Class: 4th Stage
Subject: Control Lab
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(Control laboratory)

Experiment No. 00(2)

(Training on the assembling of heat pump Air conditioning) (system)

Prepared by
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Exp.NO.(2) :- Training on the Assembling of Heat Pump Air-Conditioning System.

- Training Objective

1. To understand the constitution of refrigerating system in heat pump air conditioner.
2. To understand the functions of the main components in the air conditioning system.
3. To carry out design , connection and fastening of refrigerator system.

- Training Equipment

NO.	NAME	QUANTITY
1	Training evaluation equipment for air conditioner and refrigerator assembling and commissioning	1
2	Power and instrument modules	1
3	Electric control module of air conditioner	1
4	Special tool	1

- Training contents

Under certain conditions the transformation of a matter from one state to another is called phase transition, there are normally six types of phase transition ,as indicated in fig.7-1.

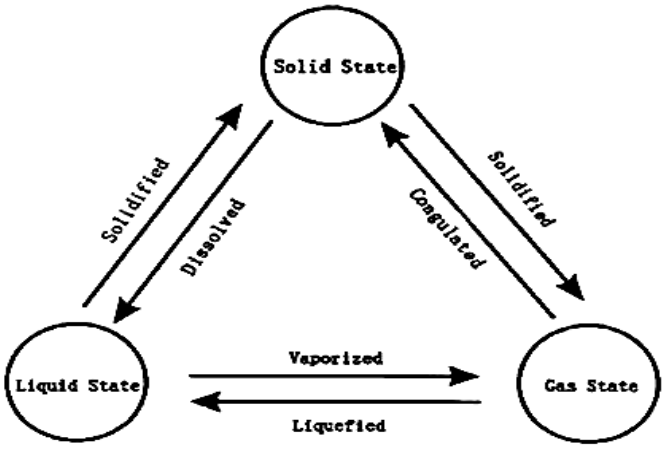

Fig. 7-1: Transition of State

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Refrigerating system is composed of compressor, condenser, evaporator, throttling device etc. It is an enclosed system connected in sequence by pipes .The flow of refrigerating system is indicated in fig.7-2.working medium is vaporized by absorbing the heat of the object to be cooled inside the evaporator. The low pressure vapor produced will be inhaled by compressor and then discharged under high pressure out of the compressor. The high temperature high pressure gaseous working medium out of the compressor will be cooled by the normal temperature medium (water or air) in condenser and will be condense into high pressure liquid. This high pressure liquid will be throttled and depressurized through the throttling device, refrigerated .repeat doing like this ,the objective of continuous refrigerating can be achieved.

