

CPC COOPERATIVE PATENT CLASSIFICATION

F MECHANICAL ENGINEERING; LIGHTING; HEATING; WEAPONS; BLASTING (NOTE omitted)

LIGHTING; HEATING

F24 HEATING; RANGES; VENTILATING (NOTE omitted)

F24H FLUID HEATERS, e.g. WATER OR AIR HEATERS, HAVING HEAT-GENERATING MEANS, e.g. HEAT PUMPS, IN GENERAL (steam generation F22)

NOTES

1. The distinguishing feature of the air heaters covered by this subclass is that the heat is predominantly released to the air by convection, mostly by forced circulation of the air. The domestic stoves or ranges covered by subclasses [F24B](#), [F24C](#) may also be fired or electric air heaters but they release their heat to a considerable extent by radiation and only to some extent by natural convection.
2. In this subclass, the following terms are used with the meanings indicated:
 - "water" includes other liquids and means always the liquid to be heated;
 - "air" includes other gases or gas mixtures and means always the gas to be heated;
 - "furnace tubes" means tubes inside the heater wherein combustion is performed;
 - "fire tubes" means tubes inside the heater through which flue-gases flow from a combustion chamber located outside the tubes;
 - "heater" means apparatus including both heat generating means and means for transferring the generated heat to water or air.
3. All storage heaters are classified in group [F24H 7/00](#).

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| <p>1/00 Water heaters, e.g. boilers, continuous-flow heaters or water-storage heaters (steam boilers F22B)</p> <p>1/0009 . {of the reduced pressure or vacuum steam type}</p> <p>1/0018 . {using electric energy supply}</p> <p>1/0027 . {using fluid fuel}</p> <p>1/0036 . . {of the sealed type}</p> <p>1/0045 . . {with catalytic combustion}</p> <p>1/0054 . {Gas- or oil-fired immersion heaters for open containers or ponds}</p> <p>1/0063 . {using solid fuel}</p> <p>1/0072 . {Special adaptations}</p> <p>1/009 . . {for vehicle systems}</p> <p>1/06 . Portable or mobile, e.g. collapsible</p> <p>1/08 . Packaged or self-contained boilers, i.e. water heaters with control devices and pump in a single unit</p> <p>1/10 . Continuous-flow heaters, i.e. heaters in which heat is generated only while the water is flowing, e.g. with direct contact of the water with the heating medium</p> <p>1/101 . . {using electric energy supply}</p> <p>1/102 . . . {with resistance}</p> <p>1/103 {with bare resistances in direct contact with the fluid}</p> <p>1/105 {formed by the tube through which the fluid flows}</p> <p>1/106 . . . {with electrodes}</p> <p>1/107 . . {using fluid fuel}</p> <p>1/108 . . {using solid fuel}</p> <p>1/12 . . in which the water is kept separate from the heating medium</p> <p>1/121 . . . {using electric energy supply}</p> | <p>1/122 {combined with storage tank}</p> <p>1/124 . . . {using fluid fuel}</p> <p>1/125 {combined with storage tank}</p> <p>1/127 . . . {using solid fuel}</p> <p>1/128 {combined with storage tank}</p> <p>1/14 . . . by tubes, e.g. bent in serpentine form</p> <p>1/142 {using electric energy supply}</p> <p>1/145 {using fluid fuel}</p> <p>1/147 {using solid fuel}</p> <p>1/16 helically or spirally coiled</p> <p>1/162 {using electrical energy supply}</p> <p>1/165 {using fluid fuel}</p> <p>1/167 {using solid fuel}</p> <p>1/18 . Water-storage heaters</p> <p>1/181 . . {Construction of the tank}</p> <p>1/182 . . . {Insulation}</p> <p>1/183 . . . {Inner linings}</p> <p>1/185 . . {using electric energy supply (F24H 1/201 takes precedence)}</p> <p>1/186 . . {using fluid fuel}</p> <p>1/187 . . {using solid fuel}</p> <p>1/188 . . {with means for compensating water expansion}</p> <p>1/20 . . with immersed heating elements, e.g. electric elements or furnace tubes</p> <p>1/201 . . . {using electric energy supply}</p> <p>1/202 {with resistances}</p> <p>1/203 {with electrodes}</p> <p>1/205 . . . {with furnace tubes}</p> <p>1/206 {with submerged combustion chamber}</p> <p>1/207 {with water tubes}</p> <p>1/208 . . . {with tubes filled with heat transfer fluid}</p> |
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- 1/22 . Water heaters other than continuous-flow or water-storage heaters, e.g. water heaters for central heating
- 1/225 . . {electrical central heating boilers}
- 1/24 . . with water mantle surrounding the combustion chamber or chambers
- 1/26 . . . the water mantle forming an integral body
- 1/263 {with a dry-wall combustion chamber}
- 1/28 including one or more furnace or fire tubes
- 1/282 {with flue gas passages built-up by coaxial water mantles}
- 1/285 {with the fire tubes arranged alongside the combustion chamber}
- 1/287 {with the fire tubes arranged in line with the combustion chamber}
- 1/30 . . . the water mantle being built up from sections
- 1/32 with vertical sections arranged side by side
- 1/34 . . with water chamber arranged adjacent to the combustion chamber or chambers, e.g. above or at side
- 1/36 . . . the water chamber including one or more fire tubes
- 1/38 . . with water contained in separate elements, e.g. radiator-type element
- 1/40 . . with water tube or tubes
- 1/403 . . . {the water tubes being arranged in one or more circles around the burner}
- 1/406 . . . {the tubes forming a membrane wall}
- 1/41 . . . in serpentine form
- 1/43 . . . helically or spirally coiled
- 1/44 . . with combinations of two or more of the types covered by groups [F24H 1/24 - F24H 1/40](#) {, e.g. boilers having a combination of features covered by [F24H 1/24 - F24H 1/40](#)}
- 1/445 . . . {with integrated flue gas condenser}
- 1/46 . Water heaters having plural combustion chambers
- 1/48 . Water heaters for central heating incorporating heaters for domestic water
- 1/50 . . incorporating domestic water tanks
- 1/52 . . incorporating heat exchangers for domestic water ([F24H 1/50](#) takes precedence)
- 1/523 . . . {Heat exchangers for sanitary water directly heated by the burner}
- 1/526 . . . {Pipes in pipe heat exchangers for sanitary water}
- 1/54 . Water heaters for bathtubs or pools; Water heaters for reheating the water in bathtubs or pools

