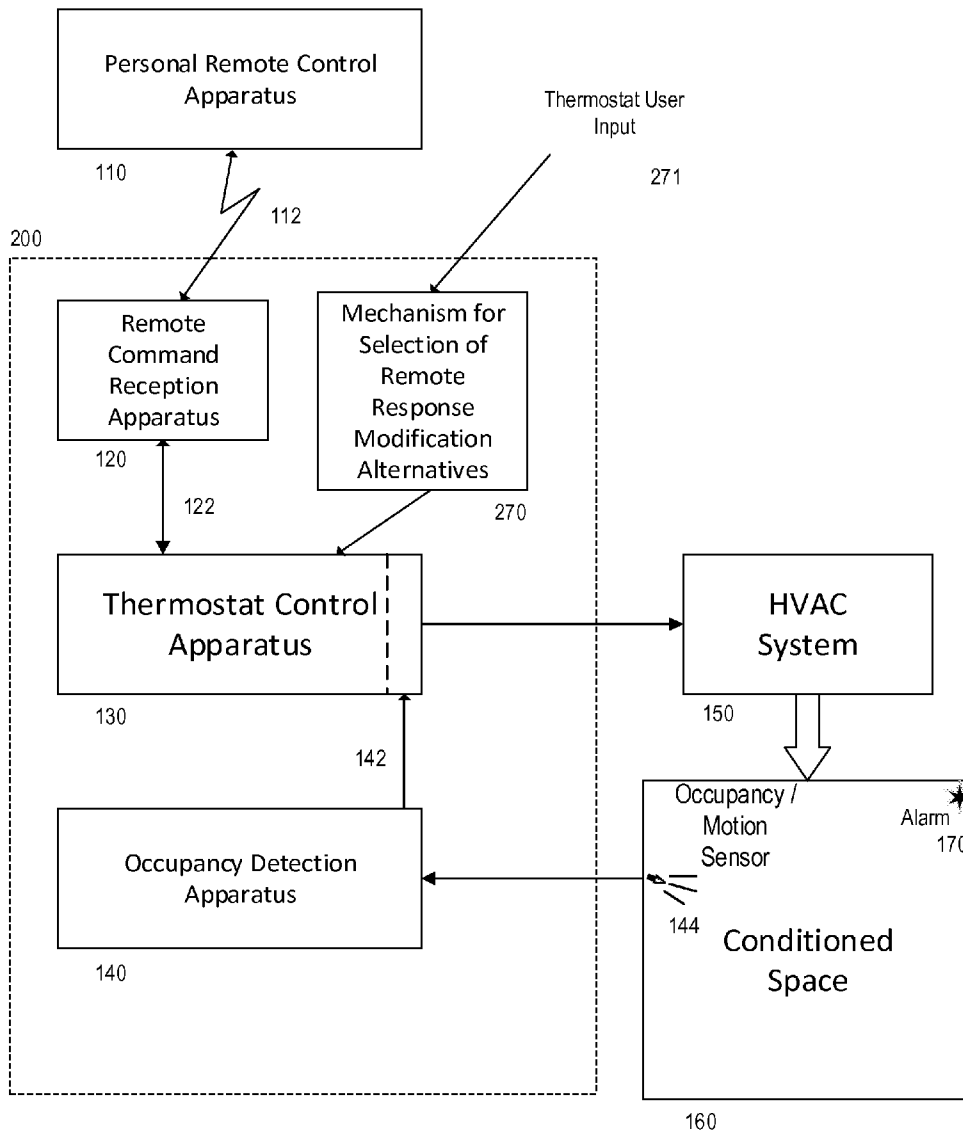
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(57) **ABSTRACT**

An improvement in operation of a thermostat with regard to overall safety, efficiency, comfort, cost of operation or other such items is disclosed in which limits or restrictions are placed on remote control features of the thermostat based upon detection of occupancy, or locality of people or devices owned by people identified as potential occupants or the locality of a device utilized in attempting to send commands to the thermostat.



