

**CPC****COOPERATIVE PATENT CLASSIFICATION****F02K**

**JET-PROPULSION PLANTS** (arrangement or mounting of jet-propulsion plants in land vehicles or vehicles in general [B60K](#); arrangement or mounting of jet-propulsion plants in waterborne vessels [B63H](#); controlling aircraft attitude, flight direction or altitude by jet reaction [B64C](#); arrangement or mounting of jet-propulsion plants in aircraft [B64D](#); plants characterised by the power of the working fluid being divided between jet-propulsion and another form of propulsion, e.g. propeller, [F02B](#), [F02C](#); features of jet-propulsion plants common to gas-turbine plants, air intakes or fuel supply control of air-breathing jet-propulsion plants [F02C](#))

**NOTES**

1. In this subclass, the following expression is used with the meaning indicated:
  - "jet-propulsion plants" means plants using combustion to produce a fluid stream from which a propulsive thrust on the plant is obtained on the reaction principle.
2. Attention is drawn to the notes preceding class [F01](#).

**F02K 1/00**

**Plants characterised by the form or arrangement of the jet pipe or nozzle; Jet pipes or nozzles peculiar thereto** ([rocket nozzles F02K 9/97](#))

**F02K 1/002**

- {with means to modify the direction of thrust vector ([F02K 1/54](#) takes precedence; thrust vectoring of rockets [F02K 9/80](#); aerodynamic vectoring surfaces [B64C](#))}

**F02K 1/004**

- . {by using one or more swivable nozzles rotating about their own axis}

**F02K 1/006**

- . {within one plane only}

**F02K 1/008**

- . {in any rearward direction}

**F02K 1/04**

- Mounting of an exhaust cone in the jet pipe

**F02K 1/06**

- Varying effective area of jet pipe or nozzle ([F02K 1/30](#) takes precedence)

**F02K 1/08**

- . by axially moving or transversely deforming an internal member, e.g. the exhaust cone

**F02K 1/085**

- . . {by transversely deforming an internal member}

**F02K 1/09**

- . by axially moving an external member, e.g. a shroud ([F02K 1/12](#) takes precedence)

**F02K 1/10**

- . by distorting the jet pipe or nozzle

**F02K 1/11**

- . by means of pivoted eyelids

**F02K 1/12**

- . by means of pivoted flaps

**F02K 1/1207**

- . . . {of one series of flaps hinged at their upstream ends on a fixed structure ([F02K 1/1215](#) - [F02K 1/1276](#) take precedence)}

**F02K 1/1215**

- . . . {of two series of flaps, the upstream series having its flaps hinged at their upstream ends on a fixed structure, and the downstream series having its flaps hinged at their downstream ends on a fixed structure}

**F02K 1/1223**

- . . . {of two series of flaps, the upstream series having its flaps hinged at their upstream ends on a fixed structure and the downstream series having its flaps hinged at their upstream ends on the downstream ends of the flaps of the upstream series}



- F02K 1/123 . . . {of two series of flaps, both having their flaps hinged at their upstream ends on a fixed structure}
- F02K 1/1238 . . . {of two series of flaps, the upstream series having its flaps hinged at their upstream ends on a fixed structure and the downstream series having its flaps hinged at their upstream ends on a substantially axially movable structure}
- F02K 1/1246 . . . {of two series of flaps, the upstream series having its flaps hinged at their upstream ends on a fixed structure and the downstream series having its flaps hinged at their downstream ends on a substantially axially movable structure}
- F02K 1/1253 . . . {of one series of flaps hinged at their upstream ends on a fixed structure and of a substantially axially movable external member}
- F02K 1/1261 . . . {of one series of flaps hinged at their upstream ends on a substantially axially movable structure}
- F02K 1/1269 . . . {of three series of flaps, the upstream series having its flaps hinged at their upstream ends on a fixed structure and the internal downstream series having its flaps hinged at their downstream ends on the downstream ends of the flaps of the external downstream series hinged on a fixed structure at their upstream ends}
- F02K 1/1276 . . . {of three series of flaps, the upstream series having its flaps hinged at their upstream ends on a substantially axially movable structure and the downstream or external series having its flaps hinged at their upstream ends on a fixed structure}
- F02K 1/1284 . . . {of three series of flaps, the upstream series having its flaps hinged at their upstream ends on a fixed structure and the internal downstream series having its flaps hinged at their downstream ends on the downstream ends of the flaps of the external downstream series hinged at their upstream ends on a substantially axially movable structure}
- F02K 1/1292 . . . {of three series of flaps, the upstream series having its flaps hinged at their upstream ends on a fixed structure, the internal downstream series having its flaps hinged at their upstream ends on the downstream ends of the flaps of the upstream series and at their downstream ends on the downstream ends of the flaps of the external downstream series hinged at their upstream ends on a substantially axially movable structure}
- F02K 1/15 . . Control or regulation
- F02K 1/16 . . . conjointly with another control
- F02K 1/165 . . . . {with air intake control}
- F02K 1/17 . . . . with control of fuel supply
- F02K 1/18 . . . automatic
- F02K 1/28 . . using fluid jets to influence the jet flow
- F02K 1/30 . . for varying effective area of jet pipe or nozzle
- F02K 1/32 . . for reversing thrust
- F02K 1/34 . . for attenuating noise
- F02K 1/36 . . having an ejector
- F02K 1/38 . . Introducing air inside the jet ([F02K 1/28 takes precedence](#))
- F02K 1/383 . . {with retractable elements}
- F02K 1/386 . . {mixing devices in the jet pipe e.g. for mixing primary and secondary flow}



