DISPLAY APPARATUS AND METHOD FOR A CONTROL UNIT FOR AN ENVIRONMENTAL CONTROL SYSTEM

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ABSTRACT
A display apparatus for a control unit in an environmental control system; the display apparatus including: a display area presenting a plurality of first loci, a plurality of second loci and at least one third locus; each respective first locus of the plurality of first loci being responsive to pressure for effecting a respective response; each respective second locus of the plurality of second loci presenting information using a fixed segment data format; at least one third locus of the at least one third locus presenting information using a dot matrix data format.
FIG. 9

HOLD SETTING UNTIL
10:50AM OCT 10

FIG. 10

OUTDOOR TEMP 40F
THU MAR 06 6:16AM
FIG. 19

HUM SETPOINT
DEFAULT (45%) 35%

CANCEL  SAVE

FIG. 20

OUTDOOR TEMP 40°F
THU MAR 06 6:16 AM

72°
FIG. 33

FIG. 34
FIG. 35

FIG. 36
FIG. 37

HOME SCHEDULE OPTIONS

MODE
AUTO
FAN
AUTO
SCHED
ON

72°

HEATING
THU MAR 06 6:16AM

SET AT 78° HEAT
SET AT 80° COOL

30

FIG. 38

HOME SCHEDULE OPTIONS

MODE
AUTO
FAN
AUTO
SCHED
ON

72°

INDOOR RH 45%
THU MAR 06 6:16AM

SET AT 78° HEAT
SET AT 80° COOL

30
FIG. 39

OUTDOOR TEMP 40F
THU MAR 06 6:16AM

FIG. 40

INSTALLER SETTINGS
FIG. 45

OUTDOOR TEMP 40F
THU MAR 06 6:16AM

FIG. 46

SYSTEM SETUP
OUTDOOR SENSOR

BACK
ENTER
FIG. 47

NON HEAT PUMP
ELECTRIC

FIG. 48

COMPRESSOR STAGES
1
FIG. 51
DISPLAY APPARATUS AND METHOD FOR A
CONTROL UNIT FOR AN ENVIRONMENTAL
CONTROL SYSTEM

CROSS REFERENCE TO RELATED
APPLICATION

[0001] The present application is related to U.S. patent
application Ser. No. ______ entitled “DISPLAY APPARA-
TUS AND METHOD FOR ENTERING A REMINDER IN
A CONTROL UNIT FOR AN ENVIRONMENTAL CONTROL
SYSTEM,” filed ______, which is assigned to the
current assignee hereof.

FIELD OF THE INVENTION

[0002] The present invention is directed to Heating Ventil-
ating Air Conditioning (HVAC) system controller devices,
and especially to a thermostat or other control unit for use
with a HVAC system. The present invention is particularly
useful with a residential HVAC system.

BACKGROUND OF THE INVENTION

[0003] HVAC systems have become more complex in
recent years. Control units for use with HVAC systems have
not been sufficiently detailed and varied in the information
provided for a user to permit efficient use of features of the
HVAC system. Complexity in programming and displaying
information has caused some confusion to the extent that
some users do not employ all of the features of an HVAC
system, or find that the employment of some features is
cumbersome.

[0004] Some attempts at facilitating the interface between a
user and an HVAC control unit have involved limiting flex-
bility in the programming or display capabilities of the con-
trol unit. Such oversimplification of a control unit may also
limit employment of features or capabilities of a HVAC sys-
tem.

[0005] There is a need for an improved control unit for use
with HVAC systems that is intuitively easy to program.

[0006] There is a need for an improved control unit for use
with HVAC systems that provides varied detail information
for a user.

SUMMARY OF THE INVENTION

[0007] A display apparatus for a control unit in an environ-
mental control system; the display apparatus including: a
display area presenting a plurality of first loci, a plurality of
second loci, and at least one third locus; each respective first
locus of the plurality of first loci being responsive to pressure
for effecting a respective response; each respective second
locus of the plurality of second loci presenting information
using a fixed segment data format; at least one third locus of
the at least one third locus presenting information using a
dot matrix data format.

[0008] A method for entering input to an environmental
control system; the method including: (a) providing a display
area; (b) in no particular order: (1) presenting a plurality of
first loci in the display area; (2) presenting a plurality of
second loci in the display area; and (3) presenting at least one
third locus in the display area; and (c) in no particular order:
(1) configuring each respective first locus of the plurality of
first loci for being responsive to pressure for effecting a
respective the input; (2) configuring each respective second
locus of the plurality of second loci presenting information
using a fixed segment data format; and (3) configuring at least
one third locus of the at least one third locus presenting
information using a dot matrix data format.

[0009] It is, therefore, a feature of the present invention to
provide an improved control unit for use with HVAC systems
that is intuitively easier to program.

[0010] It is another feature of the present invention to pro-
vide an improved control unit for use with HVAC systems that
provides varied detail information for a user.

[0011] Further features of the present invention will be
apparent from the following specification and claims when
considered in connection with the accompanying drawings,
in which like elements are labeled using like reference numer-
als in the various figures, illustrating the preferred embodi-
ments of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] FIG. 1 is a plan view of a thermostat display con-
figured according to the teachings of the present invention.

[0013] FIG. 2 is a first view of the display illustrating fea-
tures associated with the HOME Tab.

[0014] FIG. 3 is a second view of the display illustrating
features associated with the HOME Tab.

[0015] FIG. 4 is a view of the display illustrating features
associated with the SCHEDULE Tab.

[0016] FIG. 5 is a first view of the display illustrating fea-
tures associated with the OPTIONS Tab.

[0017] FIG. 6 is a second view of the display illustrating
features associated with the OPTIONS Tab.

[0018] FIG. 7 is a third view of the display illustrating
features associated with the OPTIONS Tab.

[0019] FIG. 8 is a first view of the display illustrating pro-
gramming steps associated with Mode of operation.

[0020] FIG. 9 is a second view of the display illustrating
programming steps associated with Mode of operation.

[0021] FIG. 10 is a first view of the display illustrating
programming steps associated with operation Schedule.

[0022] FIG. 11 is a second view of the display illustrating
programming steps associated with operation Schedule.

[0023] FIG. 12 is a third view of the display illustrating
programming steps associated with operation Schedule.

[0024] FIG. 13 is a first view of the display illustrating
programming steps associated with Temporary/Vacation
Hold.

[0025] FIG. 14 is a second view of the display illustrating
programming steps associated with Temporary/Vacation
Hold.

[0026] FIG. 15 is a first view of the display illustrating
programming steps associated with Humidity Settings.

[0027] FIG. 16 is a second view of the display illustrating
programming steps associated with Humidity Settings.

[0028] FIG. 17 is a third view of the display illustrating
programming steps associated with Humidity Settings.

[0029] FIG. 18 is a fourth view of the display illustrating
programming steps associated with Humidity Settings.

[0030] FIG. 19 is a fifth view of the display illustrating
programming steps associated with Humidity Settings.

[0031] FIG. 20 is a first view of the display illustrating
programming steps associated with Setting Service Remind-
ers.

[0032] FIG. 21 is a second view of the display illustrating
programming steps associated with Setting Service Remind-
ers.
FIG. 22 is a third view of the display illustrating programming steps associated with Setting Service Reminders.

FIG. 23 is a fourth view of the display illustrating programming steps associated with Setting Service Reminders.

FIG. 24 is a fifth view of the display illustrating programming steps associated with Setting Service Reminders.

FIG. 25 is a sixth view of the display illustrating programming steps associated with Setting Service Reminders.

FIG. 26 is a seventh view of the display illustrating programming steps associated with Setting Service Reminders.

FIG. 27 is a first view of the display illustrating programming steps associated with the Clean Screen Feature.

FIG. 28 is a second view of the display illustrating programming steps associated with the Clean Screen Feature.