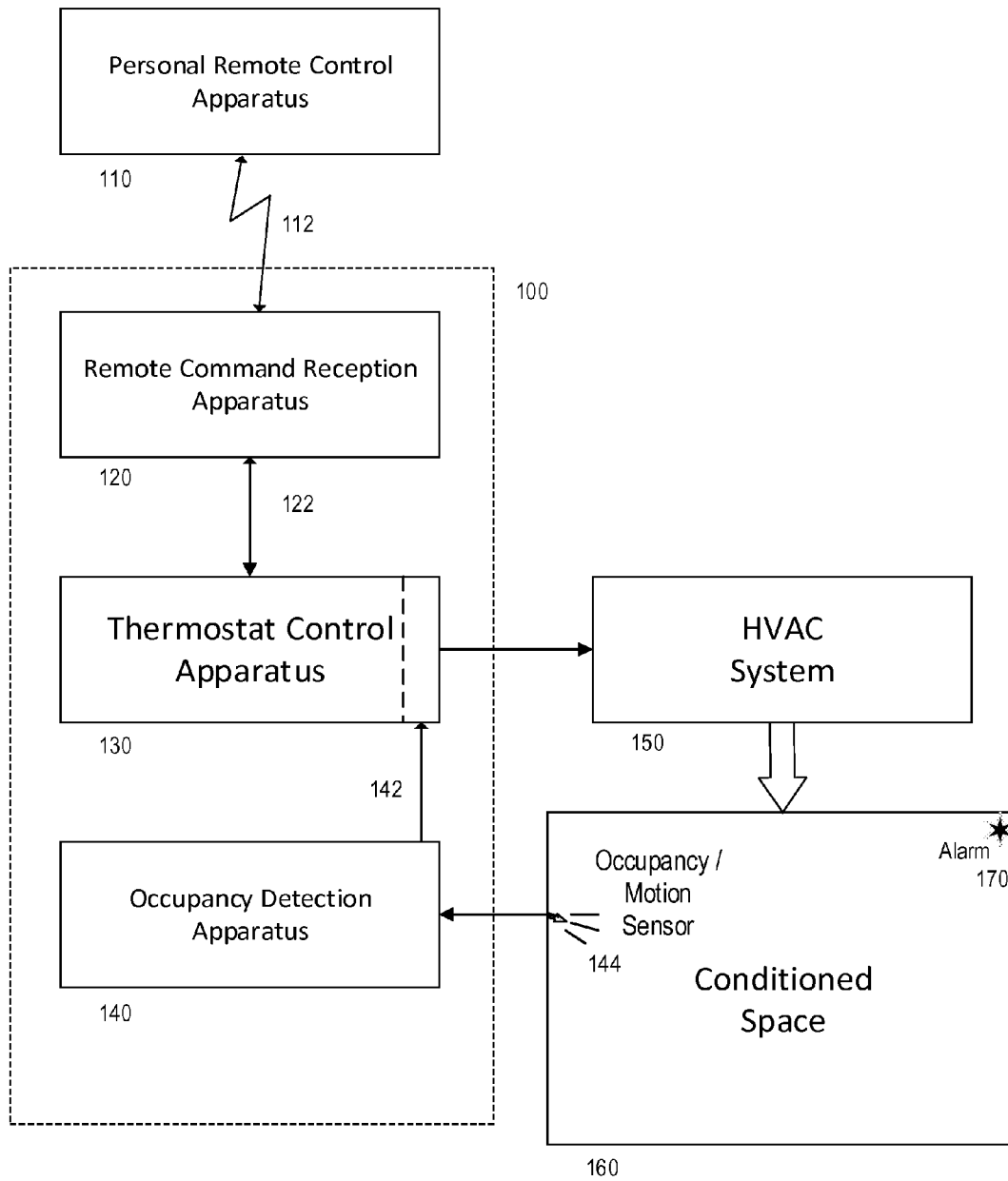


FIG. 1

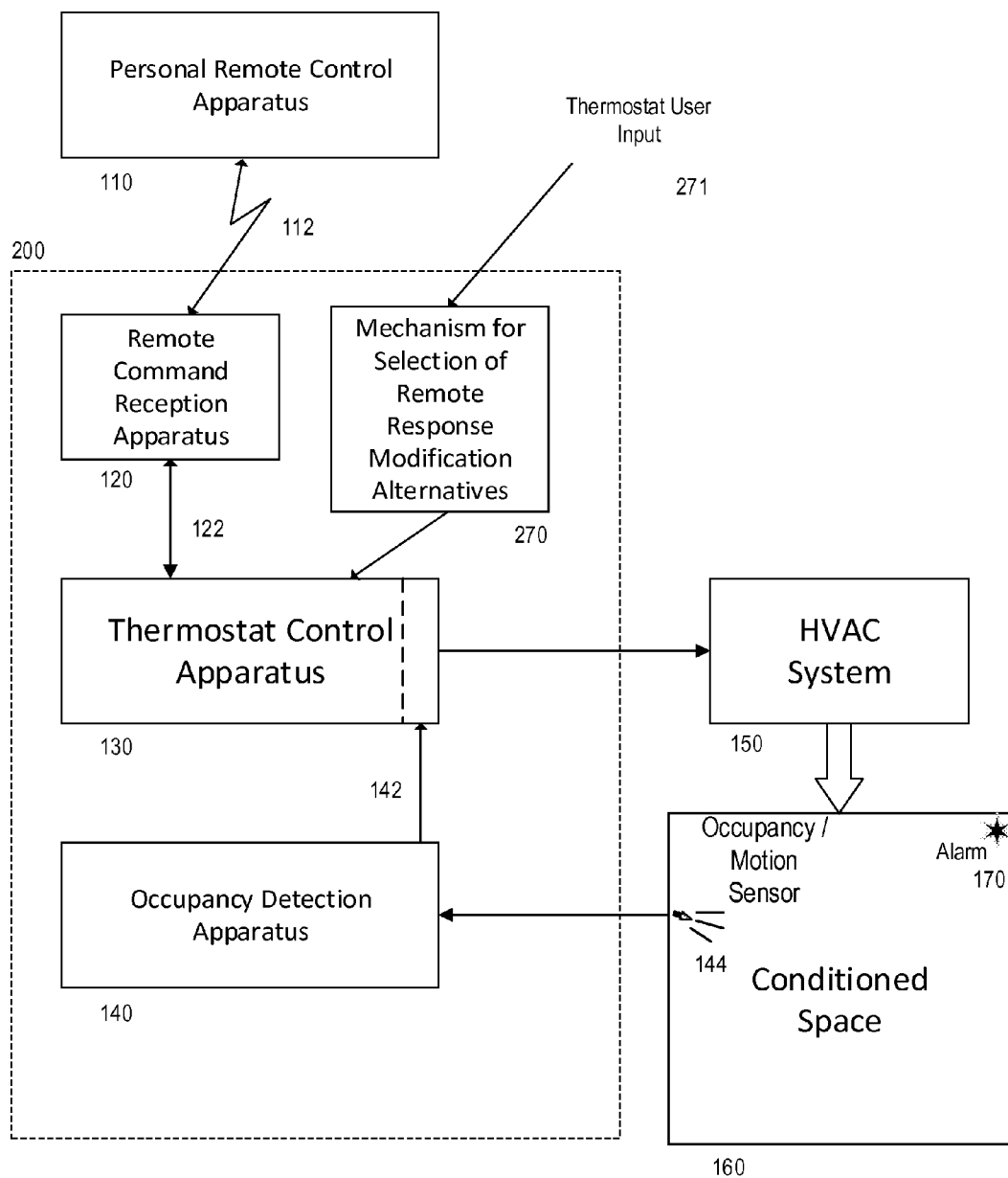


FIG. 2

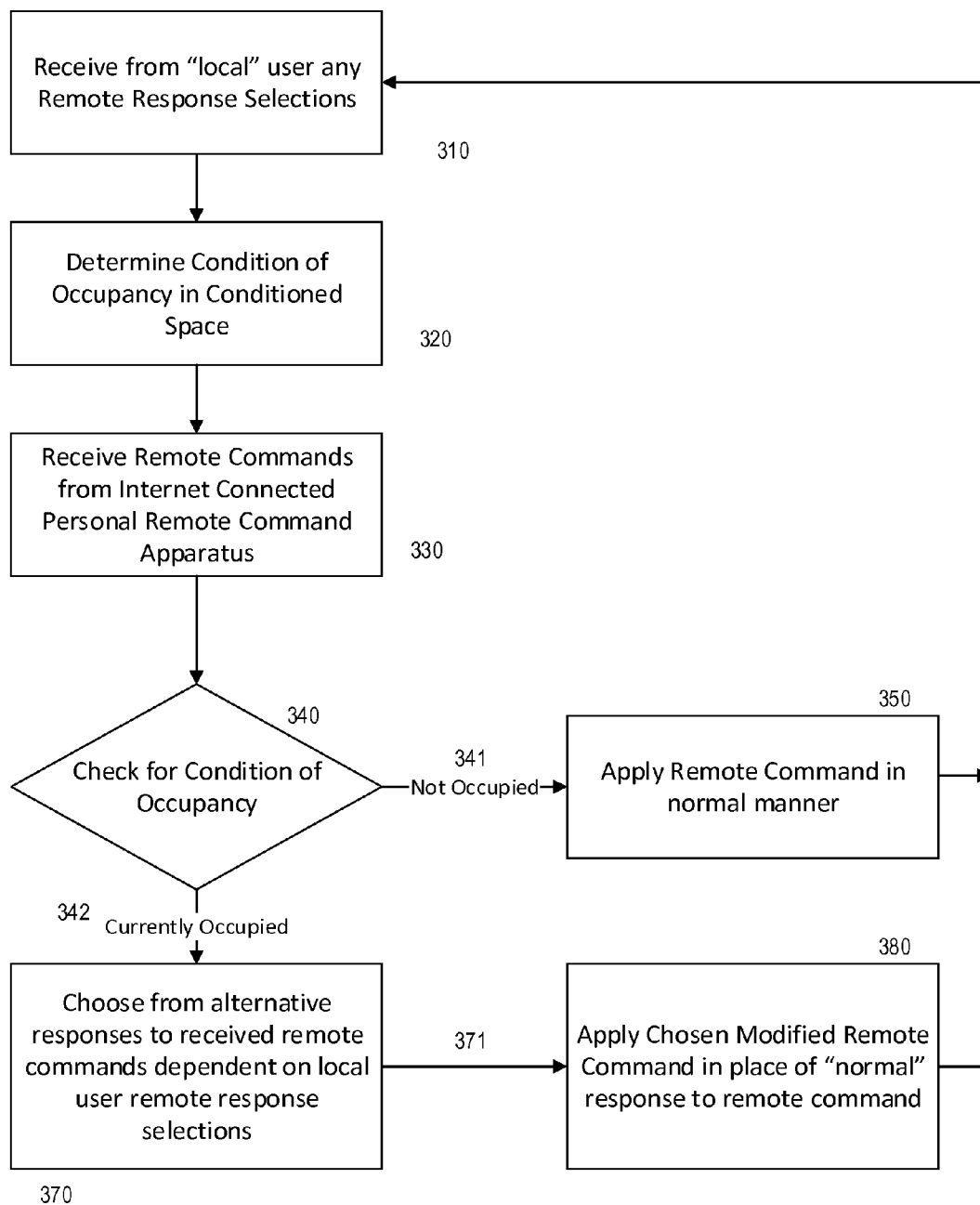


FIG. 3

METHOD AND APPARATUS PROVIDING SAFETY IMPROVEMENT FOR THERMOSTAT DEVICES THAT PROVIDE REMOTE CONTROL FEATURES

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] Not Applicable

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

[0002] Not Applicable

THE NAMES OF THE PARTIES TO A JOINT RESEARCH AGREEMENT

[0003] Not Applicable

INCORPORATION-BY-REFERENCE OF MATERIAL SUBMITTED ON A COMPACT DISC

[0004] Not Applicable

BACKGROUND OF THE INVENTION

[0005] This invention relates to the art of environmental control systems, to thermostats which control heating, ventilation and cooling systems, and in particular to thermostats which provide one or more features which allow for remote control of a thermostat and/or environmental control system.

[0006] Modern thermostat devices are evolving in a manner that provides for more and more “remote” control of these thermostat devices. For example, certain thermostats now provide for remote control of certain settings of the thermostat over the internet utilizing a cell phone application, or web browser interface. Allowing for remote control of a thermostat, although it may be convenient, introduces certain risks, and even possibly dangers.

[0007] There are many scenarios that can be envisioned that can serve as examples of these risks/dangers. For example, someone turns off a heating system using a remote control application while another disabled person is still at home, and the lack of heat poses a health risk to the disabled person at home. A second example, someone utilizes remote control to raise the set-point temperature for a thermostat controlling a home air conditioning system even though someone is at home and discomfort to the person at home is the result. A third example, someone turns off an air-conditioning system remotely, even though someone is at home, and by the time the change is noticed energy costs are higher because time has moved to a period of higher energy rates, therefore additional costs are incurred to recover reasonable comfort. Many other scenarios can be easily envisioned by someone skilled in the art of thermostat system design and/or environmental system control design.

BRIEF SUMMARY OF THE INVENTION

[0008] It would be therefore be an improvement in operation of a thermostat with regard to overall safety, efficiency, comfort, cost of operation or other such items if limits or restrictions could be placed on one or more remote control features for controlling the operation of the thermostat based upon determination or detection of conditions such as: the present operational status of the thermostat, occupancy of the room or conditioned space controlled by the thermostat, and/

or other conditions of the environment within or surrounding the conditioned space served by heating or air conditioning equipment controlled by the thermostat.

