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Gilles

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[54] **ENERGY RECLAIMING MULTIZONE AIR PROCESSING SYSTEM**

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[52] **U.S. Cl.** **165/16;** 165/22; 236/91

[51] **Int. Cl.²** **F24F 3/00**

[58] **Field of Search** ..... 165/16, 22; 236/91 D

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[57] **ABSTRACT**

An air processing system for an enclosure having at least two temperature zones. The system includes a multizone heating, ventilating and air conditioning unit and a control mechanism which continuously monitors the energy utilized by the hot deck energy source and the enthalpy of the outdoor air drawn into the system to determine and effect the most efficient operation of the multizone unit.

10 Claims, 5 Drawing Figures

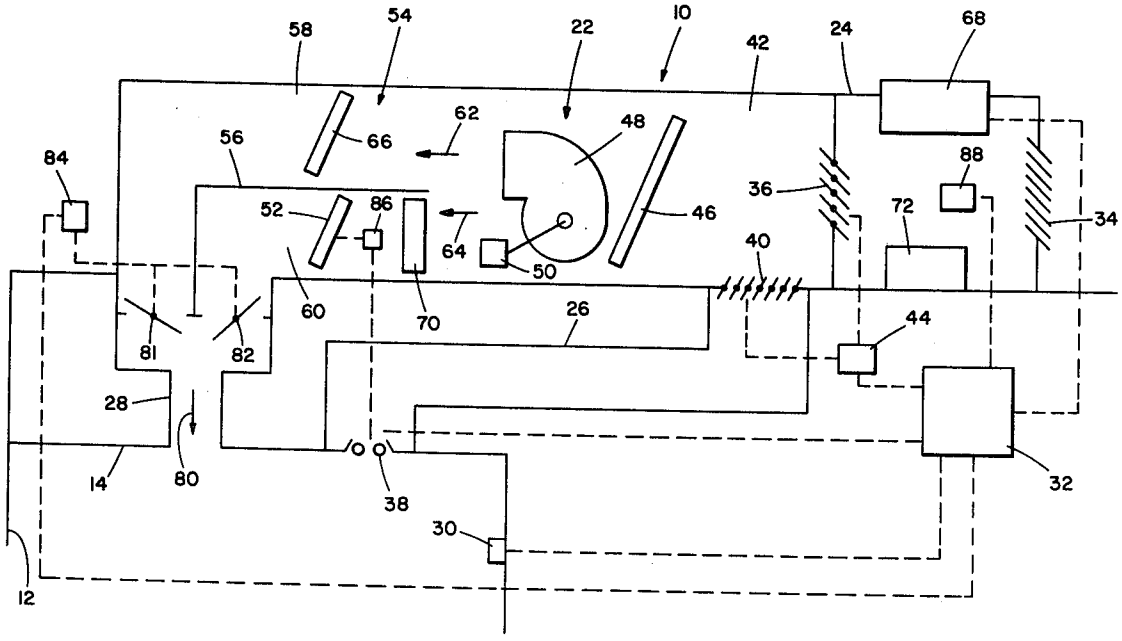
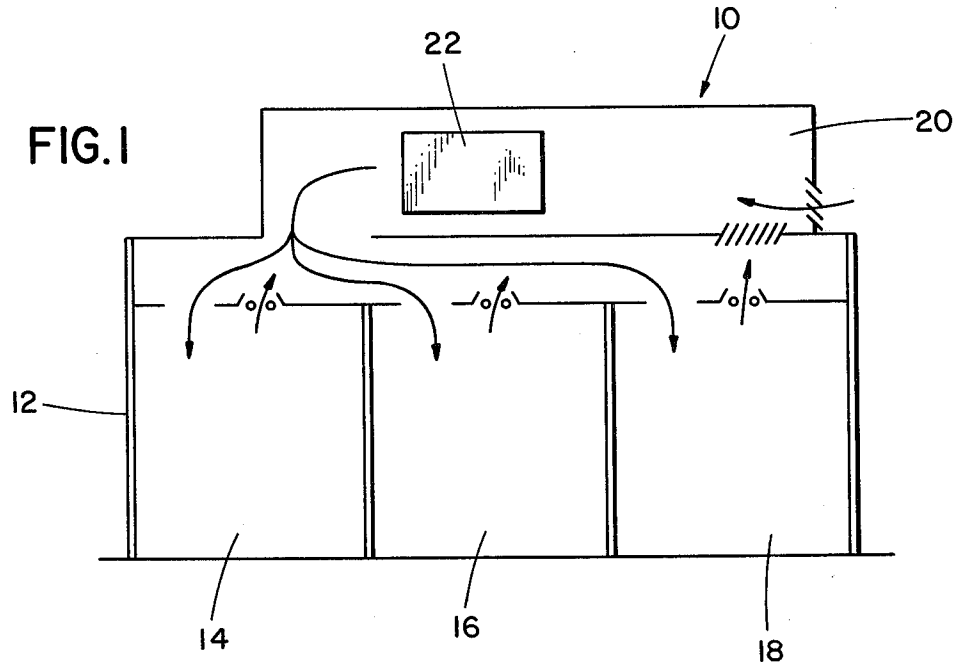


