

TEMPERATURE REGULATION SYSTEM WITH ACTIVE JETTING TYPE REFRIGERANT SUPPLY AND REGULATION

5 BACKGROUND OF THE INVENTION

(a) Field of the invention

This invention relates to an air conditioning system that actively jets a refrigerant into an evaporator in an active jetting manner so as to enhance the diffusibility and uniformity thereof.

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(b) Description of the Prior Art

In a conventional temperature regulation system applied for air conditioning or refrigeration, such as an application device applied for integrated or separate heating and cooling air conditioning, ice water air conditioning, refrigerator, refrigeration or temperature-regulating for cooling or heating, dehumidifying, the refrigerant flows typically through a regulation coil or regulation valve so as to be sucked into an evaporator, the diffusibility and uniformity thereof being poor.

20 SUMMARY OF THE INVENTION

The temperature regulation system with active jetting type refrigerant supply and regulation of this invention is a temperature regulation system with active jetting type refrigerant supply and regulation providing an application device applied for integrated or separate heating and cooling air conditioning, ice water air conditioning, refrigerator, refrigeration or temperature-regulating for cooling or heating, dehumidifying, which is an air conditioning system having a refrigerant jetting device disposed on an evaporator so as to jet the refrigerant from a conventional pressure reduction throttle device (R100) to the evaporator in a pressurized jetting manner, regulating the jetting direction of the refrigerant jetting device,

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the pressurized jetting set amount and the jetting pressure intensity to the interior or exterior of the evaporator (EVA100) by means of an electric control device (ECU100);

In the aspect of structure, after the refrigerant of a conventional dry-expansion type evaporator absorbs the thermal energy of icy water in a copper pipe, the refrigerant would become over-heating gas and return to the compressor, the icy water enters an enclosure and covers the exterior of the copper pipe; a flooded type evaporator is the evaporator having the refrigerant filled at the interior and the exterior, the refrigerant at the enclosure side maintains at a certain liquid level, wherein the refrigerant absorbs the thermal energy of icy water for being evaporated to gaseous refrigerant and returned to the compressor; a spray type evaporator utilizes a means of injecting the liquid refrigerant on a compressor for forming a flowing film which can be used to absorb the thermal energy of icy water for being evaporated to gaseous refrigerant and returned to the compressor; a falling type evaporator allows the liquid refrigerant in a dripping, columnar or sheet-like state to downwardly flow, so bubbles formed by evaporating the refrigerant are driven by the gravity of liquid refrigerant so as to downwardly move along with the liquid refrigerant;

The present invention discloses a temperature regulation system with active jetting type refrigerant supply and regulation, in which the refrigerant is injected by a refrigerant injector (IJ100) for allowing the refrigerant to be in a small particle or fine mist state and injected to the interior or exterior of an evaporator (EVA100), such that the refrigerant in the small particle or fine mist state is enabled to be accelerated for being injected to the surface of the evaporator (EVA100) thereby being diffused to films and evaporated, and forcing the gaseous refrigerant, which has already been evaporated, to be away from the surface of the evaporator (EVA100).

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic view of the main system configuration according to the system basic principle of this invention.

5 Fig. 2 is a schematic view of the main system configuration of Fig. 1 in which a temperature detection device (TD100) is added.

Fig. 3 is a schematic view of the main system configuration of Fig. 1 in which a liquid refrigerant detection device (HD100) is added.

Fig. 4 is a schematic view of the main system configuration of Fig. 1
10 in which a temperature detection device (TD100) and a liquid refrigerant detection device (HD100) are added.

Fig. 5 is a schematic view of the main system configuration of Fig. 4 in which a fan (F101) for blowing the airflow through an evaporator (EVA100) is added.

15 Fig. 6 is a schematic view of the main system configuration of Fig. 4 in which a fan (F101) for blowing the airflow through the evaporator (EVA100), and a fan (F102) for blowing the airflow through a condenser (CON100) are added.

Fig. 7 is a system block schematic view in which the evaporator
20 (EVA100) in the embodiment of Fig. 4 is further combined with a heat-exchanging device (HE100).

Fig. 8 is system block schematic view in which the fan (F102) is incorporated into Fig. 7.

Fig. 9 is a schematic view of the system configuration of Fig. 1 in
25 which a pressure reduction throttle device (R100) is added.

Fig. 10 is a schematic view of the system configuration of Fig. 2 in which a pressure reduction throttle device (R100) is added.

Fig. 11 is a schematic view of the system configuration of Fig. 3 in which a pressure reduction throttle device (R100) is added.

30 Fig. 12 is a schematic view of the system configuration of Fig. 4 in

which a pressure reduction throttle device (R100) is added.

Fig. 13 is a schematic view of the system configuration of Fig. 5 in which a pressure reduction throttle device (R100) is added.

Fig. 14 is a schematic view of the system configuration of Fig. 6 in
5 which a pressure reduction throttle device (R100) is added.

Fig. 15 is a schematic view of the system configuration of Fig. 7 in which a pressure reduction throttle device (R100) is added.

Fig. 16 is a schematic view of the system configuration of Fig. 8 in which a pressure reduction throttle device (R100) is added.

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DESCRIPTION OF MAIN COMPONENT SYMBOLS

CD100 : drive circuit device

CON100 : condenser

ECU100 : electric control device

15 EVA100 : evaporator

F101、F102 : fan

HD100 : liquid refrigerant detection device

HE100 : heat-exchanging device

IJ100 : refrigerant jetting device

20 OID100 : operation input device

P100 : pipe

P200 : secondary side pipe

PUMP100 : compression pump

R100 : pressure reduction throttle device

25 REF100 : refrigerant

TD100 : temperature detection device

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In a conventional temperature regulation system applied for air
30 conditioning or refrigeration, such as an application device applied for

integrated or separate heating and cooling air conditioning, ice water air conditioning, refrigerator, refrigeration or temperature-regulating for cooling or heating, dehumidifying, the refrigerant flows typically through a regulation coil or regulation valve so as to be sucked into an evaporator,
5 the diffusibility and uniformity thereof being poor;

this invention relates to an air conditioning system that actively jets a refrigerant into an evaporator in an active jetting manner so as to enhance the diffusibility and uniformity thereof;

the temperature regulation system with active jetting type refrigerant
10 supply and regulation of this invention is a temperature regulation system with active jetting type refrigerant supply and regulation providing an application device applied for integrated or separate heating and cooling air conditioning, ice water air conditioning, refrigerator, refrigeration or temperature-regulating for cooling or heating, dehumidifying, which is an
15 air conditioning system having a refrigerant jetting device disposed on an evaporator so as to jet the refrigerant from a conventional pressure reduction throttle device (R100) to the evaporator in a pressurized jetting manner, regulating the jetting direction of the refrigerant jetting device, the pressurized jetting set amount and the jetting pressure intensity to the
20 interior or exterior of the evaporator (EVA100) by means of an electric control device (ECU100);

In the aspect of structure, after the refrigerant of a conventional dry-expansion type evaporator absorbs the thermal energy of icy water in a copper pipe, the refrigerant would become over-heating gas and return
25 to the compressor, the icy water enters an enclosure and covers the exterior of the copper pipe; a flooded type evaporator is the evaporator having the refrigerant filled at the interior and the exterior, the refrigerant at the enclosure side maintains at a certain liquid level, wherein the refrigerant absorbs the thermal energy of icy water for being evaporated to
30 gaseous refrigerant and returned to the compressor; a spray type

evaporator utilizes a means of injecting the liquid refrigerant on a compressor for forming a flowing film which can be used to absorb the thermal energy of icy water for being evaporated to gaseous refrigerant and returned to the compressor; a falling type evaporator allows the liquid refrigerant in a dripping, columnar or sheet-like state to downwardly flow, so bubbles formed by evaporating the refrigerant are driven by the gravity of liquid refrigerant so as to downwardly move along with the liquid refrigerant;

The present invention discloses a temperature regulation system with active jetting type refrigerant supply and regulation, in which the refrigerant is injected by a refrigerant injector (IJ100) for allowing the refrigerant to be in a small particle or fine mist state and injected to the interior or exterior of an evaporator (EVA100), such that the refrigerant in the small particle or fine mist state is enabled to be accelerated for being injected to the surface of the evaporator (EVA100) thereby being diffused to films and evaporated, and forcing the gaseous refrigerant, which has already been evaporated, to be away from the surface of the evaporator (EVA100).