[0009] According to a first illustrated embodiment of the present invention, a thermostat provides control of a Heating, Cooling, Ventilation or Air Conditioning system (HVAC system), the HVAC system for serving to condition air in a conditioned space, and incorporates a remote command reception capability for receiving one or more remote control commands or control signals directly or indirectly from a personal remote interface apparatus such as a personal cell phone, a personal tablet device, or a personal computer device. Thermostat control apparatus included in the thermostat is designed to receive one or more remote control commands, and in response to those remote control commands to cause changes in either the current or the programmed operation of the HVAC system as those specified by such remote control commands or control signals. An occupancy detection mechanism is also included in the embodiment and provides to the thermostat control apparatus, a signal indicative of occupancy. For example, it would be an advantage in the operation of the thermostat if, when a condition of current occupancy is determined, to be able to ignore or disregard any commands sent to the thermostat to change settings. This would have advantage of not allowing a remote person to change any settings of the thermostat when the conditioned space is occupied and the one or more of the occupants can be presumed to already be in control of the thermostat in a way they desire.

[0010] In an enhancement to the thermostat, the occupants can be signaled by an alarm when a remote change is requested and given a chance to “okay” or “ignore” the remote commands, or to take other more complex action such as delaying the effect of the remote command for a specified period of time, or until occupancy is no longer determined (i.e. being detected). Another alternative approach would be always delay the application of remote commands until occupancy is no longer determined.

[0011] In a first enhanced embodiment of the present invention, the changing of specific settings such as the current set-point temperature of the thermostat are limited, for example, such as allowing a change of no more than some preset number of degrees of temperature such as five degrees. This approach may have advantage in providing for some degree of “safety” while still allowing for some amount of remote control.

[0012] In a second enhanced embodiment of the present invention, remote control commands are stored by the thermostat but are not acted upon until there has been confirmation or acceptance of the commands by a person physically at or near the thermostat.

[0013] According to a third embodiment of the present invention, an operator of a remote control application (or web interface) is informed by the thermostat when the conditioned space is occupied and queried as to whether the operator wants to continue with that command or further commands. A password feature for overriding rejection of a command, due to occupancy, or modification of a command, due to occupancy, is also optionally incorporated into the thermostat.

[0014] According to a fourth illustrated embodiment of the present invention, a thermostat with occupancy detection and remote control features sends or displays a signal to an occupant when a remote access to the thermostat is being attempted, or when a change in settings of thermostat is

attempted remotely. The signal to the occupant is optionally provided in one or more forms such as: a) a visual signal on the thermostat screen such as a flashing icon, or flashing of the background of the thermostat screen; b) an audible signal from the thermostat such as a beep, or continuous audible signal; c) sending of an electronic message such as a text message or email sent to a previously specified email address of a potential occupant; and/or, d) a display on another device in the home or condition space such as a network connected television of a notification message that a remote control access to the thermostat has been attempted.

[0015] In a further enhancement to these previously described illustrated embodiments of the present invention, the occupancy detection apparatus or method is enhanced with occupancy identification. That is, occupancy of the conditioned space is recognized/detected through a mechanism associated with the thermostat that provides more precise identification of an occupant which is then optionally utilized by the thermostat control apparatus to customize the response to any remote control commands, dependent on one or more of: the recognition, the detection, and, the identification of one or more current occupants. Occupancy determination can be made, for example, by an approach utilizing motion detection. Occupancy detection and occupant identification can also be enhanced or determined utilizing the recognition of electronic signals from a personal electronic device, such as a cell phone, that is typically carried with an occupant. An alternative is to recognize electronic signals from an automobile or other apparatus that is typically driven or utilized by a previously identified potential occupant, and which is determined to be in locality of the conditioned space or thermostat. A response to a remote control access or command applied to a thermostat can also be customized based upon a) identification of the person or device from which a remote control command is sent, and/or b) identification of one or more current occupants of the conditioned space. For example, a "master" remote control user could be identified who is allowed access to previously identified remote control commands, or all remote control commands, in spite of or despite any determination of a state of occupancy. In this case, for example, other potential remote control users would be denied access, or given limited access to the thermostat commands, and/or to information gathered and recorded by the thermostat.

[0016] Identification of an occupant in a room or home or conditioned space served by and Heating, Ventilation, and/or Air Conditioning system (HVAC system) utilizes the recognition of signals from personal devices that can be associated with a specific person, or alternatively groups of people. For example, a cell phone typically carried by "Bob" is identifiable by the cell phones connection to a local w-fi router that is known to be local to an area served by the thermostat. In similar manner, the recognition of a blue-tooth signal from a cell device can be utilized to identify a cell phone typically carried by a certain person. In similar manner, an automobile that includes Wi-Fi access can be recognized as being in vicinity of a local network (the same local network to which the thermostat is connected) when a Wi-Fi connection by the automobile is detected/discovered, and optionally identifiable as being owned or operated by a previously detected occupant or identified occupant.

[0017] In another further enhancement to these previously described illustrated embodiments of the present invention, patterns of occupancy are also recognizable in known man-

ner, and the changing of a response to remote control commands is then determined based upon these patterns of occupancy. For example, a thermostat recognizes or detects that a room (conditioned space) is typically occupied every day from 8 a.m. until 4 p.m. The thermostat would then ignore remote control commands during those periods, or, would delay the effect of any remote control commands until after a recognized pattern of occupancy.

[0018] In a further enhancement to these previously described illustrated embodiments of the present invention, a thermostat delays response to remote control commands when a condition of occupancy is determined, and then applies one or more of the remote control commands after occupancy is no longer detected, or alternatively after a defined period of time from when occupancy was detected.