- F02K 1/40
  - Nozzles having means for dividing the jet into a plurality of partial jets or having an elongated cross-section outlet
- F02K 1/42
  - . the means being movable into an inoperative position
- F02K 1/44
  - Nozzles having means, e.g. a shield, reducing sound radiation in a specified direction ([F02K 1/40 takes precedence](#))
- F02K 1/46
  - Nozzles having means for adding air to the jet or for augmenting the mixing region between the jet and the ambient air, e.g. for silencing ([F02K 1/28](#), [F02K 1/36](#), [F02K 1/38 take precedence](#))
- F02K 1/48
  - . Corrugated nozzles
- F02K 1/50
  - . Deflecting outwardly a portion of the jet by retractable scoop-like baffles
- F02K 1/52
  - Nozzles specially constructed for positioning adjacent to another nozzle or to a fixed member, e.g. fairing
- F02K 1/54
  - Nozzles having means for reversing jet thrust ([F02K 1/32 takes precedence](#))
- F02K 1/56
  - . Reversing jet main flow
- F02K 1/563
  - . . {in specified direction, e.g. to obviate its reinjection}
- F02K 1/566
  - . . {by blocking the rearward discharge by means of a translatable member}
- F02K 1/58
  - . . Reversers mounted on the inner cone or the nozzle housing {or the fuselage}
- F02K 1/60
  - . . by blocking the rearward discharge by means of pivoted eyelids or clamshells, e.g. target-type reversers
- F02K 1/605
  - . . . {the aft end of the engine cowlings being movable to uncover openings for the reversed flow}
- F02K 1/62
  - . . by blocking the rearward discharge by means of flaps
- F02K 1/625
  - . . . {the aft end of the engine cowlings being movable to uncover openings for the reversed flow}
- F02K 1/64
  - . Reversing fan flow
- F02K 1/645
  - . . {using inflatable diaphragms}
- F02K 1/66
  - . . using reversing fan blades
- F02K 1/68
  - . . Reversers mounted on the engine housing downstream of the fan exhaust section
- F02K 1/70
  - . . using thrust reverser flaps or doors mounted on the fan housing
- F02K 1/72
  - . . . the aft end of the fan housing being movable to uncover openings in the fan housing for the reversed flow
- F02K 1/74
  - . Reversing at least one flow in relation to at least one other flow in a plural-flow engine
- F02K 1/76
  - . Control or regulation of thrust reversers
- F02K 1/763
  - . . {with actuating systems or actuating devices; Arrangement of actuators for thrust reversers}
- F02K 1/766
  - . . {with blocking systems or locking devices; Arrangement of locking devices for thrust reversers}
- F02K 1/78
  - Other construction of jet pipes
- F02K 1/80
  - . Couplings or connections
- F02K 1/805
  - . . {Sealing devices therefor, e.g. for movable parts of jet pipes or nozzle flaps}



