

CPC COOPERATIVE PATENT CLASSIFICATION

F25B REFRIGERATION MACHINES, PLANTS OR SYSTEMS; COMBINED HEATING AND REFRIGERATION SYSTEMS; HEAT-PUMP SYSTEMS ({evaporation or evaporation apparatus for physical or chemical purposes, e.g. evaporation of liquids for gas phase reactions [B01B 1/005](#)}; 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](#))

NOTES

1. Attention is drawn to Note (2) following the title of subclass [F24F](#).
2. 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](#).

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)

- 1/005 . {of the single unit type ([F25B 1/10](#) takes precedence)}
- 1/02 . with compressor of reciprocating-piston type ({[F25B 1/005](#), [F25B 1/10](#) take precedence})
- 1/04 . with compressor of rotary type ({[F25B 1/005](#), [F25B 1/10](#) take precedence})
- 1/047 . . of screw type
- 1/053 . . of turbine type
- 1/06 . with compressor of jet type, e.g. using liquid under pressure ({[F25B 1/005](#), [F25B 1/10](#) take precedence})
- 1/08 . . using vapour under pressure
- 1/10 . with multi-stage compression (with cascade operation [F25B 7/00](#))

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

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

- 5/02 . arranged in parallel
- 5/04 . arranged in series

6/00 Compression machines, plant, or systems, with several condenser circuits

- 6/02 . arranged in parallel
- 6/04 . arranged in series

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)

9/00 Compression machines, plant, or systems, in which the refrigerant is air or other gas of low boiling point

- 9/002 . {characterised by the refrigerant}

- 9/004 . . {the refrigerant being air (air conditioning [F24F](#))}
- 9/006 . . {the refrigerant containing more than one component ([F25B 9/004](#) takes precedence; refrigerant materials per se [C09K 5/00](#))}
- 9/008 . . {the refrigerant being carbon dioxide}
- 9/02 . using Joule-Thompson effect; using vortex effect
- 9/04 . . using vortex effect
- 9/06 . using expanders ([F25B 9/10](#) takes precedence)
- 9/065 . . {using pressurised gas jets}
- 9/08 . using ejectors ([F25B 9/10](#) takes precedence)
- 9/10 . with several cooling stages
- 9/12 . using ^3He - ^4He dilution
- 9/14 . characterised by the cycle used, e.g. Stirling cycle {(engine plants with Vuilleumier-type cycles [F02G 1/0445](#))}
- 9/145 . . {pulse-tube cycle}

11/00 Compression machines, plant, or systems, using turbines, e.g. gas turbines

- 11/02 . as expanders ([F25B 9/06](#) takes precedence)
- 11/04 . . centrifugal type

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

Sorption machines, plant, or systems

15/00 Sorption machines, plant, or systems, operating continuously, e.g. absorption type

- 15/002 . {using the endothermic solution of salt}
- 15/004 . {of rotary type}
- 15/006 . {with cascade operation}
- 15/008 . {with multi-stage operation ([F25B 15/006](#) takes precedence)}
- 15/02 . without inert gas ({[F25B 15/004](#), [F25B 15/006](#), [F25B 15/008](#)}, [F25B 15/12](#), [F25B 15/14](#), [F25B 15/16](#) take precedence)}
- 15/025 . . {Liquid transfer means}
- 15/04 . . the refrigerant being ammonia evaporated from aqueous solution {([F25B 15/025](#) takes precedence)}
- 15/06 . . the refrigerant being water vapour evaporated from a salt solution, e.g. lithium bromide {([F25B 15/025](#) takes precedence)}