[0019] In a still further enhancement to these previously described illustrated embodiments of the present invention, a current occupant is queried by the thermostat as to how he or she wants the thermostat to respond to a remote control command. For example, the thermostat displays a selection choice of, for example, two or more of: a) ignore remote control commands; b) apply the remote control command; c) apply some or certain remote control commands; d) delay response to remote commands until a specified time has elapsed; e) delay response to one or more remote commands until after occupancy is no longer detected (determined); and, f) delay response to remote commands until a certain specified time has elapsed.

[0020] According to a further illustrated embodiment of the present invention, a thermostat with occupancy detection and remote control capability sends a message or signal to a remote device upon detection of occupancy by an unrecognized person. For example, a motion detector operatively coupled to the thermostat control apparatus detects motion, and no identification of occupancy by a known person has been made, causing a signal or electronic message to be sent by the thermostat to a remote correspondent to notify them of occupancy by an unknown person. The indication of a determination of occupancy by an unknown person is sent to a remote correspondent when he or she initiates or has already or previously initiated contact with the thermostat. That is, the address of one or more remote correspondents is logged and stored by the thermostat when someone makes connection to the thermostat remotely, and can be established and transmitted by an application running on the remote correspondent's communication device when the connection is made.

[0021] In another illustrated embodiment, an absence of occupancy is utilized by the thermostat to initiate messages to one or more previously logged and recorded remote correspondents when specified environmental conditions are detected.

[0022] For example, an application is downloaded from a central server or application store to a cell phone, the application being one that provides for remote control of a thermostat. A remote correspondent utilizes the application on his or her cell phone (or any communication device) and sends commands or makes connection to the thermostat. The application transmits to the thermostat, an address (such as a cell phone number) and the thermostat stores that address (cell phone number) in storage included in the thermostat. That address, or a list of addresses, is utilized as a list of "to" addresses for sending of messages relating to status of thermostat and its detected conditions. For example, a condition of current temperature more than "n" degrees above the cur-

rent set-point of the thermostat is a condition that may warrant a warning message being sent to the list of addresses. Another example would be detection of a current temperature that is too low, such as approaching freezing, may warrant a warning message to previously or currently connected remote correspondents. Modern thermostats also may have access to conditions outside the conditioned space such as current outdoor temperature, or outdoor humidity. Detection of an outdoor temperature above 110 degrees might be an example of a condition that warrants sending by the thermostat of a warning message to previously identified and stored list of remote correspondents. This notification/warning then could be used to cause or prompt the remote correspondent to send commands to the thermostat to raise or lower the current set-point temperature, or to switch from heating to cooling or vice-versa. Optionally, the remote correspondent would be sent these messages only if a condition of no occupancy was currently detected or determined based upon techniques well known in the state of the art (assuming that if someone is home, for example, that he or she would handle any problems without need to notify someone remotely).

[0023] In these above described illustrated embodiments of the present invention, the incorporation of both an occupancy sensing apparatus and remote control features into a thermostat are utilized in concert to provide novel advantages in operation and/or environmental sensing and “safety” of the conditioned space related to the thermostat and its associated HVAC system.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

[0024] The invention is better understood by reading the detailed description of the invention in conjunction with the accompanying drawings in which:

[0025] FIG. 1 illustrates processing apparatus and logic of a thermostat apparatus which includes the capability for being controlled remotely and in which an occupancy detection apparatus associated therewith is used to detect a condition of occupancy, and use the condition of occupancy in determining or influencing the overall effect of one or more remote commands received from a remote control operator.

[0026] FIG. 2 illustrates a thermostat apparatus similar to that of FIG. 1 that further comprises a selection of remote response mechanism.

[0027] FIG. 3 is a flow chart illustrating an exemplary method for controlling an HVAC system according to several aspects of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0028] The following detailed description includes references to the accompanying figures of the drawing, which form a part of the detailed description. The figures show, by way of illustration, specific embodiments in which the apparatus may be practiced. These embodiments, which are also referred to herein as “examples” or “options,” are described in enough detail to enable those skilled in the art to practice the illustrated embodiments. The disclosed embodiments may be combined, other embodiments may be utilized or structural or logical changes may be made without departing from the scope of the invention. The following detailed description is, therefore, not to be taken in a limiting sense and the scope of the invention is defined by the appended claims and their legal equivalents.

[0029] The present invention as described and/or illustrated according to the embodiments discussed above is directed to an improved method and system for managing remote control command to a thermostat device that overcomes the risks and limitations of traditional approaches.

[0030] FIG. 1 provides illustration of a thermostat apparatus 100 that comprises a remote command reception apparatus 120 operatively coupled to the overall control apparatus 130 of the thermostat 100. The remote command reception apparatus 120 receives remote commands 112 from a remote personal control apparatus 110 and forwards those commands 122 to the thermostat control apparatus 130. Examples of a personal remote control apparatus include devices typically utilized by an individual such as a personal cell phone, a personal computer tablet device which may include an application running on the personal device for interaction across the internet to control an apparatus such as a thermostat apparatus. The thermostat control apparatus 130 receives the remote commands 122 to affect control of an HVAC system 150 used for controlling a conditioned space 160. The thermostat control apparatus 130 also receives a signal indicative of a condition of occupancy 142 from an occupancy detection apparatus 140 with an occupancy detection sensor 144 positioned with a “view” into the conditioned space 160. The thermostat control apparatus 130, based on the state of occupancy, inhibits or modifies the commands sent by the thermostat control apparatus 130 to the HVAC system 150. For example, if occupancy is detected, it would be appropriate to assume that the occupant has already set the thermostat 100 to control the HVAC system 150 in the manner he or she desires, and therefore the thermostat control apparatus 130 ignores any remote commands during any detected period of occupancy. An alternative is to modify the effect of the commands, for example to delay application of the remote commands until after occupancy is no longer detected.

[0031] A further enhancement to the illustrated embodiment of the present invention is to include a mechanism for sounding an alarm or signal for alarm 170 to be heard within the conditioned space or in other manner signaling the detection of a current occupant. The alarm is intended to notify any occupants of the conditioned space that a remote control command has been received by the thermostat. The occupant is then optionally given capability of deciding whether to accept the remote command or ignore the remote command.