FIG. 29 is a third view of the display illustrating programming steps associated with the Clean Screen Feature.

FIG. 30 is a first view of the display illustrating programming steps associated with turning ON or OFF of display of certain parameters.

FIG. 31 is a second view of the display illustrating programming steps associated with turning ON or OFF of display of certain parameters.

FIG. 32 is a third view of the display illustrating programming steps associated with turning ON or OFF of display of certain parameters.

FIG. 33 is a fourth view of the display illustrating programming steps associated with turning ON or OFF of display of certain parameters.

FIG. 34 is a fifth view of the display illustrating programming steps associated with turning ON or OFF of display of certain parameters.

FIG. 35 is a sixth view of the display illustrating programming steps associated with turning ON or OFF of display of certain parameters.

FIG. 36 is a first view of the display illustrating toggling among displays of certain parameters.

FIG. 37 is a second view of the display illustrating toggling among displays of certain parameters.

FIG. 38 is a third view of the display illustrating toggling among displays of certain parameters.

FIG. 39 is a first view of the display illustrating programming steps associated with displays of custom reminders.

FIG. 40 is a second view of the display illustrating programming steps associated with displays of custom reminders.

FIG. 41 is a third view of the display illustrating programming steps associated with displays of custom reminders.

FIG. 42 is a fourth view of the display illustrating programming steps associated with displays of custom reminders.

FIG. 43 is a fifth view of the display illustrating programming steps associated with displays of custom reminders.

FIG. 44 is a sixth view of the display illustrating programming steps associated with displays of custom reminders.

FIG. 45 is a first view of the display illustrating programming steps associated with hiding display of menu items not relevant to a user's extant system.

FIG. 46 is a second view of the display illustrating programming steps associated with hiding display of menu items not relevant to a user's extant system.

FIG. 47 is a third view of the display illustrating programming steps associated with hiding display of menu items not relevant to a user's extant system.

FIG. 48 is a fourth view of the display illustrating programming steps associated with hiding display of menu items not relevant to a user's extant system.

FIG. 49 is a fifth view of the display illustrating programming steps associated with hiding display of menu items not relevant to a user's extant system.

FIG. 50 is a sixth view of the display illustrating programming steps associated with hiding display of menu items not relevant to a user's extant system.

FIG. 51 is a flow chart illustrating the method of the present invention.

FIG. 1 is a plan view of a thermostat display configured according to the teachings of the present invention. In FIG. 1, a thermostat display 10 may be appropriate for use with a control unit in an environmental control system such as, by way of example and not by way of limitation, a Heating Ventilating Air Conditioning (HVAC) system. Display 10 may include a plurality of touch responsive loci configured to respond to pressure applied to respective touch responsive loci for effecting respective responses.

In the exemplary display 10 illustrated FIG. 1, touch responsive loci 12 may be generally indicated by delineated directional areas 20, 20, 20, 20, 20, 20, 20, annotated with directional symbols indicating alteration or adjustment of a parameter up or down. Actuation may be carried out in any known manner, preferably by pressing or depressing an individual locus 20, in the manner of a touch screen input device known by those skilled in the art of design of control devices for HVAC systems. The indicator “n” is employed to signify that there can be any number of delineated directional areas in display 10. The inclusion of six delineated directional areas 20, 20, 20, 20, 20, 20, in FIG. 1 is illustrative only and does not constitute any limitation regarding the number of delineated directional areas that may be included in the display of the present invention.

Display 10 may include additional touch responsive first loci 14 generally indicated by functional action areas 22, 22, 22, 22, 22, 22, 22, annotated to indicate specified actions or functions that may be effected by actuating a respective area. Action area 22 permits effecting a “CANCEL” or “EDIT” action or function. Action area 22, permits effecting a “BACK” or “WAKE” action or function. Action area 22, permits effecting a “LEAVE” action or function. Action area 22, permits effecting a “CLEAN” or “RETURN” action or function. Action area 22, permits effecting an “ENTER” or “SLEEP” action or function. Action area 22, permits effecting an “EDIT” or “NEXT” action or function. Action area 22, permits effecting a “SAVE” action or function. The indicator “m” is employed to signify that there can be any number of functional action areas 22, 22, 22, 22, 22, 22, 22, 22, 22, 22, in FIG. 1 is illustrative only and does not
constitute any limitation regarding the number of functional action areas that may be included in the display of the present invention.

[0066] Display 10 may include additional touch responsive loci 16 generally indicated by mode controlling areas 24, 24, 24, annotated to indicate specified modes or controls that may be effected by actuating a respective area. Mode controlling area 24, permits effecting a “HEAT” mode, a “COOL” mode, an “AUTO” mode, an “OFF” mode or an “EM HEAT” (emergency heat) mode. Mode controlling area 24, permits effecting a fan mode of “ON”, “AUTO” or “CIRC” (circulate). Mode controlling area 24, permits effecting a schedule mode of “ON” or “OFF”. Actuation may be carried out in any known manner, preferably by pressing or depressing an individual locus 24, in the manner of a touch screen input device known by those skilled in the art of design of control devices for HVAC systems. The indicator “r” is employed to signify that there can be any number of mode controlling areas in display 10. The inclusion of three mode controlling areas 24, 24, 24, in FIG. 1 is illustrative only and does not constitute any limitation regarding the number of mode controlling areas that may be included in the display of the present invention.

[0067] Display 10 may include additional touch responsive loci 18 generally indicated by tab selecting areas 26, 26, 26, annotated to indicate specified separate control menus or tabs that may be effected by actuating a respective area. Tab selecting area 26, permits selecting a “HOME” menu or tab. Tab selecting area 26, permits selecting a “SCHEDULE” menu or tab. Tab selecting area 26, permits selecting an “OPTIONS” menu or tab. Actuation may be carried out in any known manner, preferably by pressing or depressing an individual locus 26, in the manner of a touch screen input device known by those skilled in the art of design of control devices for HVAC systems. The indicator “s” is employed to signify that there can be any number of tab selecting areas in display 10. The inclusion of three tab selecting areas 26, 26, 26, in FIG. 1 is illustrative only and does not constitute any limitation regarding the number of tab selecting areas that may be included in the display of the present invention.

[0068] Touch responsive areas 12, 14, 16, 18 may be configured using fixed segment display technology. Fixed segment display technology generally results in clear, crisp, well-defined displayed information. However, fixed segment display technology is generally inflexible and resistant to change. Fixed segment display technology is not readily amenable to presenting custom messages or similar ad hoc information displays. Displays employing fixed segment display technology do not permit in-the-field changes in displayed information to accommodate differing needs among different users.

[0069] Display 10 may include a display locus 30 configured to employ dot matrix display technology. Dot matrix display technology is readily accepting of changes so that customizable messages or other information may be presented using dot matrix display technology responsive to changes entered by a user. Display locus 30 may include a message zone 32 for display of customized messages, alerts or other displays. Display locus 30 may further include touch responsive loci 34, generally indicated by customizable selecting areas 36, 36, 36, 36, 36, annotated to indicate specified separate control functions or selections that may be effected by pressing or otherwise actuating a respective area. Each of customizable selecting areas 36, 36, 36, 36, 36, may be programmed to effect a predetermined response in reaction to pressure applied to a respective customizable area. The particular response to touching may be indicated by a customized message in display area 30 using dot matrix display technology. The indicator “t” is employed to signify that there can be any number of customizable selecting areas in display 10. The inclusion of five customizable selecting areas 36, 36, 36, 36, 36, in FIG. 1 is illustrative only and does not constitute any limitation regarding the number of customizable selecting areas that may be included in the display of the present invention. Alternatively, selecting areas 36, 36, 36, 36, 36, may be non-responsive to touch but may be effected to label associating touch-responsive areas located substantially adjacent to selecting areas 36, 36, 36, 36, 36. By way of example and not by way of limitation, selecting area 36, may be employed to label functional area 22, for use as a selecting button associated with an element displayed in message zone 32. Selecting area 36, may be employed to label functional area 22, for use as a selecting button associated with an element displayed in message zone 32. Selecting area 36, may be employed to label functional area 22, for use as a selecting button associated with an element displayed in message zone 32. Selecting area 36, may be employed to label functional area 22, for use as a selecting button associated with an element displayed in message zone 32. Selecting area 36, may be employed to label functional area 22, for use as a selecting button associated with an element displayed in message zone 32.

