CPC COOPERATIVE PATENT CLASSIFICATION

F02G HOT GAS OR COMBUSTION-PRODUCT POSITIVE-DISPLACEMENT ENGINE PLANTS (steam engine plants, special vapour plants, plants operating on either hot gas or combustion-product gases together with other fluid F01K; gas-turbine plants F02C; jet-propulsion plants F02K); USE OF WASTE HEAT OF COMBUSTION ENGINES; NOT OTHERWISE PROVIDED FOR

NOTE

Attention is drawn to the notes preceding class F01.

1/00 **Hot gas positive-displacement engine plants** (positive-displacement engine plants characterised by the working gas being generated by combustion in the plant F02G 3/00)

1/02 . of open-cycle type

1/04 . of closed-cycle type

1/043 . . the engine being operated by expansion and contraction of a mass of working gas which is heated and cooled in one of a plurality of constantly communicating expansible chambers, e.g. Stirling cycle type engine

1/0435 . . . {the engine being of the free piston type}

1/044 . . . having at least two working members, e.g. pistons, delivering power output

1/0445 . . . . {Engine plants with combined cycles, e.g. Vuilleumier}

1/045 . . . Controlling

1/047 . . . . by varying the heating or cooling

1/05 . . . . by varying the rate of flow or quantity of the working gas

1/053 . . . Component parts or details

1/0535 . . . . {Seals or sealing arrangements}

1/055 . . . . Heaters or coolers

1/057 . . . . Regenerators

1/06 . Controlling

3/00 **Positive-displacement engine plants characterised by the working gas being generated by combustion in the plant**

3/02 . with reciprocating-piston engines

5/00 **Profiting from waste heat of combustion engines, not otherwise provided for**

5/02 . Profiting from waste heat of exhaust gases

5/04 . . in combination with other waste heat from combustion engines

2242/00 **Ericsson-type engines having open regenerative cycles controlled by valves**

2242/02 . Displacer-type engines

2242/04 . . having constant working volume

2242/06 . . . with external drive displacers

2242/08 . . . . having gas actuated valves, e.g. "Bush engines"

2242/10 . . . . having mechanically actuated valves, e.g. "Gifford" or "McMahon engines"

2242/30 . . having variable working volume

2242/32 . . . Regenerative displacers with independent pistons

2242/40 . Piston-type engines

2242/42 . . having a single piston regenerative displacer attached to the piston, e.g. "Gifford-McMahon" engines

2242/44 . . having two pistons and reverse flow regenerators

2243/00 **Stirling type engines having closed regenerative thermodynamic cycles with flow controlled by volume changes**

2243/02 . having pistons and displacers in the same cylinder

2243/04 . . Crank-connecting-rod drives

2243/06 . . . Regenerative displacers

2243/08 . . . External regenerators, e.g. "Rankine Napier" engines

2243/20 . . each having a single free piston, e.g. "Beale engines"

2243/202 . . . resonant

2243/204 . . . non-resonant

2243/206 . . . externally excited

2243/22 . . with oscillating cylinders

2243/24 . . with free displacers

2243/30 . having their pistons and displacers each in separate cylinders (two-piston machines F02G 2244/00)

2243/32 . . Regenerative displacers having parallel cylinder, e.g. "Lauberau" or "Schwartzkopff" engines

2243/34 . . Regenerative displacers having their cylinders at right angle, e.g. "Robinson" engines

2243/36 . . with twin-expansion cylinders, e.g. "Rainbow" engines

2243/38 . . External regenerators having parallel cylinders, e.g. "Heinrici" engines

2243/40 . . with free displacers

2243/50 . . having resonance tubes

2243/52 . . . acoustic

2243/54 . . . thermo-acoustic

2244/00 **Machines having two pistons**

2244/02 . Single-acting two piston engines

2244/04 . . of rotary cylinder type, e.g. "Finkelstein" engines

2244/06 . . of stationary cylinder type

2244/08 . . . having parallel cylinder, e.g. "Rider" engines

2244/10 . . . having cylinders in V-arrangement

2244/12 . . . having opposed pistons

2244/50 . Double acting piston machines

2244/52 . . having interconnecting adjacent cylinders constituting a single system, e.g. "Rinia" engines

