

Air Distribution Fan and Outside Air Damper Recycling Control (DIV)

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Rudd

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(45) **Date of Patent:** ***Aug. 13, 2002**

(54) **AIR DISTRIBUTION FAN AND OUTSIDE AIR DAMPER RECYCLING CONTROL**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

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(51) **Int. Cl.**⁷ **B64D 13/04**; F24F 11/04

(52) **U.S. Cl.** **165/223**; 62/231; 165/244; 236/49.3

(58) **Field of Search** 62/231, 176.6; 236/49.3, 44 C; 165/223, 244, 270; 454/233, 256

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Primary Examiner—William Wayner

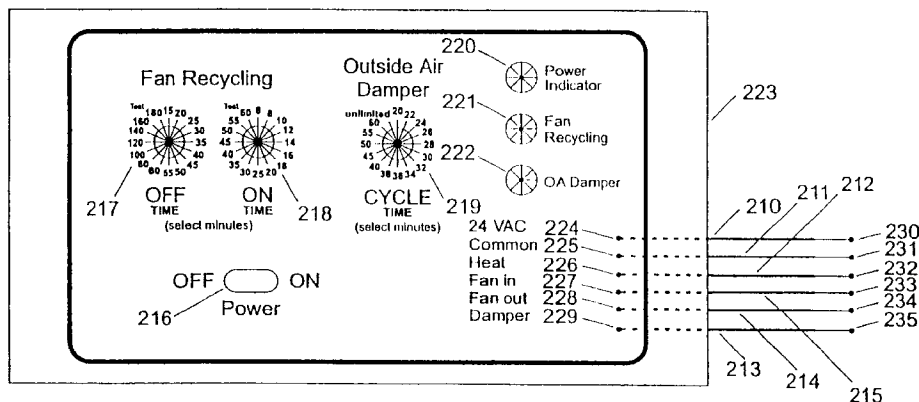
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(57) **ABSTRACT**

A system for controlling the operation of an air distribution fan and the operation of a motorized outside air damper of an air conditioning system, having heating and/or cooling and/or humidifying and/or dehumidifying operating modes. The system includes a fan recycling control for periodically energizing and de-energizing an air distribution fan in an air conditioning system in order to operate the air distribution fan for a first selectable time period after a second selectable time period from the end of the last operation of the air distribution fan. The last operation of the air distribution fan could have been due to the heating or cooling or humidifying or dehumidifying or constant fan modes of the air conditioning system, or due to fan operation initiated by the fan recycling system, or due to fan operation initiated by the fan recycling control. The system includes an outside air damper recycling control that can open a motorized outside air damper, for the purpose of drawing in ventilation air, each time the air distribution fan operates, and for as long as the air distribution fan continued to operate, can cycle, periodically close then open, the outside air damper based on selectable time periods since it was last opened or closed, respectively. The outside air damper recycling control can de-energize the motorized outside air damper at the end of each operation of the air distribution fan.

9 Claims, 5 Drawing Sheets

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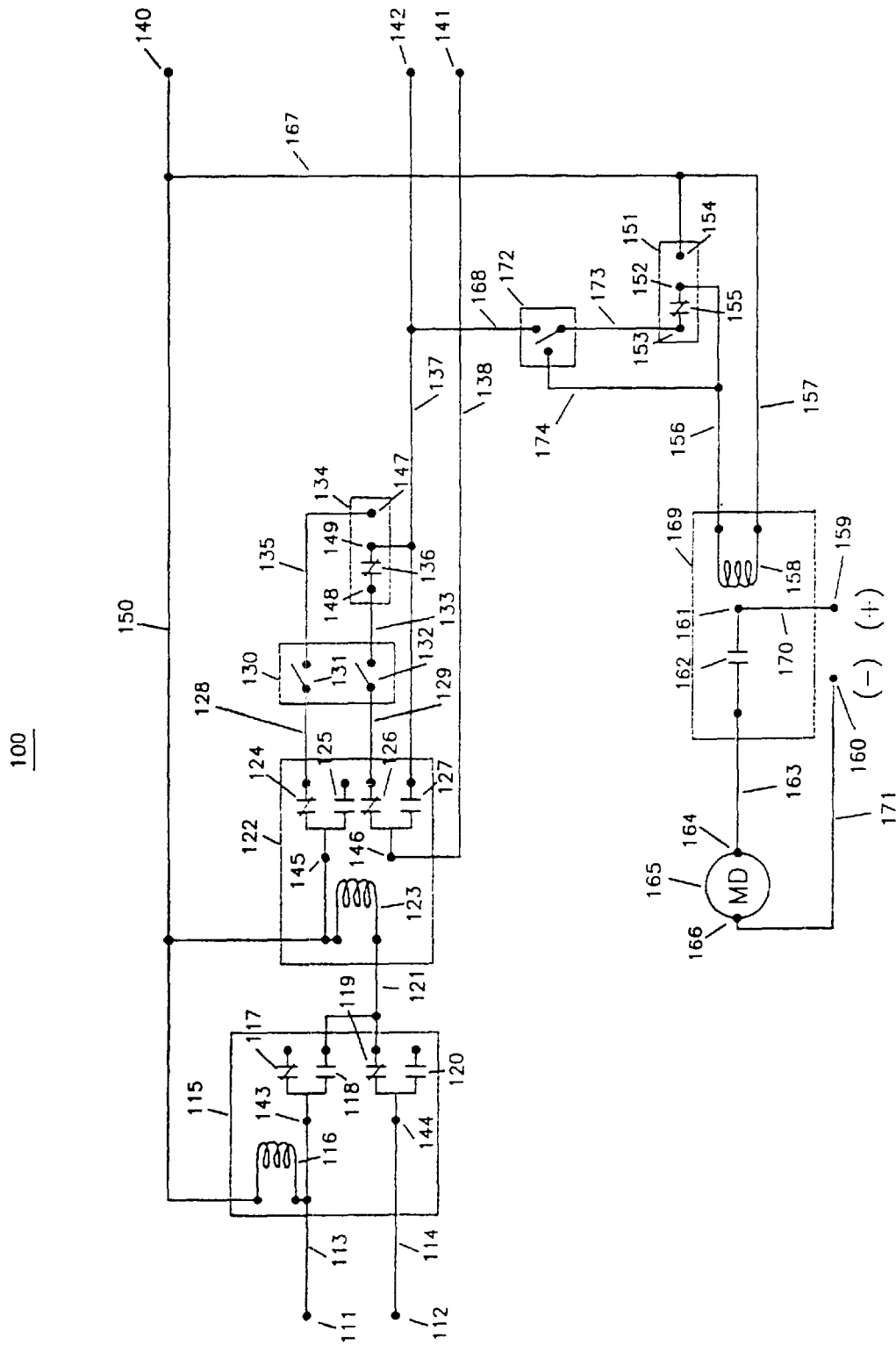


