SECTION F — MECHANICAL ENGINEERING; LIGHTING; HEATING; WEAPONS; BLASTING

F25 REFRIGERATION OR COOLING; COMBINED HEATING AND REFRIGERATION SYSTEMS; HEAT PUMP SYSTEMS; MANUFACTURE OR STORAGE OF ICE; LIQUEFACTION OR SOLIDIFICATION OF GASES

F25B REFRIGERATION MACHINES, PLANTS, OR SYSTEMS; COMBINED HEATING AND REFRIGERATION SYSTEMS; HEAT PUMP SYSTEMS (heat-transfer, heat-exchange or heat-storage materials, e.g. refrigerants, or materials for the production of heat or cold by chemical reactions other than by combustion C09K 5/00; pumps, compressors F04; use of heat pumps for domestic or space-heating or for domestic hot-water supply F24D; air-conditioning, air-humidification F24F; fluid heaters using heat pumps F24H)

Note(s) [5]

Attention is drawn to Note (2) following the title of subclass F24F.

Subclass index

MODE OF OPERATION
- Compression type
  - characterised by the cycle 1/00, 13/00
  - characterised by the arrangement
    - self-contained rotary; with several evaporation circuits; with several condenser circuits; with cascade operation 3/00, 5/00, 6/00, 7/00
  - characterised by the refrigerant 9/00
  - using turbines 11/00
- Sorption type 15/00, 17/00
- Other types having a single mode of operation, using: evaporation without recovery; electric or magnetic effects; other effect 19/00, 21/00, 23/00
- Combinations: of above modes of operation; of heating and refrigerating 25/00, 29/00
- Heat pumps 30/00
- Using special energy source 27/00

DETAILS, ARRANGEMENTS, OR COMPONENTS
- Components: boilers, analysers, rectifiers; boiler-absorbers; absorbers, adsorbers; evaporators, condensers; subcoolers, desuper- heaters, superheaters 33/00, 35/00, 37/00, 39/00, 40/00
- Arrangements
  - compressor arrangement; fluid circulation; separating or purifying gases 31/00, 41/00, 43/00
  - for charging or discharging refrigerant; for combating corrosion or deposits 45/00, 47/00
- Mounting of control and safety devices 49/00

Compression machines, plant, or systems

1/00 Compression machines, plant or systems with non-reversible cycle (F25B 3/00, F25B 5/00, F25B 6/00, F25B 7/00, F25B 9/00 take precedence) **[1, 5, 2006.01]**

1/02 • with compressor of reciprocating-piston type (F25B 1/10 takes precedence) **[1, 2006.01]**

1/04 • with compressor of rotary type (F25B 1/10 takes precedence) **[1, 2006.01]**

1/047 • • of screw type **[5, 2006.01]**

1/053 • • of turbine type **[5, 2006.01]**

1/06 • with compressor of jet type, e.g. using liquid under pressure (F25B 1/10 takes precedence) **[1, 2006.01]**

1/08 • • using vapour under pressure **[1, 2006.01]**

1/10 • with multi-stage compression (with cascade operation F25B 7/00) **[1, 2006.01]**

3/00 Self-contained rotary compression machines, i.e. with compressor, condenser, and evaporator rotating as a single unit [1, 2006.01]

5/00 Compression machines, plant, or systems, with several evaporator circuits, e.g. for varying refrigerating capacity (with cascade operation F25B 7/00) **[1, 2006.01]**

5/02 • arranged in parallel **[5, 2006.01]**

5/04 • arranged in series **[5, 2006.01]**

6/00 Compression machines, plant, or systems, with several condenser circuits [5, 2006.01]

6/02 • arranged in parallel **[5, 2006.01]**
6/04 • arranged in series **[5, 2006.01]**

7/00 Compression machines, plant, or systems, with cascade operation, i.e. with two or more circuits, the heat from the condenser of one circuit being absorbed by the evaporator of the next circuit (F25B 9/00 takes precedence) **[1, 2006.01]**

9/00 Compression machines, plant, or systems, in which the refrigerant is air or other gas of low boiling point [1, 2006.01]
9/02 • using Joule-Thompson effect; using vortex effect **[1, 2006.01]**
9/04 • • using vortex effect **[5, 2006.01]**
9/06 • using expanders (F25B 9/10 takes precedence) **[5, 2006.01]**
9/08 • using ejectors (F25B 9/10 takes precedence) **[5, 2006.01]**
9/10 • with several cooling stages **[5, 2006.01]**
9/12 • using 3He-4He dilution **[5, 2006.01]**
9/14 • characterised by the cycle used, e.g. Stirling cycle **[5, 2006.01]**