[0070] Other areas of display 10 may be configured for display only without providing a coincident touch sensitive area for receiving user inputs such as, by way of example and not by way of limitation, display-only areas 40, 40, 40, 40, 40, 40, display-only areas 40, 40, 40, 40, 40, 40, may employ any display technology, but preferably employ a fixed segment display technology. By way of example and not by way of limitation, display-only area 40 may display up to two digits indicating a set temperature for a HEAT mode of operation, display-only area 40, may display up to two digits indicating a set temperature for a COOL mode of operation, display-only area 40, may display an “F” indicator indicating degrees Fahrenheit or a “C” indicator indicating degrees Celsius, and display-only areas 40, 40, 40, may cooperate to display up to two digits indicating an outside air temperature. The indicator “u” is employed to signify that there can be any number of display-only areas in display 10. The inclusion of five display-only areas 40, 40, 40, 40, 40, in FIG. 1 is illustrative only and does not constitute any limitation regarding the number of display-only areas that may be included in the display of the present invention.

[0071] Day-of-week indicators “MON” (Monday), “TUE” (Tuesday), “WED” (Wednesday), “THU” (Thursday), “FRI” (Friday), “SAT” (Saturday) and “SUN” (Sunday) are illustrated as being included within message zone 32 and configured using dot-matrix display format. Day-of-week indicators may be situated outside of message zone 32 and configured using fixed segment display format if desired.

[0072] Employment of fixed segment display technology and dot matrix display technology in display 10 permits designing display 10 so that frequently used controls and associated information displays such as, by way of example and not by way of limitation, controls and information related with touch responsive loci 12, 14, 16, 18 may be rendered in highly readable fixed segments. Mixing display technologies also permits dynamic information to be rendered in dot
matrix display technology to present customizable text messages clearly understandable by a user and instructive to a user.

[0073] By way of example and not by way of limitation, system status indications on prior art thermostat display units have typically been effected using fixed indicators such as a light indicator, a code display or a fixed Liquid Crystal Display (LCD) text. Such fixed indicators are not generally descriptive so that a user, such as a homeowner, may be left wanting more information than is provided by the indicator. This may be the case when a “trouble” indicator such as a lighted or blinking Light Emitting Diode (LED) indicator is actuated, but no indication of the exact problem is available without consulting a user’s manual. Further, because the indicators are in fixed positions on the display screen there is not a single place on the screen or other user interface that one can always look at to determine whether there are any problems. An indicator of system status could be located anywhere on the display screen making it difficult to review system status. Difficulty in reviewing system status may create a possibility of a critical message being inadvertently overlooked.

[0074] Providing a variable display area such as display area 30 using a technology permitting variation of information presented permits a user to look to a particular area of display 10, such as display area 30, to quickly and assuredly determine whether the system is operating properly and, if not, what the nature of the extant problem may be.

[0075] FIG. 2 is a first view of the display illustrating features associated with the HOME tab. In FIG. 2, HOME tab selecting area 26, is depressed or otherwise actuated to orient display 10 in an exemplary “HOME” configuration. Display 10 is preferably configured with a backlit screen with adjustable brightness and presents large graphics so as to be easy to read and easy to use.

[0076] A user’s depressing or otherwise actuating HOME tab selecting area 26, configures display 10 for displaying current system operations including, by way of example and not by way of limitation, display of indoor temperature (display only areas 40a, 40b) and heating and cooling set points (display only areas 40c, 40d) and permits a user to make adjustments to system operation. The HOME tab may be actuated automatically pursuant to satisfying predetermined conditions. By way of example and not by way of limitation, the HOME tab may be actuated when there is a period of inactivity (e.g., 60 seconds) while a user is on either the SCHEDULE tab or the OPTIONS tab.

[0077] In the “HOME” configuration illustrated in FIG. 2, touch responsive loci 12 are partially presented to provide directional areas 20, 20a, 20b, 20c; touch responsive loci 14 are generally not presented to a user; touch responsive loci 16 are generally fully presented; touch responsive loci 16 are represented in FIG. 2 as having experienced selection by a user to establish an AUTO Mode with Fan in AUTO and Schedule ON; and touch responsive loci 18 are generally fully presented as having experienced selection by a user to establish the HOME configuration.

[0078] Providing a “file folder” type of display organization using TABS selectable by depressing or otherwise activating tab selecting areas 26, 26a, 26b, avoids cluttering display 10 with menu selections that are not relevant to an extant selection task. As prior art thermostat control displays added more and more capability to control an associated HVAC system, the number of buttons and menu screens became more and more complicated. A result was complex control or programming procedures that were cumbersome to execute, even with the aid of an associated user’s manual. Providing TABS improves intuitive easy navigating among functions programmable or selectable using display 10. Grouping configuration and control options on logical TABS on the user interface, i.e., display 10, provides a user with displays familiar to users, especially to users having experience dealing with such software programs as MS Excel (a trademark of Microsoft Corporation) and various web browser programs. Tabbed interface permits users to quickly navigate to and control features of a system.

[0079] If an outdoor temperature sensor is installed (not shown in FIG. 2), display area 30 may display outdoor temperature, or relative humidity, or both outdoor temperature and relative humidity (only outdoor temperature is illustrated as displayed in FIG. 2), along with accompanying information such as, by way of example and not by way of limitation, date and time.

[0080] By way of example and not by way of limitation, display 10 may be operated in the HOME configuration illustrated in FIG. 2 to permit a user to actuate the SCHED button 24, to select SCHED ON so that the controlled system (not shown in FIG. 2) will follow a pre-programmed schedule. A user may again depress or otherwise actuate the SCHED button to select SCHED OFF for non-programmed, manual system operation.

[0081] Prior art thermostat controls generally always have a pre-programmed operation running so that heating and cooling set points are changed according to pre-programmed settings when a predetermined time is reached. If a user wished to disable the pre-programmed operation using a prior art thermostat control the user was required to put the thermostat in a “permanent hold” state. The term “permanent hold” proved to be confusing to many users. Further, if a user wished to change temperature setting of a thermostat control there was a requirement that the user perform another permanent hold regarding the newly set temperature set point. In short, the process for changing a programmed temperature was sometimes cumbersome, frustrating and confusing to users. Providing a SCHED button permitting a user to easily press a single button for placing a system in a SCHED ON mode for following a pre-programmed schedule or in a SCHED OFF mode for non-programmed, manual operation is intuitively easy for a user to understand and carry out.

[0082] FIG. 3 is a second view of the display illustrating features associated with the HOME tab. In FIG. 3, display 10 remains in the HOME tab but is additionally configured for effecting a Temporary Schedule Hold setting. Display 10 may be configured so that while in the HOME tab, anytime a temperature set point (displayed at display-only areas 40b, 40d) is changed, a display is presented in display area 30 relating to setting a Temperature Schedule Hold mode of operation. In the Temporary Schedule Hold mode the HOME tab display is altered somewhat to provide selection buttons within display area 30 for effecting a Temporary Schedule Hold entry. Specifically, touch responsive loci are oriented to present a CANCEL button 22a, a Time Selecting button 22b, (labeled in cooperation with display area 30a, a Date Selecting button 22c, (labeled in cooperation with display area 30a), an UP arrow 20b, a DOWN arrow 20c, and a SAVE button 22d.

