CLAIMS

1. A refrigeration system (10), comprising:

a compressor assembly (20) having an inlet of first compression stage (32), an outlet of first compression stage (34), an inlet of second compression stage (42), and an outlet of second compression stage (44);

a heat rejection heat exchanger assembly (22), comprising:

a primary heat exchanger (50) having an inlet (80) that is fluidly connected to the outlet of second compression stage (44) of the compressor assembly and an outlet (82) that is fluidly connected to the inlet (110) of a heat absorption heat exchanger assembly (24), the primary heat exchanger (50), comprising:

a first tube bank (60) extending between a first manifold (70) and a first intermediate manifold (72),

a second tube bank (62) extending between a second manifold (76) and a second intermediate manifold (74),

at least one bend extending between the first tube bank (60) and the second tube bank (62), and

a connecting tube (78) or a block part (78A) extending between the first intermediate manifold (72) and the second intermediate manifold (74);

a secondary heat exchanger (52) having a third manifold (92) defining an inlet (98) that is fluidly connected to the outlet of first compression stage (34) of the compressor assembly and a fourth manifold (94) defining an outlet (102) that is fluidly connected to the inlet of second compression stage (42) of the compressor assembly (20); and

a heat absorption heat exchanger assembly (24) fluidly connected to the heat rejection heat exchanger assembly (22) and the compressor assembly (20);

wherein the primary heat exchanger (50) and the secondary heat exchanger (52) are arranged in a closed shape.

2. The refrigeration system of claim 1, wherein the secondary heat exchanger (52) is arranged as a single-row heat exchanger.

3. The refrigeration system of claim 1 or 2, the at least one bend being a finned bend.

4. The refrigeration system of claim 1, 2 or 3, wherein the primary heat exchanger (50) is arranged as a two-row heat exchanger.

5. The refrigeration system of any preceding claim, the heat absorption heat exchanger assembly (24) having an outlet (112) that is fluidly connected to the inlet of first compression stage (32) of the compressor assembly (20) and an inlet (110) that is fluidly connected to the outlet (82) of the primary heat exchanger (50) of the heat rejection heat exchanger assembly (22) through expansion devices (160, 164; 180, 184) and an economizer (162; 182).

6. The refrigeration system of claim 5, wherein the economizer is at least one of a flash tank type economizer (162) or a heat exchanger type economizer (182).

7. The refrigeration system of any preceding claim, wherein the third manifold (92) is disposed adjacent to the second intermediate manifold (74) and the fourth manifold (94) is disposed adjacent to the second manifold (76).

8. The refrigeration system of any preceding claim, further comprising:

a heat rejection fan (54) disposed within the closed space defined by the primary heat exchanger (50) and the secondary heat exchanger (52).

9. A refrigeration system (10), comprising:

a compressor assembly (20) having an inlet of first compression stage (32), an outlet of first compression stage (34), and inlet of second compression stage (42), and an outlet of second compression stage (44):

a compact heat exchanger assembly comprising a heat rejection heat exchanger assembly, comprising:

a primary heat exchanger (50) having an inlet (80) that is fluidly connected to the outlet of second compression stage (44) of the compressor assembly and an outlet (82) that is fluidly connected to the inlet (110) of a heat absorption heat exchanger assembly (24), the primary heat exchanger (50) comprising:

a first tube bank (120) extending from a first manifold (130),

a second tube bank (122) extending from a second manifold (132),

at least one bend (124) arranged to connect the first tube bank (120) and the second tube bank (122), and

bends provided with the first tube bank (120) and the second tube bank (122) such that at least a portion of the first tube bank is disposed parallel to the second tube bank; and

a secondary heat exchanger (52) disposed between the second manifold (132) and the at least one bend (124), the secondary heat exchanger (52) having a third manifold (92; 146) defining an inlet (98) that is fluidly connected to the outlet of first compression stage (34) of the compressor assembly and a fourth manifold (94; 148) defining an outlet (102) that is fluidly connected to the inlet of second compression stage (42) of the compressor assembly (20); and

a heat absorption heat exchanger assembly (24) fluidly connected to the heat rejection heat exchanger assembly (22) and the compressor assembly (20);

wherein the primary heat exchanger (50) and the secondary heat exchanger (52) are arranged in a closed shape.

10. The refrigeration system of claim 9, wherein the at least one bend (124) being an un-finned bend, and/or the bends being finned bends and/or the compact heat exchanger assembly further comprising fins interposed between neighboring tubes of the first tube bank (120) and the second tube bank (122).

11. The refrigeration system of claim 9 or 10, wherein the secondary heat exchanger (52) includes:

a tube bank section (140) that extends between the third manifold (146) and an un-finned bend (144).

12. The refrigeration system of claim 9 or 10, wherein the secondary heat exchanger (52) of the heat rejection heat exchanger assembly is arranged as a single-row heat exchanger.

13. A refrigeration system (10), comprising:

a compressor assembly (20) having an inlet of first compression stage (32), and outlet of first compression stage (34), an inlet of second compression stage (42), and an outlet of second compression stage (44);

a compact heat exchanger assembly, comprising

a heat rejection heat exchanger assembly, comprising:

a primary heat exchanger (50) having an inlet (80) that is fluidly connected to the outlet of second compression stage (44) of the compressor assembly and an outlet (82) that is fluidly connected to the inlet (110) of a heat absorption heat exchanger assembly (24), the primary heat exchanger (50) comprising:

a tube bank (120) extending between a first manifold (130) and a second manifold (132), the tube bank being provided with at least one bend such that the primary heat exchanger has a generally curvilinear shape; and

a secondary heat exchanger (52) disposed between the first manifold (130) and the second manifold (132), the secondary heat exchanger (52) having a tube bank section (90) that extends between a third manifold (92) defining an inlet (98) that is fluidly connected to the outlet of first compression stage (34) of the compressor assembly and a fourth manifold (94) defining an outlet (102) that is fluidly connected to the inlet of second compression stage (42) of the compressor assembly (20); and

a heat absorption heat exchanger assembly (24) fluidly connected to the heat rejection heat exchanger assembly (22) and the compressor assembly (20);

wherein the primary heat exchanger (50) and the secondary heat exchanger (52) are arranged in a closed shape.

14. The refrigeration of claim 13, the at least one bend being a finned bend.

15. The refrigeration system of claim 13 or 14, wherein:

the first manifold (130) is disposed adjacent to the third manifold (92) and the second manifold (132) is disposed adjacent to the fourth manifold (94); and/or the primary heat exchanger (50) and the secondary heat exchanger (22) of the heat rejection heat exchanger assembly are each arranged as single-row heat exchangers.