15/08	<ul style="list-style-type: none"> the refrigerant being sulfuric acid (F25B 15/025 takes precedence) 	27/007	<ul style="list-style-type: none"> {in sorption type systems}
15/09	<ul style="list-style-type: none"> the refrigerant being hydrogen desorbed from a hydride (F25B 15/025 takes precedence) 	27/02	<ul style="list-style-type: none"> using waste heat, e.g. from internal-combustion engines
15/10	<ul style="list-style-type: none"> with inert gas (F25B 15/004, F25B 15/006, F25B 15/008, F25B 15/12, F25B 15/14, F25B 15/16 take precedence) 	29/00	Combined heating and refrigeration systems, e.g. operating alternately or simultaneously
15/12	<ul style="list-style-type: none"> with resorber (F25B 15/004, F25B 15/006, F25B 15/008, F25B 15/14 take precedence) 	29/003	<ul style="list-style-type: none"> {of the compression type system}
15/14	<ul style="list-style-type: none"> using osmosis (F25B 15/004, F25B 15/006, F25B 15/008 take precedence) 	29/006	<ul style="list-style-type: none"> {of the sorption type system}
15/16	<ul style="list-style-type: none"> using desorption cycle (F25B 15/004, F25B 15/006, F25B 15/008 take precedence) 	30/00	Heat pumps
		30/02	<ul style="list-style-type: none"> of the compression type
		30/04	<ul style="list-style-type: none"> of the sorption type
		30/06	<ul style="list-style-type: none"> characterised by the source of low potential heat
17/00	Sorption machines, plant, or systems, operating intermittently, e.g. absorption or adsorption type	Component parts or details	
17/02	<ul style="list-style-type: none"> the absorbent or adsorbent being a liquid, e.g. brine (F25B 17/10 takes precedence) 	31/00	Compressor arrangements (compressors per se F04)
17/04	<ul style="list-style-type: none"> with two or more boilers operating alternately 	31/002	<ul style="list-style-type: none"> {lubrication (of compressors per se F04B, of machines or engines in general F01M)}
17/06	<ul style="list-style-type: none"> with the boiler and evaporator built-up as a unit in a tiltable or revolving arrangement 	31/004	<ul style="list-style-type: none"> {oil recirculating arrangements}
17/08	<ul style="list-style-type: none"> the absorbent or adsorbent being a solid, e.g. salt (F25B 17/12 takes precedence) 	31/006	<ul style="list-style-type: none"> {cooling of compressor or motor (of compressors per se F04B 39/06)}
17/083	<ul style="list-style-type: none"> {with two or more boiler-sorbers operating alternately} 	31/008	<ul style="list-style-type: none"> {by injecting a liquid (for compressors in general F04B 39/062)}
17/086	<ul style="list-style-type: none"> {with two or more boiler-sorber/evaporator units} 	31/02	<ul style="list-style-type: none"> of motor-compressor units
17/10	<ul style="list-style-type: none"> using the endothermic solution of salt 	31/023	<ul style="list-style-type: none"> {with compressor of reciprocating-piston type}
17/12	<ul style="list-style-type: none"> using desorption of hydrogen from a hydride 	31/026	<ul style="list-style-type: none"> {with compressor of rotary type}
Machines, plant, or systems, with a single mode of operation, not covered by groups F25B 1/00 - F25B 17/00		33/00	Boilers; Analysers; Rectifiers (boiler-absorbers F25B 35/00)
19/00	Machines, plant, or systems, using evaporation of a refrigerant but without recovery of the vapour	35/00	Boiler-absorbers, i.e. boilers usable for absorption or adsorption
19/005	<ul style="list-style-type: none"> {the refrigerant being a liquefied gas} 	35/02	<ul style="list-style-type: none"> using a liquid as sorbent, e.g. brine
19/02	<ul style="list-style-type: none"> using fluid jet, e.g. of steam (F25B 19/005 takes precedence) 	35/04	<ul style="list-style-type: none"> using a solid as sorbent
19/04	<ul style="list-style-type: none"> using liquid jet, e.g. of water 	37/00	Absorbers; Adsorbers (boiler-absorbers F25B 35/00 ; separating processes involving the treatment of liquids with adsorbents 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 ; {absorption or adsorption in general B01J 20/00 })
21/00	Machines, plant, or systems, using electric or magnetic effects {(magnetic refrigerating material H01F 1/012 and H01F 1/017)}	39/00	Evaporators; Condensers
21/02	<ul style="list-style-type: none"> using Peltier effect; using Nernst-Ettinghausen effect (thermo-electric elements H01L 35/00, H01L 37/00) 	39/02	<ul style="list-style-type: none"> Evaporators
21/04	<ul style="list-style-type: none"> reversible 	39/022	<ul style="list-style-type: none"> {with plate-like or laminated elements}
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	39/024	<ul style="list-style-type: none"> {with elements constructed in the shape of a hollow panel (for heat exchange in general F28F 3/12)}
23/003	<ul style="list-style-type: none"> {using selective radiation effect} 	39/026	<ul style="list-style-type: none"> {specially adapted for sorption type systems}
23/006	<ul style="list-style-type: none"> {boiling cooling systems} 	39/028	<ul style="list-style-type: none"> {having distributing means}
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)	39/04	<ul style="list-style-type: none"> Condensers
25/005	<ul style="list-style-type: none"> {using primary and secondary systems} 	40/00	Subcoolers, desuperheaters or superheaters
25/02	<ul style="list-style-type: none"> Compression-sorption machines, plants, or systems 	40/02	<ul style="list-style-type: none"> Subcoolers
27/00	Machines, plant, or systems, using particular sources of energy (F25B 30/06 takes precedence)	40/04	<ul style="list-style-type: none"> Desuperheaters
27/002	<ul style="list-style-type: none"> {using solar energy (use of solar heat not otherwise provided for F24J 2/00)} 	40/06	<ul style="list-style-type: none"> Superheaters
27/005	<ul style="list-style-type: none"> {in compression type systems} 	41/00	Fluid-circulation arrangements, e.g. for transferring liquid from evaporator to boiler (pumps per se , sealings therefor F04)
		41/003	<ul style="list-style-type: none"> {fluid line arrangements}
		41/006	<ul style="list-style-type: none"> {optical fluid control arrangements}
		41/02	<ul style="list-style-type: none"> using electro-osmosis
		41/04	<ul style="list-style-type: none"> Disposition of valves (valves per se F16K)