FIG. 1



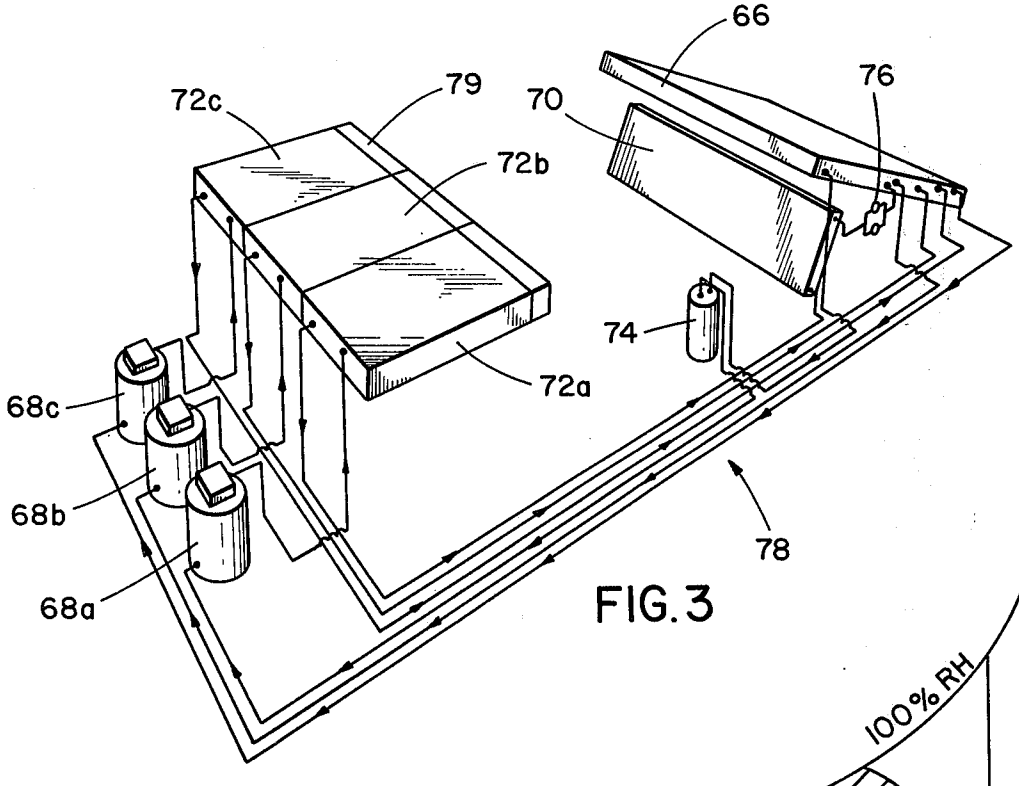


FIG. 3

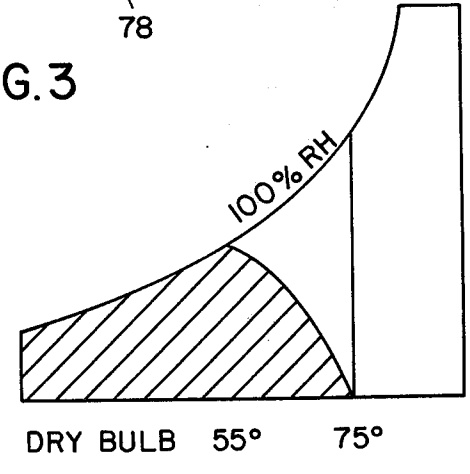


FIG. 4

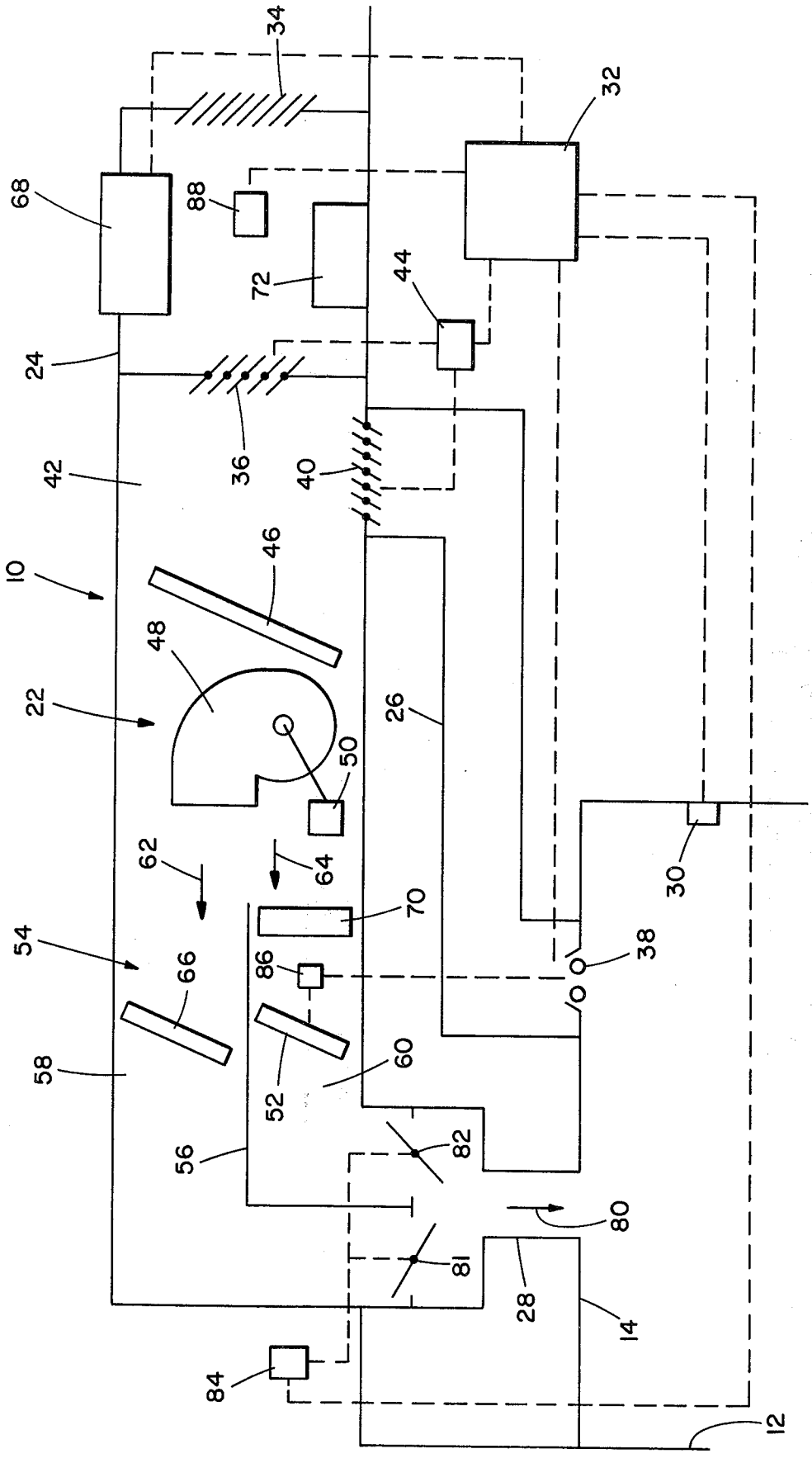

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FIG.2

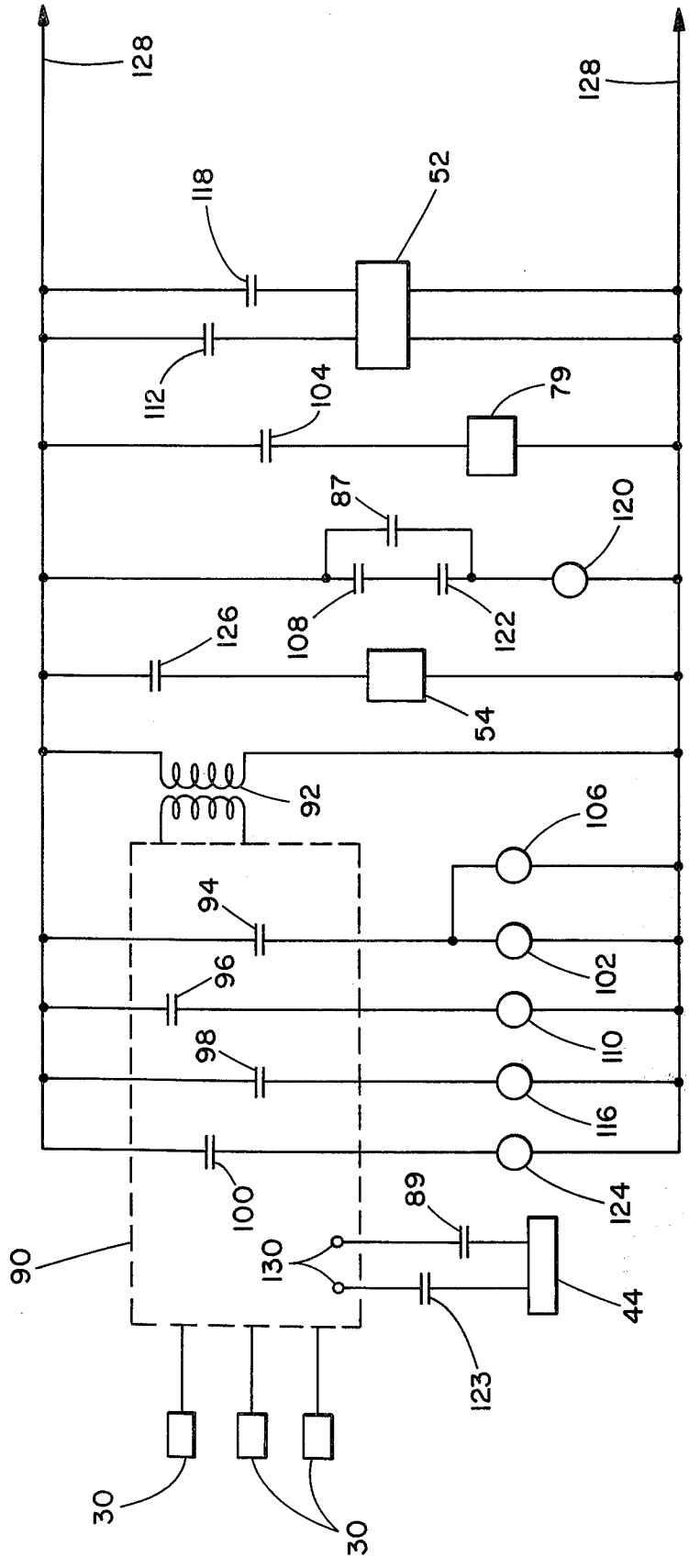

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FIG.5

ENERGY RECLAIMING MULTIZONE AIR PROCESSING SYSTEM

BACKGROUND OF THE INVENTION

The present invention relates generally to an air processing system and, more particularly, to an air processing system utilizing a multizone heating, ventilating and air conditioning unit, wherein the mode of operation of the multizone unit depends upon temperature and energy considerations.