11/00 Compression machines, plant, or systems, using turbines, e.g. gas turbines [1, 2006.01]
11/02 • as expanders (F25B 9/06 takes precedence) **[5, 2006.01]**
11/04 • • centrifugal type **[5, 2006.01]**

13/00 Compression machines, plant, or systems, with reversible cycle (defrosting cycles F25B 47/02) **[1, 2006.01]**

Sorption machines, plant, or systems

15/00 Sorption machines, plant, or systems, operating continuously, e.g. absorption type [1, 2006.01]
15/02 • without inert gas (F25B 15/12, F25B 15/14, F25B 15/16 take precedence) **[1, 2006.01]**
15/04 • • the refrigerant being ammonia evaporated from aqueous solution **[1, 2006.01]**
15/06 • • the refrigerant being water vapour evaporated from a salt solution, e.g. lithium bromide **[1, 2006.01]**
15/08 • • the refrigerant being sulfuric acid **[1, 2006.01]**
15/09 • • the refrigerant being hydrogen desorbed from a hydride **[5, 2006.01]**
15/10 • with inert gas (F25B 15/12, F25B 15/14, F25B 15/16 take precedence) **[1, 2006.01]**
15/12 • with resorber (F25B 15/14 takes precedence) **[1, 2006.01]**
15/14 • using osmosis **[1, 2006.01]**
15/16 • using desorption cycle **[1, 2006.01]**

17/00 Sorption machines, plant, or systems, operating intermittently, e.g. absorption or adsorption type [1, 2006.01]
17/02 • the absorbent or adsorbent being a liquid, e.g. brine (F25B 17/10 takes precedence) **[1, 2006.01]**
17/04 • • with two or more boilers operating alternately **[1, 2006.01]**
17/06 • • with the boiler and evaporator built-up as a unit in a tiltable or revolving arrangement **[1, 2006.01]**
17/08 • the absorbent or adsorbent being a solid, e.g. salt (F25B 17/12 takes precedence) **[1, 5, 2006.01]**
17/10 • using the endothermic solution of salt **[1, 2006.01]**
17/12 • using desorption of hydrogen from a hydride **[5, 2006.01]**

Machines, plant, or systems, with a single mode of operation, not covered by groups F25B 1/00-F25B 17/00

19/00 Machines, plant, or systems, using evaporation of a refrigerant but without recovery of the vapour [1, 2006.01]
19/02 • using fluid jet, e.g. of steam **[1, 2006.01]**
19/04 • • using liquid jet, e.g. of water **[1, 2006.01]**

21/00 Machines, plant, or systems, using electric or magnetic effects [1, 2006.01]
21/02 • using Peltier effect; using Nernst-Ettinghausen effect (thermoelectric elements H01L 35/00, H01L 37/00) **[1, 2006.01]**
21/04 • • reversible **[5, 2006.01]**

23/00 Machines, plant, or systems, with a single mode of operation not covered by groups F25B 1/00-F25B 21/00, e.g. using selective radiation effect [1, 2006.01]

25/00 Machines, plant, or systems, using a combination of modes of operation covered by two or more of the groups F25B 1/00-F25B 23/00 (combinations of two or more modes of operation covered by a single main group, see the relevant group) **[1, 2006.01]**
25/02 • Compression-sorption machines, plants, or systems **[1, 2006.01]**

27/00 Machines, plant, or systems, using particular sources of energy (F25B 30/06 takes precedence) **[1, 2006.01]**
27/02 • using waste heat, e.g. from internal-combustion engines **[1, 2006.01]**

29/00 Combined heating and refrigeration systems, e.g. operating alternately or simultaneously [1, 5, 2006.01]

30/00 Heat pumps [5, 2006.01]

Note(s) [5]

When classifying heat pump circuits or systems, groups F25B 1/00-F25B 25/00 and F25B 29/00 take precedence over group F25B 30/00.