FIG. 1

200

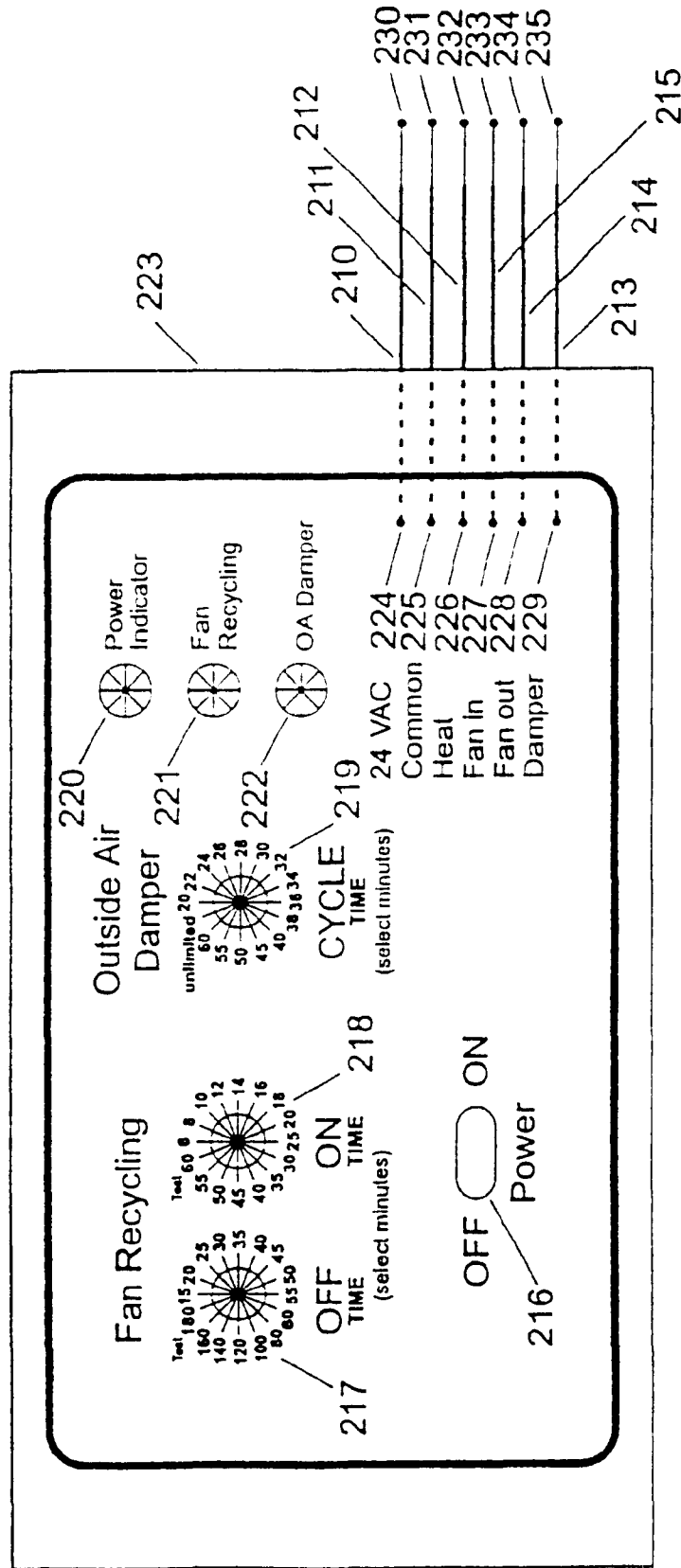


Fig. 2

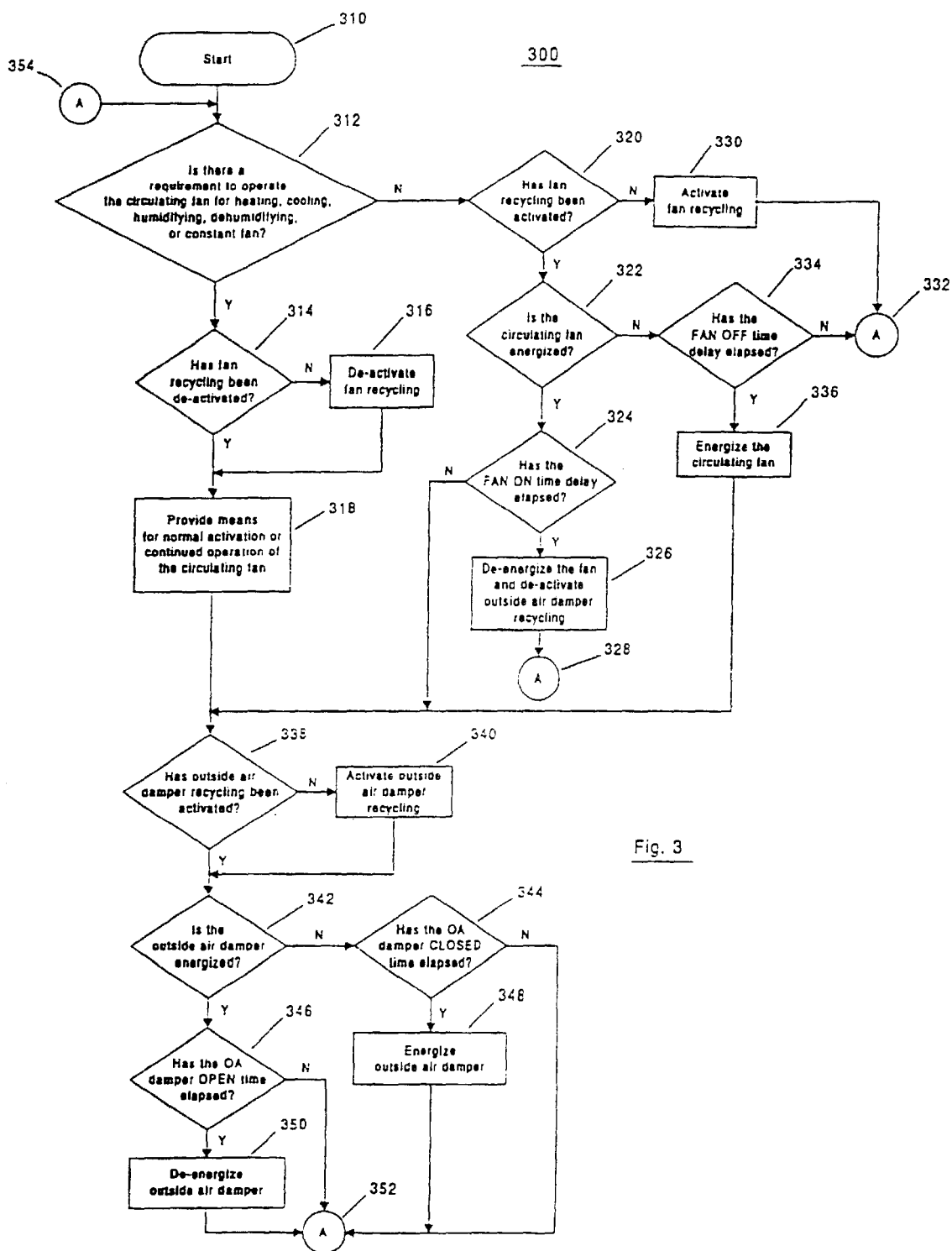


Fig. 3

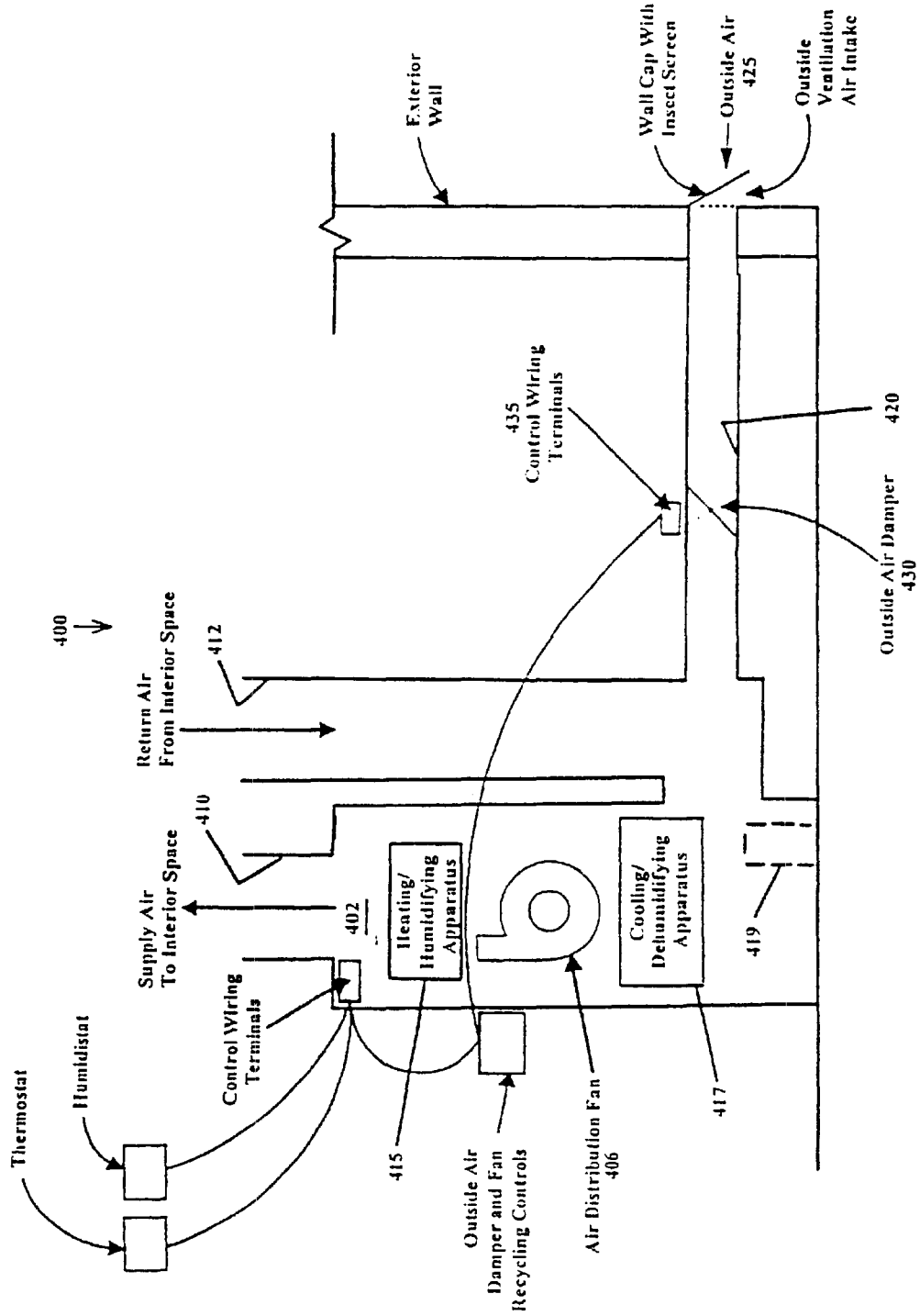


Fig. 4

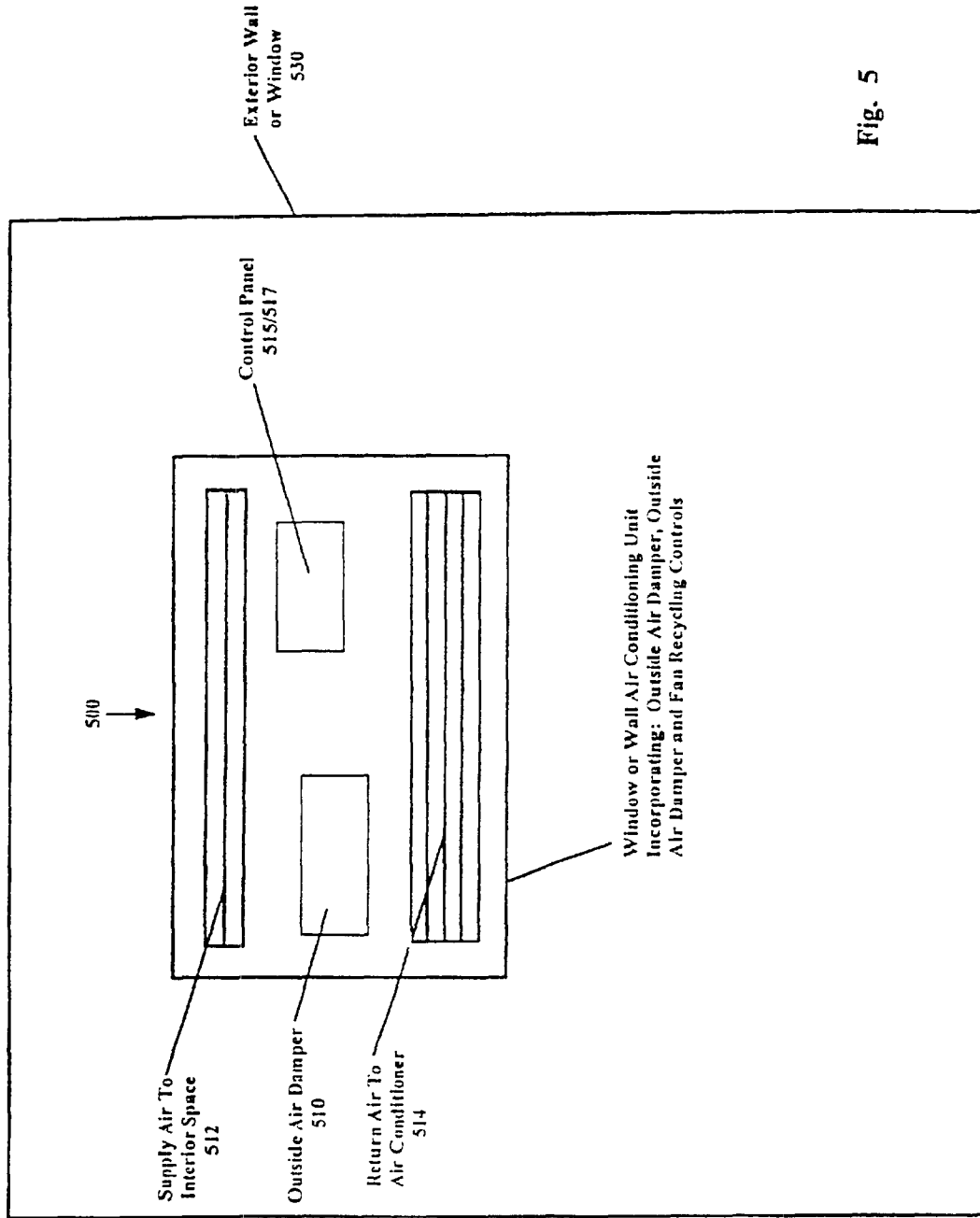


Fig. 5

AIR DISTRIBUTION FAN AND OUTSIDE AIR DAMPER RECYCLING CONTROL

This is a Divisional of application Ser. No. 08/912,664 filed Aug. 18, 1997 and now U.S. Pat. No. 5,881,806 issued on Mar. 16, 1999.

This invention relates to distributing outside ventilation air in an interior space or mixing air in an interior space, and in particular to a control that operates the air distribution fan of an air conditioning system dependent on the last operation of the fan, and operates an outside air damper in an outside air duct of an air conditioning system dependent on the operating time of the air distribution fan. This application is related to U.S. patent application Ser. No. 08/369,180 filed on Jan. 5, 1995 and now issued as U.S. Pat. No. 5,547,017, now REEXAMINATION CERTIFICATE U.S. Pat. No. B1 5,547,017 with Certificate Issued Nov. 28, 2000 which is incorporated as reference.

BACKGROUND AND PRIOR ART

