



## 4.2.2 Condenser

The condenser functions to change the state of the refrigerant discharged by the compressor from gas to liquid. Since the refrigerant vapor discharged by the compressor is high

in temperature and pressure, the refrigerant can be condensed easily by outdoor air or water. The heat gained through the evaporator is discharged into outdoors or water by the condenser.

The heat discharged by the condenser is larger than evaporation heat, since the compression heat in the compressor is added to it.

The condenser can be classified into two types according to its cooling method; i.e. water cooled type and air cooled type. Each type is further classified into two types.

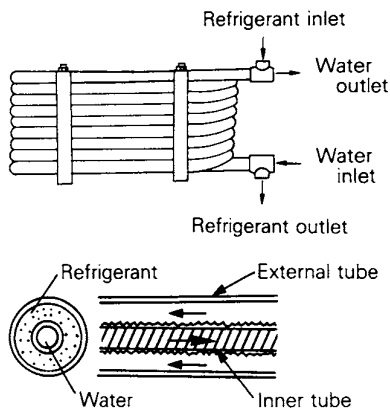
- Water cooled — {
  - Double tube type..... (1)
  - Shell and tube type ..... (2)
- Air cooled — {
  - Cross fin coil type ..... (3)
  - Wind fin type ..... (4)

### (1) Double tube type (Tube-within-a-tube type)

This type is adopted in smaller capacity models of water cooled packaged water chillers and air conditioners. Water flows through the inner tube and the refrigerant flows in the opposite direction between the inner and outer tubes.

The external surface of the inner tube is formed with a spiral groove flute to increase heat exchange coefficient.

Fig.4-20 Double tube type



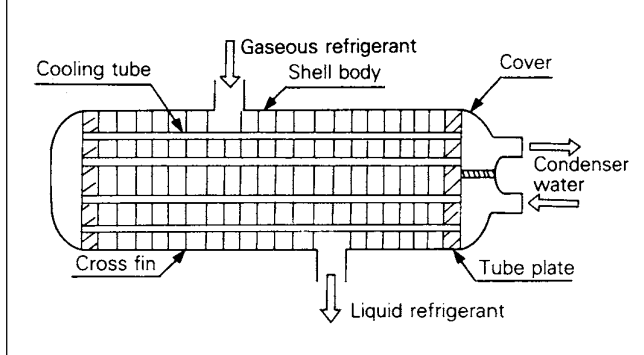


**(2) Shell and tube type**

This type is adopted in larger capacity models of water cooled packaged water chillers and air conditioners. The condensers are composed of many copper cooling tubes with aluminium cross fins around them, which are fixed to the end plates at both ends by enlarging the tube ends and encased neatly in a steel body as shown on the right.

Condenser water is circulated in the tubes so that the refrigerant vapor can be condensed on the surface of the cooling tubes with cross fins.

**Fig.4-21 Shell and tube type**



**(3) Cross fin coil type**

This type is adopted in nearly all sizes of air cooled air conditioners and water chillers.

The cross fin coil type condenser consists of U shaped copper tubes inserted in aluminum fins to have larger heat transferring area. Some recent condensers have waffle louver fins or multi-slit fins and Hi-X tubes, the internal surface of which is modified by serration. They increase the heat exchange coefficient and reduce the size of the unit.

**Fig.4-22 Cross fin coil type**

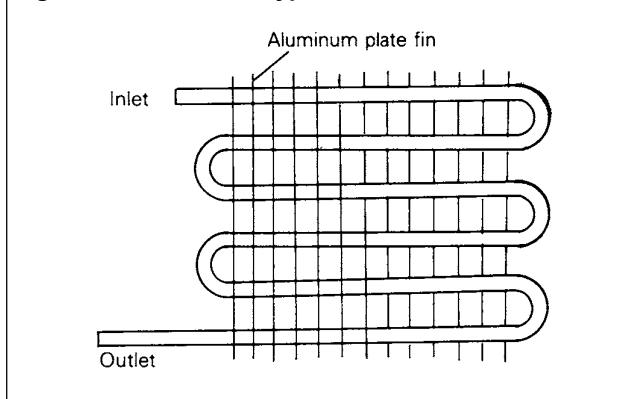
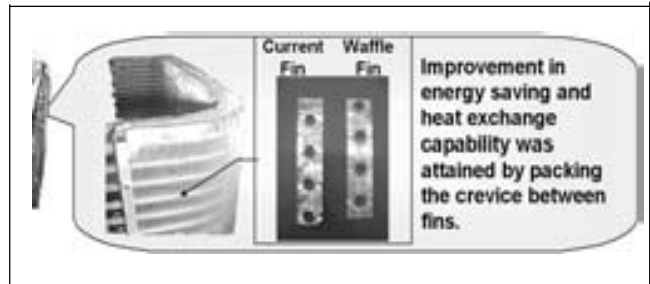
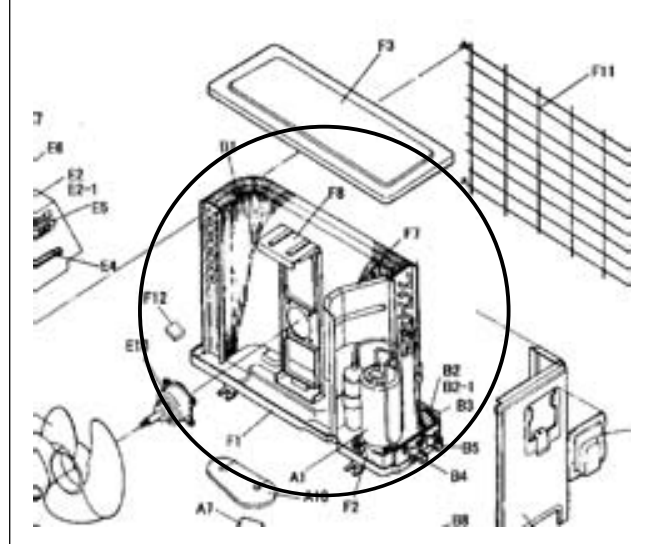


Figure on the right shows an example of this type of coil designed to suit with outdoor units of cooling only room air conditioners, which is usually used in such double-coil configuration as shown in the figure. The fin pattern has been improved to upgrade the thermal efficiency.



**Fig.4-23**



**(4) Wind fin type**

This type is adopted in the Sky Air Series (air cooled split system air conditioners). (R4L, 5L)

The spinelike aluminum fins are wound around a copper tube and they shape like rectangular spiral.

**Fig.4-24 Wind fin type**