The temperatures and thermal loads within a multizone enclosure or facility vary continuously. The factors determining the supply air temperature requirements of the various temperature zones within the enclosure include, among others, solar effect, occupancy and lighting variations, and ambient conditions, such as wind, etc.

Two basic systems have been utilized to meet these diverse heating and cooling requirements of a multizone enclosure. One utilizes multiple single zone heating and cooling units. As implied, each separate zone is served by a heating and cooling unit.

The other basic system utilizes a multizone heating, ventilating and air conditioning unit, commonly referred to as an HVAC unit. The HVAC unit has a capacity and capability to simultaneously heat and cool different zone areas within the enclosure.

Although functional, the presently known systems, both single zone and multizone, have inefficient energy utilization characteristics. That is, energy use penalties are incurred with operation of the system, as designed.

SUMMARY OF THE INVENTION

In a principal aspect, the present invention is an air processing system for an enclosure having at least two temperature zone areas. The system includes a multizone heating, ventilating and air conditioning unit having a basic energy heat source, an air cooler and appropriate duct work. The air cooler includes an evaporator and heat reclaim condenser. The basic energy heat source and reclaim condenser are situated within the hot deck of the multizone unit.

The multizone heat, ventilating and air conditioning unit also has economizer cycle capability. As used herein, the terms "economizer," "economizer cycle," and obvious modifications thereof are defined as air conditioning or cooling utilizing outdoor air to the maximum possible extent, with or without mechanical refrigeration.

The system also includes a control mechanism which continuously monitors the temperatures of the zones within the enclosure, power input to the basic energy heat source and enthalpy of the outdoor air drawn into the system. If the power input and outdoor air enthalpy are less than a predetermined power threshold and enthalpy threshold, respectively, the multizone heating, ventilating and air conditioning unit functions, in response to the control mechanism, in the economizer mode. If either condition, i.e., power and enthalpy is not met, the control mechanism activates the air cooler, whereby mechanical cooling and reclaim heating occurs in the cold and hot deck, respectively, of the multizone unit.

It is thus an object of the present invention to provide an effective and efficient air processing system for a multizone enclosure.

It is another object of the present invention to provide an air processing system utilizing a multizone heating, ventilating and air conditioning unit wherein the operation of the multizone unit and conditions within the enclosure are continuously monitored by a control mechanism to determine and effect the most efficient operational mode of the multizone unit.

These and other objects, advantages and features of the present invention will become apparent in the following detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

A preferred embodiment of the present invention will be described, in detail, with reference to the drawing wherein:

FIG. **1** is a simplified schematic diagram illustrating a preferred embodiment of the present invention;

FIG. **2** is a detailed schematic diagram of the preferred embodiment shown in FIG. **1** illustrating the structural features with reference to a single zone;

FIG. **3** is a perspective view of an air conditioner or cooler for use in the preferred embodiment shown in FIG. **1**;

FIG. **4** is a graph illustrating the temperature-dependent enthalpy threshold of an enthalphy control for use in the preferred embodiment shown in FIG. **1**; and

FIG. **5** is a schematic diagram of a control mechanism for use in the preferred embodiment shown in FIG. **1**.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A preferred embodiment of the present invention is shown simplistically and schematically in FIG. **1** as an air processing system **10**. The system **10** processes and conditions the air in an enclosure **12** having a series of thermal or temperature zones **14, 16, 18**. Although three zones **14, 16, 18** are illustrated in FIG. **1**, it is to be understood that the system **10** has the capability to serve an enclosure **12** having two or more thermal zones.

As shown, the system **10** is a roof-top system operating in a plenum, generally designated **20**. Again this is simply illustrative of a single application of the present invention.

Referring now to FIGS. **1** and **2**, the system **10** includes a heating, ventilating and air conditioning unit **22** (hereinafter referred to as the HVAC 22), outdoor air duct **24**, return air duct **26**, supply air duct **28**, thermostat **30** and control mechanism **32**. As shown, the outdoor air duct **24** and return air duct **26** deliver quantities of outdoor and indoor air, respectively, to the plenum **20** and HVAC 22. The outdoor air passes through an air inlet **34** and is regulated by an outdoor air damper **36** located within the outdoor air duct **24**. Similarly, the indoor air passes through air-passing light fixtures **38**, or other devices such as grilles, in the zones **14, 16, 18** and is regulated by an indoor air damper **40**. The outdoor and indoor air are mixed in an intake region, generally designated **42**, to produce a stream of intake air for the HVAC **22**. The dampers **36, 40** are operated and positioned by the control mechanism **32** through a motor **44**.