[0032] It is to be noted that with regards to the occupancy detection apparatus and the occupancy/motion sensor that incorporation of the occupancy detection apparatus is meant to be interpreted generally. That is, the occupancy/motion sensor is given a “view” into the conditioned space for detection of motion/occupancy and the electronics/apparatus that “refine” that signal, for example, can be either part of the “sensor” itself (in that package) or can be incorporated into the “housing” of the thermostat.

[0033] It is further noted that the various “apparatus” described are to be interpreted generally in that the functions of the various apparatus may be implemented in many ways as could be determined and possible by one skilled in the art of electronics or thermostat design. For example, the remote command reception apparatus and the thermostat control apparatus may be integrated with the functions of the two apparatus comprising a controller and control memory and storage with control memory program code stored in multiple locations in a control memory for performing the functional-

ity of receiving remote commands, and “controlling” the thermostat, including the formation of any commands/signals to the HVAC system.

[0034] FIG. 2 provides illustration of a thermostat apparatus 200 similar to the thermostat apparatus of FIG. 1 100 that further comprises a mechanism 270 providing for user selection of a remote response modification. The selection of remote response mechanism provides for a user of the thermostat to select from a plurality of alternative possible responses to remote commands when a remote command is received during a period that the conditioned space is occupied. The thermostat user allowed to make the selection of alternative possible response to remote commands would typically be a “local” user. “Local” meaning, for example, “standing” at the thermostat or utilizing the thermostat user interface from within the immediate area of the conditioned space. A “local” user could also be user with a special password that allows a user to designate his or her self to be “local”, that is, allowed to perform commands typically reserved for “local” users. A user can be designated as “local”, for example, when that person utilizes a user input screen that is actually incorporated as part of the thermostat itself, or connected directly to the thermostat. Another “local” user is identifiable as one that utilizes a Wi-Fi or alternatively a Bluetooth connection that is determined or detected to be “local” or near to the conditioned space.

[0035] An alternative method for determination of locality utilizes features typically found in a personal remote interface apparatus such as a cell phone that provide for determination of location. An example of this often found in “smart” cell phones is an apparatus that utilizes Global Positioning System radio signals to determine location on or near the earth. Another locating system utilizes known Wi-Fi router locations to locate a device making connection to any known Wi-Fi routers. The thermostat of the present invention can optionally include means for determining or having input for specifying location coordinates of the thermostat or coordinates of other devices that can be determined to be within or close to the conditioned space. A cell phone apparatus, for example, running an application serving for connection to the thermostat has optional access to coordinates provided by location providing apparatus of the cell phone such as the Global Positioning System of the cell phone. This location information from the cell phone is compared to the location coordinates of the thermostat or conditioned space to determine of the cell phone (personal remote interface apparatus) is “local” or in the alternative “remote”.

[0036] In FIG. 2, a thermostat user provides input 271 to a selection of remote response mechanism 270 to choose from a plurality of alternatives in response to a remote command. An example of this choice would be a selection from alternatives such as: 1) remote commands are ignored when the conditioned space is occupied; 2) the effect of any remote commands received during periods of occupancy is delayed until occupants leave the conditioned space and no occupancy is detected; 3) when a remote command is received during a period of occupancy a query is made on the screen of the thermostat asking a “local” user if he or she wants to “allow” application of the remote command or not; 4) an alarm is generated when a remote command is received during a period of occupancy with the alarm being an audible noise, a flashing light, a flashing of the screen, a text message to a previously identified master user of the thermostat or other such “alarm” response; or 5) when a remote command is

received during a period of occupancy the remote user is notified that he must supply a special password in order to apply the remote command or to continue with further commands. These possible responses are exemplary and other responses in similar manner could be designed or defined by one skilled or at least knowledgeable in the art or of thermostat design or skilled in electronic user interface design.

[0037] FIG. 3 provides an illustration of an exemplary method for controlling an HVAC system such as illustrated in FIGS. 1 and 2 in a manner incorporating several aspects of the present invention. In FIG. 3, a “local” user of the thermostat 330 makes a selection 310 from one or more possible proposed responses to remote commands when occupancy is determined. The selection mechanism provided to the user may be for example implemented using a touch screen interface with a display of the alternatives on the touch screen. The thermostat apparatus also receives a signal from a motion detector located in the conditioned space and determines whether the conditioned space is occupied or not 320. The thermostat 330 receives a remote command from a remote user of the thermostat 330 that has connected to the thermostat using an application on his or her cell phone, for example. The thermostat then checks whether or not the conditioned space is currently occupied 340. If not occupied 341, the thermostat 330 responds to the remote command in a normal manner 360 and then goes back to waiting for any further input from the remote user or the local user or for any change in occupancy status, or else, if occupied 342 thermostat modifies the control of the HVAC system in manner different than the “normal” response to the remote command. The modification 370 is optionally dependent on a choice made by the local user 371, and the “modified” remote command is applied 380 in place of the normal response to the remote command. This flow chart is exemplary and the order of the steps could be modified or steps skipped without necessarily departing from the concepts of the present invention.

[0038] It is to be understood that the above description is intended to be illustrative and not restrictive. Other embodiments will be apparent to those of skill in the art upon reading and understanding the above description. It should be noted that embodiments discussed in different portions of the description or referred to in different drawings can be combined to form additional embodiments of the present application. The scope should, therefore, be determined with reference to the appended claims, along with the full scope of equivalents to which such claims are entitled.