- 3/00 Air heaters**
- 3/002 . {using electric energy supply}
- 3/004 . . {with a closed circuit for a heat transfer liquid}
- 3/006 . {using fluid fuel}
- 3/008 . {using solid fuel}
- 3/02 . with forced circulation
- 3/022 . . {using electric energy supply}
- 3/025 . . {using fluid fuel}
- 3/027 . . {using solid fuel}
- 3/04 . . the air being in direct contact with the heating medium, e.g. electric heating element

- 3/0405 . . . {using electric energy supply, e.g. the heating medium being a resistive element; Heating by direct contact, i.e. with resistive elements, electrodes and fins being bonded together without additional element in-between ([F24H 3/06](#), [F24H 3/08](#), [F24H 3/10](#) take precedence)}
- 3/0411 {for domestic or space-heating systems}
- 3/0417 {portable or mobile}
- 3/0423 {hand-held air guns}
- 3/0429 {For vehicles}
- 3/0435 {Structures comprising heat spreading elements in the form of fins}
- 3/0441 {Interfaces between the electrodes of a resistive heating element and the power supply means}
- 3/0447 {Forms of the electrode terminals, e.g. tongues or clips}
- 3/0452 {Frame constructions}
- 3/0458 {One-piece frames}
- 3/0464 {Two-piece frames, e.g. two-shell frames, also including frames as a central body with two covers}
- 3/047 {Multiple-piece frames assembled on their four or more edges}
- 3/0476 {Means for putting the electric heaters in the frame under strain, e.g. with springs}
- 3/0482 {Frames with integrated fan}
- 3/0488 . . . {using fluid fuel}
- 3/0494 . . . {using solid fuel}
- 3/06 . . the air being kept separate from the heating medium, e.g. using forced circulation of air over radiators
- 3/062 . . . {using electric energy supply; the heating medium being the resistive element ([F24H 3/08](#), [F24H 3/10](#) takes precedence)}
- 3/065 . . . {using fluid fuel}
- 3/067 . . . {using solid fuel}
- 3/08 . . . by tubes
- 3/081 {using electric energy supply}
- 3/082 {The tubes being an electrical isolator containing the heater}
- 3/084 {The tubes being an electrode for the heater}
- 3/085 {The tubes containing an electrically heated intermediate fluid, e.g. water}
- 3/087 {using fluid fuel}
- 3/088 {using solid fuel}
- 3/10 . . . by plates
- 3/102 {using electric energy supply}
- 3/105 {using fluid fuel}
- 3/107 {using solid fuel}
- 3/12 . with additional heating arrangements