The outdoor air damper **36** is normally operable in a closed position or state. In this specification, the terms "closed," "closed position," and "closed state" with reference to the outdoor air damper **36** define a minimum set point, as opposed to a truly closed position.

That is, at minimum set point, the outdoor air damper **36** permits a predetermined quantity of outdoor air, e.g., 10%, to be drawn into plenum **20** for ventilation purposes.

The HVAC 22 includes, from upstream to downstream, an air filter **46**, air handler or blower **48** operated by a motor **50**, air heater **52** and air cooler or conditioner, generally designated **54**. The HVAC 22 also includes an interior partition **56** which physically defines the HVAC 22 into an upper cold deck **58** and a lower hot deck **60**. As shown, the air handler **48** operates upon the intake air drawn through the air filter **46** to produce two streams of air, designated by arrows **62, 64**. The streams **62, 64** flow within the cold deck **58** and hot deck **60**, respectively.

The air heater **52** is a source of basic heat, such as natural gas, direct element electric heat or hot water coils. In this preferred embodiment and for purposes of illustration, a two-stage direct element electric heater **52** is utilized. The air heater **52** is located within the hot deck **60** and directly communicates with the air stream **64**.

The air cooler **54** includes an evaporator **66**, compressor **68**, first or heat reclaim condenser **70** and second condenser **72**. As shown, the evaporator **66** is preferably located in the upper, cold deck **58**, while the first or heat reclaim coil **70** is within the lower, hot deck **60** of the HVAC 22. The evaporator may, however, interpose the air filter **46** and air handler **48**. The condenser **72** communicates directly with the outdoor air for maximum heat rejection at outdoor design conditions.

The air cooler **54** is shown in greater detail in FIG. **3**. As shown, the air cooler **54** includes the evaporator **66**, a series of compressors **68*a***, **68*b***, **68*c*** (shown schematically at **68** in FIG. **2**), the first or heat reclaim condenser **70**, a series of second condensers **72*a***, **72*b***, **72*c*** (shown schematically at **72** in FIG. **2**), an accumulator **74**, and an expansion valve network **76**, interconnected as illustrated, by a series of refrigerant circuit lines, generally designated **78** (not shown for clarity in FIG. **2**).

The compressor **68*a***, or lead compressor, is a two-speed capacity control type, while the remaining compressors **68*b***, **68*c*** are fixed capacity type. In operation, the compressors **68*a***, **68*b***, **68*c*** are cycled "on" and "off," "high" and "low" by the control mechanism **32** to provide the necessary refrigeration.

As shown, the expansion valve network **76** interposes the first or heat reclaim coil **70** and the evaporator **66**. Regulation of the expansion valve network **76** effectively controls the operational mode of the first or heat reclaim coil **70**. That is, if the second condenser **72** and expansion valve network **76** are operating normally, the active quantity of refrigerant in the system is such that only liquid refrigerant leaves the second condenser **72**. Therefore, any heat transfer in the first or heat reclaim condenser **70** is a minimum amount equal to the sub-cooling of the liquid refrigerant.

Conversely, to produce maximum heat in the first or heat reclaim condenser **70**, the second condenser **72** is de-activated, e.g., by rendering inoperative the condenser fan, generally designated **79** in FIG. **3**. Additionally, the expansion valve network **76** effects an accumulation of refrigerant in the accumulator **74**. The combined effect of de-activating the second condenser **72** and reducing the active amount of refrigerant in the system causes the principal condensation and resulting heat transfer to occur in the first or heat reclaim condenser **70**.

Referring again to FIG. **2**, the cold and hot decks **58, 60** of the HVAC **22** extend into the supply air duct **28**. The duct **28** directs processed supply air, shown by arrow **80**, to the zone **14** of the enclosure **12**. For the purpose of clarity, the supply duct work **28** is shown for only zone **14**. It is to be understood, however, a similar structure exists for each additional zone **16, 18**.

As shown, the supply air duct **28** includes a pair of supply air dampers **81, 82**. The dampers **81, 82**, driven coordinated by a motor **84** responsive to the control mechanism **32**, regulate and control the content and temperature of the supply air stream **80**. That is, depending upon the temperature conditions of the zone **14**, the supply air dampers **81, 82** will adjust to deliver only heated air from the hot deck **60**, only cooled air from the cold deck **58**, or a mixture thereof.

The system **10** also includes a power sensing or measuring device **86**, such as a wattmeter or current sensing relay (hereinafter referred to as power meter **86**) having associated switch contacts **87** and an enthalpy monitor or control **88** having switch contacts **89**. The switch contacts **87, 89** are shown in FIG. **5**. The power meter **86** continuously monitors the input power to the air heater **52** to determine whether the power input exceeds a predetermined power threshold. The switch contacts **87** are normally open and close whenever the input power exceeds the power threshold. The power threshold of the power meter **86**, as discussed in detail below, is substantially equal to the power input necessary to operate the air cooler **54**. If an alternative heat source **52** is utilized, as discussed above, an alternative power monitoring device **86** must also be used.

Similarly, the enthalpy control **88** continuously monitors the enthalpy of outdoor air drawn through the air inlet **34** to determine whether a predetermined, temperature-dependent enthalpy threshold is exceeded. The normally closed switch contacts **89** open whenever the enthalpy threshold is exceeded.

