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)

1. 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.
2. Attention is drawn to the Notes preceding class F01, especially as regards Note (3).
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, 2006.01]**

1/02 • Arrangements for cooling cylinders or cylinder heads, e.g. ducting cooling-air from its pressure source to cylinders or along cylinders **[1, 2006.01]**

1/04 • Arrangements for cooling pistons **[1, 2006.01]**

1/06 • Arrangements for cooling other engine or machine parts **[1, 2006.01]**

1/08 • • for cooling intake or exhaust valves **[1, 2006.01]**

1/10 • • for cooling fuel injectors or sparking-plugs **[1, 2006.01]**

3/00 **Liquid cooling** (propelling cooling-air or liquid coolants F01P 5/00; controlling supply or circulation of coolants F01P 7/00) **[1, 2006.01]**

3/02 • Arrangements for cooling cylinders or cylinder heads **[1, 2006.01]**

3/04 • • Liquid-to-air heat-exchangers combined with, or arranged on, cylinders or cylinder heads **[1, 2006.01]**

3/06 • Arrangements for cooling pistons **[1, 2006.01]**

3/08 • • Cooling of piston exterior only, e.g. by jets **[1, 2006.01]**

3/10 • • Cooling by flow of coolant through pistons **[1, 2006.01]**

3/12 • Arrangements for cooling other engine or machine parts **[1, 2006.01]**

3/14 • • for cooling intake or exhaust valves **[1, 2006.01]**

3/16 • • for cooling fuel injectors or sparking-plugs **[1, 2006.01]**

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) **[1, 2006.01]**

3/20 • Cooling circuits not specific to a single part of engine or machine (F01P 3/22 takes precedence) **[1, 2006.01]**

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 **[1, 2006.01]**

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) **[1, 2006.01]**

5/02 • Pumping cooling-air; Arrangements of cooling-air pumps, e.g. fans or blowers **[1, 2006.01]**

5/04 • • Pump-driving arrangements **[1, 2006.01]**

5/06 • • Guiding or ducting air to or from ducted fans **[1, 2006.01]**

5/08 • • Use of engine exhaust gases for pumping cooling-air **[1, 2006.01]**

5/10 • Pumping liquid coolant; Arrangements of coolant pumps **[1, 2006.01]**

5/12 • • Pump-driving arrangements **[1, 2006.01]**

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 **[1, 2006.01]**

7/00 **Controlling of coolant flow [1, 2006.01]**

7/02 • the coolant being cooling-air **[1, 2006.01]**

7/04 • • by varying pump speed, e.g. by changing pump-drive gear ratio **[1, 2006.01]**

7/06 • • by varying blade pitch **[1, 2006.01]**

7/08 • • by cutting in or out of pumps **[1, 2006.01]**

7/10 • • by throttling amount of air flowing through liquid-to-air heat-exchangers **[1, 2006.01]**
7/12 • • • by thermostatic control **[1, 2006.01]**
7/14 • the coolant being liquid **[1, 2006.01]**
7/16 • • by thermostatic control **[1, 2006.01]**

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) **[1, 2006.01]**
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) **[1, 2006.01]**
9/04 • by simultaneous or alternative use of direct air cooling and liquid cooling (F01P 9/02 takes precedence) **[1, 2006.01]**
9/06 • by use of refrigerating apparatus, e.g. of compressor or absorber type **[1, 2006.01]**

11/00 Component parts, details, or accessories, not provided for in, or of interest apart from, groups F01P 1/00-F01P 9/00 [1, 2006.01]
11/02 • Liquid-coolant overflow, venting, or draining devices (automatic draining during freezing conditions F01P 11/20) **[1, 2006.01]**
11/04 • Arrangements of liquid pipes or hoses **[1, 2006.01]**
11/06 • Cleaning (in general B08B); Combating corrosion (in general C23F) **[1, 2006.01]**
11/08 • Arrangements of lubricant coolers (in lubrication apparatus F01M) **[1, 2006.01]**
11/10 • Guiding or ducting cooling-air to or from liquid-to-air heat-exchangers **[1, 2006.01]**
11/12 • Filtering, cooling, or silencing cooling-air **[1, 2006.01]**
11/14 • Indicating devices; Other safety devices **[1, 2006.01]**
11/16 • • concerning coolant temperature (F01P 11/20 takes precedence) **[1, 2006.01]**
11/18 • • concerning coolant pressure, coolant flow, or liquid-coolant level **[1, 2006.01]**
11/20 • • concerning atmospheric freezing conditions, e.g. automatically draining or heating during frosty weather **[1, 2006.01]**