The various embodiments of the temperature regulation system with active jetting type refrigerant supply and regulation will be described as follows:

Fig. 1 is a schematic view of the main system configuration according to the system basic principle of this invention;

As shown in Fig. 1, the temperature regulation system mainly comprises:

-- an operation input device (OID100), formed by a manually operative electromechanical interface or a circuit device inputted by an analog or digital operation signal, for performing the actuation/shutdown of the system, selecting the operation modes, setting the regulation temperature, and setting the amount of an airflow when a fan is provided, etc.;

-- an electric control device (ECU100), formed by an electromechanical operation device, a solid electronic circuit device and a microprocessor and related softwares so as to receive and process a command from the operation input device (OID100), for operating a drive circuit device (CD100) to further drive a refrigerant jetting device (IJ100), thereby controlling the timing of a liquid refrigerant (REF100) from a condenser (CON100) through the refrigerant jetting device (IJ100) to pressurize and jet the same to the interior or exterior of an evaporator (EVA100);

-- the drive circuit device (CD100), receiving the operation command from the electric control device (ECU100) to drive the refrigerant jetting device (IJ100), spraying the liquid refrigerant (REF100) from a condenser (CON100) to the interior or exterior of the evaporator (EVA100) in a fixed or periodical scan driving direction with a pressurized jetting set amount and set intensity in the form of fine particles or fine mists;

-- the refrigerant jetting device (IJ100), provided with one or more than one active pressurized jetting device driven by mechanical force or electromagnetic force or magnetostriction or piezoelectric effect, incorporated with the evaporator (EVA100) or formed integrally with the evaporator (EVA100) so as to be driven by the drive circuit device (CD100), for spraying the liquid refrigerant (REF100) from the condenser (CON100) to the interior or exterior of the evaporator (EVA100) in the fixed or periodical scan driving direction, with the pressurized jetting set amount and set intensity in the form of fine particles or fine mists;

-- the evaporator (EVA100), formed by a material of a good heat conductivity, having a space formed therein so as to allow a fluid to pass through, the evaporator (EVA100) being provided with the refrigerant jetting device (IJ100) for jetting the refrigerant (REF100) from the condenser (CON100), and an outlet for the escape of a vaporized gas refrigerant (REF100) or the discharge of an incompletely vaporized liquid refrigerant (REF100);

- a compression pump (PUMP100), which is a fluid compression pump to be rotationally or reciprocally driven by a mechanical force or motor force or a hydrodynamic motor or engine or an electromagnetic coil for compressing the gas refrigerant (REF100) from the evaporator (EVA100) to the condenser (CON100) so as to convert the same into a liquid phase;
- the condenser (CON100), formed by a material of a good heat conductivity, having a space formed therein so as to allow the refrigerant (REF100) to pass through;
- a pipe (P100), coupling the refrigerant jetting device (IJ100), the evaporator (EVA100), the compression pump (PUMP100), the condenser (CON100) for circulating the refrigerant (REF100) therein.

Fig. 2 is a schematic view of the main system configuration of Fig. 1 in which a temperature detection device (TD100) is added;

As shown in Fig. 2, the temperature regulation system mainly comprises:

- an operation input device (OID100), formed by a manually operative electromechanical interface or a circuit device inputted by an analog or digital operation signal, for performing the actuation/shutdown of the system, selecting the operation modes, setting the regulation temperature, and setting the amount of an airflow when a fan is provided, etc.;
- a temperature detection device (TD100), detecting the temperature generated from the evaporator so as to supply the same to an electric control device (ECU100);
- an electric control device (ECU100), formed by an electromechanical operation device, a solid electronic circuit device and a microprocessor and related softwares so as to receive and process a command from the operation input device (OID100) and a detection signal of a temperature detection device (TD100) for operating a drive circuit device (CD100) to further drive a refrigerant jetting device (IJ100), thereby controlling the timing of a liquid refrigerant (REF100) from a condenser (CON100)

through the refrigerant jetting device (IJ100) to pressurize and jet the same to the interior or exterior of an evaporator (EVA100);

- the drive circuit device (CD100), receiving the operation command from the electric control device (ECU100) to drive the refrigerant jetting device (IJ100), spraying the liquid refrigerant (REF100) from a condenser (CON100) to the interior or exterior of the evaporator (EVA100) in a fixed or periodical scan driving direction with a pressurized jetting set amount and set intensity in the form of fine particles or fine mists;
- the refrigerant jetting device (IJ100), provided with one or more than one active pressurized jetting device driven by mechanical force or electromagnetic force or magnetostriction or piezoelectric effect, incorporated with the evaporator (EVA100) or formed integrally with the evaporator (EVA100) so as to be driven by the drive circuit device (CD100), for spraying the liquid refrigerant (REF100) from the condenser (CON100) to the interior or exterior of the evaporator (EVA100) in the fixed or periodical scan driving direction, with the pressurized jetting set amount and set intensity in the form of fine particles or fine mists;
- the evaporator (EVA100), formed by a material of a good heat conductivity, having a space formed therein so as to allow a fluid to pass through, the evaporator (EVA100) being provided with the refrigerant jetting device (IJ100) for jetting the refrigerant (REF100) from the condenser (CON100), and an outlet for the escape of a vaporized gas refrigerant (REF100) or the discharge of an incompletely vaporized liquid refrigerant (REF100);
- a compression pump (PUMP100), which is a fluid compression pump to be rotationally or reciprocally driven by a mechanical force or motor force or a hydrodynamic motor or engine or an electromagnetic coil for compressing the gas refrigerant (REF100) from the evaporator (EVA100) to the condenser (CON100) so as to convert the same into a liquid phase;
- the condenser (CON100), formed by a material of a good heat

conductivity, having a space formed therein so as to allow the refrigerant (REF100) to pass through;

- a pipe (P100), coupling the refrigerant jetting device (IJ100), the evaporator (EVA100), the compression pump (PUMP100), the condenser (CON100) for circulating the refrigerant (REF100) therein.

Fig. 3 is a schematic view of the main system configuration of Fig. 1 in which a liquid refrigerant detection device (HD100) is added;

As shown in Fig. 3, the temperature regulation system mainly comprises:

- an operation input device (OID100), formed by a manually operative electromechanical interface or a circuit device inputted by an analog or digital operation signal, for performing the actuation/shutdown of the system, selecting the operation modes, setting the regulation temperature, and setting the amount of an airflow when a fan is provided, etc.;
- an electric control device (ECU100), formed by an electromechanical operation device, a solid electronic circuit device and a microprocessor and related softwares so as to receive and process a command from the operation input device (OID100) and the detection signal of a liquid refrigerant detection device (HD100), for operating a drive circuit device (CD100) to further drive a refrigerant jetting device (IJ100), thereby controlling the timing of a liquid refrigerant (REF100) from a condenser (CON100) through the refrigerant jetting device (IJ100) to pressurize and jet the same to the interior or exterior of an evaporator (EVA100);
- the drive circuit device (CD100), receiving the operation command from the electric control device (ECU100) to drive the refrigerant jetting device (IJ100), spraying the liquid refrigerant (REF100) from a condenser (CON100) to the interior or exterior of the evaporator (EVA100) in a fixed or periodical scan driving direction with a pressurized jetting set amount and set intensity in the form of fine particles or fine mists;
- the refrigerant jetting device (IJ100), provided with one or more than

one active pressurized jetting device driven by mechanical force or electromagnetic force or magnetostriction or piezoelectric effect, incorporated with the evaporator (EVA100) or formed integrally with the evaporator (EVA100) so as to be driven by the drive circuit device (CD100), for spraying the liquid refrigerant (REF100) from the condenser (CON100) to the interior or exterior of the evaporator (EVA100) in the fixed or periodical scan driving direction, with the pressurized jetting set amount and set intensity in the form of fine particles or fine mists;

-- the evaporator (EVA100), formed by a material of a good heat conductivity, having a space formed therein so as to allow a fluid to pass through, the evaporator (EVA100) being provided with the refrigerant jetting device (IJ100) for jetting the refrigerant (REF100) from the condenser (CON100), and an outlet for the escape of a vaporized gas refrigerant (REF100) or the discharge of an incompletely vaporized liquid refrigerant (REF100);

-- a liquid refrigerant detection device (HD100), disposed in the evaporator (EVA100) for detecting an evaporation status of the refrigerant (REF100) within the evaporator (EVA100), a signal being transmitted back to the electric control device (ECU100) when the refrigerant (REF100) is not completely vaporized and a residual liquid refrigerant (REF100) is present, so that the electric control device (ECU100) operatively controls the drive circuit device (CD100) to regulate the refrigerant jetting device (IJ100) to reduce the jetting amount of the refrigerant (REF100) into the evaporator (EVA100);

-- a compression pump (PUMP100), which is a fluid compression pump to be rotationally or reciprocally driven by a mechanical force or motor force or a hydrodynamic motor or engine or an electromagnetic coil for compressing the gas refrigerant (REF100) from the evaporator (EVA100) to the condenser (CON100) so as to convert the same into a liquid phase;

-- the condenser (CON100), formed by a material of a good heat

conductivity, having a space formed therein so as to allow the refrigerant (REF100) to pass through;

-- a pipe (P100), coupling the refrigerant jetting device (IJ100), the evaporator (EVA100), the compression pump (PUMP100), the condenser (CON100) for circulating the refrigerant (REF100) therein.

