

## SECTION F – MECHANICAL ENGINEERING; LIGHTING; HEATING; WEAPONS; BLASTING

### F01 MACHINES OR ENGINES IN GENERAL (combustion engines F02; machines for liquids F03, F04); 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)

- (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** (propelling cooling-air or liquid coolants F01P 5/00; controlling supply or circulation of coolants F01P 7/00; cylinders, pistons, valves, fuel injectors, sparking-plugs, or other engine or machine parts, modified to facilitate cooling, see the relevant classes for such parts)

#### 1/00 Air cooling

- 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

- 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
- 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)

## F01P

- 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