Air conditioning systems for residential buildings, having heating and/or cooling and/or humidifying and/or dehumidifying and/or air-cleaning modes, for conditioning air, normally operate the system air distribution fan only when the air conditioning system is operating to condition air. Alternatively, the air distribution fan of an air conditioning system can be operated constantly. However, such a constant running of the fan would constitute a waste of energy and power, and could cause moisture related problems in warm, humid climates.

In air conditioning systems, a heating and/or cooling and/or humidifying and/or dehumidifying and/or air-cleaning apparatus produces conditioned air. Normally, the conditioned air is distributed by a fan or blower through various ducts throughout an interior space in order to place the conditioned air at desirable locations. Generally, thermostats or humidistats are used to activate the conditioning apparatus. For example, when the air temperature within an interior space drops below a selected level, an air temperature sensor and switch in a thermostat can activate a heating apparatus and an air distribution fan. Likewise, when the air temperature within an interior space rises above a selected level, an air temperature sensor and switch in a thermostat can activate a cooling apparatus and an air distribution fan. Likewise, when the air humidity within an interior space drops below a selected level, an air humidity sensor and switch in a humidistat can activate a humidifying apparatus and an air distribution fan. Likewise, when the air humidity within an interior space rises above a selected level, an air humidity sensor and switch in a humidistat can activate a dehumidifying apparatus and an air distribution fan. The conditioning apparatus and air distribution fan are deactivated when the interior space temperature or humidity reaches the selected level. In some air conditioning systems, while in the heating mode, the air distribution fan may continue to run after the heating apparatus has been deactivated, usually until residual heat in the heating apparatus has been removed by the circulating air. Likewise, in some air conditioning systems, while in the cooling mode, the air distribution fan may continue to run after the cooling apparatus has been deactivated, usually for a preset delay time to continue to distribute cool air while the cooling apparatus is still cold. In warm, humid climates, this running of the air distribution fan immediately after the cooling/dehumidifying apparatus has been deactivated is counter-productive, in that, moisture on the wet cooling/dehumidifying apparatus is returned to the interior space by