41/043	. . {in the circuit between evaporator and compressor}	2309/021	. . with a cryosurgical probe tip having a specific construction
41/046	. . {of fluid flow reversing valves}	2309/022	. . characterised by the expansion element
41/06	. Flow restrictors, e.g. capillary tubes; Disposition thereof	2309/023	. . with two stage expansion
41/062	. . {Expansion valves (regulating valves per se G05D)}	2309/06	. Compression machines, plant or systems characterised by the refrigerant being carbon dioxide
41/065	. . . {Float control valves}	2309/061	. . with cycle highest pressure above the supercritical pressure
41/067	. . {capillary tubes}	2309/14	. Compression machines, plant or systems characterised by the cycle used
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)	2309/1401	. . Ericsson or Ericsson cycles
43/003	. {filters (in general B01D)}	2309/1402	. . Pulse-tube cycles with acoustic driver
43/006	. {accumulators}	2309/1403	. . Pulse-tube cycles with heat input into acoustic driver
43/02	. for separating lubricants from the refrigerant	2309/1404	. . Pulse-tube cycles with loudspeaker driven acoustic driver
43/04	. for withdrawing non-condensable gases	2309/1405	. . Pulse-tube cycles with travelling waves
43/043	. . {for compression type systems}	2309/1406	. . Pulse-tube cycles with pulse tube in co-axial or concentric geometrical arrangements
43/046	. . {for sorption type systems}	2309/1407	. . Pulse-tube cycles with pulse tube having in-line geometrical arrangements
45/00	Arrangements for charging or discharging refrigerant	2309/1408	. . Pulse-tube cycles with pulse tube having U-turn or L-turn type geometrical arrangements
47/00	Arrangements for preventing or removing deposits or corrosion, not provided for in another subclass	2309/1409	. . Pulse-tube cycles with pulse tube having special type of geometrical arrangements not being a coaxial, in-line or U-turn type
47/003	. {for preventing corrosion}	2309/1411	. . Pulse-tube cycles characterised by control details, e.g. tuning, phase shifting or general control
47/006	. {for preventing frost}	2309/1412	. . Pulse-tube cycles characterised by heat exchanger details
47/02	. Defrosting cycles	2309/1413	. . Pulse-tube cycles characterised by performance, geometry or theory
47/022	. . {hot gas defrosting}	2309/1414	. . Pulse-tube cycles characterised by pulse tube details
47/025	. . . {by reversing the cycle}	2309/1415	. . Pulse-tube cycles characterised by regenerator details
47/027	. . {for defrosting sorption type systems}	2309/1416	. . Pulse-tube cycles characterised by regenerator stack details
49/00	Arrangement or mounting of control or safety devices (testing refrigerators G01M; control in general G05)	2309/1417	. . Pulse-tube cycles without any valves in gas supply and return lines
49/005	. {of safety devices (F25B 49/02 and F25B 49/04 take precedence)}	2309/1418	. . Pulse-tube cycles with valves in gas supply and return lines
49/02	. for compression type machines, plant or systems	2309/14181	. . . the valves being of the rotary type
49/022	. . {Compressor control arrangements (in general F04B)}	2309/1419	. . Pulse-tube cycles with pulse tube having a basic pulse tube refrigerator [PTR], i.e. comprising a tube with basic schematic
49/025	. . {Motor control arrangements (motors per se H02K)}	2309/1421	. . Pulse-tube cycles characterised by details not otherwise provided for
49/027	. . {Condenser control arrangements}	2309/1422	. . Pulse tubes with basic schematic including a counter flow heat exchanger instead of a regenerative heat exchanger
49/04	. for sorption type machines, plant or systems	2309/1423	. . Pulse tubes with basic schematic including an inertance tube
49/043	. . {Operating continuously}	2309/1424	. . Pulse tubes with basic schematic including an orifice and a reservoir
49/046	. . {Operating intermittently}	2309/14241	. . . Pulse tubes with basic schematic including an orifice reservoir multiple inlet pulse tube
2300/00	Special arrangements or features for refrigeration machines, plants or systems, combined heating and refrigeration systems or heat-pump systems	2309/1425	. . Pulse tubes with basic schematic including several pulse tubes
2309/00	Gas cycle refrigeration machines	2309/1426	. . Pulse tubes with basic schematic including at the pulse tube warm end a so called warm end expander
2309/001	. with a linear configuration or a linear motor	2309/1427	. . Control of a pulse tube
2309/002	. with parallel working cold producing expansion devices in one circuit		
2309/003	. characterised by construction or composition of the regenerator		
2309/004	. using a compressor of the rotary type		
2309/005	. using an expander of the rotary type		
2309/006	. using a distributing valve of the rotary type		
2309/02	. using the Joule-Thompson effect		