Fig. 4 is a schematic view of the main system configuration of Fig. 1 in which a temperature detection device (TD100) and a liquid refrigerant detection device (HD100) are added;

As shown in Fig. 4, the temperature regulation system mainly comprises:

-- an operation input device (OID100), formed by a manually operative electromechanical interface or a circuit device inputted by an analog or digital operation signal, for performing the actuation/shutdown of the system, selecting the operation modes, setting the regulation temperature, and setting the amount of an airflow when a fan is provided, etc.;

-- a temperature detection device (TD100), detecting the temperature generated from the evaporator so as to supply the same to an electric control device (ECU100);

-- an electric control device (ECU100), formed by an electromechanical operation device, a solid electronic circuit device and a microprocessor and related softwares so as to receive and process a command from the operation input device (OID100), the detection signal of a temperature detection device (TD100), and the detection signal of a liquid refrigerant detection device (HD100), for operating a drive circuit device (CD100) to further drive a refrigerant jetting device (IJ100), thereby controlling the timing of a liquid refrigerant (REF100) from a condenser (CON100) through the refrigerant jetting device (IJ100) to pressurize and jet the same into an interior of an evaporator (EVA100);

-- the drive circuit device (CD100), receiving the operation command from the electric control device (ECU100) to drive the refrigerant jetting

device (IJ100), spraying the liquid refrigerant (REF100) from a condenser (CON100) to the interior or exterior of the evaporator (EVA100) in a fixed or periodical scan driving direction with a pressurized jetting set amount and set intensity in the form of fine particles or fine mists;

5 -- the refrigerant jetting device (IJ100), provided with one or more than one active pressurized jetting device driven by mechanical force or electromagnetic force or magnetostriction or piezoelectric effect, incorporated with the evaporator (EVA100) or formed integrally with the evaporator (EVA100) so as to be driven by the drive circuit device
10 (CD100), for spraying the liquid refrigerant (REF100) from the condenser (CON100) to the interior or exterior of the evaporator (EVA100) in the fixed or periodical scan driving direction, with the pressurized jetting set amount and set intensity in the form of fine particles or fine mists;

-- the evaporator (EVA100), formed by a material of a good heat
15 conductivity, having a space formed therein so as to allow a fluid to pass through, the evaporator (EVA100) being provided with the refrigerant jetting device (IJ100) for jetting the refrigerant (REF100) from the condenser (CON100), and an outlet for the escape of a vaporized gas refrigerant (REF100) or the discharge of an incompletely vaporized liquid
20 refrigerant (REF100);

-- a liquid refrigerant detection device (HD100), disposed in the evaporator (EVA100) for detecting an evaporation status of the refrigerant (REF100) within the evaporator (EVA100), a signal being transmitted back to the electric control device (ECU100) when the refrigerant
25 (REF100) is not completely vaporized and a residual liquid refrigerant (REF100) is present, so that the electric control device (ECU100) operatively controls the drive circuit device (CD100) to regulate the refrigerant jetting device (IJ100) to reduce the jetting amount of the refrigerant (REF100) into the evaporator (EVA100);

30 -- a compression pump (PUMP100), which is a fluid compression pump

to be rotationally or reciprocally driven by a mechanical force or motor force or a hydrodynamic motor or engine or an electromagnetic coil for compressing the gas refrigerant (REF100) from the evaporator (EVA100) to the condenser (CON100) so as to convert the same into a liquid phase;

5 -- the condenser (CON100), formed by a material of a good heat conductivity, having a space formed therein so as to allow the refrigerant (REF100) to pass through;

-- a pipe (P100), coupling the refrigerant jetting device (IJ100), the evaporator (EVA100), the compression pump (PUMP100), the condenser

10 (CON100) for circulating the refrigerant (REF100) therein.

Fig. 5 is a schematic view of the main system configuration of Fig. 4 in which a fan (F101) for blowing the airflow through an evaporator (EVA100) is added;

As shown in Fig. 5, the temperature regulating system mainly

15 comprises:

-- an operation input device (OID100), formed by a manually operative electromechanical interface or a circuit device inputted by an analog or digital operation signal, for performing the actuation/shutdown of the system, selecting the operation modes, setting the regulation temperature,

20 and setting the amount of an airflow when a fan is provided, etc.;

-- a temperature detection device (TD100), detecting the temperature generated from the evaporator so as to supply the same to an electric control device (ECU100);

-- an electric control device (ECU100), formed by an electromechanical

25 operation device, a solid electronic circuit device and a microprocessor and related softwares so as to receive and process a command from the operation input device (OID100), the detection signal of a temperature detection device (TD100), and the detection signal of a liquid refrigerant detection device (HD100), for operating a drive circuit device (CD100) to

30 further drive a refrigerant jetting device (IJ100), thereby controlling the

timing of a liquid refrigerant (REF100) from a condenser (CON100) through the refrigerant jetting device (IJ100) to pressurize and jet the same to the interior or exterior of an evaporator (EVA100);

-- the drive circuit device (CD100), receiving the operation command

5 from the electric control device (ECU100) to drive the refrigerant jetting device (IJ100), spraying the liquid refrigerant (REF100) from a condenser (CON100) to the interior or exterior of the evaporator (EVA100) in a fixed or periodical scan driving direction with a pressurized jetting set amount and set intensity in the form of fine particles or fine mists;

10 -- the refrigerant jetting device (IJ100), provided with one or more than one active pressurized jetting device driven by mechanical force or electromagnetic force or magnetostriction or piezoelectric effect, incorporated with the evaporator (EVA100) or formed integrally with the evaporator (EVA100) so as to be driven by the drive circuit device

15 (CD100), for spraying the liquid refrigerant (REF100) from the condenser (CON100) to the interior or exterior of the evaporator (EVA100) in the fixed or periodical scan driving direction, with the pressurized jetting set amount and set intensity in the form of fine particles or fine mists;

-- the evaporator (EVA100), formed by a material of a good heat

20 conductivity, having a space formed therein so as to allow a fluid to pass through, the evaporator (EVA100) being provided with the refrigerant jetting device (IJ100) for jetting the refrigerant (REF100) from the condenser (CON100), and an outlet for the escape of a vaporized gas refrigerant (REF100) or the discharge of an incompletely vaporized liquid

25 refrigerant (REF100);

-- a liquid refrigerant detection device (HD100), disposed in the evaporator (EVA100) for detecting an evaporation status of the refrigerant (REF100) within the evaporator (EVA100), a signal being transmitted back to the electric control device (ECU100) when the refrigerant

30 (REF100) is not completely vaporized and a residual liquid refrigerant

(REF100) is present, so that the electric control device (ECU100) operatively controls the drive circuit device (CD100) to regulate the refrigerant jetting device (IJ100) to reduce the jetting amount of the refrigerant (REF100) into the evaporator (EVA100);

- 5 -- a compression pump (PUMP100), which is a fluid compression pump to be rotationally or reciprocally driven by a mechanical force or motor force or a hydrodynamic motor or engine or an electromagnetic coil for compressing the gas refrigerant (REF100) from the evaporator (EVA100) to the condenser (CON100) so as to convert the same into a liquid phase;
- 10 -- the condenser (CON100), formed by a material of a good heat conductivity, having a space formed therein so as to allow the refrigerant (REF100) to pass through;
- a pipe (P100), coupling the refrigerant jetting device (IJ100), the evaporator (EVA100), the compression pump (PUMP100), the condenser
- 15 (CON100) for circulating the refrigerant (REF100) therein;
- a fan (F101): driven by an electric motor or mechanical rotational force so as to blow the airflow through the evaporator (EVA100), so that the airflow is discharged after the heat exchange with the evaporator (EVA100).

20 Fig. 6 is a schematic view of the main system configuration of Fig. 4 in which a fan (F101) for blowing the airflow through the evaporator (EVA100), and a fan (F102) for blowing the airflow through a condenser (CON100) are added;

As shown in Fig. 6, the temperature regulation system mainly
25 comprises:

- an operation input device (OID100), formed by a manually operative electromechanical interface or a circuit device inputted by an analog or digital operation signal, for performing the actuation/shutdown of the system, selecting the operation modes, setting the regulation temperature,
- 30 and setting the amount of an airflow when a fan is provided, etc.;

-- a temperature detection device (TD100), detecting the temperature generated from the evaporator so as to supply the same to an electric control device (ECU100);

-- an electric control device (ECU100), formed by an electromechanical operation device, a solid electronic circuit device and a microprocessor and related softwares so as to receive and process a command from the operation input device (OID100), the detection signal of a temperature detection device (TD100), and the detection signal of a liquid refrigerant detection device (HD100), for operating a drive circuit device (CD100) to further drive a refrigerant jetting device (IJ100), thereby controlling the timing of a liquid refrigerant (REF100) from a condenser (CON100) through the refrigerant jetting device (IJ100) to pressurize and jet the same to the interior or exterior of an evaporator (EVA100);

-- the drive circuit device (CD100), receiving the operation command from the electric control device (ECU100) to drive the refrigerant jetting device (IJ100), spraying the liquid refrigerant (REF100) from a condenser (CON100) to the interior or exterior of the evaporator (EVA100) in a fixed or periodical scan driving direction with a pressurized jetting set amount and set intensity in the form of fine particles or fine mists;

-- the refrigerant jetting device (IJ100), provided with one or more than one active pressurized jetting device driven by mechanical force or electromagnetic force or magnetostriction or piezoelectric effect, incorporated with the evaporator (EVA100) or formed integrally with the evaporator (EVA100) so as to be driven by the drive circuit device (CD100), for spraying the liquid refrigerant (REF100) from the condenser (CON100) to the interior or exterior of the evaporator (EVA100) in the fixed or periodical scan driving direction, with the pressurized jetting set amount and set intensity in the form of fine particles or fine mists;

-- the evaporator (EVA100), formed by a material of a good heat conductivity, having a space formed therein so as to allow a fluid to pass