FIG. **4** illustrates graphically the acceptable range of outdoor air conditions, as determined by the enthalpy control **88**. That is, outdoor air having a temperature and humidity within the cross-hatched area of FIG. **4** will have an enthalpy less the temperature-dependent threshold of the enthalpy control **88**.

Referring to FIG. **5**, the control mechanism **32** includes a logic circuit, shown schematically at **90**, transformer **82**, first, second and third heating switches **94, 96, 98**, cooling switch **100**, relay **102** having normally closed contacts **104**, relay **106** having normally open contacts **108**, relay **110** having normally open contacts **112**, relay **116** having normally open contacts **118**, relay **120** having normally open contacts **122** and normally closed contacts **123**, relay **124** having normally open contacts **126**, and a power supply, generally designated **128**, connected as shown. The power supply **128** is a conventional 120 volt, 60 hertz source. The transformer **92** reduces the supply voltage to 24 volts AC.

The logic circuit **90** receives heating and cooling demands from the thermostats **30** in the zones **14, 16, 18**. In response, the logic circuit **90** continuously matches the temperature of the cold deck **58** and hot deck **60** of the HVAC 22 to the hottest and coldest zone temperatures, respectively. The logic circuit **90** is available from Ranco Controls Division of Columbus, Ohio under the trade name of EA3 Load Analyzer

Control Module. Additionally, the Ranco control module is described, in detail, in U.S. Pat. Nos. 3,788,386 and 3,820,713. The Ranco logic circuit **90** operates under the 24 volts AC provided by the secondary winding of the transformer **92.**

More particularly, the thermostat **30,** demanding the greatest heating, causes the heating switches **94, 96, 98** to progressively close in response to need. The closing of heating switch **94,** indicative of lowest heating demand, energizes the relays **102, 106,** opening contacts **104** and closing contacts **108.** As a result, the second condenser fan **79** ceases operation and the first or heat reclaim condenser **70** is activated to process the air stream **64,** provided the air cooler **54** is operative. If the air cooler **54** is inoperative or additional heating is required, the heating switches **96, 98** progressively close, energizing relays **110, 116,** respectively, and thereby activating the first and second stages of air heater **52.**

In response to the thermostat **30** demanding the greatest cooling, the control mechanism **32** through motor **44** variably opens the outdoor air damper **36,** provided the switch contacts **87, 89** are open and closed, respectively. This is accomplished by imposition of a potential across the command terminals **130** of the logic circuit **90.** Additional cooling demands cause cooling switch **100** to close, thereby energizing the air cooler **54.** If heating is simultaneously required, the first or heat reclaim condenser **70** and, if necessary, the air heater **52** will be active.

The closing of switch contacts **87** or opening of switch contacts **89** effectively terminates outdoor air cooling, i.e., the economizer cycle. The opening of switch contacts **89** disconnects the motor **44** from the command terminals **130.** The closing of switch contacts **87** energizes relay **120,** opening contacts **123.** In either event, the outdoor air damper **36** is closed.

Further, the closing of switch contacts **87** causes contacts **122** to close, thereby maintaining the relay **120** in an energized state until contacts **108** open. Thus, the outdoor air damper **36** is "locked" in a closed position until all heating demands are met, i.e., until relay **106** is de-energized by opening of heating contacts **94.** Thus, despite the fact that the power threshold of the power meter **86** exceeds the input power to the air heater **52,** the system **10** will not return to the economizer cycle until heating requirements are fulfilled. This latching circuitry substantially avoids rapid and excessive cycling of the air cooler **54.**

With switch contacts **87** closed or switch contacts **89** open, the cooling switch **100** will close in response to a demand for cooling from a thermostat **30.** If heating is also required, the first or heat reclaim condenser **70** will be activated. As such, the system **10** operates in a "boot strap" heat pump mode until the cooling demand ceases or heat requirement in the air hot deck **60** drops to substantially zero.

As illustrated schematically in FIG. **2,** the control mechanism **32** is responsive to the thermostats **30,** the power meter **86** and the enthapy control **88** and controls or regulates the HVAC 22, including the air heater **52** and air cooler **54,** the outdoor air damper **36,** the return air damper **40,** and the supply air dampers **81, 82.** The operational states of the control mechanism **32** are summarized below:

STATE	CONDITIONS
1st	(a) cooling demand (b) enthalpy exceeds enthalpy threshold
2nd	(a) cooling demand (b) power input exceeds power threshold
3rd	(a) cooling demand (b) enthalpy threshold exceeds enthalpy (c) power threshold exceeds power input

In the 1st and 2nd states, and under the assumption that a thermostat **30** demands heating, the air cooler **54** is operative, such that the evaporator **66** cools the air stream **62** and the first or heat reclaim condenser **70** heats the air stream **64.** Additional heating, if necessary, is provided by the air heater **52,** i.e., the air heater **52** cooperates with the first condenser **70** in processing the hot deck air stream **64.** In the 3rd state, cooling is effected by use of outdoor air, while heating is effected by the air heater **52** alone.