[0083] Additionally, in the Temporary Schedule Hold mode, display area 30 displays a time and date until which a temporary hold is to be maintained. Selectively actuating Time Selecting button 22b or Date Selecting button 22c, per-
mits a user to pause a pre-programmed schedule for a time set using Time Selecting button 22, or Date Selecting button 22, to set the time and date it is desired that the pre-programmed schedule is to resume. By way of example and not by way of limitation, a temporary schedule hold may be imposed for a time interval ranging from a few hours up to forty-five days. [0084] FIG. 4 is a view of the display illustrating features associated with the SCHEDULE Tab. In FIG. 4, SCHEDULE tab selecting area 26, is depressed or otherwise actuated to orient display 10 in an exemplary “SCHEDULE” configuration. A user’s selecting or otherwise actuating SCHEDULE tab selecting area 26, configures display 10 for displaying a programming screen to permit a user to select temperatures for certain times of day such as, by way of example and not by way of limitation, time of waking (WAKE time), time of leaving one’s house for work (LEAVE time), time returning to house after work (RETURN time) and time of going to sleep (SLEEP time).

[0085] Display 10 may permit a user to schedule or program events for an entire week, as indicated by inclusion of all days of the week in display area 30. Alternately, selected subsets of the week may be programmed separately such as, by way of example and not by way of limitation, scheduling events according to the same schedule for a Monday-Friday workweek with a different schedule set for weekends. Another choice may be for a user to schedule events for each individual day of the week. Opting among subsets of a week for scheduling may be effected by depressing or otherwise actuating the NEXT button 22n among touch responsive loci 14.

[0086] In the “SCHEDULE” configuration illustrated in FIG. 4, touch responsive loci 12 are generally not presented to a user; touch responsive loci 14 are generally presented to a user as described in connection with FIG. 1 (functional action areas 22, 22, 22, 22, 22, 22, 22, 22) with no SAVE button (22n) presented. In this SCHEDULE configuration functional action areas are as labeled in the bottom portion of areas illustrated in FIG. 1. Thus, functional action area 22 affects an EDIT function, functional action area 22 affects a WAKE time setting; functional action area 22 affects a LEAVE time setting, functional action area 22 affects a RETURN time setting; functional action area 22 affects a SLEEP time setting and functional action area 22, affects a NEXT function. Touch responsive loci 14 are generally presented in terms of a FAN mode selection button with the Fan in AUTO in FIG. 4. Touch responsive loci 18 are generally fully presented as having experienced selection by a user to establish the SCHEDULE configuration.

[0087] FIG. 5 is a first view of the display illustrating features associated with the OPTIONS Tab. FIG. 6 is a second view of the display illustrating features associated with the OPTIONS Tab. FIG. 7 is a third view of the display illustrating features associated with the OPTIONS Tab. Regarding FIGS. 5-7 together, OPTIONS tab selecting area 26, is depressed or otherwise actuated to orient display 10 in an exemplary “OPTIONS” configuration. A user’s depressing or otherwise actuating OPTIONS tab selecting area 26, configures display 10 for displaying a scrolling list of adjustable settings.

[0088] In the “OPTIONS” configuration illustrated in FIGS. 5-7, touch responsive loci 12 are generally presented to a user as described in connection with FIG. 1 only in so far as two selecting or scrolling buttons are represented, such as delineated directional areas 20, 20, Touch responsive loci 14 are generally presented to a user as described in connection with FIG. 1 only in so far as two functional action areas 22, 22, are represented. In this OPTIONS configuration functional action areas are as labeled in the top portion of areas illustrated in FIG. 1. Thus, functional action area 22, affects a CLEAN function, functional action area 22, affects an ENTER function. Touch responsive loci 18 are generally fully presented as having experienced selection by a user to establish the OPTIONS configuration.

[0089] By way of example and not by way of limitation, a user may employ delineated directional areas 20, 20, to scroll through a list of adjustable settings presented in display area 30 (FIG. 5). Adjustable settings are highlighted or otherwise differentiated from other adjustable settings as becomes available for selection. When a desired adjustable setting is highlighted or otherwise indicated as available for selection, a user may depress or otherwise actuate the ENTER button 22, to select the adjustable setting to be adjusted. Other sub-lists may be displayed. Eventually a user will be able to indicate and select a particular setting for adjustment, the user may then depress or otherwise actuate the ENTER button 22, to select the indicated setting for adjustment and then delineated directional areas 20, 20, may be employed to adjust the setting upward or downward until the desired setting level is achieved.

[0090] By way of example and not by way of limitation, one may scroll to a setting USER SETTINGS, select USER SETTINGS and be presented with a sub-list or sub-lists that ultimately permit a user to establish settings such as Date, Time, Events per Day, Backlight Intensity, Backlight Setting or Security Lock.

[0091] Similarly a user may scroll to a setting REMINDERS, select REMINDERS and ultimately select from a series of service, parts replacement, maintenance or custom reminders (FIG. 6). As the function of display 10 changes, (e.g., selecting an adjustable setting (FIG. 5) or displaying a reminder (FIG. 6)) the particular respective functional areas 22n presented to a user may change. FIG. 6 illustrates that functional areas 22n (BACK) and 22n, (EDIT) may be presented to a user while viewing reminder messages. The selected reminders may be displayed in display area 30 when display 10 is in the HOME configuration (FIG. 2).

[0092] As indicated in FIG. 7, contact information relating to one’s HVAC dealer or repair facility may be selected while in the OPTIONS configuration and may appear on display 10 in the HOME configuration when a critical system error occurs. Prior art thermostat display units typically are provided with an adhesive sticker or decal for adhering to the housing of the thermostat with contact information relating to a HVAC dealer or repair facility. Homeowners sometimes regard such stickers as unsightly and remove them. If their system needs service, there is a problem determining how to contact the repair facility.

[0093] Entering appropriate service and repair contact information in memory of a thermostat permits its display of the information without requiring a sticker. Further, the system may be programmed to recognize circumstances under which it would be advisable to contact a repair facility and automatically display the contact information when such circumstances occur.

[0094] More than one message may be displayed in display area 30 using a “slide show” technique successively displaying each message for a predetermined time, using a “scroll-
ing” display by which the message displays are rolled by for a viewer’s perusal or using another multi-message display technique.

[0095] FIG. 8 is a first view of the display illustrating programming steps associated with Mode of operation. FIG. 9 is a second view of the display illustrating programming steps associated with Mode of operation. Regarding FIGS. 8-9 together, a user may touch display 10 generally anywhere to activate the backlight and render display 10 easy to read.

[0096] In programming heating and cooling set point temperatures in a system using display 10, a user places display 10 in a HOME configuration substantially as described above in connection with FIG. 2. To set or program a temperature, a user may press the MODE button 24, repeatedly to select a choice of system operation (i.e., HEAT, COOL, AUTO, OFF, EM HEAT). AUTO allows the thermostat unit to automatically switch between heating and cooling as dictated by the indoor temperature. EM HEAT (Emergency Heat) is used to disable heat pump operation on very cold days and use electric strip heating or fossil fuel heating instead.

[0097] A user may press UP arrow 20, or DOWN arrow 20, to program a desired heating set point (displayed at display-only area 40.). A user may press UP arrow 20, or DOWN arrow 20, to program a desired cooling set point (displayed at display-only area 40.). A user may press UP arrow 20, or DOWN arrow 20, to program a desired time (selected by time selection button 22.) and date (selected by date selection button 22.) the user desires that the schedule resume (displayed at display area 30).