the circulating air. However, no known control systems exist having means to periodically operate the air distribution fan for a first selectable time period after a second selectable time period from the end of the last operation of the air distribution fan, that is, operate the fan dependent on the last operation of the fan.

Prior art related to the air distribution fan recycling control portion of the present invention is cited but was not found to overcome the problems cited above. See for example, U.S. Pat. Nos. 2,882,383 to Boyd Jr. et al.; U.S. Pat. No. 3,454,078 to Elwart; U.S. Pat. No. 4,167,966 to Freeman; U.S. Pat. No. 4,267,967 to Beck et al.; U.S. Pat. No. 4,452,391 to Chow; U.S. Pat. No. 4,718,021 to Timblin; U.S. Pat. No. 4,773,587 to Lipman; U.S. Pat. No. 5,131,236 to Wruck et al.; U.S. Pat. No. 5,179,524 to Parker et al.; U.S. Pat. No. 5,325,286 to Weng et al.; and Japanese Patents 0095538 and 0008544. U.S. Pat. No. 4,838,482 to Vogelzang describes an air conditioning system with periodic fan operation. However, this device is limited to periodic cyclings of the air distribution fan during periods when the activation of a heating or cooling apparatus has been locked out. Vogelzang '482 describes a fan cycle mode, selected on a thermostat, that energizes a switch that turns the fan on and off a "predetermined number of times each hour" such as "6" times per hour. When this fan cycle mode is selected, the heating or cooling modes cannot be activated, since the operation of the heating and cooling apparatus require non-cycling, constant, operation of the air distribution fan. If operation of the heating or cooling apparatus is desired, the fan cycling mode must be manually de-selected. The Vogelzang '48 fan cycling system is not dependent upon the last operation of the fan nor dependent on the last operation of the heating or cooling apparatus. In fact, Vogelzang '482 specifically, claims that the fan cycling is "independent" of the operation of the heating or cooling apparatus. Whereas, prior U.S. Pat. No. 5,547,017 to Rudd, the same inventor of the subject invention, requires recycling of the air conditioning system air distribution fan "where the periodic ON/OFF control of the fan is dependent on the time since the last fan operation." A signal from the thermostat to operate the heating or cooling or constant fan modes will automatically interrupt the fan recycling. Rudd '017 can determine the selectable time delay based on the volume dimensions of the rooms and/or the number of occupants.

In air conditioning systems, an outside air duct connecting between the outside of an interior space and the return air side of an air distribution fan, for the purpose of drawing in ventilation air, is known. Often, motorized dampers are placed in the outside air duct to limit outside air entry to times when the air distribution fan is operating. Motorized outside air dampers are known and exist commercially. It is known to energize an outside air damper upon energizing an air distribution fan, and it is known to de-energize a damper upon de-energizing an air distribution fan. However, no known control systems exist to first open an outside air damper upon energizing an air distribution fan, then for as long as the fan continues to operate, to periodically close and open the outside air damper based on selectable time periods since the outside air damper was last opened or closed, respectively, then to close the outside air damper at the end of each operation of the air distribution fan. In this way, the subject invention would control the outside air damper position dependent on the operating time of the air distribution fan, and allow a limit to be placed on the amount of outside air to be drawn in when the air distribution fan is operating.

Standards enacted in 1989 by the American Society of Heating, Refrigeration and Air Conditioning Engineers

(ASHRAE) such as the ASHRAE 62-89 Standard now require 15 cubic feet per minute of outside air per person in residential dwellings, which can result in approximately 0.35 air changes per hour. The ASHRAE 62-89 Standard further includes a recommendation to limit the concentration of carbon dioxide to 1000 parts per million to control indoor air quality due to respiration.

The Manufactured Home Construction and Safety Standards set forth by the U.S. Department of Housing and Urban Development (HUD) has enacted standards for manufactured homes that require fresh air ventilation systems. These ventilation systems must distribute outdoor air throughout the conditioned living space. Some ventilation systems require the installation of supply ducts separate from those of the air conditioning system, to distribute ventilation air. The separate ventilation supply ducts are potentially an unnecessary additional expense.

SUMMARY OF THE INVENTION

The first objective of the present invention is a fan recycling control system for using the existing air distribution fan and ducts of an air conditioning system, having heating and/or cooling and/or humidifying and/or dehumidifying operating modes, for the periodic distributing of ventilation air and mixing of air throughout the interior air space served by the air conditioning system while the air distribution fan is not operating due to lack of a positive signal from the thermostat or humidistat for heating or cooling or humidifying or dehumidifying or constant fan modes.

The fan recycling control provides a means for operating the air distribution fan for a first selectable time period after a second selectable time period from the end of the last operation of the air distribution fan, where the last operation of the air distribution fan could have been due to a positive signal from the thermostat or humidistat for heating or cooling or humidifying or dehumidifying or constant fan modes of the air conditioning system, or due to fan operation initiated by the fan recycling control. The present invention includes an outside air damper recycling control having a means to open a motorized outside air damper, for the purpose of drawing in ventilation air, each time the air distribution fan operates, and for as long as the air distribution fan continues to operate, having a means to cycle, periodically close then open, the outside air damper based on selectable time periods since it was last opened or closed, respectively, and having a means to cause the motorized outside air damper to close at the end of each operation of the air distribution fan.