2309/1428 . . Control of a Stirling refrigeration machine

2313/00 Compression machines, plant, or systems with reversible cycle not otherwise provided for

- 2313/001 . with two or more accumulators
- 2313/002 . geothermal
- 2313/003 . Indoor unit with water as a heat sink or heat source
- 2313/004 . Outdoor unit with water as a heat sink or heat source
- 2313/005 . Outdoor unit expansion valves
- 2313/006 . two pipes connecting the outdoor side to the indoor side with multiple indoor units
- 2313/007 . three pipes connecting the outdoor side to the indoor side with multiple indoor units
- 2313/008 . Refrigerant heaters
- 2313/009 . indoor unit in circulation with outdoor unit in first operation mode, indoor unit in circulation with an other heat exchanger in second operation mode or outdoor unit in circulation with an other heat exchanger in third operation mode
- 2313/021 . Indoor unit or outdoor unit with auxiliary heat exchanger not forming part of the indoor or outdoor unit
 - 2313/0211 . . the auxiliary heat exchanger being only used during defrosting
 - 2313/0212 . . the auxiliary heat exchanger being only used during dehumidifying
 - 2313/0213 . . the auxiliary heat exchanger being only used during heating
 - 2313/0214 . . the auxiliary heat exchanger being used parallel to the indoor unit during heating operation
 - 2313/0215 . . the auxiliary heat exchanger being used parallel to the outdoor heat exchanger during heating operation
- 2313/023 . using multiple indoor units
 - 2313/0231 . . with simultaneous cooling and heating
 - 2313/0232 . . with bypasses
 - 2313/02321 . . . during cooling
 - 2313/02322 . . . during defrosting
 - 2313/02323 . . . during heating
 - 2313/0233 . . in parallel arrangements
 - 2313/02331 . . . during cooling
 - 2313/02332 . . . during defrosting
 - 2313/02333 . . . during dehumidification
 - 2313/02334 . . . during heating
 - 2313/0234 . . in series arrangements
 - 2313/02341 . . . during cooling
 - 2313/02342 . . . during defrosting
 - 2313/02343 . . . during dehumidification
 - 2313/02344 . . . during heating
- 2313/025 . using multiple outdoor units
 - 2313/0251 . . being defrosted alternately
 - 2313/0252 . . with bypasses
 - 2313/02521 . . . during cooling
 - 2313/02522 . . . during defrosting
 - 2313/02523 . . . during heating
 - 2313/0253 . . in parallel arrangements
 - 2313/02531 . . . during cooling
 - 2313/02532 . . . during defrosting
 - 2313/02533 . . . during heating
 - 2313/0254 . . in series arrangements
 - 2313/02541 . . . during cooling
 - 2313/02542 . . . during defrosting