- through, the evaporator (EVA100) being provided with the refrigerant jetting device (IJ100) for jetting the refrigerant (REF100) from the condenser (CON100), and an outlet for the escape of a vaporized gas refrigerant (REF100) or the discharge of an incompletely vaporized liquid refrigerant (REF100);
- 5 -- a liquid refrigerant detection device (HD100), disposed in the evaporator (EVA100) for detecting an evaporation status of the refrigerant (REF100) within the evaporator (EVA100), a signal being transmitted back to the electric control device (ECU100) when the refrigerant
- 10 (REF100) is not completely vaporized and a residual liquid refrigerant (REF100) is present, so that the electric control device (ECU100) operatively controls the drive circuit device (CD100) to regulate the refrigerant jetting device (IJ100) to reduce the jetting amount of the refrigerant (REF100) into the evaporator (EVA100);
- 15 -- a compression pump (PUMP100), which is a fluid compression pump to be rotationally or reciprocally driven by a mechanical force or motor force or a hydrodynamic motor or engine or an electromagnetic coil for compressing the gas refrigerant (REF100) from the evaporator (EVA100) to the condenser (CON100) so as to convert the same into a liquid phase;
- 20 -- the condenser (CON100), formed by a material of a good heat conductivity, having a space formed therein so as to allow the refrigerant (REF100) to pass through;
- a pipe (P100), coupling the refrigerant jetting device (IJ100), the evaporator (EVA100), the compression pump (PUMP100), the condenser
- 25 (CON100) for circulating the refrigerant (REF100) therein;
- a fan (F101): driven by an electric motor or mechanical rotational force so as to blow the airflow through the evaporator (EVA100), so that the airflow is discharged after the heat exchange with the evaporator (EVA100);
- 30 -- a fan (F102), driven by an electric motor or mechanical rotational force,

and arranged to blow the airflow through the condenser (CON100) such that the condenser (CON100) performs heat exchange with the airflow.

Fig. 7 is a system block schematic view in which the evaporator (EVA100) in the embodiment of Fig. 4 is further combined with a
5 heat-exchanging device (HE100);

As shown in Fig. 7, the temperature regulation system mainly comprises:

-- an operation input device (OID100), formed by a manually operative electromechanical interface or a circuit device inputted by an analog or
10 digital operation signal, for performing the actuation/shutdown of the system, selecting the operation modes, setting the regulation temperature, and setting the amount of an airflow when a fan is provided, etc.;

-- a temperature detection device (TD100), detecting the temperature generated from the evaporator so as to supply the same to an electric
15 control device (ECU100);

-- an electric control device (ECU100), formed by an electromechanical operation device, a solid electronic circuit device and a microprocessor and related softwares so as to receive and process a command from the operation input device (OID100), the detection signal of a temperature
20 detection device (TD100), and the detection signal of a liquid refrigerant detection device (HD100), for operating a drive circuit device (CD100) to further drive a refrigerant jetting device (IJ100), thereby controlling the timing of a liquid refrigerant (REF100) from a condenser (CON100) through the refrigerant jetting device (IJ100) to pressurize and jet the
25 same to the interior or exterior of an evaporator (EVA100);

-- the drive circuit device (CD100), receiving the operation command from the electric control device (ECU100) to drive the refrigerant jetting device (IJ100), spraying the liquid refrigerant (REF100) from a condenser (CON100) to the interior or exterior of the evaporator (EVA100) in a fixed
30 or periodical scan driving direction with a pressurized jetting set amount

and set intensity in the form of fine particles or fine mists;

-- the refrigerant jetting device (IJ100), provided with one or more than one active pressurized jetting device driven by mechanical force or electromagnetic force or magnetostriction or piezoelectric effect, incorporated with the evaporator (EVA100) or formed integrally with the evaporator (EVA100) so as to be driven by the drive circuit device (CD100), for spraying the liquid refrigerant (REF100) from the condenser (CON100) to the interior or exterior of the evaporator (EVA100) in the fixed or periodical scan driving direction, with the pressurized jetting set amount and set intensity in the form of fine particles or fine mists;

-- the evaporator (EVA100), formed by a material of a good heat conductivity, having a space formed therein so as to allow a fluid to pass through, the evaporator (EVA100) being provided with the refrigerant jetting device (IJ100) for jetting the refrigerant (REF100) from the condenser (CON100), and an outlet for the escape of a vaporized gas refrigerant (REF100) or the discharge of an incompletely vaporized liquid refrigerant (REF100);

-- a liquid refrigerant detection device (HD100), disposed in the evaporator (EVA100) for detecting an evaporation status of the refrigerant (REF100) within the evaporator (EVA100), a signal being transmitted back to the electric control device (ECU100) when the refrigerant (REF100) is not completely vaporized and a residual liquid refrigerant (REF100) is present, so that the electric control device (ECU100) operatively controls the drive circuit device (CD100) to regulate the refrigerant jetting device (IJ100) to reduce the jetting amount of the refrigerant (REF100) into the evaporator (EVA100);

-- a compression pump (PUMP100), which is a fluid compression pump to be rotationally or reciprocally driven by a mechanical force or motor force or a hydrodynamic motor or engine or an electromagnetic coil for compressing the gas refrigerant (REF100) from the evaporator (EVA100)

to the condenser (CON100) so as to convert the same into a liquid phase;
-- the condenser (CON100), formed by a material of a good heat conductivity, having a space formed therein so as to allow the refrigerant (REF100) to pass through;

- 5 -- a pipe (P100), coupling the refrigerant jetting device (IJ100), the evaporator (EVA100), the compression pump (PUMP100), the condenser (CON100) for circulating the refrigerant (REF100) therein;
- a heat-exchanging device (HE100), configured in a structure that the primary side evaporator (EVA100) and a secondary side pipe (P200)
- 10 connect one another so as to transfer the thermal energy;
- a secondary side pipe (P200), which is the secondary side pipe of the heat-exchanging device (HE100), for passing through a gas or liquid fluid.

Fig. 8 is system block schematic view in which the fan (F102) is incorporated into Fig. 7;

- 15 As shown in Fig. 8, the temperature regulation system mainly comprises:

- an operation input device (OID100), formed by a manually operative electromechanical interface or a circuit device inputted by an analog or digital operation signal, for performing the actuation/shutdown of the
- 20 system, selecting the operation modes, setting the regulation temperature, and setting the amount of an airflow when a fan is provided, etc.;
- a temperature detection device (TD100), detecting the temperature generated from the evaporator so as to supply the same to an electric control device (ECU100);
- 25 -- an electric control device (ECU100), formed by an electromechanical operation device, a solid electronic circuit device and a microprocessor and related softwares so as to receive and process a command from the operation input device (OID100), the detection signal of a temperature detection device (TD100), and the detection signal of a liquid refrigerant
- 30 detection device (HD100), for operating a drive circuit device (CD100) to

further drive a refrigerant jetting device (IJ100), thereby controlling the timing of a liquid refrigerant (REF100) from a condenser (CON100) through the refrigerant jetting device (IJ100) to pressurize and jet the same to the interior or exterior of an evaporator (EVA100);

5 -- the drive circuit device (CD100), receiving the operation command from the electric control device (ECU100) to drive the refrigerant jetting device (IJ100), spraying the liquid refrigerant (REF100) from a condenser (CON100) to the interior or exterior of the evaporator (EVA100) in a fixed or periodical scan driving direction with a pressurized jetting set amount

10 and set intensity in the form of fine particles or fine mists;

-- the refrigerant jetting device (IJ100), provided with one or more than one active pressurized jetting device driven by mechanical force or electromagnetic force or magnetostriction or piezoelectric effect, incorporated with the evaporator (EVA100) or formed integrally with the

15 evaporator (EVA100) so as to be driven by the drive circuit device (CD100), for spraying the liquid refrigerant (REF100) from the condenser (CON100) to the interior or exterior of the evaporator (EVA100) in the fixed or periodical scan driving direction, with the pressurized jetting set amount and set intensity in the form of fine particles or fine mists;

20 -- the evaporator (EVA100), formed by a material of a good heat conductivity, having a space formed therein so as to allow a fluid to pass through, the evaporator (EVA100) being provided with the refrigerant jetting device (IJ100) for jetting the refrigerant (REF100) from the condenser (CON100), and an outlet for the escape of a vaporized gas

25 refrigerant (REF100) or the discharge of an incompletely vaporized liquid refrigerant (REF100);

-- a liquid refrigerant detection device (HD100), disposed in the evaporator (EVA100) for detecting an evaporation status of the refrigerant (REF100) within the evaporator (EVA100), a signal being transmitted

30 back to the electric control device (ECU100) when the refrigerant

(REF100) is not completely vaporized and a residual liquid refrigerant (REF100) is present, so that the electric control device (ECU100) operatively controls the drive circuit device (CD100) to regulate the refrigerant jetting device (IJ100) to reduce the jetting amount of the refrigerant (REF100) into the evaporator (EVA100);

-- a compression pump (PUMP100), which is a fluid compression pump to be rotationally or reciprocally driven by a mechanical force or motor force or a hydrodynamic motor or engine or an electromagnetic coil for compressing the gas refrigerant (REF100) from the evaporator (EVA100) to the condenser (CON100) so as to convert the same into a liquid phase;

-- the condenser (CON100), formed by a material of a good heat conductivity, having a space formed therein so as to allow the refrigerant (REF100) to pass through;

-- a pipe (P100), coupling the refrigerant jetting device (IJ100), the evaporator (EVA100), the compression pump (PUMP100), the condenser (CON100) for circulating the refrigerant (REF100) therein;

-- a heat-exchanging device (HE100), configured in a structure that the primary side evaporator (EVA100) and a secondary side pipe (P200) connect one another so as to transfer the thermal energy;

-- a secondary side pipe (P200), which is the secondary side pipe of the heat-exchanging device (HE100), for passing through a gas or liquid fluid;

-- a fan (F102), driven by an electric motor or mechanical rotational force, and arranged to blow the airflow through the condenser (CON100) such that the condenser (CON100) performs heat exchange with the airflow.