If there is no heating demand during 1st and 2nd stage operation of control mechanism **32,** the second condenser **72** will operate normally, de-activating the first or heat reclaim condenser **70.** This substantially avoids the problem of "wiping" experienced in the presently known multizone air processing systems. That is, as shown in FIG. **2,** air entering the cold deck **58** contacts the surface of the hot deck **60.** In the previous systems, this "wiping" elevated the temperature of the air stream **62,** requiring additional cooling in the cold deck **58.** in the present invention, the first or heat reclaim condenser **70** is inactive, i.e., de-activated, whenever heating demands are fully satisfied and heating switch **94** is open. Thus, heat transfer is substantially avoided.

As discussed above, the power threshold of the power meter **86** is preferably substantially equivalent to the minimal operational power input of the air cooler **54.** Switching from outdoor air cooling to mechanical refrigeration preferably occurs at this power level because mechanical refrigeration provides both cooling and reclaim heating, while reducing heating requirements through utilization of minimum outdoor air.

Utilization of multiple compressors **68,** including a two-speed capacity control lead compressor **68***a*, significantly facilitates tracking of the refrigeration load. Fractional horsepower is also substantially reduced, thereby increasing the relative efficiency of the system **10,** as a whole. In addition, location of the evaporator **66** in the cold deck **58** of the HVAC 22 permits the heat from the air handler motor **50** to be treated as machine sensible load.

The significance of the discriminating capability of the system **10,** i.e., the ability to effectively choose between outdoor air cooling-mechanical, secondary heating and mechanical cooling-reclaim heating, is theoretically shown in Table I. For each outdoor air temperature, Case No. 1 compares a multi-zone unit utilizing outdoor air for cooling with a multizone unit utilizing refrigeration and heat reclaim in a heating-dominant situation. Case No. 2 presents a similar comparison in a cooling-dominant mode.

Mid-range outdoor air temperatures of 45° to 65° F were analyzed for three basic reasons. First, the presently known systems are, generally speaking, most inef-

ficient over this range. Second, in this range, the most diverse internal space temperature requirements occur. And third, the mid-range outdoor air temperatures occur in geographical areas where heating and air conditioning systems are applied.

TABLE I

OUTDOOR AIR TEMPERATURE	CASE	COMPARATIVE ENERGY (KW) WITH MINIMUM OUTSIDE AIR AND ECONOMIZER CYCLE HEATING AND COOLING REQ'S	ENERGY MIN. OUTDOOR AIR	ENERGY ECONOMIZER
45°F	I	8000 cfm at 80° 2000 cfm at 63°	29.77	43.04
	II	2000 cfm at 68° 8000 cfm at 58°	8.21	6.33
55°F	I	4000 cfm at 72° 6000 cfm at 62°	4.21	12.66
	II	2000 cfm at 68° 8000 cfm at 57°	9.94	6.96
65°F	I	4000 cfm at 71° 6000 cfm at 58°	8.75	13.43
	II	2000 cfm at 71° 8000 cfm at 56°	11.66	7.78

As shown, the most efficient operational mode of the system **10**, i.e., economizer cycle or minimum outdoor air with mechanical refrigeration, depends upon the dominant requirement of the enclosure **12**. Thus, if the enclosure **12** requires predominanently heating, then use of refrigerated cooling in the cold deck **58** and heat reclaim in the hot deck **60** provides the most efficient energy utilization. If, on the other hand, cooling is predominantly required, the economizer cycle is most efficient. The system **10** maximizes efficiency by continuously monitoring the energy used by the hot deck air heater **52** and enthalpy of the outdoor air and selecting the most advantageous mode of operation of the HVAC 22.

By computer simulation, the system **10** has been compared, in terms of energy consumption, to various other systems, including multiple single zone units, with and without economizer cycles, a damperless multizone unit and a drawthrough multizone unit, with and without an economizer cycle. The results are shown in Table II.

It is readily apparent that the system **10** displayed a performance advantage for each randomly selected test point. Substantial energy savings are, therefore, available with utilization of the system **10**.

TABLE II

OUTDOOR AIR TEMPERATURE	HEATING cfm	HEATING °F	COOLING cfm	COOLING °F	MULTIPLE SINGLE ZONE WITH ECONOMIZER	MULTIPLE SINGLE ZONE WITHOUT ECONOMIZER	DAMPERLESS MULTIZONE WITHOUT ECONOMIZER	DRAWTHROUGH MULTIZONE WITH ECONOMIZER	DRAWTHROUGH MULTIZONE WITHOUT ECONOMIZER	PRESENT INVENTION
COMPARISON OF POWER INPUT (KW) OF 10,000 CFM SYSTEMS WITH TYPICAL CONDITIONS										
45°F	8000	80	2000	67	31.64	31.75	31.75	32.91	31.84	31.44
	6000	80	4000	63	23.73	25.68	25.68	32.28	22.90	19.98
	4000	80	6000	58	15.82	21.98	21.98	27.85	10.26	6.16
55°F	8000	76	2000	67	18.99	19.31	19.31	22.78	19.65	18.36
	6000	76	4000	62	14.24	17.05	17.05	26.58	13.03	8.82
	4000	76	6000	57	9.49	16.95	16.95	24.05	12.42	7.45
65°F	6000	73	4000	67	6.65	7.73	7.73	11.39	6.18	4.56
	4000	73	6000	62	6.37	9.29	9.29	7.65	8.10	4.86
	2000	73	8000	56	9.99	13.88	13.88	9.72	14.58	7.78

In analyzing and comparing the tested systems, it should be noted that the multiple single zone units, have, in the past, been generally recognized as a superior system. The present invention, however, has the capability to utilize heat rejected by zones requiring cooling in zones requiring heating. This is properly characterized as "free heat." By definition, the multiple single zone units lack this "free heat" capability. Additionally, the presently known multiple single zone units do not have heat exchange capability, i.e., an evaporator in the cold deck and and an associated heat reclaim condenser in the hot deck.