[0098] FIG. 10 is a first view of the display illustrating programming steps associated with Operation Schedule. FIG. 11 is a second view of the display illustrating programming steps associated with Operation Schedule. FIG. 12 is a third view of the display illustrating programming steps associated with Operation Schedule. Regarding FIGS. 10-12 together, a user may touch display 10 generally anywhere to activate the backlight and render display 10 easy to read.

[0099] In programming a schedule in a system using display 10, a user places display 10 in a SCHEDULE configuration substantially as described above in connection with FIG. 4. In the SCHEDULE configuration display 10 may appear substantially as presented in FIG. 11. To set or program a schedule, a user may press EDIT button 22., and then press NEXT button 22., repeatedly to select a grouping of days displayed in display area 30. When the desired grouping of days is displayed, a user may press WAKE button 22., LEAVE button 22., RETURN button 22., or SLEEP button 22., to select an event to be programmed. After selecting an event to be programmed and pressing EDIT button 22., display 10 may appear substantially as presented in FIG. 12.

[0100] A user may thereafter use UP arrows 20, 20, or DOWN arrows 20, 20, to select a desired temperature set point for the selected event. A user may then press FAN button 24., repeatedly to select a desired fan mode for the selected event. A user may then press UP arrow 20, or DOWN arrow 20, to set a start time for the selected event. Another event may be selected for programming by pressing or otherwise actuating an appropriate functional area: WAKE button 22., LEAVE button 22., RETURN button 22., or SLEEP button 22., A user may press SAVE button 22., when all events and days are programmed as desired. Pressing HOME Tab 26, returns display 10 to the main screen (see FIG. 2). A user must ensure that SCHED button 24, is set to ON so that the system will follow the programmed events just entered.

[0101] Prior art thermostat control devices generally require a user to navigate through a menu of day groupings to program such as, by way of example and not by way of limitation, M-SUN (Monday-Sunday), M-F (Monday-Friday), SA (Saturday), SUN (Sunday), and other similar day groupings. Some prior art thermostat control devices require a user to select multiple days on different buttons or select each day for separate programming treatment. Display 10 permits a user to select among predetermined day groupings using a single button (e.g., NEXT button 22.). Each press or other actuation of NEXT button 22., presents a different group of days to be programmed in display area 30 offering a quick and easy way for a user to select which group of days is desired for programming without having to navigate confusing menus or make multiple selections on different buttons.

[0102] FIG. 13 is a first view of the display illustrating programming steps associated with Temporary/Vacation Hold. FIG. 14 is a second view of the display illustrating programming steps associated with Temporary/Vacation Hold. Regarding FIGS. 13-14 together, a user may touch display 10 generally anywhere to activate the backlight and render display 10 easy to read.

[0103] In programming a Temporary/Vacation Hold in a system using display 10, a user places display 10 in a HOME configuration substantially as described above in connection with FIG. 2. In the HOME configuration display 10 may appear substantially as presented in FIG. 13. To set or program a Temporary/Vacation Hold, a user may press UP arrow 20, or DOWN arrow 20, to program a desired heating set point (displayed at display-only area 40.). A user may press UP arrow 20, or DOWN arrow 20, to program a desired cooling set point (displayed at display-only area 40.). Adjusting either of the heating set point or the cooling set point will cause display 10 to present display area 30 substantially as illustrated in FIG. 14. A user may then press UP arrow 20, or DOWN arrow 20, to program a desired setting (selected by time selection button 22.) and date (selected by date selection button 22.) the user desires that the programmed schedule will resume (displayed at display area 30). Display 10 may be configured so that skipping the step of programming a desired date a time for desired resumption of the programmed schedule may result in the set point temperatures entered above for Temporary/Vacation Hold will hold for a predetermined time such as, by way of example and not by way of limitation, three hours before resuming the programmed schedule. A user may press SAVE button 22., to save the set point temperatures, time and date to resume, entered above for Temporary % Vacation Hold. The Temporary % Vacation Hold may be cancelled at any time by pressing SCHED button 24.,

[0104] FIG. 15 is a first view of the display illustrating programming steps associated with Humidity Settings. FIG. 16 is a second view of the display illustrating programming steps associated with Humidity Settings. FIG. 17 is a third view of the display illustrating programming steps associated with Humidity Settings. FIG. 18 is a fourth view of the display illustrating programming steps associated with Humidity Settings. FIG. 19 is a fifth view of the display illustrating programming steps associated with Humidity Settings. Regarding FIGS. 15-19 together, a user may touch display 10 generally anywhere to activate the backlight and render display 10 easy to read (FIG. 15).

[0105] In programming Humidity Settings in a system using display 10, a user places display 10 in an OPTION configuration substantially as described above in connection
with FIGS. 5-7. In the OPTIONS configuration display 10 may appear substantially as presented in FIG. 16. To set or program Humidity Settings, a user may press UP arrow 20, or DOWN arrow 20, to scroll through a list of adjustable settings presented in display area 30 (FIG. 16). Adjustable settings are highlighted or otherwise differentiated from other adjustable settings as each becomes available for selection. A user may be presented with a plurality of displayed settings for selection, may scroll among the displayed settings using UP arrow 20, or DOWN arrow 20, and may select USER SETTINGS by pressing or otherwise actuating ENTER button 22, when USER SETTINGS is highlighted. A user may then press UP arrow 20, or DOWN arrow 20, to scroll through a list of user setting alternatives presented in display area 30 (FIG. 17). A user may then select HUMIDITY SETTING by pressing or otherwise actuating ENTER button 22, when HUMIDITY SETTING is highlighted. Thereafter, a user may press UP arrow 20, or DOWN arrow 20, to select a desired relative humidity set point (FIG. 18). A user may press or otherwise actuate SAVE button 22, to save the selected relative humidity set point (FIG. 19).

[0106] FIG. 20 is a first view of the display illustrating programming steps associated with Setting Service Reminders. FIG. 21 is a second view of the display illustrating programming steps associated with Setting Service Reminders. FIG. 22 is a third view of the display illustrating programming steps associated with Setting Service Reminders. FIG. 23 is a fourth view of the display illustrating programming steps associated with Setting Service Reminders. FIG. 24 is a fifth view of the display illustrating programming steps associated with Setting Service Reminders. FIG. 25 is a sixth view of the display illustrating programming steps associated with Setting Service Reminders. FIG. 26 is a seventh view of the display illustrating programming steps associated with Setting Service Reminders. Regarding FIGS. 20-26 together, a user may touch display 10 generally anywhere to activate the backlight and render display 10 easy to read (FIG. 20).

[0107] In programming a Service Reminder in a system using display 10, a user places display 10 in an OPTION configuration substantially as described above in connection with FIGS. 5-7. In the OPTIONS configuration display 10 may appear substantially as presented in FIG. 21. To set or program a Service Reminder, a user may press UP arrow 20, or DOWN arrow 20, to scroll through a list of adjustable settings presented in display area 30 (FIG. 21). Adjustable settings are highlighted or otherwise differentiated from other adjustable settings as each becomes available for selection. A user may select REMINDERS by pressing or otherwise actuating ENTER button 22, when REMINDERS is highlighted. A user may then press UP arrow 20, or DOWN arrow 20, to scroll through a list of reminder alternatives presented in display area 30 (FIG. 22). By way of example and not by way of limitation, a user may then select REPLACE MEDIA FILTER by pressing or otherwise actuating ENTER button 22, when REPLACE MEDIA FILTER is displayed in display area 30 (FIG. 22).

[0108] Thereafter, a user may press EDIT button 22, to select a first editable element associated with REPLACE MEDIA FILTER. A user may use arrows 20, 20, to select whether it is desired to modify or edit CALENDAR TIME or RUN TIME, and press ENTER button 22, to complete the selection of CALENDAR TIME or RUN TIME (FIG. 23).