- 2313/02543 . . . during heating
- 2313/027 . characterised by the reversing means
- 2313/0271 . . the compressor allows rotation in reverse direction
 - 2313/0272 . . using bridge circuits of one-way valves
 - 2313/02731 . . using one three-way valve
 - 2313/02732 . . using two three-way valves
 - 2313/02741 . . using one four-way valve
 - 2313/02742 . . using two four-way valves
 - 2313/02743 . . using three four-way valves
 - 2313/0276 . . using six-way valves
 - 2313/0279 . . using nine-way valves
 - 2313/02791 . . using shut-off valves
 - 2313/02792 . . using reversing valve changing the refrigerant flow direction due to pressure differences of the refrigerant and not by external actuation
- 2313/029 . Control issues
 - 2313/0291 . . related to the pressure of the indoor unit
 - 2313/0292 . . related to reversing valves
 - 2313/0293 . . related to the indoor fan, e.g. controlling speed
 - 2313/0294 . . related to the outdoor fan, e.g. controlling speed
- 2313/031 . Sensor arrangements
 - 2313/0311 . . Pressure sensors near the expansion valve
 - 2313/0312 . . Pressure sensors near the indoor heat exchanger
 - 2313/0313 . . Pressure sensors near the outdoor heat exchanger
 - 2313/0314 . . Temperature sensors near the indoor heat exchanger
 - 2313/0315 . . Temperature sensors near the outdoor heat exchanger
 - 2313/0316 . . Temperature sensors near the refrigerant heater

2315/00 Sorption refrigeration cycles or details thereof

- 2315/001 . Crystallization prevention
- 2315/002 . Generator absorber heat exchanger [GAX]
- 2315/003 . Hydrates for sorption cycles
- 2315/004 . Inert heat-exchangers
- 2315/005 . Regeneration
- 2315/006 . Reversible sorption cycles
- 2315/007 . Parallel systems therefor

2321/00 Details of machines, plants, or systems, using electric or magnetic effects

- 2321/001 . by using electro-caloric effects
- 2321/002 . by using magneto-caloric effects
 - 2321/0021 . . with a static fixed magnet
 - 2321/0022 . . with a rotating or otherwise moving magnet
 - 2321/0023 . . with modulation, influencing or enhancing an existing magnetic field
- 2321/003 . by using thermionic electron cooling effects
- 2321/02 . using Peltier effects; using Nernst-Ettinghausen effects
 - 2321/021 . . Control thereof
 - 2321/0211 . . . of fans
 - 2321/0212 . . . of electric power, current or voltage
 - 2321/023 . . Mounting details thereof
 - 2321/025 . . Removal of heat
 - 2321/0251 . . . by a gas
 - 2321/0252 . . . by liquids or two-phase fluids