The temperature regulation system with active jetting type refrigerant supply and regulation further connects in series a pressure reduction throttle device (R100) between the flowpath of the condenser (CON100) and the refrigerant jetting device (IJ100) to enhance the stability of the system; and the embodiments thereof are as follows:

Fig. 9 is a schematic view of the system configuration of Fig. 1 in

which a pressure reduction throttle device (R100) is added.

As shown in Fig. 9, the temperature regulation system mainly comprises:

- 5 -- an operation input device (OID100), formed by a manually operative electromechanical interface or a circuit device inputted by an analog or digital operation signal, for performing the actuation/shutdown of the system, selecting the operation modes, setting the regulation temperature, and setting the amount of an airflow when a fan is provided, etc.;
- 10 -- an electric control device (ECU100), formed by an electromechanical operation device, a solid electronic circuit device and a microprocessor and related softwares so as to receive and process a command from the operation input device (OID100), for operating a drive circuit device (CD100) to further drive a refrigerant jetting device (IJ100), thereby controlling the timing of a liquid refrigerant (REF100) from a condenser
15 (CON100) through the refrigerant jetting device (IJ100) to pressurize and jet the same to the interior or exterior of an evaporator (EVA100);
- the drive circuit device (CD100), receiving the operation command from the electric control device (ECU100) to drive the refrigerant jetting device (IJ100), spraying the liquid refrigerant (REF100) from a condenser
20 (CON100) to the interior or exterior of the evaporator (EVA100) in a fixed or periodical scan driving direction with a pressurized jetting set amount and set intensity in the form of fine particles or fine mists;
- the refrigerant jetting device (IJ100), provided with one or more than one active pressurized jetting device driven by mechanical force or
25 electromagnetic force or magnetostriction or piezoelectric effect, incorporated with the evaporator (EVA100) or formed integrally with the evaporator (EVA100) so as to be driven by the drive circuit device (CD100), for spraying the liquid refrigerant (REF100) from the pressure reduction throttle device (R100) to the interior or exterior of the
30 evaporator (EVA100) in the fixed or periodical scan driving direction,

with the pressurized jetting set amount and set intensity in the form of fine particles or fine mists;

- the evaporator (EVA100), formed by a material of a good heat conductivity, having a space formed therein so as to allow a fluid to pass through, the evaporator (EVA100) being provided with the refrigerant jetting device (IJ100) for jetting the refrigerant (REF100) from the condenser (CON100), and an outlet for the escape of a vaporized gas refrigerant (REF100) or the discharge of an incompletely vaporized liquid refrigerant (REF100);
- 10 -- a compression pump (PUMP100), which is a fluid compression pump to be rotationally or reciprocally driven by a mechanical force or motor force or a hydrodynamic motor or engine or an electromagnetic coil for compressing the gas refrigerant (REF100) from the evaporator (EVA100) to the condenser (CON100) so as to convert the same into a liquid phase;
- 15 -- the condenser (CON100), formed by a material of a good heat conductivity, having a space formed therein so as to allow the refrigerant (REF100) to pass through;
- a pressure reduction throttle device (R100): formed by an expansion valve or capillary device or liquid level control device for pressure reduction and throttling of the refrigerant from the condenser (CON100), and disposed between the condenser (CON100) and the refrigerant jetting device (IJ100);
- 20 -- a pipe (P100), coupling the refrigerant jetting device (IJ100), the evaporator (EVA100), the compression pump (PUMP100), the condenser (CON100) for circulating the refrigerant (REF100) therein.
- 25

Fig. 10 is a schematic view of the system configuration of Fig. 2 in which a pressure reduction throttle device (R100) is added.

As shown in Fig. 10, the temperature regulation system mainly comprises:

- 30 -- an operation input device (OID100), formed by a manually operative

electromechanical interface or a circuit device inputted by an analog or digital operation signal, for performing the actuation/shutdown of the system, selecting the operation modes, setting the regulation temperature, and setting the amount of an airflow when a fan is provided, etc.;

5 -- a temperature detection device (TD100), detecting the temperature generated from the evaporator so as to supply the same to an electric control device (ECU100);

-- an electric control device (ECU100), formed by an electromechanical operation device, a solid electronic circuit device and a microprocessor
10 and related softwares so as to receive and process a command from the operation input device (OID100) and a detection signal of a temperature detection device (TD100) for operating a drive circuit device (CD100) to further drive a refrigerant jetting device (IJ100), thereby controlling the timing of a liquid refrigerant (REF100) from a condenser (CON100)
15 through the refrigerant jetting device (IJ100) to pressurize and jet the same into an interior of an evaporator (EVA100);

-- the drive circuit device (CD100), receiving the operation command from the electric control device (ECU100) to drive the refrigerant jetting device (IJ100), spraying the liquid refrigerant (REF100) from a condenser
20 (CON100) to the interior or exterior of the evaporator (EVA100) in a fixed or periodical scan driving direction with a pressurized jetting set amount and set intensity in the form of fine particles or fine mists;

-- the refrigerant jetting device (IJ100), provided with one or more than one active pressurized jetting device driven by mechanical force or
25 electromagnetic force or magnetostriction or piezoelectric effect, incorporated with the evaporator (EVA100) or formed integrally with the evaporator (EVA100) so as to be driven by the drive circuit device (CD100), for spraying the liquid refrigerant (REF100) from the pressure reduction throttle device (R100) to the interior or exterior of the
30 evaporator (EVA100) in the fixed or periodical scan driving direction,

with the pressurized jetting set amount and set intensity in the form of fine particles or fine mists;

- the evaporator (EVA100), formed by a material of a good heat conductivity, having a space formed therein so as to allow a fluid to pass through, the evaporator (EVA100) being provided with the refrigerant jetting device (IJ100) for jetting the refrigerant (REF100) from the condenser (CON100), and an outlet for the escape of a vaporized gas refrigerant (REF100) or the discharge of an incompletely vaporized liquid refrigerant (REF100);
- 10 -- a compression pump (PUMP100), which is a fluid compression pump to be rotationally or reciprocally driven by a mechanical force or motor force or a hydrodynamic motor or engine or an electromagnetic coil for compressing the gas refrigerant (REF100) from the evaporator (EVA100) to the condenser (CON100) so as to convert the same into a liquid phase;
- 15 -- the condenser (CON100), formed by a material of a good heat conductivity, having a space formed therein so as to allow the refrigerant (REF100) to pass through;
- a pressure reduction throttle device (R100): formed by an expansion valve or capillary device or liquid level control device for pressure reduction and throttling of the refrigerant from the condenser (CON100), and disposed between the condenser (CON100) and the refrigerant jetting device (IJ100);
- 20 -- a pipe (P100), coupling the refrigerant jetting device (IJ100), the evaporator (EVA100), the compression pump (PUMP100), the condenser (CON100) for circulating the refrigerant (REF100) therein.

Fig. 11 is a schematic view of the system configuration of Fig. 3 in which a pressure reduction throttle device (R100) is added.

As shown in Fig. 11, the temperature regulation system mainly comprises:

- 30 -- an operation input device (OID100), formed by a manually operative

- electromechanical interface or a circuit device inputted by an analog or digital operation signal, for performing the actuation/shutdown of the system, selecting the operation modes, setting the regulation temperature, and setting the amount of an airflow when a fan is provided, etc.;
- 5 -- an electric control device (ECU100), formed by an electromechanical operation device, a solid electronic circuit device and a microprocessor and related softwares so as to receive and process a command from the operation input device (OID100) and the detection signal of a liquid refrigerant detection device (HD100), for operating a drive circuit device
- 10 (CD100) to further drive a refrigerant jetting device (IJ100), thereby controlling the timing of a liquid refrigerant (REF100) from a condenser (CON100) through the refrigerant jetting device (IJ100) to pressurize and jet the same to the interior or exterior of an evaporator (EVA100);
- the drive circuit device (CD100), receiving the operation command
- 15 from the electric control device (ECU100) to drive the refrigerant jetting device (IJ100), spraying the liquid refrigerant (REF100) from a condenser (CON100) to the interior or exterior of the evaporator (EVA100) in a fixed or periodical scan driving direction with a pressurized jetting set amount and set intensity in the form of fine particles or fine mists;
- 20 -- the refrigerant jetting device (IJ100), provided with one or more than one active pressurized jetting device driven by mechanical force or electromagnetic force or magnetostriction or piezoelectric effect, incorporated with the evaporator (EVA100) or formed integrally with the evaporator (EVA100) so as to be driven by the drive circuit device
- 25 (CD100), for spraying the liquid refrigerant (REF100) from the pressure reduction throttle device (R100) to the interior or exterior of the evaporator (EVA100) in the fixed or periodical scan driving direction, with the pressurized jetting set amount and set intensity in the form of fine particles or fine mists;
- 30 -- the evaporator (EVA100), formed by a material of a good heat

conductivity, having a space formed therein so as to allow a fluid to pass through, the evaporator (EVA100) being provided with the refrigerant jetting device (IJ100) for jetting the refrigerant (REF100) from the condenser (CON100), and an outlet for the escape of a vaporized gas refrigerant (REF100) or the discharge of an incompletely vaporized liquid refrigerant (REF100);