The fan recycling control and outside air damper recycling control can be effective on many different types of air conditioning systems. For example, the invention can be equally applied to a cooling only air conditioning system for cooling and dehumidifying, a cooling air conditioning system with electric heat for cooling and dehumidifying and heating, a heat pump air conditioning system for cooling and dehumidifying and heating, a gas or oil furnace system with or without a humidifier for heating and humidifying, and any combination of these systems.

Further objects and advantages of the present invention will be apparent from the following detailed description of a presently preferred embodiment which is illustrated in the accompanying drawings.

BRIEF DESCRIPTION OF THE FIGURES

FIG. 1 is a first preferred embodiment of a schematic of the subject invention showing a stand-alone unit with electro-mechanical relays with solid-state recycling timer units.

FIG. 2 is a second preferred embodiment showing the external face of a stand-alone unit incorporating the subject invention.

FIG. 3 is a third embodiment algorithm incorporating the fan recycling control and outside air damper recycling control functions of FIGS. 1-2 for use with a microprocessor based thermostat.

FIG. 4 is an exterior view of an air conditioning system with recycling controls for the fan and the damper along with an outside air damper.

FIG. 5 is a external view of a window/wall air conditioning unit incorporating the novel recycling controls for a fan and outside air damper.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Before explaining the disclosed embodiment of the present invention in detail it is to be understood that the invention is not limited in its application to the details of the particular arrangement shown since the invention is capable of other embodiments. Also, the terminology used herein is for the purpose of description and not of limitation. This invention incorporates by reference U.S. Pat. No. 5,547,017 to Rudd, the same inventor of the subject invention.

First Embodiment

FIG. 1 is a first preferred embodiment of the present invention 100 showing a stand-alone control until first-put-to-practice embodiment, based on electro-mechanical relays with solid-state recycling timer units. The components of FIG. 1 will now be described.

Referring to FIG. 1, component 111 is the fan control terminal of the thermostat or humidistat. Component 112 is the heat control terminal of the thermostat. Component 113 is the wire connecting terminal 111 to the power input side of the 24 Vac relay coil 116 and pole 1, 143, of the double-pole double-throw (DPDT) relay 115. Component 114 is the wire connecting terminal 112 to pole 2, 144, of the DPDT relay 115. Component 121 is the wire connecting the normally open (NO) contact 118, of pole 1, 143, and the normally closed contact (LNC) 119, of pole 2, 144, to the power input side of the 24 Vac relay coil 123, of the DPDT relay 122, NO contact 118, and NC contact 120, of DPDT relay 115, are not used. Component 128 is the wire connecting NC contact, 124, of pole 1, 145, to switch 131, of double-pole single-throw (DPST) switch 130. Component 129 is the wire connecting NC contact 126, of pole 2, 146, to switch 132, of DPST switch 130, NO contact 118, and NC contact 120, of DPDT relay 122, are not used. Component 113 is the wire connecting switch 132, to the power input terminal 148, of the solid-state recycling timer 134. Component 135 is a wire connecting switch 130 to the common input terminal 147, of solid-state recycling timer 134. Component 136 is a switch in the solid-state recycling timer 134, between the power input terminal 148, and the switched output terminal 149. Component 137 is a wire connecting switched output terminal 149, and NO contact 127, to the fan relay terminal 142, of the air conditioning system air distribution fan. Component 138 is a wire connecting pole 2, 146, of DPDT relay 122, to the 24 Vac power terminal 141, of the air conditioning system power supply. Component 150 is a wire connecting the common side of 24 Vac relay coils, 116 and 123, to the common terminal 140, of the 24 Vac power supply of the air conditioning system. Component 167 is a wire connecting common terminal 140, to the common input terminal 154, of the solid-state recycling

timer **151**. Component **168** is a wire connecting fan relay terminal **142**, to the single pole double throw switch (SPDT), **172**. Component **174** is a wire connecting the SPDT switch **172** to the power input side of the 24 Vac relay coil **158**. Component **173** is a wire connecting the SPDT switch **172**, to the power input terminal **153** of the recycling timer **151**. Component **155** is a switch in the solid-state recycling timer **151** between the power input terminal **153**, and the switched output terminal **152**. Component **156** is a wire connecting switched output terminal **152**, and the power input side of the 24 Vac relay coil **158**, of the single-pole single-throw (SPST) relay **169**. Component **157** is a wire connecting the common terminal **140**, to the common input side of the 24 Vac relay coil **158**. Component **170** is a wire connecting the power terminal **159**, of the 24 Vac or nominal 110 Vac power supply for the motorized damper **165**, to the pole **161**, of the SPST relay **169**. Component **163** is a wire connecting the NO contact **162**, to the power input terminal of the motorized damper **165**. Component **171** is a wire connecting the common terminal **160**, of the 24 Vac or nominal 110 Vac power supply, to the common input terminal **166**, of the motorized damper **165**.

The operation of the components of FIG. 1 will now be described. Referring to FIG. 1, the present invention is wired in series between the thermostat or humidistat fan control terminal **111** and the fan relay terminal **142**, of the air conditioning system air distribution fan, and the present invention is wired in parallel with the thermostat heat control terminal **112**. When the fan control terminal **111**, is energized, the 24 Vac relay coil **116**, closes normally open (NO) contact **118**, and opens normally closed (NC) contact **119**, which energizes the 24 Vac relay coil. **123** and blocks current flow back to the thermostat heat control terminal **112**. When the thermostat heat control terminal **112**, is energized, the 24 Vac relay coil **116**, remains de-energized and the 24 Vac relay coil **123**, is energized through NC contact **119**, while NO contact, **118** blocks current flow back to the fan control terminal **111**. When either the fan control terminal **111**, or the thermostat heat control terminal **112**, are energized, the line **121** is energized, and the 24 Vac relay coil **123**, is energized, which closes NO contact **127**, which energizes the fan relay terminal **142**, of the air conditioning system air distribution fan. At the same time, NC contacts **124** and **126**, are opened which de-energizes and resets the solid-state recycling timer **134**. When both the fan control terminal **111**, and the thermostat heat control terminal **112**, are de-energized, the line **121** is de-energized, and the 24 Vac relay coil **123**, is de-energized, which opens the NO contact **127**, cutting off current flow to the fan relay terminal **142**. At the same time, NC contacts **124** and **126**, close, which energizes the solid-state recycling timer **134**. While the recycling timer **134**, is energized, the timer will continuously cycle through a preselected OFF delay, during which time the switched output terminal **149**, and fan relay terminal **142**, are de-energized, and a preselected ON delay, during which time the switched output terminal **149**, and fan relay terminal **142**, are energized. If the double-pole double throw (DPDT) switch **130**, is switched in the off position, the recycling timer **134**, will remain de-energized continuously, while fan control signals from the thermostat or humidistat, through fan control terminal **111**, will continue operate the fan relay terminal **142**, normally. When line **137** is energized, current will flow to the power input terminal **153**, of the solid-state recycling timer **151**, which will energize the recycling timer. While the recycling timer **151**, is energized, the timer will continuously cycle through a preselected ON delay, during which time the switched