[0109] A user may thereafter press or otherwise actuate RESET button 22, or EDIT button 22, (labeled in cooperation with display area 30) and use arrows 20, 20, to set time for the service reminder being programmed (FIG. 24). By way of example and not by way of limitation one may set the time for a reminder for a period ranging from one month to twenty-four months (FIG. 25). A user may thereafter press SAVE button to save the programming steps entered. Pressing or otherwise actuating HOME tab 26, returns display 10 to its HOME configuration (FIG. 26). Service reminders are displayed in display area 30 in the HOME configuration at the programmed date.

[0110] Display 10 permits resetting a reminder, such as a service reminder, directly from display screen 10 without having to go to a special set-up or configuration screen. With many prior art thermostat devices one must dismiss and reset (or at least reset) the reminder using a special set-up or configuration screen requiring a user manual to know how to perform the operation. Often a homeowner does not know how to carry out this programming evolution so the service reminder message is never reset and the feature is rendered substantially useless. Display 10 permits resetting the reminder time interval directly when it appears on display 30 using a reset button 22, (FIG. 26; labeled in cooperation with display area 30) without having to go to little used and unfamiliar special set-up or configuration screen. This direct reset capability increases usability of the feature.

[0111] A reminder button 22, (FIG. 26; labeled in connection with display area 30) permits a user to direct the system served by a thermostat using display 10 to remind the user at a later time of the need for a service such as, by way of example and not by way of limitation, redisplaying the reminder message, displaying the reminder message in a flashing mode, emitting an audible alert or another reminder technique. This “Remind Later” feature may be useful when a homeowner does not have a replacement filter handy when the reminder is first displayed. The “Remind Later” feature permits a user to dismiss a reminder temporarily without having to reset the reminder or having to see the reminder displayed continuously until reset. The reminder period may be a predetermined maximum time such as, by way of example and not by way of limitation, seven days.

[0112] Prior art thermostat control devices generally require a user to enter a reminder interval or delay using a code corresponding to a time, such as a number of days. The time code is commonly provided in a user manual and is likely not something the user remembers. The capability to enter reminder delay interval or other time in terms of a number of months (or other predetermined time interval) in display 10 is a significant improvement in convenience and ease of use for a user.

[0113] Display 10 could be provided with access to a stored calendar. Such a stored calendar could be contained within a processor device associated with a control device operating with display 10 (not shown in detail in FIGS. 1-51). In such an arrangement, a user could select a “calendar function” and scroll through calendars to select a particular date for a reminder to be displayed.

[0114] FIG. 27 is a first view of the display illustrating programming steps associated with the Clean Screen Feature. FIG. 28 is a second view of the display illustrating programming steps associated with the Clean Screen Feature. FIG. 29 is a third view of the display illustrating programming steps associated with the Clean Screen Feature. Regarding FIGS.
27-29 together, a user may touch display 10 generally anywhere to activate the backlight and render display 10 easy to read (FIG. 27).

[0115] In setting up a CLEAN SCREEN configuration in a system using display 10, a user places display 10 in an OPTION configuration substantially as described above in connection with FIGS. 5-7. In the OPTIONS configuration display 10 may appear substantially as presented in FIG. 28. To set up a CLEAN SCREEN configuration, a user may press CLEAN button 22. The CLEAN SCREEN configuration thus set up deactivates all touch responsive loci for touch screen entry to display 10 for a predetermined period such as, by way of example and not by way of limitation, thirty seconds. By deactivating the touch responsive loci of display 10 one may be able to clean the screen without inadvertently providing input signals to the system supported and controlled by the thermostat device using display 10 (not shown in FIG. 27-29). Pressing or otherwise activating CLEAN button 22 again may provide additional time for cleaning the screen. Display 10 may indicate remaining time for duration of the CLEAN SCREEN configuration as at locus 42 (FIG. 29).

[0116] FIG. 30 is a first view of the display illustrating programming steps associated with turning ON or OFF of display of certain parameters. FIG. 31 is a second view of the display illustrating programming steps associated with turning ON or OFF of display of certain parameters. FIG. 32 is a third view of the display illustrating programming steps associated with turning ON or OFF of display of certain parameters. FIG. 33 is a fourth view of the display illustrating programming steps associated with turning ON or OFF of display of certain parameters. FIG. 34 is a fifth view of the display illustrating programming steps associated with turning ON or OFF of display of certain parameters. FIG. 35 is a sixth view of the display illustrating programming steps associated with turning ON or OFF of display of certain parameters. FIGS. 30-35 together, in programming display 10 to turn ON or OFF the display of certain parameters, a user places display 10 in an OPTION configuration substantially as described above in connection with FIGS. 5-7. In the OPTIONS configuration display 10 may appear substantially as presented in FIG. 30. A user may press UP arrow 20 or DOWN arrow 20, to scroll through a list of adjustable settings presented in display area 30 (FIG. 30). Adjustable settings are highlighted or otherwise differentiated from other adjustable settings as each becomes available for selection. A user may select USER SETTIGNGS by pressing or otherwise actuating ENTER button 22, when USER SETTINGS is highlighted. A user may then press UP arrow 20, or DOWN arrow 20, to scroll through a list of USER SETTINGS alternatives presented in display area 30 (FIG. 32). A user may then select DISPLAY INFO by pressing or otherwise actuating ENTER button 22, when DISPLAY INFO is displayed in display area 30 (FIG. 33). A user may then press UP arrow 20, or DOWN arrow 20, to scroll through a list of DISPLAY INFO alternatives presented in display area 30 (FIG. 34). A user may then select OUTDOOR TEMP (by way of example and not by way of limitation) by pressing or otherwise actuating ENTER button 22, when OUTDOOR TEMP is displayed in display area 30 (FIG. 34). A user may then press UP arrow 20, or DOWN arrow 20, to scroll through a list of DISPLAY INFO alternatives presented in display area 30 (FIG. 35). A user may then select ON (by way of example and not by way of limitation) by pressing or otherwise actuating SAVE button 22, when ON is displayed in display area 30 (FIG. 35).

[0117] If no outdoor sensor is installed in the system controlled by a thermostat employing display 10, a message “OUTDOOR SENSOR REQUIRED” may be displayed when the ON alternative is selected.

[0118] A user may select which parameters are displayed on the screen of display 10. This capability may reduce the amount of clutter on the screen and may make display 10 more readable. By way of example and not by way of limitation, a user can select whether or not to display indoor relative humidity or outside temperature.

[0119] FIG. 36 is a first view of the display illustrating toggling among displays of certain parameters. FIG. 37 is a second view of the display illustrating toggling among displays of certain parameters. FIG. 38 is a third view of the display illustrating toggling among displays of certain parameters. FIGS. 30-35 illustrate programming steps associated with turning ON or OFF of display of certain parameters, as discussed above. FIGS. 36-38 illustrate the result of programming steps carried out to effect toggling among displays of certain parameters.