-- a liquid refrigerant detection device (HD100), disposed in the evaporator (EVA100) for detecting an evaporation status of the refrigerant (REF100) within the evaporator (EVA100), a signal being transmitted back to the electric control device (ECU100) when the refrigerant (REF100) is not completely vaporized and a residual liquid refrigerant (REF100) is present, so that the electric control device (ECU100) operatively controls the drive circuit device (CD100) to regulate the refrigerant jetting device (IJ100) to reduce the jetting amount of the refrigerant (REF100) into the evaporator (EVA100);

-- a compression pump (PUMP100), which is a fluid compression pump to be rotationally or reciprocally driven by a mechanical force or motor force or a hydrodynamic motor or engine or an electromagnetic coil for compressing the gas refrigerant (REF100) from the evaporator (EVA100) to the condenser (CON100) so as to convert the same into a liquid phase;

-- the condenser (CON100), formed by a material of a good heat conductivity, having a space formed therein so as to allow the refrigerant (REF100) to pass through;

-- a pressure reduction throttle device (R100): formed by an expansion valve or capillary device or liquid level control device for pressure reduction and throttling of the refrigerant from the condenser (CON100), and disposed between the condenser (CON100) and the refrigerant jetting device (IJ100);

-- a pipe (P100), coupling the refrigerant jetting device (IJ100), the evaporator (EVA100), the compression pump (PUMP100), the condenser

(CON100) for circulating the refrigerant (REF100) therein.

Fig. 12 is a schematic view of the system configuration of Fig. 4 in which a pressure reduction throttle device (R100) is added.

As shown in Fig. 12, the temperature regulation system mainly
5 comprises:

- an operation input device (OID100), formed by a manually operative electromechanical interface or a circuit device inputted by an analog or digital operation signal, for performing the actuation/shutdown of the system, selecting the operation modes, setting the regulation temperature,
10 and setting the amount of an airflow when a fan is provided, etc.;
- a temperature detection device (TD100), detecting the temperature generated from the evaporator so as to supply the same to an electric control device (ECU100);
- an electric control device (ECU100), formed by an electromechanical
15 operation device, a solid electronic circuit device and a microprocessor and related softwares so as to receive and process a command from the operation input device (OID100), the detection signal of a temperature detection device (TD100), and the detection signal of a liquid refrigerant detection device (HD100), for operating a drive circuit device (CD100) to
20 further drive a refrigerant jetting device (IJ100), thereby controlling the timing of a liquid refrigerant (REF100) from a condenser (CON100) through the refrigerant jetting device (IJ100) to pressurize and jet the same to the interior or exterior of an evaporator (EVA100);
- the drive circuit device (CD100), receiving the operation command
25 from the electric control device (ECU100) to drive the refrigerant jetting device (IJ100), spraying the liquid refrigerant (REF100) from a condenser (CON100) to the interior or exterior of the evaporator (EVA100) in a fixed or periodical scan driving direction with a pressurized jetting set amount and set intensity in the form of fine particles or fine mists;
- 30 -- the refrigerant jetting device (IJ100), provided with one or more than

one active pressurized jetting device driven by mechanical force or electromagnetic force or magnetostriction or piezoelectric effect, incorporated with the evaporator (EVA100) or formed integrally with the evaporator (EVA100) so as to be driven by the drive circuit device (CD100), for spraying the liquid refrigerant (REF100) from the pressure reduction throttle device (R100) to the interior or exterior of the evaporator (EVA100) in the fixed or periodical scan driving direction, with the pressurized jetting set amount and set intensity in the form of fine particles or fine mists;

10 -- the evaporator (EVA100), formed by a material of a good heat conductivity, having a space formed therein so as to allow a fluid to pass through, the evaporator (EVA100) being provided with the refrigerant jetting device (IJ100) for jetting the refrigerant (REF100) from the condenser (CON100), and an outlet for the escape of a vaporized gas refrigerant (REF100) or the discharge of an incompletely vaporized liquid refrigerant (REF100);

15 -- a liquid refrigerant detection device (HD100), disposed in the evaporator (EVA100) for detecting an evaporation status of the refrigerant (REF100) within the evaporator (EVA100), a signal being transmitted back to the electric control device (ECU100) when the refrigerant (REF100) is not completely vaporized and a residual liquid refrigerant (REF100) is present, so that the electric control device (ECU100) operatively controls the drive circuit device (CD100) to regulate the refrigerant jetting device (IJ100) to reduce the jetting amount of the refrigerant (REF100) into the evaporator (EVA100);

20 -- a compression pump (PUMP100), which is a fluid compression pump to be rotationally or reciprocally driven by a mechanical force or motor force or a hydrodynamic motor or engine or an electromagnetic coil for compressing the gas refrigerant (REF100) from the evaporator (EVA100) to the condenser (CON100) so as to convert the same into a liquid phase;

25 30

-- the condenser (CON100), formed by a material of a good heat conductivity, having a space formed therein so as to allow the refrigerant (REF100) to pass through;

5 -- a pressure reduction throttle device (R100): formed by an expansion valve or capillary device or level control device for pressure reduction and throttling of the refrigerant from the condenser (CON100), and disposed between the condenser (CON100) and the refrigerant jetting device (IJ100);

10 -- a pipe (P100), coupling the refrigerant jetting device (IJ100), the evaporator (EVA100), the compression pump (PUMP100), the condenser (CON100) for circulating the refrigerant (REF100) therein.

Fig. 13 is a schematic view of the system configuration of Fig. 5 in which a pressure reduction throttle device (R100) is added.

As shown in Fig. 13, the temperature regulation system mainly
15 comprises:

-- an operation input device (OID100), formed by a manually operative electromechanical interface or a circuit device inputted by an analog or digital operation signal, for performing the actuation/shutdown of the system, selecting the operation modes, setting the regulation temperature,
20 and setting the amount of an airflow when a fan is provided, etc.;

-- a temperature detection device (TD100), detecting the temperature generated from the evaporator so as to supply the same to an electric control device (ECU100);

-- an electric control device (ECU100), formed by an electromechanical
25 operation device, a solid electronic circuit device and a microprocessor and related softwares so as to receive and process a command from the operation input device (OID100), the detection signal of a temperature detection device (TD100), and the detection signal of a liquid refrigerant detection device (HD100), for operating a drive circuit device (CD100) to
30 further drive a refrigerant jetting device (IJ100), thereby controlling the

timing of a liquid refrigerant (REF100) from a condenser (CON100) through the refrigerant jetting device (IJ100) to pressurize and jet the same to the interior or exterior of an evaporator (EVA100);

-- the drive circuit device (CD100), receiving the operation command

5 from the electric control device (ECU100) to drive the refrigerant jetting device (IJ100), spraying the liquid refrigerant (REF100) from a condenser (CON100) to the interior or exterior of the evaporator (EVA100) in a fixed or periodical scan driving direction with a pressurized jetting set amount and set intensity in the form of fine particles or fine mists;

10 -- the refrigerant jetting device (IJ100), provided with one or more than one active pressurized jetting device driven by mechanical force or electromagnetic force or magnetostriction or piezoelectric effect, incorporated with the evaporator (EVA100) or formed integrally with the evaporator (EVA100) so as to be driven by the drive circuit device

15 (CD100), for spraying the liquid refrigerant (REF100) from the pressure reduction throttle device (R100) to the interior or exterior of the evaporator (EVA100) in the fixed or periodical scan driving direction, with the pressurized jetting set amount and set intensity in the form of fine particles or fine mists;

20 -- the evaporator (EVA100), formed by a material of a good heat conductivity, having a space formed therein so as to allow a fluid to pass through, the evaporator (EVA100) being provided with the refrigerant jetting device (IJ100) for jetting the refrigerant (REF100) from the condenser (CON100), and an outlet for the escape of a vaporized gas

25 refrigerant (REF100) or the discharge of an incompletely vaporized liquid refrigerant (REF100);

-- a liquid refrigerant detection device (HD100), disposed in the evaporator (EVA100) for detecting an evaporation status of the refrigerant (REF100) within the evaporator (EVA100), a signal being transmitted

30 back to the electric control device (ECU100) when the refrigerant

(REF100) is not completely vaporized and a residual liquid refrigerant (REF100) is present, so that the electric control device (ECU100) operatively controls the drive circuit device (CD100) to regulate the refrigerant jetting device (IJ100) to reduce the jetting amount of the refrigerant (REF100) into the evaporator (EVA100);

-- a compression pump (PUMP100), which is a fluid compression pump to be rotationally or reciprocally driven by a mechanical force or motor force or a hydrodynamic motor or engine or an electromagnetic coil for compressing the gas refrigerant (REF100) from the evaporator (EVA100) to the condenser (CON100) so as to convert the same into a liquid phase;

-- the condenser (CON100), formed by a material of a good heat conductivity, having a space formed therein so as to allow the refrigerant (REF100) to pass through;

-- a pressure reduction throttle device (R100): formed by an expansion valve or capillary device or liquid level control device for pressure reduction and throttling of the refrigerant from the condenser (CON100), and disposed between the condenser (CON100) and the refrigerant jetting device (IJ100);

-- a pipe (P100), coupling the refrigerant jetting device (IJ100), the evaporator (EVA100), the compression pump (PUMP100), the condenser (CON100) for circulating the refrigerant (REF100) therein;

-- a fan (F101): driven by an electric motor or mechanical rotational force so as to blow the airflow through the evaporator (EVA100), so that the airflow is discharged after the heat exchange with the evaporator (EVA100).