- 4/00 Fluid heaters characterised by the use of heat pumps**
- 4/02 . Water heaters
- 4/04 . . Storage heaters
- 4/06 . Air heaters

- 6/00 Combined water and air heaters**

- 7/00 Storage heaters, i.e. heaters in which the energy is stored as heat in masses for subsequent release**

- 7/002 . {using electrical energy supply}
- 7/005 . {using fluid fuel}
- 7/007 . {using solid fuel}
- 7/02 . the released heat being conveyed to a transfer fluid
- 7/0208 . . {using electrical energy supply}
- 7/0216 . . . {the transfer fluid being air}
- 7/0225 {with supplementary heating means}
- 7/0233 . . . {the transfer fluid being water}
- 7/0241 {with supplementary heating means}
- 7/025 . . {using fluid fuel}
- 7/0258 . . . {the transfer fluid being air}
- 7/0266 . . . {the transfer fluid being water}
- 7/0275 . . {using solid fuel}
- 7/0283 . . . {the transfer fluid being air}
- 7/0291 . . . {the transfer fluid being water}
- 7/04 . . with forced circulation of the transfer fluid
- 7/0408 . . . {using electrical energy supply}
- 7/0416 {the transfer fluid being air}
- 7/0425 {with supplementary heating means}
- 7/0433 {the transfer medium being water}
- 7/0441 {with supplementary heating means}
- 7/045 . . . {using fluid fuel}
- 7/0458 {the transfer fluid being air}
- 7/0466 {the transfer fluid being water}
- 7/0475 . . . {using solid fuel}
- 7/0483 {the transfer fluid being air}
- 7/0491 {the transfer fluid being water}
- 7/06 . the released heat being radiated
- 7/062 . . {with electrical energy supply}
- 7/065 . . {with fluid fuel}
- 7/067 . . {with solid fuel}
- 8/00 Fluid heaters characterised by means for extracting latent heat from flue gases by means of condensation**
- 8/003 . {having means for moistening the combustion air with condensate from the combustion gases}
- 8/006 . {Means for removing condensate from the heater}
- 9/00 Details**
- 9/0005 . {for water heaters}
- 9/001 . . {Guiding means}
- 9/0015 . . . {in water channels}
- 9/0021 {Sleeves surrounding heating elements or heating pipes, e.g. pipes filled with heat transfer fluid, for guiding heated liquid}
- 9/0026 . . . {in combustion gas channels}
- 9/0031 {with means for changing or adapting the path of the flue gas}
- 9/0036 . . {Dispositions against condensation of combustion products}
- 9/0042 . . {Cleaning arrangements}
- 9/0052 . {for air heaters}
- 9/0057 . . {Guiding means}
- 9/0063 . . . {in air channels}
- 9/0068 . . . {in combustion gas channels}
- 9/0073 . . {Arrangement or mounting of means for forcing the circulation of air}
- 9/0078 . . . {for storage heaters}
- 9/0084 . {Combustion air preheating}
- 9/0089 . . {by double wall boiler mantle}
- 9/0094 . {having means for transporting the boiler}
- 9/02 . Casings; Cover lids; Ornamental panels
- 9/06 . Arrangement of mountings or supports {for heaters, e.g. boilers, other than space heating radiators (space heating radiators [F24D 19/02](#))}
- 9/12 . Arrangements for connecting heaters to circulation pipes
- 9/13 . . for water heaters
- 9/133 . . . {Storage heaters}
- 9/136 {Arrangement of inlet valves used therewith}
- 9/139 . . . {Continuous flow heaters}
- 9/14 . Arrangements for connecting different sections, e.g. in water heaters ([arrangements for connecting heaters to circulation pipes F24H 9/12](#))
- 9/142 . . {Connecting hydraulic components}
- 9/144 . . . {Valve seats, piping and heat exchanger connections integrated into a one-piece hydraulic unit}
- 9/146 . . {Connecting elements of a heat exchanger}
- 9/148 . . {Arrangements of boiler components on a frame or within a casing to build the fluid heater, e.g. boiler}
- 9/16 . Arrangements for water drainage
- 9/17 . . Means for retaining water leaked from heaters
- 9/18 . Arrangement or mounting of grates or heating means
- 9/1809 . . for water heaters
- 9/1818 . . . Arrangement or mounting of electric heating means
- 9/1827 {Positive temperature coefficient [PTC] resistor}
- 9/1832 . . . Arrangement or mounting of combustion heating means, e.g. grates or burners
- 9/1836 using fluid fuel
- 9/1845 using solid fuel
- 9/1854 . . for air heaters
- 9/1863 . . . Arrangement or mounting of electric heating means
- 9/1872 {PTC}
- 9/1877 . . . Arrangement or mounting of combustion heating means, e.g. grates or burners
- 9/1881 using fluid fuel
- 9/189 using solid fuel
- 9/20 . Arrangement or mounting of control or safety devices
- 9/2007 . . {for water heaters}
- 9/2014 . . . {using electrical energy supply}
- 9/2021 {Storage heaters}
- 9/2028 {Continuous-flow heaters}
- 9/2035 . . . {using fluid fuel}
- 9/2042 {Preventing or detecting the return of combustion gases}
- 9/205 {Closing the energy supply}
- 9/2057 . . . {using solid fuel}
- 9/2064 . . {for air heaters}
- 9/2071 . . . {using electrical energy supply}
- 9/2078 {Storage heaters}
- 9/2085 . . . {using fluid fuel}
- 9/2092 . . . {using solid fuel}
- 9/25 . . of remote control devices or control-panels
- 9/28 . . . characterised by the graphical user interface [GUI]
- 9/40 . Arrangements for preventing corrosion
- 9/45 . . for preventing galvanic corrosion, e.g. cathodic or electrolytic means

