

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

F01 MACHINES OR ENGINES IN GENERAL; ENGINE PLANTS IN GENERAL; STEAM ENGINES

F01P COOLING OF MACHINES OR ENGINES IN GENERAL; COOLING OF INTERNAL-COMBUSTION ENGINES (arrangements in connection with cooling of propulsion units in vehicles B60K 11/00; heat-transfer, heat-exchange or heat-storage materials C09K 5/00; heat-exchange in general, radiators F28)

Note(s)

- In this subclass, the following terms or expressions are used with the meanings indicated:
 - "air" also includes other gaseous cooling fluids;
 - "liquid cooling" also includes cooling where liquid is used as the heat-transferring fluid between parts to be cooled and the air, e.g. using radiators;
 - "air cooling" means direct air cooling and thus excludes indirect air cooling occurring in liquid cooling systems as explained under liquid cooling above;
 - "cooling-air" includes directly- or indirectly-acting cooling-air.
- Attention is drawn to the Notes preceding class F01, especially as regards Note (3).
- Cooling by lubricant is classified in subclass F01M when the lubrication aspect predominates, and in subclass F01P when the cooling aspect predominates.

Air cooling; Liquid cooling

- 1/00 Air cooling** (propelling cooling-air or liquid coolants F01P 5/00; controlling supply or circulation of coolants F01P 7/00)
- 1/02 • Arrangements for cooling cylinders or cylinder heads, e.g. ducting cooling-air from its pressure source to cylinders or along cylinders
- 1/04 • Arrangements for cooling pistons
- 1/06 • Arrangements for cooling other engine or machine parts
- 1/08 • • for cooling intake or exhaust valves
- 1/10 • • for cooling fuel injectors or sparking-plugs
- 3/00 Liquid cooling** (propelling cooling-air or liquid coolants F01P 5/00; controlling supply or circulation of coolants F01P 7/00)
- 3/02 • Arrangements for cooling cylinders or cylinder heads
- 3/04 • • Liquid-to-air heat-exchangers combined with, or arranged on, cylinders or cylinder heads
- 3/06 • Arrangements for cooling pistons
- 3/08 • • Cooling of piston exterior only, e.g. by jets
- 3/10 • • Cooling by flow of coolant through pistons
- 3/12 • Arrangements for cooling other engine or machine parts
- 3/14 • • for cooling intake or exhaust valves
- 3/16 • • for cooling fuel injectors or sparking-plugs
- 3/18 • Arrangement or mounting of liquid-to-air heat-exchangers (such arrangements on cylinders or cylinder heads F01P 3/04; relative to vehicles B60K 11/04)
- 3/20 • Cooling circuits not specific to a single part of engine or machine (F01P 3/22 takes precedence)

- 3/22 • characterised by evaporation and condensation of coolant in closed cycles (other cooling by evaporation F01P 9/02); characterised by the coolant reaching higher temperatures than normal atmospheric boiling-point

Pumping cooling-air or liquid coolants; Controlling circulation or supply of coolants

- 5/00 Pumping cooling-air or liquid coolants** (controlling circulation or supply of coolants by influencing drive of pumps F01P 7/00)
- 5/02 • Pumping cooling-air; Arrangements of cooling-air pumps, e.g. fans or blowers
- 5/04 • • Pump-driving arrangements
- 5/06 • • Guiding or ducting air to or from ducted fans
- 5/08 • • Use of engine exhaust gases for pumping cooling-air
- 5/10 • Pumping liquid coolant; Arrangements of coolant pumps
- 5/12 • • Pump-driving arrangements
- 5/14 • Safety means against, or active at, failure of coolant-pump drives, e.g. shutting engine down; Means for indicating functioning of coolant pumps
- 7/00 Controlling of coolant flow**
- 7/02 • the coolant being cooling-air
- 7/04 • • by varying pump speed, e.g. by changing pump-drive gear ratio
- 7/06 • • by varying blade pitch
- 7/08 • • by cutting in or out of pumps
- 7/10 • • by throttling amount of air flowing through liquid-to-air heat-exchangers
- 7/12 • • • by thermostatic control
- 7/14 • the coolant being liquid

F01P

7/16 • • by thermostatic control

9/00 Cooling having pertinent characteristics not provided for in, or of interest apart from, groups F01P 1/00-F01P 7/00 (profiting from waste heat of combustion-engine cooling F02G 5/00)

9/02 • Cooling by evaporation, e.g. by spraying water on to cylinders (evaporation and condensation of liquid coolant in closed cycles F01P 3/22)

9/04 • by simultaneous or alternative use of direct air cooling and liquid cooling (F01P 9/02 takes precedence)

9/06 • by use of refrigerating apparatus, e.g. of compressor or absorber type

11/00 Component parts, details, or accessories, not provided for in, or of interest apart from, groups F01P 1/00-F01P 9/00

11/02 • Liquid-coolant overflow, venting, or draining devices (automatic draining during freezing conditions F01P 11/20)

11/04 • Arrangements of liquid pipes or hoses

11/06 • Cleaning (in general B08B); Combating corrosion (in general C23F)

11/08 • Arrangements of lubricant coolers (in lubrication apparatus F01M)

11/10 • Guiding or ducting cooling-air to or from liquid-to-air heat-exchangers

11/12 • Filtering, cooling, or silencing cooling-air

11/14 • Indicating devices; Other safety devices

11/16 • • concerning coolant temperature (F01P 11/20 takes precedence)

11/18 • • concerning coolant pressure, coolant flow, or liquid-coolant level

11/20 • • concerning atmospheric freezing conditions, e.g. automatically draining or heating during frosty weather