Fig. 14 is a schematic view of the system configuration of Fig. 6 in which a pressure reduction throttle device (R100) is added.

As shown in Fig. 14, the temperature regulation system mainly comprises:

-- an operation input device (OID100), formed by a manually operative

electromechanical interface or a circuit device inputted by an analog or digital operation signal, for performing the actuation/shutdown of the system, selecting the operation modes, setting the regulation temperature, and setting the amount of an airflow when a fan is provided, etc.;

5 -- a temperature detection device (TD100), detecting the temperature generated from the evaporator so as to supply the same to an electric control device (ECU100);

-- an electric control device (ECU100), formed by an electromechanical operation device, a solid electronic circuit device and a microprocessor
10 and related softwares so as to receive and process a command from the operation input device (OID100), the detection signal of a temperature detection device (TD100), and the detection signal of a liquid refrigerant detection device (HD100), for operating a drive circuit device (CD100) to further drive a refrigerant jetting device (IJ100), thereby controlling the
15 timing of a liquid refrigerant (REF100) from a condenser (CON100) through the refrigerant jetting device (IJ100) to pressurize and jet the same to the interior or exterior of an evaporator (EVA100);

-- the drive circuit device (CD100), receiving the operation command from the electric control device (ECU100) to drive the refrigerant jetting
20 device (IJ100), spraying the liquid refrigerant (REF100) from a condenser (CON100) to the interior or exterior of the evaporator (EVA100) in a fixed or periodical scan driving direction with a pressurized jetting set amount and set intensity in the form of fine particles or fine mists;

-- the refrigerant jetting device (IJ100), provided with one or more than
25 one active pressurized jetting device driven by mechanical force or electromagnetic force or magnetostriction or piezoelectric effect, incorporated with the evaporator (EVA100) or formed integrally with the evaporator (EVA100) so as to be driven by the drive circuit device (CD100), for spraying the liquid refrigerant (REF100) from the pressure
30 reduction throttle device (R100) to the interior or exterior of the

evaporator (EVA100) in the fixed or periodical scan driving direction, with the pressurized jetting set amount and set intensity in the form of fine particles or fine mists;

-- the evaporator (EVA100), formed by a material of a good heat conductivity, having a space formed therein so as to allow a fluid to pass through, the evaporator (EVA100) being provided with the refrigerant jetting device (IJ100) for jetting the refrigerant (REF100) from the condenser (CON100), and an outlet for the escape of a vaporized gas refrigerant (REF100) or the discharge of an incompletely vaporized liquid refrigerant (REF100);

-- a liquid refrigerant detection device (HD100), disposed in the evaporator (EVA100) for detecting an evaporation status of the refrigerant (REF100) within the evaporator (EVA100), a signal being transmitted back to the electric control device (ECU100) when the refrigerant (REF100) is not completely vaporized and a residual liquid refrigerant (REF100) is present, so that the electric control device (ECU100) operatively controls the drive circuit device (CD100) to regulate the refrigerant jetting device (IJ100) to reduce the jetting amount of the refrigerant (REF100) into the evaporator (EVA100);

-- a compression pump (PUMP100), which is a fluid compression pump to be rotationally or reciprocally driven by a mechanical force or motor force or a hydrodynamic motor or engine or an electromagnetic coil for compressing the gas refrigerant (REF100) from the evaporator (EVA100) to the condenser (CON100) so as to convert the same into a liquid phase;

-- the condenser (CON100), formed by a material of a good heat conductivity, having a space formed therein so as to allow the refrigerant (REF100) to pass through;

-- a pressure reduction throttle device (R100): formed by an expansion valve or capillary device or liquid level control device for pressure reduction and throttling of the refrigerant from the condenser (CON100),

and disposed between the condenser (CON100) and the refrigerant jetting device (IJ100);

-- a pipe (P100), coupling the refrigerant jetting device (IJ100), the evaporator (EVA100), the compression pump (PUMP100), the condenser (CON100) for circulating the refrigerant (REF100) therein;

-- a fan (F101): driven by an electric motor or mechanical rotational force so as to blow the airflow through the evaporator (EVA100), so that the airflow is discharged after the heat exchange with the evaporator (EVA100);

-- a fan (F102), driven by an electric motor or mechanical rotational force, and arranged to blow the airflow through the condenser (CON100) such that the condenser (CON100) performs heat exchange with the airflow.

Fig. 15 is a schematic view of the system configuration of Fig. 7 in which a pressure reduction throttle device (R100) is added.

As shown in Fig. 15, the temperature regulation system mainly comprises:

-- an operation input device (OID100), formed by a manually operative electromechanical interface or a circuit device inputted by an analog or digital operation signal, for performing the actuation/shutdown of the system, selecting the operation modes, setting the regulation temperature, and setting the amount of an airflow when a fan is provided, etc.;

-- a temperature detection device (TD100), detecting the temperature generated from the evaporator so as to supply the same to an electric control device (ECU100);

-- an electric control device (ECU100), formed by an electromechanical operation device, a solid electronic circuit device and a microprocessor and related softwares so as to receive and process a command from the operation input device (OID100), the detection signal of a temperature detection device (TD100), and the detection signal of a liquid refrigerant detection device (HD100), for operating a drive circuit device (CD100) to

further drive a refrigerant jetting device (IJ100), thereby controlling the timing of a liquid refrigerant (REF100) from a condenser (CON100) through the refrigerant jetting device (IJ100) to pressurize and jet the same to the interior or exterior of an evaporator (EVA100);

5 -- the drive circuit device (CD100), receiving the operation command from the electric control device (ECU100) to drive the refrigerant jetting device (IJ100), spraying the liquid refrigerant (REF100) from a condenser (CON100) to the interior or exterior of the evaporator (EVA100) in a fixed or periodical scan driving direction with a pressurized jetting set amount
10 and set intensity in the form of fine particles or fine mists;

-- the refrigerant jetting device (IJ100), provided with one or more than one active pressurized jetting device driven by mechanical force or electromagnetic force or magnetostriction or piezoelectric effect, incorporated with the evaporator (EVA100) or formed integrally with the
15 evaporator (EVA100) so as to be driven by the drive circuit device (CD100), for spraying the liquid refrigerant (REF100) from the pressure reduction throttle device (R100) to the interior or exterior the evaporator (EVA100) in the fixed or periodical scan driving direction, with the pressurized jetting set amount and set intensity in the form of fine
20 particles or fine mists;

-- the evaporator (EVA100), formed by a material of a good heat conductivity, having a space formed therein so as to allow a fluid to pass through, the evaporator (EVA100) being provided with the refrigerant jetting device (IJ100) for jetting the refrigerant (REF100) from the
25 condenser (CON100), and an outlet for the escape of a vaporized gas refrigerant (REF100) or the discharge of an incompletely vaporized liquid refrigerant (REF100);

-- a liquid refrigerant detection device (HD100), disposed in the evaporator (EVA100) for detecting an evaporation status of the refrigerant
30 (REF100) within the evaporator (EVA100), a signal being transmitted

- back to the electric control device (ECU100) when the refrigerant (REF100) is not completely vaporized and a residual liquid refrigerant (REF100) is present, so that the electric control device (ECU100) operatively controls the drive circuit device (CD100) to regulate the refrigerant jetting device (IJ100) to reduce the jetting amount of the refrigerant (REF100) into the evaporator (EVA100);
- a compression pump (PUMP100), which is a fluid compression pump to be rotationally or reciprocally driven by a mechanical force or motor force or a hydrodynamic motor or engine or an electromagnetic coil for compressing the gas refrigerant (REF100) from the evaporator (EVA100) to the condenser (CON100) so as to convert the same into a liquid phase;
- the condenser (CON100), formed by a material of a good heat conductivity, having a space formed therein so as to allow the refrigerant (REF100) to pass through;
- a pressure reduction throttle device (R100): formed by an expansion valve or capillary device or liquid level control device for pressure reduction and throttling of the refrigerant from the condenser (CON100), and disposed between the condenser (CON100) and the refrigerant jetting device (IJ100);
- a pipe (P100), coupling the refrigerant jetting device (IJ100), the evaporator (EVA100), the compression pump (PUMP100), the condenser (CON100) for circulating the refrigerant (REF100) therein;
- a heat-exchanging device (HE100), configured in a structure that the primary side evaporator (EVA100) and a secondary side pipe (P200) connect one another so as to transfer the thermal energy;
- a secondary side pipe (P200), which is the secondary side pipe of the heat-exchanging device (HE100), for passing through a gas or liquid fluid.

