comprises an XY separation drive mechanism.

According to another embodiment of the invention, there is provided an air refrigerating device comprising: a compressor which pressurizes and cools air; an expander of the above embodiment which takes in pressurized air discharged from the compressor and cools and discharges the pressurized air.

Brief Description of Drawings

FIG. 1 is a block diagram schematically showing an air refrigeration device including an expander according to the first embodiment.

FIG. 2 is a perspective view showing an appearance of the expander.

FIG. 3 is a perspective view showing a back side of the expander.

FIG. 4 is a perspective view of the expander, showing an internal structure thereof.

FIG. 5 is a front view of the expander.

FIG. 6 is a perspective view showing a crankshaft of an XY-separation crank mechanism in the expander.

FIG. 7 is a plan view of the crankshaft.

FIG. 8 is an exploded perspective view showing the crankshaft and a crank connection plate.

FIG. 9 is a partially cutaway side view of a valve mechanism of the expander.

FIG. 10 is a perspective view showing an XY-separation valve mechanism.

FIG. 11 is a block diagram schematically showing an air refrigeration device according to the second embodiment.

FIG. 12 is a perspective view showing the refrigerator of the air refrigeration device according to the second embodiment.

FIG. 13 is a side view of the refrigerator.

FIG. 14 is a side view of the refrigerator with a cover being opened.

FIG. 15 is a side view schematically showing an air refrigeration device according to the third embodiment.

Mode for Carrying Out the Invention

Hereafter, an example of an expander including a Z-mechanism XY-separation crank according to an embodiment and an air refrigeration device including