output terminal **152**, and the 24 Vac relax coil **158**, are energized, and a preselected OFF delay, during which time the switched output terminal **152**, and the 24 Vac relay coil **158**, are de-energized. While the 24 Vac relay coil **158**, is energized, the NO contact **162**, of the single-pole single-throw (SPST) relay **169**, will close, energizing and opening the motorized damper **165**. While the 24 Vac relax coil **158**, is de-energized, the NO contact **162**, will open, de-energizing and closing the motorized damper **165**.

Second Embodiment

FIG. 2 is a second preferred embodiment of the present invention **200** showing a stand-alone control unit, embodiment for production manufacture, based on electronic and microprocessor design. The components of FIG. 2 will now be described.

Referring to FIG. 2 component **210** is a wire connecting from the 24 Vac power supply terminal **230**, of the air conditioning system to the 24 Vac power input terminal **224**, inside the control enclosure **223**. Component **211** is a wire connecting from the common power supply terminal **231**, of the air conditioning system to the common input terminal **225**, inside the control enclosure **223**. Component **212**, is a wire connecting from the thermostat heat control terminal **232**, of the air conditioning system to the heat input terminal **226**, inside the control enclosure **223**. Component **213**, is a wire connecting from the thermostat or humidistat fan control terminal **233**, to the fan input terminal **227**, inside the control enclosure **223**. Component **214**, is a wire connecting from the fan output terminal **228**, inside the control enclosure **223**, to the fan relay terminal **234**, of the air conditioning system air distribution fan. Component **215** is a wire connecting from the outside air damper recycling control terminal **229**, inside the control enclosure **223**, to the outside air damper power input terminal **235**. Component **220** is a light emitting diode (LED), or liquid crystal display, or other indicating means, that is energized upon power application to both the power supply input terminal **224**, and the common input terminal **225**. Component **221** is a LED, or liquid crystal display, or other indicating means, that is energized when the fan output terminal **228**, is energized by the control for recycling operation only. Component **222** is a LED, or liquid crystal display, or other indicating means, that is energized when the outside air damper recycling control terminal **229**, is energized. Component **217** can be a manually activated rotary switch or microprocessor equivalent input to allow selection of the fan recycling control OFF delay time period, whereby, this delay time period begins at the end of the last operation of the air distribution fan or the last operation of the heating apparatus of the air conditioning system. Component **218** can be a manually activated rotary switch or microprocessor equivalent input, to allow selection of the fan recycling control ON delay time period, whereby, this delay time period begins at the end of the said OFF delay time period. Component **219** can be a manually activated rotary switch or microprocessor equivalent input, to allow selection of the outside air damper cycle time period, whereby, the cycle time period refers to the time that the damper output terminal **229**, will cycle between, first energized then de-energized, and so on, for as long as the fan output terminal **228**, is energized. Component **216** is an on/off switch or microprocessor equivalent input that, when in the on position, allows the fan recycling control and the outside air damper recycling control to operate, and, when in the off position, disables the fan recycling control and the outside air damper recycling control operation. Regardless of the position of on/off switch **216**, a fan control signal at

fan input terminal **227**, from a thermostat or humidistat, always passes through to the fan output terminal **228**. Control enclosure **223**, contains a printed circuit board with circuit components including a microprocessor to receive the control inputs, execute the required control logic, and produce the control outputs.

The operation of the components of FIG. 2 will now be described. Referring to FIG. 2, the present invention is wired in series between the thermostat or humidistat fan control terminal **233**, and the fan relay terminal **234**, of the air conditioning system air distribution fan, and the present invention is wired in parallel with the thermostat heat control terminal **232**. When the fan control input terminal **227**, is energized, the fan control output terminal **228**, is energized, and the internal time clock of the microprocessor is reset. When the thermostat heat input control terminal **226**, is energized, the internal time clock of the microprocessor is reset. When the fan control input terminal **227**, is de-energized, the fan control output terminal **228**, is de-energized, and the internal time clock of the microprocessor begins to record elapsed FAN OFF time. If the elapsed FAN OFF time equals the fan recycling FAN OFF time, set by switch **217**, then the fan output control terminal **228**, is energized, and the internal time clock of the microprocessor begins to record FAN ON elapsed time. If the elapsed FAN ON time equals the fan recycling FAN ON time, set by switch **218**, then the fan output control terminal **228**, is de-energized, and the internal time clock of the microprocessor begins to record elapsed FAN OFF time, and so on, until either the fan control input terminal **227**, or the thermostat heat control input terminal **226**, is energized, at which time the fan recycling process is interrupted. When the fan output control terminal **228**, is energized, the outside air damper recycling control output terminal **229**, is energized, and the microprocessor internal time clock begins to record the outside air damper elapsed open time. If the outside air damper elapsed open time equals the outside air damper cycle time, set by switch **219**, then the outside air damper recycling control output terminal **229**, is de-energized, and the microprocessor internal time clock begins to record the outside air damper elapsed closed time. If the outside air damper elapsed closed time equals the outside air damper cycle time, set by switch **219**, then the outside air damper recycling control output terminal **229**, is energized, and the microprocessor internal time clock begins to record the outside air damper elapsed open time, and so on, until the fan control output terminal **228**, is de-energized, at which time the outdoor air damper control output terminal **229**, is de-energized.