[0120] Regarding FIGS. 30-38 together, in turning on toggling among displays of certain parameters, a user places display 10 in an OPTION configuration substantially as described above in connection with FIGS. 5-7. In the OPTIONS configuration display 10 may appear substantially as presented in FIG. 30. A user may press UP arrow 20, or DOWN arrow 20, to scroll through a list of adjustable settings presented in display area 30 (FIG. 30). Adjustable settings are highlighted or otherwise differentiated from other adjustable settings as each becomes available for selection. A user may select USER SETTIGNGS by pressing or otherwise actuating ENTER button 22, when USER SETTINGS is highlighted. A user may then press UP arrow 20, or DOWN arrow 20, to scroll through a list of USER SETTINGS alternatives presented in display area 30 (FIG. 32). A user may then select DISPLAY INFO by pressing or otherwise actuating ENTER button 22, when DISPLAY INFO is displayed in display area 30 (FIG. 33). A user may then press UP arrow 20, or DOWN arrow 20, to scroll through a list of DISPLAY INFO alternatives presented in display area 30 (FIG. 34). A user may then select OUTDOOR TEMP (by way of example and not by way of limitation) by pressing or otherwise actuating ENTER button 22, when OUTDOOR TEMP is displayed in display area 30 (FIG. 34). A user may then press UP arrow 20, or DOWN arrow 20, to scroll through an ON alternative and an OFF alternative presented in display area 30 (FIG. 35). A user may then select ON (by way of example and not by way of limitation) by pressing or otherwise actuating ENTER button 22, when

[0121] A user may then press UP arrow 20, or DOWN arrow 20, to again select DISPLAY INFO by pressing or otherwise actuating ENTER button 22, when DISPLAY INFO is displayed in display area 30 (FIG. 33). A user may then press UP arrow 20, or DOWN arrow 20, to scroll through a list of DISPLAY INFO alternatives presented in display area 30 (FIG. 34). A user may then select INDOOR RH (by way of further example and not by way of limitation) by pressing or otherwise actuating ENTER button 22, when
INDOOR RH is displayed in display area 30. A user may then press UP arrow 20, or DOWN arrow 20, to scroll through an ON alternative and an OFF alternative presented in display area 30 (FIG. 35). A user may then select ON (by way of example and not by way of limitation) by pressing or otherwise actuating ENTER button 22, when ON is displayed in display area 30 (FIG. 35) and press SAVE button 22, to save the Custom Reminder for display. Date and time for display may be entered as selectable characters in response to prompting by display 10 (not shown in detail in FIGS. 39-44).

[0122] A user may thereafter press or otherwise activate HOME tab 26, and observe display area 30 presenting messages as illustrated in FIGS. 36-38 in a repeating sequence, or toggling, display.

[0123] With the variable display capability of display area 30, fixed portions of display 10 need not be dedicated to displaying information. Information can be programmed to rotate or toggle automatically in display area 30.

[0124] FIG. 39 is a first view of the display illustrating programming steps associated with displays of custom reminders. FIG. 40 is a second view of the display illustrating programming steps associated with displays of custom reminders. FIG. 41 is a third view of the display illustrating programming steps associated with displays of custom reminders. FIG. 42 is a fourth view of the display illustrating programming steps associated with displays of custom reminders. FIG. 43 is a fifth view of the display illustrating programming steps associated with displays of custom reminders. FIG. 44 is a sixth view of the display illustrating programming steps associated with displays of custom reminders. Regarding FIGS. 39-44 together, a user may touch display 10 generally anywhere to activate the backlight and render display 10 easy to read (FIG. 39).

[0125] In programming a Custom Reminder in a system using display 10, a user places display 10 in an OPTION configuration substantially as described above in connection with FIGS. 5-7. In the OPTIONS configuration display 10 may appear substantially as presented in FIG. 40. To set or program a Custom Reminder, a user may press UP arrow 20, or DOWN arrow 20, to scroll through a list of adjustable settings presented in display area 30 (FIG. 40). Adjustable settings are highlighted or otherwise differentiated from other adjustable settings as each becomes available for selection. A user may be presented with a plurality of displayed settings for selection, may scroll among the displayed settings using UP arrow 20, or DOWN arrow 20, and may select INSTALLER SETTINGS by pressing or otherwise actuating ENTER button 22, when INSTALLER SETTINGS is highlighted. FIG. 41 is presented to warn a user that installer settings must be set by a qualified user. A user may then press ENTER button 22, to advance to installer settings. A user may be presented with a plurality of displayed INSTALLER SETTINGS for selection, may scroll among the displayed INSTALLER SETTINGS to scroll to a list of reminder alternatives presented in display area 30 (FIG. 42). A user may then select CUSTOM REMINDER by pressing or otherwise actuating ENTER button 22, when CUSTOM REMINDER is displayed in display area 30 (FIG. 42).

[0126] Thereafter, a user may press EDIT button 22, and press UP arrow 20, or DOWN arrow 20, to scroll through alphanumeric characters displayed (FIGS. 43, 44). When a desired alphanumeric character is displayed in display area 30, a user may press or otherwise activate NEXT button 22, to select a subsequent character. BACK button 22, may be employed to return to a previously selected character if desired (FIG. 43). When the desired annotation has been selected for CUSTOM REMINDER, a user may press or otherwise activate SAVE button 22, to save the Custom Reminder for display.

[0127] Installing HVAC contractors, dealers or other installing personnel typically offer users such as homeowners various routine services such as, by way of example and not by way of limitation, duct cleaning, cleaning outside portions of HVAC units, system checkups and similar services. Prior art HVAC system control displays do not provide users with reminders of such services other than the installer or dealer calling the user when the scheduled service is due or sending a reminder post card. Display 10 permits programming reminders so that a contractor, installer or dealer can add a custom reminder that is specific to the service offered. Once set up, display 10 may display the reminder message in a manner similar to other reminders, such as a reminder to check filters.

[0128] FIG. 45 is a first view of the display illustrating programming steps associated with hiding display of menu items not relevant to a user’s extant system. FIG. 46 is a second view of the display illustrating programming steps associated with hiding display of menu items not relevant to a user’s extant system. FIG. 47 is a third view of the display illustrating programming steps associated with hiding display of menu items not relevant to a user’s extant system. FIG. 48 is a fourth view of the display illustrating programming steps associated with hiding display of menu items not relevant to a user’s extant system. FIG. 49 is a fifth view of the display illustrating programming steps associated with hiding display of menu items not relevant to a user’s extant system. FIG. 50 is a sixth view of the display illustrating programming steps associated with hiding display of menu items not relevant to a user’s extant system. Regarding FIGS. 45-50 together, a user may touch display 10 generally anywhere to activate the backlight and render display 10 easy to read (FIG. 45).

[0129] In programming to hide display of selected menu items in a system using display 10, a user places display 10 in an OPTION configuration substantially as described above in connection with FIGS. 5-7. In the OPTIONS configuration display 10 may appear substantially as presented in FIG. 46. To hide display of a selected menu item, a user may press UP arrow 20, or DOWN arrow 20, to scroll through a list of adjustable settings presented in display area 30. Adjustable settings are highlighted or otherwise differentiated from other adjustable settings as each becomes available for selection. A user may select INSTALLER SETTINGS by pressing or otherwise actuating ENTER button 22, when INSTALLER SETTINGS is highlighted. FIG. 41 may be presented at this juncture to warn a user that installer settings must be set by a qualified user. A user may then press ENTER button 22, to advance to installer settings. A user may then press UP arrow 20, or DOWN arrow 20, to scroll through a list of INSTALLER SETTINGS presented in display area 30 (FIG. 46). A user may then select SYSTEM SETUP by pressing or otherwise actuating ENTER button 22, when SYSTEM SETUP is displayed in display area 30 (FIG. 46). A user may then press UP arrow 20, or DOWN arrow 20, to scroll through a list of SYSTEM SETUP choices presented in display area 30 (FIG. 47). A user may then select NON HEAT PUMP by pressing or otherwise actuating SAVE button 22, when NON HEAT PUMP is displayed in display area 30 (FIG. 47).
A user may then press UP arrow 20, or DOWN arrow 20, to scroll through a list of NON HEAT PUMP choices presented in display area 30 (FIG. 47). A user may then select ELECTRIC (indicating an electric system is controlled by a thermostat employing display 10 rather than a gas system) by pressing or otherwise actuating ENTER button 22, when ELECTRIC is displayed in display area 30 (FIG. 47).