2244/54 . . having two-cylinder twin systems, with compression in one cylinder and expansion in the other cylinder for each of the twin systems, e.g. "Finkelstein" engines

2250/00 **Special cycles or special engines**
2250/03 . Brayton cycles
2250/06 . Beau de Rochas constant volume cycles
2250/09 . Carnot cycles in general
2250/12 . Malone liquid thermal cycles
2250/15 . Sabathe mixed air cycles
2250/18 . Vuilleumier cycles
2250/21 . Cooke Yarborough engines
2250/24 . Ringbom engines, the displacement of the free displacer being obtained by expansion of the heated gas and the weight of the piston
2250/27 . Martini Stirling engines
2250/31 . Nano or micro engines

2253/00 **Seals**
2253/01 . Rotary piston seals
2253/02 . Reciprocating piston seals
2253/03 . Stem seals
2253/04 . Displacer seals
2253/06 . Bellow seals
2253/08 . Stem with rolling membranes
2253/10 . Piston with rolling membranes
2253/50 . Liquid seals
2253/60 . Sealing of the lubrication circuit
2253/80 . Sealing of the crankcase

2254/00 **Heat inputs**
2254/05 . by air
2254/10 . by burners
2254/11 . . Catalytic burners
2254/12 . by ejectors
2254/15 . by exhaust gas
2254/18 . using deflectors, e.g. spirals
2254/20 . using heat transfer tubes
2254/30 . using solar radiation
2254/40 . using heat accumulators
2254/45 . by electric heating
2254/50 . Dome arrangements for heat input
2254/60 . using air preheaters
2254/70 . by catalytic conversion, i.e. flameless oxydation
2254/90 . by radioactivity

2255/00 **Heater tubes**
2255/10 . dome shaped
2255/20 . Heater fins

2256/00 **Coolers**
2256/02 . Cooler fins
2256/04 . Cooler tubes
2256/50 . with coolant circulation

2257/00 **Regenerators**
2257/02 . rotating

2258/00 **Materials used**
2258/10 . ceramic
2258/20 . having heat insulating properties
2258/50 . having frictional properties
2258/80 . having magnetic properties
2258/90 . Processing of materials

2260/00 **Recuperating heat from exhaust gases of combustion engines and heat from cooling circuits**

2262/00 **Recuperating heat from exhaust gases of combustion engines and heat from lubrication circuits**

2270/00 **Constructional features**
2270/005 . Shells, e.g. a sealed or sealing shell for a Stirling engine
2270/02 . Pistons for reciprocating and rotating
2270/04 . Roller assemblies connecting opposed pistons
2270/10 . Rotary pistons
2270/15 . Rotating cylinders
2270/20 . Plural piston swash plates
2270/30 . Displacer assemblies
2270/40 . Piston assemblies
2270/42 . Displacer drives
2270/425 . . the displacer being driven by a four-bar mechanism, e.g. a rhombic mechanism
2270/45 . Piston rods
2270/50 . Crosshead guiding pistons
2270/55 . Cylinders
2270/60 . Counterweights for pistons
2270/70 . Liquid pistons
2270/80 . Engines without crankshafts
2270/85 . Crankshafts
2270/90 . Valves
2270/95 . Pressurised crankcases

2275/00 **Controls**
2275/10 . for vibration reduction
2275/20 . for preventing piston over stroke
2275/30 . for proper burning
2275/40 . for starting

2280/00 **Output delivery**
2280/005 . Medical applications, e.g. for prosthesis or artificial hearts
2280/10 . Linear generators
2280/20 . Rotary generators
2280/50 . Compressors or pumps
2280/60 . Heat pumps
2280/70 . Clutches

2290/00 **Engines characterised by the use of a particular power transfer medium, e.g. Helium**