Fig. 16 is a schematic view of the system configuration of Fig. 8 in which a pressure reduction throttle device (R100) is added.

As shown in Fig. 16, the temperature regulation system mainly

comprises:

- an operation input device (OID100), formed by a manually operative electromechanical interface or a circuit device inputted by an analog or digital operation signal, for performing the actuation/shutdown of the system, selecting the operation modes, setting the regulation temperature, and setting the amount of an airflow when a fan is provided, etc.;
- a temperature detection device (TD100), detecting the temperature generated from the evaporator so as to supply the same to an electric control device (ECU100);
- an electric control device (ECU100), formed by an electromechanical operation device, a solid electronic circuit device and a microprocessor and related softwares so as to receive and process a command from the operation input device (OID100), the detection signal of a temperature detection device (TD100), and the detection signal of a liquid refrigerant detection device (HD100), for operating a drive circuit device (CD100) to further drive a refrigerant jetting device (IJ100), thereby controlling the timing of a liquid refrigerant (REF100) from a condenser (CON100) through the refrigerant jetting device (IJ100) to pressurize and jet the same to the interior or exterior of an evaporator (EVA100);
- the drive circuit device (CD100), receiving the operation command from the electric control device (ECU100) to drive the refrigerant jetting device (IJ100), spraying the liquid refrigerant (REF100) from a condenser (CON100) to the interior or exterior of the evaporator (EVA100) in a fixed or periodical scan driving direction with a pressurized jetting set amount and set intensity in the form of fine particles or fine mists;
- the refrigerant jetting device (IJ100), provided with one or more than one active pressurized jetting device driven by mechanical force or electromagnetic force or magnetostriction or piezoelectric effect, incorporated with the evaporator (EVA100) or formed integrally with the evaporator (EVA100) so as to be driven by the drive circuit device

(CD100), for spraying the liquid refrigerant (REF100) from the pressure reduction throttle device (R100) to the interior or exterior of the evaporator (EVA100) in the fixed or periodical scan driving direction, with the pressurized jetting set amount and set intensity in the form of fine particles or fine mists;

5 -- the evaporator (EVA100), formed by a material of a good heat conductivity, having a space formed therein so as to allow a fluid to pass through, the evaporator (EVA100) being provided with the refrigerant jetting device (IJ100) for jetting the refrigerant (REF100) from the condenser (CON100), and an outlet for the escape of a vaporized gas refrigerant (REF100) or the discharge of an incompletely vaporized liquid refrigerant (REF100);

10 -- a liquid refrigerant detection device (HD100), disposed in the evaporator (EVA100) for detecting an evaporation status of the refrigerant (REF100) within the evaporator (EVA100), a signal being transmitted back to the electric control device (ECU100) when the refrigerant (REF100) is not completely vaporized and a residual liquid refrigerant (REF100) is present, so that the electric control device (ECU100) operatively controls the drive circuit device (CD100) to regulate the refrigerant jetting device (IJ100) to reduce the jetting amount of the refrigerant (REF100) into the evaporator (EVA100);

15 -- a compression pump (PUMP100), which is a fluid compression pump to be rotationally or reciprocally driven by a mechanical force or motor force or a hydrodynamic motor or engine or an electromagnetic coil for compressing the gas refrigerant (REF100) from the evaporator (EVA100) to the condenser (CON100) so as to convert the same into a liquid phase;

20 -- the condenser (CON100), formed by a material of a good heat conductivity, having a space formed therein so as to allow the refrigerant (REF100) to pass through;

25 -- a pressure reduction throttle device (R100): formed by an expansion

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valve or capillary device or level control device for pressure reduction and throttling of the refrigerant from the condenser (CON100), and disposed between the condenser (CON100) and the refrigerant jetting device (IJ100);

- 5 -- a pipe (P100), coupling the refrigerant jetting device (IJ100), the evaporator (EVA100), the compression pump (PUMP100), the condenser (CON100) for circulating the refrigerant (REF100) therein;
- a heat-exchanging device (HE100), configured in a structure that the primary side evaporator (EVA100) and a secondary side pipe (P200)
- 10 connect one another so as to transfer the thermal energy;
- a secondary side pipe (P200), which is the secondary side pipe of the heat-exchanging device (HE100), for passing through a gas or liquid fluid;
- a fan (F102), driven by an electric motor or mechanical rotational force, and arranged to blow the airflow through the condenser (CON100) such
- 15 that the condenser (CON100) performs heat exchange with the airflow.

The temperature regulation system with active jetting type refrigerant supply and regulation, in practical application, has various configurations as follows:

In the temperature regulation system with active jetting type refrigerant supply and regulation, the refrigerant jetting device (IJ100)

20 disposed on the evaporator (EVA100) includes constituted by one or more refrigerant jetting device.

In the temperature regulation system with active jetting type refrigerant supply and regulation, the refrigerant jetting device (IJ100) and

25 the evaporator (EVA100) includes the two are separately structures or the two are formed in an integral structure.

In the temperature regulation system with active jetting type refrigerant supply and regulation, the refrigerant jetting device (IJ100) disposed on the evaporator (EVA100) includes a refrigerant jetting device

30 separately or integrally formed with a pressure reduction throttle device

(R100).

In the temperature regulation system with active jetting type refrigerant supply and regulation, the drive circuit device (CD100) further enables to operatively control the refrigerant jetted by the refrigerant
5 jetting device (IJ100) to be in the form of fine particles or in the form of fine mists.

In the temperature regulation system with active jetting type refrigerant supply and regulation, the drive circuit device (CD100) can further control the jetting direction of the refrigerant jetting device (IJ100)
10 to be in a continuous or an indirect or a jet direction varied periodical scan manner.

The temperature regulation system with active jetting type refrigerant supply and regulation includes to be applied in the integrated or separate heating and cooling air conditioning, ice water air conditioning,
15 refrigerator, refrigeration or the application device of temperature-regulating for cooling or heating, dehumidifying.

CLAIMS:

1. A temperature regulation system, comprising:

a condenser (CON 100);

an evaporator (EVA100);

at least one refrigerant injection device (IJ100) incorporated in or formed integrally with the evaporator (EVA100) for injecting refrigerant (REF100) into the evaporator (EVA100);

a drive circuit device (CD100) connected to the at least one refrigerant injection device (IJ100) for controlling an amount and intensity of the refrigerant (REF100) injected into the evaporator (EVA100) in a fixed or periodic scan driving direction, so that said refrigerant (REF100) is sprayed into the evaporator as one of a refrigerant stream, fine particles, or mist; and

a fluid compression pump (PUMP100) connected to an outlet of the evaporator (EVA100) for compressing the vaporized refrigerant (REF100) and supplying said refrigerant (REF100) to the condenser (CON100).

2. A temperature regulation system according to claim 1, further comprising:

an operation input device (OID100) for inputting operation signals to control actuation or stopping of the system, select operation modes, regulate temperature settings, and set an air output level when a fan is installed; and

an electric control unit (ECU100) connected to receive the operation signals from the operation input device (OID100) and for supplying control signals to the driving circuit device (CD100) to control a pressurization and injection timing of the injection device (IJ100) in order to control said injection amount and intensity.

3. A temperature regulation system according to claim 2, further comprising a temperature detector (TD100) for detecting a temperature of the evaporator, wherein said electronic control unit (ECU100) controls said driving circuit device (CD100) in response to temperature detection signals from the temperature detector (TD100).

4. A temperature regulation system according to claim 2 or 3, further comprising a liquid refrigerant detector (HD100) installed in the evaporator for detecting an

evaporation state of the refrigerant (REF100) and, when the refrigerant (REF100) is not completely evaporated, sending a feedback signal to the electric control unit (ECU100) to control the driving circuit device (CD100) to reduce an amount of refrigerant (REF100) injected by the injection device (IJ100) into the evaporator (EVA100).

5. A temperature regulation system according claim 4, further comprising a fan (F101) for blowing air through the evaporator (EVA100), said fan (F101) being controlled by the electric control unit (ECU100) in response to feedback from at least one of the temperature detector (TD100) and the liquid refrigerant detector (HD100).

6. A temperature regulation system according to claim 5, further comprising a second fan (F102) controlled by the electric control unit (ECU100) for blowing air through the condenser (CON100).

7. A temperature regulation system according to claim 2, wherein the evaporator (EVA100) is included in a heat exchanger (HE100) having a secondary side pipeline (P200), the heat exchanger (HE100) transferring heat between the refrigerant (REF100) in the evaporator (EVA100) and a fluid in the secondary side pipeline (P200).

8. A temperature regulation system according to claim 2, further comprising a pressure reduction throttle device (R100) connected between the condenser (CON100) and the injection device (IJ100) and comprising one of an expansion valve, a capillary device, and a liquid level control device for reducing a pressure and throttling of said refrigerant (REF100) supplied in a liquid state from the condenser (CON100) to the injection device

9. A temperature regulation system according to claim 2, wherein the system is included in one of an air conditioner, refrigerator, and freezer.

10. A temperature regulation system according to claim 2, wherein the at least one pressurizing injector of the refrigerant injection device (IJ100) is one of a mechanical, electromagnetic, magnetostrictive, and piezoelectric injector.