F 01 P COOLING OF MACHINES OR ENGINES IN GENERAL; COOLING OF INTERNAL-COMBUSTION ENGINES

(arrangements in connection with cooling of propulsion units in vehicles B 60 K 11/00; heat-transfer, heat-exchange or heat-storage materials C 09 K 5/00; heat-exchange in general, radiators F 28)

Notes

(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 F 01, especially as regards Note (3).

(3) Cooling by lubricant is classified in subclass F 01 M when the lubrication aspect predominates, and in subclass P when the cooling aspect predominates.

Air cooling; Liquid cooling (propelling cooling-air or liquid coolants 5/00; controlling supply or circulation of coolants 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 3/04; relative to vehicles B 60 K 11/04)

3/20 . Cooling circuits not specific to a single part of engine or machine (3/22 takes precedence)

3/22 . characterised by evaporation and condensation of coolant in closed cycles (other cooling by evaporation 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 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 1/00 to 7/00 (profiting from waste heat of combustion-engine cooling F 02 G 5/00)

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

9/04 . by simultaneous or alternative use of direct air cooling and liquid cooling (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 1/00 to 9/00

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

11/04 . Arrangements of liquid pipes or hoses

11/06 . Cleaning (in general B 08 B); Combating corrosion (in general C 23 F)

11/08 . Arrangements of lubricant coolers (in lubrication apparatus F 01 M)

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 (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