What is claimed is:

1) A thermostat providing control for operation of a Heating, Cooling, Ventilation or Air Conditioning system (HVAC system), the HVAC system for serving to condition air in a conditioned space, the thermostat including:

- A) a remote command reception apparatus for receiving one or more remote control commands directly or indirectly from a remote personal interface apparatus, the one or more remote control commands specifying remotely proposed changes in the control of the HVAC system;
- B) an occupancy detection apparatus for detecting and providing a signal indicative of occupancy in the conditioned space;
- C) a thermostat control apparatus operatively coupled to the command reception apparatus and to the occupancy detection apparatus, receiving both the one or more remote control commands and the signal indicative of

occupancy in the conditioned space, and causing one or more remote instigated changes in operation of the HVAC system with at least one of the remote instigated changes in operation being dependent on both receipt of: a) at least one of the remote control commands, and b) the signal indicative of occupancy in the conditioned space.

2) The thermostat of claim 1 further including a selection of remote response mechanism, the selection of remote response mechanism providing for user selection from a plurality of preset possible modifications of the remote instigated changes in operation, and the remote instigated changes in operation then being modified as a function of user selection.

3) The thermostat of claim 1 wherein the remote personal interface apparatus is a personal cell phone or a personal tablet device.

4) The thermostat of claim 1 wherein the remote personal interface apparatus is provided from a central server an application program for running on the remote personal interface apparatus, and the application program includes specific control programming providing for user specification of desired thermostat programming changes and formation of the remote commands for sending to the remote command reception apparatus.

5) The thermostat of claim 1 wherein the remote command reception apparatus is operatively coupled to an internet interface (world-wide web interface) and the internet interface is used for receiving the remote control commands from the remote personal interface apparatus.

6) thermostat of claim 1 wherein the occupancy detection apparatus comprises a motion detector.

7) A thermostat providing control of a Heating, Cooling, Ventilation or Air Conditioning system (HVAC system), the HVAC system for serving to condition air in a conditioned space, the thermostat including:

A) a remote command reception mechanism incorporated within the thermostat for receiving one or more remote control commands or control signals directly or indirectly from a personal remote interface apparatus;

B) a thermostat control apparatus incorporated within the thermostat coupled to the remote command reception mechanism for responding to the receiving of the remote control commands so as to cause one or more normal remotely instigated changes in operation of the HVAC system based upon the received remote control commands or control signals; and,

C) an occupancy detection mechanism operatively coupled to the thermostat control apparatus for detecting and providing a signal indicative of occupancy in the conditioned space and then utilized by the thermostat control apparatus to determine a condition of occupancy in the conditioned space, the thermostat control apparatus then modifying, as a function based upon the condition of occupancy in the conditioned space, at least one of the normal remotely instigated changes, during at least a portion of time during which the condition of occupancy is determined.

8) The thermostat of claim 7 wherein the remote command reception mechanism is operatively coupled to the internet (world-wide web) and the internet is used in transmission of the remote control commands from the personal remote interface apparatus to the remote command reception mechanism.

9) The thermostat of claim 7 wherein the modifying at least one of the normal remotely instigated changes in operation of

the HVAC system is carried out by inhibiting of any changes based upon the received remote control commands.

10) thermostat of claim 7 wherein the modifying at least one of the normal remotely instigated changes in operation of the HVAC system is carried out by a delay in the application of one or more of the changes based upon the received remote control commands.

11) A Heating, Cooling, Ventilation or Air Conditioning system sensing and control apparatus (HVAC sensing and control apparatus) for providing control of a Heating, Cooling, Ventilation or Air Conditioning system (HVAC system), the HVAC sensing and control apparatus including: a) environmental sensing apparatus connected for sensing one or more environmental conditions in a conditioned space, b) input apparatus enabling entering of set-points relating to a user desired environmental condition in the conditioned space, c) output control apparatus generating HVAC control output signals or commands for controlling the operation of the HVAC system serving the conditioned space; the HVAC sensing and control apparatus further comprising:

A) a remote command reception mechanism for receiving remote control commands from a personal remote interface apparatus, the thermostat control apparatus, in response to the remote control commands, causing one or more changes in operation of the HVAC system based upon the received remote control commands;

B) an occupancy detection apparatus being connected for providing a signal indicative of occupancy in the conditioned space; and,

C) a remote override control apparatus coupled to the occupancy detection apparatus and receiving the signal indicative of occupancy in the conditioned space and operative in response to the signal indicative of occupancy in the conditioned space, modifying at least one of the changes in operation of the HVAC system as a function of the received remote control commands.

12) The HVAC sensing and control apparatus of claim 11 wherein the modifying at least one of the changes in operation of the HVAC system is an inhibiting of any changes based upon the received remote control commands.

13) HVAC sensing and control apparatus of claim 11 wherein the modifying at least one of the changes in operation of the HVAC system is a delay in application of one or more of the changes based upon the received remote control commands.

14) The HVAC sensing and control apparatus of claim 11 further comprising wherein the modifying at least one of the changes in operation of the HVAC system is further dependent upon patterns of occupancy, the patterns of occupancy being a record relating to status of the signal indicative of occupancy over a period of time greater than one day.

15) A Heating, Cooling, Ventilation or Air Conditioning system sensing and control apparatus (HVAC sensing and control apparatus) for providing control of a Heating, Cooling, Ventilation or Air Conditioning system (HVAC system), the HVAC sensing and control apparatus including: a) an environmental sensing mechanism for sensing one or more environmental conditions in a conditioned space, b) an input mechanism allowing for setting of set-points relating to a user desired environmental condition in the conditioned space, c) HVAC control output signals or commands for operation of the HVAC system serving the conditioned space; the HVAC sensing and control apparatus further comprising:

- A) a remote command reception mechanism being coupled for receiving remote control commands or remote control signals from a personal remote interface apparatus such as a personal cell phone, a personal tablet device, or a personal computer device, the thermostat control apparatus in response to the receiving of remote control commands causing one or more normal remotely instigated changes in operation of the HVAC system based upon the received remote control commands or control signals;
- B) user input apparatus for entering a remote control inhibit condition state into the HVAC sensing and control apparatus; and,
- C) remote control inhibit apparatus coupled to the user input apparatus and being operative, based upon the remote control inhibit condition state, to inhibit at least one of the normal remotely instigated changes in operation of the HVAC system in accordance with the received remote control commands or control signals.