After indicating that the system is an ELECTRIC system, a user may be again be presented with a list of SYSTEM SETUP choices presented in display area 30. A user may scroll among the displayed settings using UP arrow 20, or DOWN arrow 20, and may then select COMPRESSOR STAGES by pressing or otherwise actuating ENTER button 22, when COMPRESSOR STAGES is displayed in display area 30 (FIG. 48). A user may then press UP arrow 20, or DOWN arrow 20, to scroll through a list of COMPRESSOR STAGES choices presented in display area 30. A user may then select “1” (indicating that the system controlled by a thermostat employing display 10 has a single compressor stage) by pressing or otherwise actuating SAVE button 22, when “1” is displayed in display area 30 (FIG. 48).

A message INDOOR HEAT STAGES may thereafter be displayed in display area 30 (FIG. 49), and a user may then press UP arrow 20, or DOWN arrow 20, to scroll through a list of INDOOR HEAT STAGES choices presented in display area 30. A user may then select “1” (indicating that the system controlled by a thermostat employing display 10 has a single indoor heat stage) by pressing or otherwise actuating SAVE button 22, when “1” is displayed in display area 30 (FIG. 49). A user may then depress BACK button 22, followed by UP arrow 20, or DOWN arrow 20, to scroll through a list of selections until STG 1 DIFF appears in display area 30 (FIG. 50) and is selected by pressing or otherwise actuating ENTER button 22.

This exemplary set of selections (FIGS. 45-50) would be appropriate, by way of example and not by way of limitation, when a system controlled by a thermostat employing display 10 is a non heat pump system providing electric heat and having a one-stage compressor and one stage of indoor heat. In such an exemplary system, menu items such as, by way of example and not by way of limitation, STG 2 DIFF and STG 3 DIFF would be hidden and not displayed to a user.

Prior art HVAC system controllers typically present all menu items regardless of whether the physical equipment is connected or otherwise installed or included with the system being controlled. This display of menu items with which a user may be unfamiliar (because the user may have no need to deal with the menu item) may be confusing and worrisome to a user. The—whether a dealer or a homeowner—may be led to mistakenly believe that there is a need to set a control parameter for something that does not exist in the system at hand.

Providing a capability to hide menu items not associated with a system at hand, as described in connection with FIGS. 45-50, removes irrelevant distractions not associated with equipment installed. By way of example and not by way of limitation, if a dealer configures a system for a single stage furnace no options will be displayed that pertain to second stage settings. By way of further example and not by way of limitation, if a system has not been configured with a humidifier, then no humidification settings will be displayed.

FIG. 51 is a flow chart illustrating the method of the present invention. In FIG. 51, a method 100 for entering input to an environmental control system begins at a START locus 102. Method 100 continues with providing a display area, as indicated by a block 104.

Method 100 continues with, in no particular order: (1) presenting a plurality of first loci in the display area, as indicated by a block 106; (2) presenting a plurality of second loci in the display area, as indicated by a block 108; and (3) presenting at least one third locus in the display area, as indicated by a block 110.

Method 100 continues with, in no particular order: (1) configuring each respective first locus of the plurality of first loci for being responsive to pressure for effecting a respective input, as indicated by a block 112; (2) configuring each respective second locus of the plurality of second loci presenting information using a fixed segment data format, as indicated by a block 114; and (3) configuring at least one third locus of the at least one third locus presenting information using a dot matrix data format, as indicated by a block 116. Method 100 terminates at an END locus 118.

Display 10 avoids requiring a user to navigate to system settings by entering a configuration mode, selecting a configuration or other code to configure and then entering or selecting a configuration parameter. Display 10 also avoids requiring a user having to “drill down” through layers of menus by pressing a “next” or “back” button to enter a configuration mode, select a configuration or other code to configure and enter or select a configuration parameter, as is required when operating prior art HVAC control devices. In contrast, display 10 permits a user to scroll through a list of menu items until a desired programmable item is displayed. Thereafter, a user can enter parameters desired for effecting programming of the desired item in real text without having to deal with configuration codes, a user's manual or similar complications.

It is to be understood that, while the detailed drawings and specific examples given describe preferred embodiments of the invention, they are for the purpose of illustration only, that the apparatus and method of the invention are not limited to the precise details and conditions disclosed and that various changes may be made therein without departing from the spirit of the invention which is defined by the following claims:

1 claim:
1. A display apparatus for a control unit in an environmental control system; the display apparatus comprising: a display area presenting a plurality of first loci, a plurality of second loci and at least one third locus; each respective first locus of said plurality of first loci being responsive to pressure for effecting a respective response; each respective second locus of said plurality of second loci presenting information using a fixed segment data format; at least one third locus of said at least one third locus presenting information using a dot matrix data format.
2. A display apparatus for a control unit in an environmental control system as recited in claim 1 wherein at least one said respective first locus overlaps with at least one said respective second locus.
3. A display apparatus for a control unit in an environmental control system as recited in claim 1 wherein at least one said respective first locus overlaps with at least one said respective second locus.
4. A display apparatus for a control unit in an environmental control system as recited in claim 2 wherein at least one said respective first locus overlaps with at least one said respective third locus.

5. A display apparatus for a control unit in an environmental control system as recited in claim 2 wherein each said respective first locus is substantially aligned with a respective said second locus.

6. A display apparatus for a control unit in an environmental control system as recited in claim 2 wherein each said respective first locus is substantially aligned with a respective said second locus.

7. A display apparatus for a control unit in an environmental control system as recited in claim 4 wherein each said respective first locus is substantially aligned with a respective said second locus.

8. A display apparatus for a control unit in an environmental control system as recited in claim 1 wherein said display area is configured for selectively populating said respective second loci with display information.

9. A display apparatus for a control unit in an environmental control system as recited in claim 1 wherein said display area is configured for selectively populating said respective second loci with display information.

10. A display apparatus for a control unit in an environmental control system as recited in claim 8 wherein said display area is configured for selectively populating said respective third loci with display information.

11. A touchscreen input apparatus for an environmental control system as recited in claim 1 wherein said display area is configured for selectively populating said respective third loci with display information.

12. A touchscreen input apparatus for an environmental control system as recited in claim 11 wherein at least one respective touch-sensitive input locus of said plurality of touch-sensitive input loci overlaps with at least one respective first display locus of said at least one first display locus.

13. A touchscreen input apparatus for an environmental control system as recited in claim 12 wherein at least one respective touch-sensitive input locus of said plurality of touch-sensitive input loci overlaps with at least one respective second display locus of said at least one second display locus.

14. A touchscreen input apparatus for an environmental control system as recited in claim 11 wherein each said respective touch-sensitive input locus is substantially aligned with a respective said first display locus.

15. A touchscreen input apparatus for an environmental control system as recited in claim 12 wherein each said respective touch-sensitive input locus is substantially aligned with a respective said first display locus.

16. A touchscreen input apparatus for an environmental control system as recited in claim 11 wherein said display area is configured for selectively populating at least one selected first display locus of said at least one first display locus with display information.

17. A touchscreen input apparatus for an environmental control system as recited in claim 11 wherein said display area is configured for selectively populating at least one selected second display locus of said at least one second display locus with display information.

18. A touchscreen input apparatus for an environmental control system as recited in claim 16 wherein said display area is configured for selectively populating at least one selected second display locus of said at least one second display locus with display information.

19. A method for entering input to an environmental control system; the method comprising:
   (a) providing a display area;
   (b) in no particular order:
      (1) presenting a plurality of first loci in said display area;
      (2) presenting a plurality of second loci in said display area; and
      (3) presenting at least one third locus in said display area; and
   (c) in no particular order:
      (1) configuring each respective first locus of said plurality of first loci for being responsive to pressure for effecting a respective said input;
      (2) configuring each respective second locus of said plurality of second loci for being responsive to pressure for effecting a respective said input;
      (3) configuring at least one third locus of said at least one third locus for being responsive to pressure for effecting a respective said input.

20. A method for entering input to an environmental control system as recited in claim 19 wherein said display area is configured for selectively populating said respective second loci with display information, and wherein said display area is configured for selectively populating said respective third loci with display information.