2327/00 Refrigeration system using an engine for driving a compressor

- 2327/001 . of the internal combustion type

2333/00 Details of boilers; Analysers; Rectifiers

- 2333/001 . the generator or boiler having an analyser
- 2333/002 . the generator or boiler is heated electrically
- 2333/003 . the generator or boiler is heated by combustion gas
- 2333/004 . the generator or boiler uses an inert gas as pressure equalizing medium
- 2333/005 . the generator or boiler uses electromagnetic energy in the form of microwaves for desorbing the sorbate from the sorbate/sorbent compound
- 2333/0051 . . the energy is used for heating an auxiliary medium which is used as heating source for desorbing the sorbate from the sorbate/sorbent compound
- 2333/006 . the generator or boiler having a rectifier
- 2333/007 . the generator or boiler heated by heat exchangers with steam or hot water as heating fluid or by a secondary boiling-condensing heater
- 2339/00 Details of evaporators; Details of condensers**
- 2339/02 . Details of evaporators
- 2339/021 . . Evaporators in which refrigerant is sprayed on a surface to be cooled
- 2339/022 . . Evaporators constructed from a pair of plates forming a space in which is located a refrigerant carrying coil
- 2339/023 . . Evaporators consisting of one or several sheets on one face of which is fixed a refrigerant carrying coil
- 2339/024 . . Evaporators with refrigerant in a vessel in which is situated a heat exchanger
- 2339/0241 . . . having plate-like elements
- 2339/0242 . . . having tubular elements
- 2339/04 . Details of condensers
- 2339/041 . . of evaporative condensers
- 2339/042 . . of pcm condensers
- 2339/043 . . Condensers made by assembling plate-like or laminated elements
- 2339/044 . . Condensers with an integrated receiver
- 2339/0441 . . . containing a drier or a filter
- 2339/0442 . . . characterised by the mechanical fixation of the receiver to the header
- 2339/0443 . . . the receiver being positioned horizontally
- 2339/0444 . . . where the flow of refrigerant through the condenser receiver is split into two or more flows, each flow following a different path through the condenser receiver
- 2339/0445 . . . with throttle portions
- 2339/0446 . . . characterised by the refrigerant tubes connecting the header of the condenser to the receiver; Inlet or outlet connections to receiver
- 2339/045 . . Condensers made by assembling a tube on a plate-like element or between plate-like elements
- 2339/046 . . Condensers with refrigerant heat exchange tubes positioned inside or around a vessel containing water or pcm to cool the refrigerant gas
- 2339/047 . . Water-cooled condensers
- 2341/00 Details of ejectors not being used as compression device; Details of flow restrictors or expansion valves**
- 2341/001 . Ejectors not being used as compression device
- 2341/0011 . . Ejectors with the cooled primary flow at reduced or low pressure
- 2341/0012 . . Ejectors with the cooled primary flow at high pressure
- 2341/0013 . . Ejector control arrangements
- 2341/0014 . . Ejectors with a high pressure hot primary flow from a compressor discharge
- 2341/0015 . . using two or more ejectors
- 2341/0016 . . Ejectors for creating an oil recirculation
- 2341/06 . Details of flow restrictors or expansion valves
- 2341/061 . . Bidirectional expansion restrictors
- 2341/062 . . Capillary expansion valves
- 2341/063 . . Feed forward expansion valves
- 2341/064 . . Superheater expansion valves
- 2341/065 . . Electric expansion valves
- 2341/0651 . . . actuated by electric heating means, e.g. a heated bimetallic element
- 2341/0652 . . . being opened and closed cyclically, e.g. with pulse width modulation
- 2341/0653 . . . actuated by an electric motor
- 2341/066 . . Refrigeration circuits using more than one expansion valve
- 2341/0661 . . . arranged in parallel
- 2341/0662 . . . arranged in series
- 2341/067 . . Expansion valves having a pilot valve
- 2341/0671 . . . the pilot valve is electrically actuated
- 2341/068 . . Expansion valves combined with a sensor
- 2341/0681 . . . the sensor is heated
- 2341/0682 . . . the sensor contains sorbent materials
- 2341/0683 . . . the sensor is disposed in the suction line and influenced by the temperature or the pressure of the suction gas
- 2345/00 Details for charging or discharging refrigerants; Service stations therefor**
- 2345/001 . Charging refrigerant to a cycle
- 2345/002 . Collecting refrigerant from a cycle
- 2345/003 . Control issues for charging or collecting refrigerant to or from a cycle
- 2345/004 . with several tanks to collect or charge a cycle
- 2345/005 . Service stations therefor
- 2345/0051 . . having a carrying handle
- 2345/0052 . . having wheels
- 2345/006 . characterised by charging or discharging valves
- 2345/007 . characterised by the weighing of refrigerant or oil
- 2347/00 Details for preventing or removing deposits or corrosion**
- 2347/02 . Details of defrosting cycles
- 2347/021 . . Alternate defrosting
- 2347/022 . . Cool gas defrosting
- 2347/023 . . Set point defrosting
- 2400/00 General features or devices for refrigeration machines, plants or systems, combined heating and refrigeration systems or heat-pump systems, i.e. not limited to a particular subgroup of [F25B](#)**
- 2400/01 . Heaters
- 2400/02 . Centrifugal separation of gas, liquid or oil
- 2400/03 . Suction accumulators with deflectors
- 2400/04 . Refrigeration circuit bypassing means
- 2400/0401 . . for the compressor
- 2400/0403 . . for the condenser
- 2400/0405 . . for the desuperheater
- 2400/0407 . . for the ejector
- 2400/0409 . . for the evaporator
- 2400/0411 . . for the expansion valve or capillary tube
- 2400/0413 . . for the filter or drier
- 2400/0415 . . for the receiver