It is well known that the damperless multizone unit, which includes an individual basic energy heat source and evaporator for each zone, does not generally include an economizer cycle. Thus, the performance advantage of the present invention with respect to the damperless multizone unit is derived from the capacity to utilize outdoor air, with or without mechanical refrigeration, for cooling. Further, the damperless multizone unit lacks the heat exchange capability discussed above.

In the drawthrough multizone unit, intake air is "drawn through" the evaporator prior to division into hot and cold deck air streams. In the present invention, however, the evaporator **66** is situated within the cold deck **58** of the HVAC 22, such that only the volume of air necessary for conditioning the zones **14, 16, 18** of the enclosure **12** is mechanically cooled.

A single preferred embodiment of the present invention has been herein disclosed. It is to be understood, however, that various modifications and changes can be made without departing from the true scope and spirit of the present invention, as defined in the follow-

ing claims.

What is claimed is:

1. A system for processing a volume of indoor air in an enclosure, said enclosure having at least a first and second thermal zone, said indoor air in said first and second thermal zone having a first and second zone temperature, respectively, said first zone temperature exceeding said second zone temperature, comprising, in combination:

thermostatic means for sensing said first and second zone temperatures, said thermostatic means having a predetermined cooling threshold and a predetermined heating threshold;

multizone air processing means for producing a first stream of cooling supply air having a first stream temperature and a second stream of heating supply air having a second stream temperature, said multizone air processing means including air heating means having a power input and air cooling means including evaporator means, compressor means and first condenser means, said air heating means and said first condenser means communicating directly with said second stream, said thermostatic means regulating said first and second air stream temperatures according to said first and second zone temperatures, respectively;

outdoor air duct means for supplying a first quantity of outdoor air having an enthalpy to said multizone air processing means, said outdoor air duct means including outdoor air damper means for regulating said first quantity;

return air duct means for supplying a second quantity of indoor air to said multizone air processing means, said return air duct means including return air damper means for regulating said second quantity;

first means for monitoring said enthalpy of said outdoor air, said first means having a predetermined enthalpy threshold;

second means for monitoring said power input to said air heating means, said second means having a predetermined power threshold; and

means for controlling said multizone air processing means, said outdoor air damper means and said return air damper means in response to said thermostatic means, said first means and said second means, said outdoor air duct means and said return air duct means cooperatively defining means for supplying a quantity of intake air to said multizone air processing means, said intake air being a mixture of outdoor and return air and having a predetermined intake temperature, said controlling means being operable in a first state whenever said first zone temperature exceeds said cooling threshold and said enthalpy exceeds said enthalpy threshold, a second state whenever said first zone temperature exceeds said cooling threshold and said power input exceeds said power threshold, and at least a third state whenever said first zone temperature exceeds said cooling threshold, said enthalpy threshold exceeds said enthalpy and said power threshold exceeds said power input, said air cooling means, said outdoor air damper means and said indoor air damper means being operative, closed and open, respectively, in said first state, said air heating means cooperating with said first condenser means in said first state to process said second stream, said air cooling means, said outdoor air damper means and said return air damper means being operative, closed and open, respectively, in said second state, said air heating means cooperating with said condenser means in said second state to process said second stream, said air cooling means, outdoor air damper means, return air damper means and air heating means bieng inoperative, variably open, variably open and operative, respectively, in said third state.

2. A system as claimed in claim 1 wherein said enclosure includes a third zone having a third zone temperature, said third zone temperature interposing said first and second zone temperatures.

3. A system as claimed in claim 1 wherein said controlling means further includes relay means for maintaining said controlling means in said second state whenever said power input drops below said power threshold until said second zone temperature substantially equals said heating threshold substantially avoiding excess cycling of said air cooling means.

4. A system as claimed in claim 1 wherein said evaporating means directly communicates with said first stream in said multizone air processing means.

5. A system as claimed in claim 1 wherein said air cooling means has a minimum operational power input.

6. A system as claimed in claim 5 wherein said minimum operational power input and said power threshold are substantially equal.

7. A system as claimed in claim 1 wherein said air cooling means includes a second condenser means and expansion valve means interposing said first and second condenser means, said second condenser means and said expansion valve means cooperating to define means for de-activating said first condenser means.

8. A system as claimed in claim 7 wherein said controlling means is operable in a fourth state whenever said air cooling means is operative and said second zone temperature exceeds said heating threshold and a fifth state whenever said air cooling means is operable and said heating threshold exceeds said second zone temperature, said de-activating means being operative and inoperative, respectively, in said fourth and fifth states.

9. A system as claimed in claim 7 wherein said multizone air processing means includes supply air duct means for directing said first and second streams to said first and second zones, respectively.

10. A system as claimed in claim 9 wherein said supply air duct means further includes supply air damper means for mixing said first and second streams to produce a third stream of supply air, said supply air duct means directing said third stream to said third zone.

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