16) A Heating, Cooling, Ventilation or Air Conditioning system sensing and control apparatus (HVAC sensing and control apparatus) for providing control of a Heating, Cooling, Ventilation or Air Conditioning system (HVAC system), the HVAC sensing and control apparatus including: a) an environmental sensing mechanism for sensing one or more environmental conditions in a conditioned space, b) an input mechanism allowing for setting of set-points relating to a user desired environmental condition in the conditioned space, c) HVAC control output signals or commands for operation of the HVAC system serving the conditioned space; the HVAC sensing and control apparatus further comprising:

- A) a remote command reception mechanism for receiving remote control commands or remote control signals from a personal remote interface apparatus, the thermostat control apparatus responding to the receiving of remote control commands so as to cause one or more changes in operation of the HVAC system based upon the received remote control commands or remote control signals;
- B) an occupancy detection mechanism providing a signal indicative of occupancy in the conditioned space; and,
- C) a remote override control apparatus that inhibits, based upon the signal indicative of occupancy in the conditioned space, at least one of the changes in operation of the HVAC system based upon the received remote control commands or remote control signals, until a pre-set period of time of a condition of no occupancy is detected as having elapsed, the condition of no occupancy being based upon an absence of the signal indicative of occupancy in the conditioned space.

17) A method for controlling a thermostat, the thermostat providing for control of a Heating, Cooling, Ventilation or Air Conditioning system (HVAC system), the HVAC system for serving to condition air in a conditioned space, the thermostat being coupled to a communications interface and further including occupancy detection apparatus for detecting a condition of occupancy, the method for controlling the thermostat including the steps of:

- A) the thermostat utilizing the communications interface and receiving one or more remote control commands or control signals directly or indirectly from a personal remote interface apparatus;

- B) in response to the receiving of the one or more remote control commands, the thermostat checking the condition of occupancy using the occupancy detection apparatus; and,

- C) when the occupancy detection apparatus indicates that the condition of occupancy does exist, the thermostat responding by then changing in a first way how the HVAC system operates, and when the occupancy detection apparatus indicates that the condition of occupancy does not exist, the thermostat responding by then changing in a second way how the HVAC system operates, the first and second ways in which the HVAC system operates being different from each other.

18) The method of claim **17** wherein the checking of the condition of occupancy is preceded by a step of the thermostat checking if the personal remote interface is connected to a local area network which is the same local area network to which the thermostat is connected, and the thermostat then skipping the step of checking the condition of occupancy upon determining that the personal remote interface is connected to the same local area network.

19) The method of claim **17** wherein the checking of the condition of occupancy is preceded by a step of the thermostat checking if the personal remote interface is located in close proximity to the conditioned space served by the HVAC system, and then, if the personal remote interface is physically in close proximity, the thermostat then skipping the step of checking the condition of occupancy.

20) The method of claim **17** wherein the occupancy detection apparatus comprises a motion detector.

21) A method for remotely controlling a thermostat coupled to a communications interface, the thermostat providing for control of a Heating, Cooling, Ventilation or Air Conditioning system (HVAC system), the HVAC system for serving to condition air in a conditioned space, the thermostat further including an occupancy detection mechanism for determining a condition of occupancy, the method for controlling the thermostat including the steps of:

- A) providing a thermostat control application program installable for running on a personal remote interface apparatus, the thermostat control application providing a user interface to the thermostat;
- B) the thermostat establishing communication with the thermostat control application installed on the personal remote interface apparatus through the communications interface;
- C) if the condition of occupancy has been determined by the occupancy detection apparatus of the thermostat, the thermostat reporting the condition of occupancy to the thermostat control application via the communications interface.

22) The method of claim **21** further comprising a step of: the thermostat making one or more remote instigated changes in control of the HVAC system with the remote instigated changes based upon both a) commands sent from the thermostat control application program to the thermostat, and, b) the condition of occupancy.

23) The method of claim **22** wherein the remote instigated changes in control of the HVAC system are delayed in time based upon the condition of occupancy.

24) The method of claim **21** wherein the thermostat control application program includes control programming such that one or more features of the thermostat control application

program are disabled when the thermostat reports the condition of occupancy to the thermostat control application program.

25) A method for controlling a thermostat, the thermostat providing for control of a Heating, Cooling, Ventilation or Air Conditioning system (HVAC system), the HVAC system for serving to condition air to a conditioned space, the thermostat further including an occupancy detection mechanism for determining a condition of occupancy, the method for controlling the thermostat including the steps of:

- A) the thermostat receiving one or more remote control commands or control signals directly or indirectly from a personal remote interface apparatus operated by a user of the personal remote interface apparatus;
- B) in response to the receiving of the one or more remote control commands, the thermostat checking the condition of occupancy; and,
- C) when the condition of occupancy exists, the thermostat being operative for reporting a remote control access attempt while occupied to one or more of: a) an occupant of the conditioned space, and, the user of the personal remote interface apparatus.

26) The method of claim **25** wherein the reporting of the remote control access attempt while occupied includes instigating an audible and/or visual notification to one or more of:

a) the occupant of the conditioned space, and, b) the user of the personal remote interface apparatus.

27) A method for controlling a thermostat, the thermostat providing for control of a Heating, Cooling, Ventilation or Air Conditioning system (HVAC system), the HVAC system for serving to condition air in a conditioned space, the thermostat being coupled to a communications interface, the method for controlling the thermostat including the steps of:

- A) the thermostat utilizing the communications interface to receive one or more remote control commands or control signals directly or indirectly from a personal remote interface apparatus;
- B) in response to the receiving of the one or more remote control commands from the personal remote interface apparatus, the thermostat entering and then running in an altered mode of operation for controlling the HVAC system based upon the remote control commands; and,
- C) in response to receiving a command from a local user the thermostat leaving the altered mode of operation based upon the remote control commands and responding to the command from the local user by altering in some way current operation for controlling the HVAC system.

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