- 2400/0417 . . for the subcooler
- 2400/0419 . . for the superheater
- 2400/05 . Compression system with heat exchange between particular parts of the system
- 2400/051 . . between the accumulator and another part of the cycle
- 2400/052 . . between the capillary tube and another part of the refrigeration cycle
- 2400/053 . . between the storage receiver and another part of the system
- 2400/054 . . between the suction tube of the compressor and another part of the cycle
- 2400/06 . Several compression cycles arranged in parallel
- 2400/061 . . the capacity of the first system being different from the second
- 2400/07 . Details of compressors or related parts
- 2400/071 . . Compressor mounted in a housing in which a condenser is integrated
- 2400/072 . . Intercoolers therefor
- 2400/073 . . Linear compressors
- 2400/074 . . with multiple cylinders
- 2400/075 . . with parallel compressors
- 2400/0751 . . . the compressors having different capacities
- 2400/076 . . having multiple cylinders driven by a rotating swash plate
- 2400/077 . . Compressor control units, e.g. terminal boxes, mounted on the compressor casing wall containing for example starter, protection switches or connector contacts
- 2400/08 . Refrigeration machines, plants and systems having means for detecting the concentration of a refrigerant
- 2400/09 . Refrigeration machines, plants and systems having means for detecting the concentration of a sorbent solution
- 2400/11 . Drop catchers
- 2400/12 . Inflammable refrigerants
- 2400/121 . . using R1234
- 2400/13 . Economisers
- 2400/14 . Power generation using energy from the expansion of the refrigerant
- 2400/141 . . the extracted power is not recycled back in the refrigerant circuit
- 2400/15 . Micro-electro-mechanical devices
- 2400/16 . Receivers
- 2400/161 . . arranged in parallel
- 2400/162 . . characterised by the plug or stop
- 2400/17 . Re-condensers
- 2400/18 . Refrigerant conversion
- 2400/19 . Pumping down refrigerant from one part of the cycle to another part of the cycle, e.g. when the cycle is changed from cooling to heating, or before a defrost cycle is started
- 2400/21 . Modules for refrigeration systems
- 2400/22 . Refrigeration systems for supermarkets
- 2400/23 . Separators
- 2400/24 . Storage receiver heat
- 2500/00 Problems to be solved**
- 2500/01 . Geometry problems, e.g. for reducing size
- 2500/02 . Increasing the heating capacity of a reversible cycle during cold outdoor conditions
- 2500/03 . Cavitations
- 2500/04 . Clogging
- 2500/05 . Cost reduction
- 2500/06 . Damage
- 2500/07 . Exceeding a certain pressure value in a refrigeration component or cycle
- 2500/08 . Exceeding a certain temperature value in a refrigeration component or cycle
- 2500/09 . Improving heat transfers
- 2500/11 . Reducing heat transfers
- 2500/12 . Sound
- 2500/13 . Vibrations
- 2500/14 . the presence of moisture in a refrigeration component or cycle
- 2500/15 . Hunting, i.e. oscillation of controlled refrigeration variables reaching undesirable values
- 2500/16 . Lubrication
- 2500/17 . Size reduction
- 2500/18 . Optimization, e.g. high integration of refrigeration components
- 2500/19 . Calculation of parameters
- 2500/21 . Reduction of parts
- 2500/22 . Preventing, detecting or repairing leaks of refrigeration fluids
- 2500/221 . . Preventing leaks from developing
- 2500/222 . . Detecting refrigerant leaks
- 2500/23 . High amount of refrigerant in the system
- 2500/24 . Low amount of refrigerant in the system
- 2500/25 . Standardisation of apparatus or parts
- 2500/26 . characterised by the startup of the refrigeration cycle
- 2500/27 . characterised by the stop of the refrigeration cycle
- 2500/28 . Means for preventing liquid refrigerant entering into the compressor
- 2500/29 . High ambient temperatures
- 2500/31 . Low ambient temperatures
- 2500/32 . Weight
- 2600/00 Control issues**
- 2600/01 . Timing
- 2600/02 . Compressor control
- 2600/021 . . Inverters therefor
- 2600/022 . . for multi-stage operation
- 2600/023 . . controlling swash plate angles
- 2600/024 . . by controlling the electric parameters, e.g. current or voltage
- 2600/025 . . by controlling speed
- 2600/0251 . . . with on-off operation
- 2600/0252 . . . with two speeds
- 2600/0253 . . . with variable speed
- 2600/026 . . by controlling unloaders
- 2600/0261 . . . external to the compressor
- 2600/0262 . . . internal to the compressor
- 2600/027 . . by controlling pressure
- 2600/0271 . . . the discharge pressure
- 2600/0272 . . . the suction pressure
- 2600/05 . Refrigerant levels
- 2600/07 . Remote controls
- 2600/11 . Fan speed control
- 2600/111 . . of condenser fans
- 2600/112 . . of evaporator fans
- 2600/13 . Pump speed control
- 2600/15 . during shut down
- 2600/17 . by controlling the pressure of the condenser