30/02 • of the compression type **[5, 2006.01]**
30/04 • of the sorption type **[5, 2006.01]**
30/06 • characterised by the source of low potential heat **[5, 2006.01]**

Component parts or details

31/00 Compressor arrangements (compressors per se F04) **[1, 2006.01]**
31/02 • of motor-compressor units **[1, 2006.01]**

33/00 Boilers; Analysers; Rectifiers (boiler-absorbers F25B 35/00) **[1, 2006.01]**

35/00 Boiler-absorbers, i.e. boilers usable for absorption or adsorption [1, 2006.01]
35/02 • using a liquid as sorbent, e.g. brine **[1, 2006.01]**
35/04 • using a solid as sorbent **[1, 2006.01]**

37/00 **Absorbers; Adsorbers** (boiler-absorbers F25B 35/00; separating processes involving the treatment of liquids with solid sorbents B01D 15/00; separation of gases or vapours by adsorption B01D 53/02; separation of gases or vapours by absorption B01D 53/14; investigating using adsorption or absorption G01N 30/00) **[1, 2006.01]**

39/00 **Evaporators; Condensers [1, 2006.01]**

39/02 • Evaporators **[1, 2006.01]**

39/04 • Condensers **[1, 2006.01]**

40/00 **Subcoolers, desuperheaters or superheaters [5, 2006.01]**

40/02 • Subcoolers **[5, 2006.01]**

40/04 • Desuperheaters **[5, 2006.01]**

40/06 • Superheaters **[5, 2006.01]**

41/00 ***Fluid-circulation arrangements [1, 2006.01, 2021.01]***

41/10 • *using electro-osmosis **[2021.01]***

41/20 • *Disposition of valves, e.g. of on-off valves or flow control valves (expansion valves F25B 41/31) **[2021.01]***

41/22 • • *between evaporator and compressor **[2021.01]***

41/24 • • *Arrangement of shut-off valves for disconnecting a part of the refrigerant cycle, e.g. an outdoor part **[2021.01]***

41/26 • • *of fluid flow reversing valves **[2021.01]***

41/28 • • *specially adapted for sorption cycles **[2021.01]***

41/30 • *Expansion means; Dispositions thereof **[2021.01]***

41/31 • • *Expansion valves **[2021.01]***

41/315 • • • *actuated by floats **[2021.01]***

41/32 • • • *having flow rate limiting means other than the valve member, e.g. having bypass orifices in the valve body **[2021.01]***

41/325 • • • *having two or more valve members **[2021.01]***

41/33 • • • *with the valve member being actuated by the fluid pressure, e.g. by the pressure of the refrigerant **[2021.01]***

41/335 • • • • *via diaphragms **[2021.01]***

41/34 • • • *with the valve member being actuated by electric means, e.g. by piezo-electric actuators **[2021.01]***

41/345 • • • • *by solenoids **[2021.01]***

41/35 • • • • *by rotary motors, e.g. by stepping motors **[2021.01]***

41/355 • • • • *by electric heating of bimetal elements, shape memory elements or heat expanding elements **[2021.01]***

41/36 • • • *with the valve member being actuated by bimetal elements or shape-memory elements influenced by fluids, e.g. by the refrigerant **[2021.01]***

41/37 • • *Capillary tubes **[2021.01]***

41/375 • • • *characterised by a variable restriction, e.g. restrictors made of shape memory alloy **[2021.01]***

41/38 • • *specially adapted for reversible cycles, e.g. bidirectional expansion restrictors **[2021.01]***

41/385 • • *Dispositions with two or more expansion means arranged in parallel on a refrigerant line leading to the same evaporator **[2021.01]***

41/39 • • *Dispositions with two or more expansion means arranged in series, i.e. multi-stage expansion, on a refrigerant line leading to the same evaporator **[2021.01]***

41/40 • *Fluid line arrangements **[2021.01]***

41/42 • • *Arrangements for diverging or converging flows, e.g. branch lines or junctions **[2021.01]***

41/45 • • • *for flow control on the upstream side of the diverging point, e.g. with spiral structure for generating turbulence **[2021.01]***

41/48 • • • *for flow path resistance control on the downstream side of the diverging point, e.g. by an orifice **[2021.01]***

43/00 **Arrangements for separating or purifying gases or liquids** (in analysers or rectifiers F25B 33/00)**; Arrangements for vaporising the residuum of liquid refrigerant, e.g. by heat** (F25B 40/00 takes precedence) **[1, 5, 2006.01]**

43/02 • for separating lubricants from the refrigerant **[1, 2006.01]**

43/04 • for withdrawing non-condensible gases **[1, 2006.01]**

45/00 **Arrangements for charging or discharging refrigerant [1, 2006.01]**

47/00 **Arrangements for preventing or removing deposits or corrosion, not provided for in another subclass [1, 2006.01]**

47/02 • Defrosting cycles **[5, 2006.01]**

49/00 **Arrangement or mounting of control or safety devices** (testing refrigerators G01M; control in general G05) **[1, 2006.01]**

49/02 • for compression type machines, plant or systems **[5, 2006.01]**

49/04 • for sorption type machines, plant or systems **[5, 2006.01]**