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| 9/455 | . . . {for water heaters} | 15/254 | . . Room temperature |
| 9/457 | . . . {for air heaters} | 15/258 | . . Outdoor temperature |
| 15/00 | Control of fluid heaters | 15/262 | . . Weather information or forecast |
| 15/10 | . characterised by the purpose of the control | 15/265 | . . Occupancy |
| 15/104 | . . Inspection; Diagnosis; Trial operation | 15/269 | . . Time, e.g. hour or date |
| 15/108 | . . Resuming operation, e.g. after power outages | 15/273 | . . Address or location |
| 15/112 | . . Preventing or detecting blocked flues | 15/277 | . . Price |
| 15/116 | . . . Disabling the heating means in response thereto | 15/281 | . . Input from user |
| 15/12 | . . Preventing or detecting fluid leakage | 15/288 | . . Accumulation of deposits, e.g. lime or scale |
| 15/124 | . . Preventing or detecting electric faults, e.g. electric leakage | 15/292 | . . Metering of electricity sold to the grid |
| 15/128 | . . Preventing overheating | 15/296 | . . Information from neighbouring devices |
| 15/132 | . . . Preventing the operation of water heaters with low water levels, e.g. dry-firing | 15/30 | . characterised by control outputs; characterised by the components to be controlled |
| 15/136 | . . Defrosting or de-icing; Preventing freezing | 15/305 | . . Control of valves (of heat pumps F24H 15/385 , F24H 15/39) |
| 15/14 | . . Cleaning; Sterilising; Preventing contamination by bacteria or microorganisms, e.g. by replacing fluid in tanks or conduits | 15/31 | . . . of valves having only one inlet port and one outlet port, e.g. flow rate regulating valves |
| 15/144 | . . Measuring or calculating energy consumption | 15/315 | . . . of mixing valves |
| 15/148 | . . . Assessing the current energy consumption | 15/32 | . . . of switching valves (for by-passing F24H 15/325) |
| 15/152 | . . . Forecasting future energy consumption | 15/325 | . . . of by-pass valves |
| 15/156 | . . Reducing the quantity of energy consumed; Increasing efficiency | 15/33 | . . Control of dampers |
| 15/16 | . . Reducing cost using the price of energy, e.g. choosing or switching between different energy sources | 15/335 | . . Control of pumps, e.g. on-off control (control of compressors of heat pumps F24H 15/38) |
| 15/164 | . . . where the price of the electric supply changes with time | 15/34 | . . . Control of the speed of pumps |
| 15/168 | . . Reducing the electric power demand peak | 15/345 | . . Control of fans, e.g. on-off control (control of fans of heat pump units F24H 15/375) |
| 15/172 | . . Scheduling based on user demand, e.g. determining starting point of heating | 15/35 | . . . Control of the speed of fans |
| 15/174 | . . Supplying heated water with desired temperature or desired range of temperature | 15/355 | . . Control of heat-generating means in heaters |
| 15/175 | . . . where the difference between the measured temperature and a set temperature is kept under a predetermined value | 15/36 | . . . of burners |
| 15/176 | . . Improving or maintaining comfort of users | 15/365 | of two or more burners, e.g. an array of burners |
