

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](#).

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| 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) | 2242/42 | . . having a single piston regenerative displacer attached to the piston, e.g. "Gifford-McMahon" engines |
| 1/02 | . of open-cycle type | 2242/44 | . . having two pistons and reverse flow regenerators |
| 1/04 | . of closed-cycle type | 2243/00 | Stirling type engines having closed regenerative thermodynamic cycles with flow controlled by volume changes |
| 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 | 2243/02 | . having pistons and displacers in the same cylinder |
| 1/0435 | . . . {the engine being of the free piston type} | 2243/04 | . . Crank-connecting-rod drives |
| 1/044 | . . . having at least two working members, e.g. pistons, delivering power output | 2243/06 | . . . Regenerative displacers |
| 1/0445 | {Engine plants with combined cycles, e.g. Vuilleumier} | 2243/08 | . . . External regenerators, e.g. "Rankine Napier" engines |
| 1/045 | . . . Controlling | 2243/20 | . . each having a single free piston, e.g. "Beale engines" |
| 1/047 | by varying the heating or cooling | 2243/202 | . . . resonant |
| 1/05 | by varying the rate of flow or quantity of the working gas | 2243/204 | . . . non-resonant |
| 1/053 | . . . Component parts or details | 2243/206 | . . . externally excited |
| 1/0535 | {Seals or sealing arrangements} | 2243/22 | . . with oscillating cylinders |
| 1/055 | Heaters or coolers | 2243/24 | . . with free displacers |
| 1/057 | Regenerators | 2243/30 | . having their pistons and displacers each in separate cylinders (two-piston machines F02G 2244/00) |
| 1/06 | . Controlling | 2243/32 | . . Regenerative displacers having parallel cylinder, e.g. "Lauberau" or "Schwartzkopff" engines |
| 3/00 | Positive-displacement engine plants characterised by the working gas being generated by combustion in the plant | 2243/34 | . . Regenerative displacers having their cylinders at right angle, e.g. "Robinson" engines |
| 3/02 | . with reciprocating-piston engines | 2243/36 | . . with twin-expansion cylinders, e.g. "Rainbow" engines |
| 5/00 | Profiting from waste heat of combustion engines, not otherwise provided for | 2243/38 | . . External regenerators having parallel cylinders, e.g. "Heinrici" engines |
| 5/02 | . Profiting from waste heat of exhaust gases | 2243/40 | . . with free displacers |
| 5/04 | . . in combination with other waste heat from combustion engines | 2243/50 | . . having resonance tubes |
| 2242/00 | Ericsson-type engines having open regenerative cycles controlled by valves | 2243/52 | . . . acoustic |
| 2242/02 | . Displacer-type engines | 2243/54 | . . . thermo-acoustic |
| 2242/04 | . . having constant working volume | 2244/00 | Machines having two pistons |
| 2242/06 | . . . with external drive displacers | 2244/02 | . Single-acting two piston engines |
| 2242/08 | having gas actuated valves, e.g. "Bush engines" | 2244/04 | . . of rotary cylinder type, e.g. "Finkelstein" engines |
| 2242/10 | having mechanically actuated valves, e.g. "Gifford" or "McMahon engines" | 2244/06 | . . of stationary cylinder type |
| 2242/30 | . . having variable working volume | 2244/08 | . . . having parallel cylinder, e.g. "Rider" engines |
| 2242/32 | . . . Regenerative displacers with independent pistons | 2244/10 | . . . having cylinders in V-arrangement |
| 2242/40 | . Piston-type engines | 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