2600/19	. Refrigerant outlet condenser temperature	2700/2107	. . of a Peltier element
2600/21	. Refrigerant outlet evaporator temperature	2700/2108	. . of a receiver
2600/23	. Time delays	2700/2109	. . of a separator
2600/25	. Control of valves	2700/2111	. . of a heat storage receiver
2600/2501	. . Bypass valves	2700/2113	. . of a suction accumulator
2600/2503	. . Condenser exit valves	2700/2115	. . of a compressor or the drive means therefor
2600/2505	. . Fixed-differential control valves	2700/21151	. . . at the suction side of the compressor
2600/2507	. . Flow-diverting valves	2700/21152	. . . at the discharge side of the compressor
2600/2509	. . Economiser valves	2700/21153	. . . of electronic components
2600/2511	. . Evaporator distribution valves	2700/21154	. . . of an inverter
2600/2513	. . Expansion valves	2700/21155	. . . of the oil
2600/2515	. . Flow valves	2700/21156	. . . of the motor
2600/2517	. . Head-pressure valves	2700/21157 at the coil or rotor
2600/2519	. . On-off valves	2700/2116	. . of a condenser
2600/2521	. . On-off valves controlled by pulse signals	2700/21161	. . . the fluid cooled by the condenser
2600/2523	. . Receiver valves	2700/21162	. . . of the refrigerant at the inlet of the condenser
2600/2525	. . Pressure relief valves	2700/21163	. . . of the refrigerant at the outlet of the condenser
2700/00	Sensing or detecting of parameters; Sensors therefor	2700/2117	. . of an evaporator
2700/01	. Sensors determining characteristics of the burner for a generator	2700/21171	. . . of the fluid cooled by the evaporator
2700/02	. Humidity	2700/21172 at the inlet
2700/03	. Oil level	2700/21173 at the outlet
2700/04	. Refrigerant level	2700/21174	. . . of the refrigerant at the inlet of the evaporator
2700/05	. Load shedding of a compressor	2700/21175	. . . of the refrigerant at the outlet of the evaporator
2700/06	. Piston positions of a compressor		
2700/11	. Sensor to detect if defrost is necessary		
2700/111	. . using an emitter and receiver, e.g. sensing by emitting light or other radiation and receiving reflection by a sensor		
2700/13	. Mass flow of refrigerants		
2700/131	. . at the outlet of a subcooler		
2700/133	. . through the condenser		
2700/1331	. . . at the inlet		
2700/1332	. . . at the outlet		
2700/135	. . through the evaporator		
2700/1351	. . . of the cooled fluid upstream or downstream of the evaporator		
2700/1352	. . . at the inlet		
2700/1353	. . . at the outlet		
2700/15	. Power, e.g. by voltage or current		
2700/151	. . of the compressor motor		
2700/17	. Speeds		
2700/171	. . of the compressor		
2700/172	. . of the condenser fan		
2700/173	. . of the evaporator fan		
2700/19	. Pressures		
2700/191	. . near an expansion valve		
2700/193	. . of the compressor		
2700/1931	. . . Discharge pressures		
2700/1932	. . . Oil pressures		
2700/1933	. . . Suction pressures		
2700/195	. . of the condenser		
2700/197	. . of the evaporator		
2700/21	. Temperatures		
2700/2101	. . in a bypass		
2700/2102	. . at the outlet of the gas cooler		
2700/2103	. . near a heat exchanger		
2700/2104	. . of an indoor room or compartment		
2700/2105	. . Oil temperatures		
2700/2106	. . of fresh outdoor air		