| 15/18 | . . . Preventing sudden or unintentional change of fluid temperature | 15/37 | . . . of electric heaters |
| 15/184 | . . Preventing harm to users from exposure to heated water, e.g. scalding | 15/375 | . . Control of heat pumps |
| 15/196 | . . Automatically filling bathtubs or pools; Reheating the water in bathtubs or pools | 15/38 | . . . Control of compressors of heat pumps |
| 15/20 | . characterised by control inputs | 15/385 | . . . Control of expansion valves of heat pumps |
| 15/204 | . . Temperature of the air before heating | 15/39 | . . . Control of valves for distributing refrigerant to different evaporators or condensers in heat pumps |
| 15/208 | . . Temperature of the air after heating | 15/395 | . . Information to users, e.g. alarms |
| 15/212 | . . Temperature of the water | 15/40 | . characterised by the type of controllers |
| 15/215 | . . . before heating | 15/407 | . . using electrical switching, e.g. TRIAC |
| 15/219 | . . . after heating | 15/414 | . . using electronic processing, e.g. computer-based |
| 15/223 | . . . in the water storage tank | 15/421 | . . . using pre-stored data |
| 15/225 | at different heights of the tank | 15/429 | for selecting operation modes |
| 15/227 | . . Temperature of the refrigerant in heat pump cycles | 15/436 | for selecting sleeping modes |
| 15/231 | . . . at the evaporator | 15/443 | . . . using a central controller connected to several sub-controllers |
| 15/232 | . . . at the condenser | 15/45 | . . . remotely accessible |
| 15/235 | . . Temperature of exhaust gases | 15/457 | using telephone networks or Internet communication |
| 15/238 | . . Flow rate | 15/464 | using local wireless communication |
| 15/242 | . . Pressure | 15/479 | for programming the system |
| 15/246 | . . Water level | 15/486 | . . using timers |
| 15/248 | . . . of water storage tanks | 15/493 | . . specially adapted for enabling recognition of parts newly installed in the fluid heating system, e.g. for retrofitting or for repairing by replacing parts |
| 15/25 | . . Temperature of the heat-generating means in the heater | | |
| | | 2203/00 | ** to be deleted ** |
| | | 2210/00 | Burner and heat exchanger are integrated |
| | | 2220/00 | Measures for environmentally correct disposal |

F24H

2230/00 Solid fuel fired boiler

- 2230/02 . Solid and fluid fuel fired boilers

2240/00 Fluid heaters having electrical generators

- 2240/01 . Batteries, electrical energy storage device
- 2240/02 . with combustion engines
 - 2240/04 . . External combustion engines
 - 2240/06 . . Internal combustion engines
- 2240/08 . with peltier elements
- 2240/09 . with photovoltaic cells
- 2240/10 . with fuel cells
- 2240/12 . with thermodynamic cycle for converting thermal energy to mechanical power to produce electrical energy
 - 2240/122 . . Stirling cycles
 - 2240/125 . . Carnot cycles
 - 2240/127 . . Rankine cycles, e.g. steam heat engines

2250/00 Electrical heat generating means

- 2250/02 . Resistances
- 2250/04 . Positive or negative temperature coefficients, e.g. PTC, NTC
- 2250/06 . Peltier
- 2250/08 . Induction
- 2250/10 . Electrodes
- 2250/12 . Microwaves
- 2250/14 . Lamps