Third Embodiment

FIG. 3 is an algorithm of steps for integrating the fan recycling control and outside air damper recycling control functions of FIG. 1 and FIG. 2 into a microprocessor based thermostat. The algorithm of FIG. 3 will now be described.

The algorithm starts at **310**. At **311** the program checks if the thermostat is calling for heating, cooling, humidifying, dehumidifying, or constant fan operation. If any of those modes are active, the program goes to **314** where it checks if fan recycling has been de-activated. If it has not, the program goes to **316** where fan recycling is de-activated, if it has, the program goes to **318** where the thermostat provides means for normal activation or continued operation of the air distribution fan. If the heating, cooling, humidifying, dehumidifying, or constant fan modes are not active, the program goes to **320** where it checks if fan recycling has been activated. If it has, the program goes to

322 where it checks if the air distribution fan is energized. If fan recycling has not been activated the program goes to **330** where fan recycling is activated, whereby fan recycling activation starts with the FAN OFF time delay, then the program loops back to **354** through **332**. If the air distribution fan is energized, the program goes to **324** where it checks if the FAN ON time delay has elapsed. If it has, the program goes to **326** where the fan is de-energized and the outside air damper recycling is de-activated, if it has not, the program goes to **338** where it checks if the outside air damper recycling has been activated. If the air distribution fan is not energized, the program goes to **334** where it checks if the FAN OFF time delay has elapsed. If it has, the program goes to **336** where it energizes the air distribution fan, if it has not, the program loops back to **354** through **332**. If outside air damper recycling has been activated, the program goes to **342** where it checks if the outside air damper is energized. If outside air damper recycling has not been activated, the program goes to **340** where it activates outside air damper recycling, whereby the outside air damper recycling starts with the damper OPEN time. If the outside air damper is energized, the program goes to **346** where it checks if the outside air damper OPEN time has elapsed. If it has, the program goes to **350** where it de-energizes the outside air damper, then loops back to **354** through **352**, if it has not, the program loops back to **354** through **352**. If the outside air damper is not energized, the program goes to **344** where it checks if the outside air damper CLOSED time has elapsed. If it has, the program goes to **348** where it energizes the outside air damper, then loops back to **354** through **352**, if it has not, the program loops back to **354** through **352**.

Although the algorithm of FIG. 3 describes a particular flow of logic, other logic paths may be used to accomplish the same function.

Fourth Embodiment

FIG. 4 is a fourth embodiment schematic of an air conditioning system **400** showing an air handling unit **402** with an air distribution fan **406**, a supply air duct **410** delivering air to the interior space, a return air duct returning air from the interior space to the air distribution fan **412**, a heating and humidifying apparatus **415**, a cooling and dehumidifying apparatus **417**, and an air cleaning apparatus **419**. Also shown in FIG. 4, is an outside air duct **420** connecting between outside to the return air side of the air distribution fan, for the purpose of draining in outside ventilation air **425**, an outside air damper **430** in the duct with control wiring **435**. Also shown in FIG. 4, is a thermostat **452**, a humidistat **454**, a fan recycling control, an outside air damper recycling control **458**, that correspond to the components and operation of the preceding figures.

Fifth Embodiment

FIG. 5 is a fifth embodiment view of the face of a window or wall air conditioning system **500** such as but not limited to a Carrier with incorporated outside air damper **510**, supply air **512**, return air **514**, fan recycling control **525**, and outside air damper control **527**, where the system is mounted over an existing window/wall opening **530**.

I claim:

1. A fan recycling control for an air conditioning apparatus including at least one of:
 - a heating apparatus, a cooling apparatus, a humidifying apparatus, a dehumidifying apparatus, and an air cleaning apparatus for providing conditioned air;
 - a fan to distribute conditioned air to an interior space;

at least one of:

a thermostat and humidstat, each of the at least one of the thermostat and the humidstat for activating and deactivating the air conditioning apparatus and the fan, and further having a selectable constant fan mode, said activating causing a continuous fan operation, said deactivating causing no fan operation;

a fan recycling control means for periodically activating and deactivating only the fan of said air conditioning system in order to operate the fan for a first time period after a second time period dependent from the end of a last operation of the fan, wherein the last operation of the fan includes at least one of: a last operation of said air conditioning system, and a last fan operation initiated by the fan recycling control.

2. The recycling control of claim 1, wherein the air conditioning system includes:

a central air conditioning system.

3. The recycling control of claim 1, wherein the air conditioning system includes at least one of:

a window unit and a wall unit.

4. A fan recycling control, comprising:

means for providing conditioned air, the air conditioner means being selected from at least one of: an air heater, an air cooler, an air humidifier, an air dehumidifier, and an air cleaner;

a fan for distributing the conditioned air;

control means for activating and deactivating the air conditioner means, and for providing a selectable constant fan mode, said activating causing a continuous fan mode, said deactivating causing no fan operation; and

a recycle control for periodically activating and deactivating only the fan after a preselected time period, since the air conditioner means has been deactivated, or the fan has been deactivated from the selectable constant fan mode.

5. A fan recycling control system, comprising:

means for providing conditioned air to an air space;

means for distributing the conditioned air in the air space;

control means for activating and deactivating the air conditioner means, and for providing a selectable constant air distribution mode, said activating causing a continuous air distribution mode, said deactivating causing no air distribution operation; and

a recycle control for periodically activating and deactivating only the air distribution means after a preselected time period, since the air conditioner means has been deactivated, or the air distribution means has been deactivated from the selectable constant air distribution mode.

6. The fan recycling control system of claim 5, wherein the providing means includes:

air conditioner.

7. The fan recycling control system of claim 5, wherein the providing means includes:

air conditioning system.

8. The fan recycling control system of claim 5, wherein the providing means includes at least one of: a window unit and a wall unit.

9. The fan recycling control system of claim 5, wherein the providing means includes at an air heater, an air cooler, an air humidifier, an air dehumidifier, and an air cleaner.

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