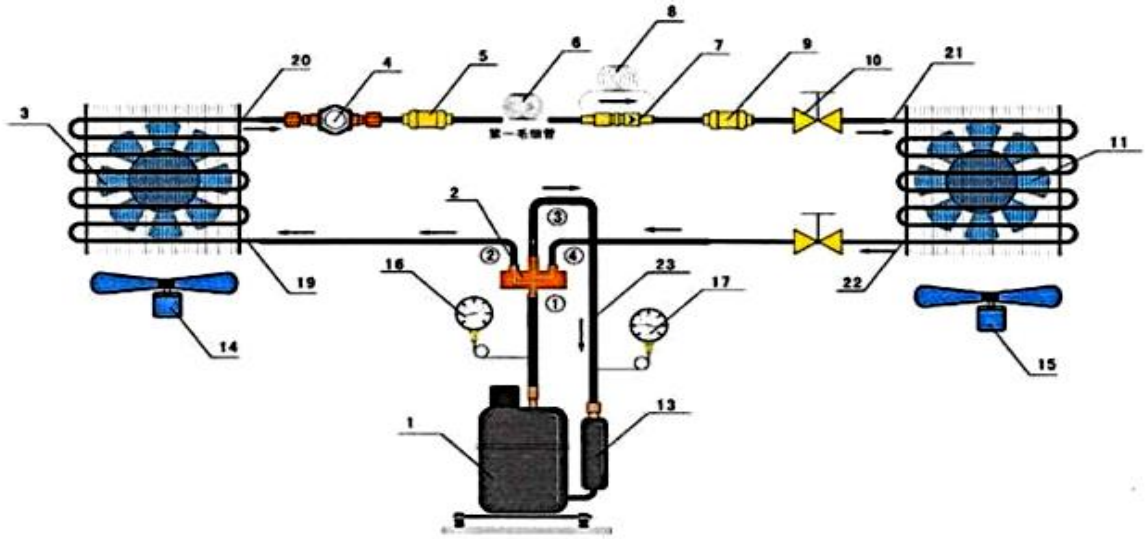


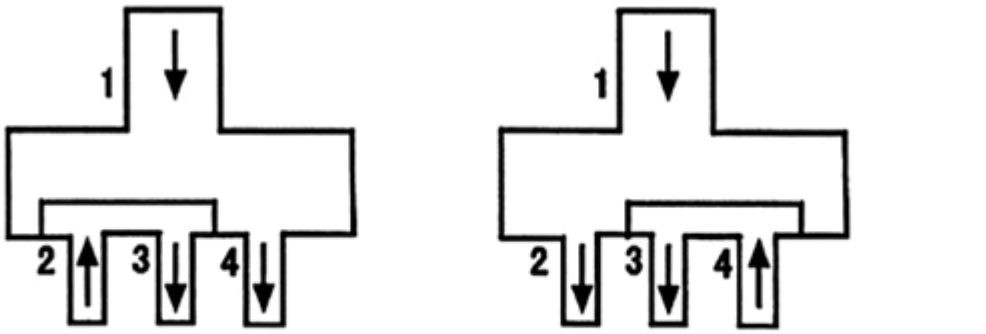
Fig. 7-2: Flow of Refrigerating System (Arrowhead in dotted line being pipeline)

1. Compressor
2. Four-way Valve
3. Outdoor Heat Exchanger
4. Liquid Viewing Glass
5. Filter
6. One-way Valve
7. Capillary Pipe
8. Capillary Pipe
9. Filter
10. Air-conditioning Valve
11. Evaporator
12. Air-conditioning Valve
13. Gas-liquid Separator
14. Outdoor Fan Motor
15. Indoor Fan Motor
16. High Pressure Gauge
17. Low Pressure Gauge
18. High Pressure Outlet Pipe
19. Inlet Pipe of Outdoor Heat Exchanger
20. Outlet Pipe of Outdoor Heat Exchanger
21. Inlet Pipe of Indoor Heat Exchanger
22. Outlet Pipe of Indoor Heat Exchanger
23. Low Pressure Return Pipe

- flow through introduction to working medium under refrigerating conditions :gaseous refrigerant will turn into high temperature high pressure gas through compressor .under this condition ,the solenoid operated four way valve will not be energized (1 communicated with 2 , 3 communicated with 4).after gaseous has been heat exchanged

(condensed) throughout door heat exchanger ,the high temperature high pressure gaseous will be cooled into intermediate temperature (normal temperature)high pressure liquid .after flowing through filter 1 and one way valve, the high pressure liquid will be throttle and depressurized into low temperature low pressure moist steam ,then flowing through filter 2 into indoor heat exchanger .the moist steam will be vaporized(evaporation process)by evaporating and absorbing indoor heat exchanger, and the low pressure steam (gas state) produced will be inhaled by compressor.

- flow through introduction to working medium under heating conditions: gaseous refrigerating will be turned into high temperature high pressure gas state through compressor .under this condition, the solenoid operated four way valve will not be energized (1 connected with 2 , 3 connected with 4).after gaseous has been heat exchanged (condensed) through outdoor heat exchanger ,the high temperature high pressure gaseous will be cooled into intermediate temperature (normal temperature)high pressure .



Working Principle of Four-way Valve under Refrigerating State Working Principle of Four-way Valve under Heating State

Fig. 7-3: Internal Structure of Solenoid Operated Four-way Valve Working under Different Conditions

With heat released indoors during condensing, it will be liquefied into high pressure intermediate temperature liquid, then flowing through filter1 and finally into outdoor heat exchanger. The moist steam will be vaporized (evaporation process)by evaporating and absorbing outdoor heat exchanger, and the low pressure steam (gas state) produced will be inhaled by compressor.

In the process of compression, there may be a little lubrication oil, after being separated ,will return into the compressor .the gaseous reentered into the compressor will be compressed .under such repeated continuous process, the objective of heating can be achieved .some household air –conditioning system is provided with auxiliary electric heater.

- function of solenoid operated four –way valve: in the refrigerating system of heat pump split air conditioner , solenoid operated four –way valve is functioned to change the flow direction of refrigerant as required , which working state is indicated in ffig.7-3. The methods to detect the failures of solenoid operated four –way valve including:

(1) use multimeter to measure the coil resistance of four way valve .if the value turns to be 0, it means the coil has short cct. If it turns out to be infinitely great, it means coil has open cct. Write down the resistance of coil: Rf=_____ Ω;

(2) Under the heating conditions after being started, used multimeter to measure the voltage at the ends of coils of four way valve. If the voltage turns out normal, four way valves will not reverse, which means reversing valve has got stuck mechanically or the left and right capillary pipes have been jammed. If there is no voltage at the two ends, it means the coil control cct of solenoid operated fourway valve is in failure (main board need to be checked).

Think and practice:

1. Explain the functions and working process of four way valve in heat pump air conditioning system.
2. Brief the working principle of electric circuit and the whole working process of refrigerating and heating

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