F02K 1/82	<ul style="list-style-type: none"> <li>• • Jet pipe walls, e.g. liners</li> </ul>
F02K 1/822	<ul style="list-style-type: none"> <li>• • • {Heat insulating structures or liners, cooling arrangements, e.g. post combustion liners; Infra-red radiation suppressors}</li> </ul>
F02K 1/825	<ul style="list-style-type: none"> <li>• • • • {Infra-red radiation suppressors}</li> </ul>
F02K 1/827	<ul style="list-style-type: none"> <li>• • • {Sound absorbing structures or liners (noise attenuators in general <a href="#">G10K 11/00</a>; noise suppression in air intakes <a href="#">F02C 7/045</a>)}</li> </ul>
<b>F02K 3/00</b>	<b>Plants including a gas turbine driving a compressor or a ducted fan</b>
F02K 3/02	<ul style="list-style-type: none"> <li>• in which part of the working fluid by-passes the turbine and combustion chamber</li> </ul>
F02K 3/025	<ul style="list-style-type: none"> <li>• • {the by-pass flow being at least partly used to create an independent thrust component}</li> </ul>
F02K 3/04	<ul style="list-style-type: none"> <li>• • the plant including ducted fans, i.e. fans with high volume, low pressure outputs, for augmenting the jet thrust, e.g. of double-flow type</li> </ul>
F02K 3/06	<ul style="list-style-type: none"> <li>• • • with front fan</li> </ul>
F02K 3/062	<ul style="list-style-type: none"> <li>• • • with aft fan</li> </ul>
F02K 3/065	<ul style="list-style-type: none"> <li>• • • with front and aft fans</li> </ul>
F02K 3/068	<ul style="list-style-type: none"> <li>• • • being characterised by a short axial length relative to the diameter</li> </ul>
F02K 3/072	<ul style="list-style-type: none"> <li>• • • with counter-rotating {fan} rotors {(turbomachines with counter-rotating rotors <a href="#">F01D 1/24</a>; gas turbines having counter-rotating rotors <a href="#">F02C 3/067</a>; axial flow pumps for elastic fluids with counter-rotating parts <a href="#">F04D 19/024</a>)}</li> </ul>
F02K 3/075	<ul style="list-style-type: none"> <li>• • • controlling flow ratio between flows</li> </ul>
F02K 3/077	<ul style="list-style-type: none"> <li>• • • the plant being of the multiple flow type, i.e. having three or more flows</li> </ul>
F02K 3/08	<ul style="list-style-type: none"> <li>• with supplementary heating of the working fluid (after-burners, combustion chambers <a href="#">F23R</a>); Control thereof (control of fuel supply therefor <a href="#">F02C 9/26</a>)</li> </ul>
F02K 3/10	<ul style="list-style-type: none"> <li>• • by after-burners (<a href="#">F02K 3/105</a> takes precedence)</li> </ul>
F02K 3/105	<ul style="list-style-type: none"> <li>• • Heating the by-pass flow</li> </ul>
F02K 3/11	<ul style="list-style-type: none"> <li>• • • by means of burners or combustion chambers</li> </ul>
F02K 3/115	<ul style="list-style-type: none"> <li>• • • by means of indirect heat exchange</li> </ul>
F02K 3/12	<ul style="list-style-type: none"> <li>• characterised by having more than one gas turbine</li> </ul>
<b>F02K 5/00</b>	<b>Plants including an engine, other than a gas turbine, driving a compressor or a ducted fan</b>
F02K 5/02	<ul style="list-style-type: none"> <li>• the engine being of the reciprocating-piston type</li> </ul>
F02K 5/023	<ul style="list-style-type: none"> <li>• • {the compressor being of the reciprocating-piston type (<a href="#">F02K 5/026</a> takes precedence)}</li> </ul>
F02K 5/026	<ul style="list-style-type: none"> <li>• • {free-piston engines}</li> </ul>
<b>F02K 7/00</b>	<b>Plants in which the working fluid is used in a jet only, i.e. the plants not having a turbine or other engine driving a compressor or a ducted fan; Control thereof (rocket-engine plants <a href="#">F02K 9/00</a>)</b>
F02K 7/005	<ul style="list-style-type: none"> <li>• {the engine comprising a rotor rotating under the actions of jets issuing from this rotor (in general <a href="#">F01D 1/32</a>; the working fluid being a combustion product <a href="#">F02C 3/165</a>)}</li> </ul>



- F02K 7/02 . the jet being intermittent, i.e. pulse-jet
- F02K 7/04 . . with resonant combustion chambers
- F02K 7/06 . . with combustion chambers having valves
- F02K 7/067 . . . having aerodynamic valves
- F02K 7/075 . . with multiple pulse-jet engines
- F02K 7/08 . the jet being continuous
- F02K 7/10 . characterised by having ram-action compression, i.e. aero-thermo-dynamic-ducts or ram-jet engines
- F02K 7/105 . . {using a solid fuel}
- F02K 7/12 . . Injection-induction jet engines
- F02K 7/14 . . with external combustion, e.g. scram-jet engines
- F02K 7/16 . . Composite ram-jet/turbo-jet engines
- F02K 7/18 . . Composite ram-jet/rocket engines
- F02K 7/20 . . Composite ram-jet/pulse-jet engines
  
- F02K 9/00** **Rocket- engine plants, i.e. plants carrying both fuel and oxidant therefor; Control thereof (chemical composition of propellants [C06B](#), [C06D](#) {launching apparatus for rockets [F41F 3/04](#); explosive charges, ammunition [F42B](#)})**
- F02K 9/08 . using solid propellants ([F02K 9/72](#) takes precedence; using semi-solid or pulverulent propellants [F02K 9/70](#) {cartridges for producing gas under pressure [F42B 3/04](#)})
- F02K 9/10 . . Shape or structure of solid propellant charges
- F02K 9/12 . . . made of two or more portions burning at different rates {or having different characteristics}
- F02K 9/14 . . . made from sheet-like materials, e.g. of carpet-roll type, of layered structure
- F02K 9/16 . . . of honeycomb structure
- F02K 9/18 . . . of the internal-burning type having a star or like shaped internal cavity
- F02K 9/20 . . . of the external-burning type
- F02K 9/22 . . . of the front-burning type
- F02K 9/24 . . Charging rocket engines with solid propellants; Methods or apparatus specially adapted for working solid propellant charges
- F02K 9/26 . . Burning control {([F02K 9/10](#), [F02K 9/34](#), [F02K 9/86](#), [F02K 9/92](#) and [F02K 9/94](#) take precedence)}
- F02K 9/28 . . having two or more propellant charges with the propulsion gases exhausting through a common nozzle
- F02K 9/30 . . with the propulsion gases exhausting through a plurality of nozzles
- F02K 9/32 . . Constructional parts; Details (shape or structure of solid propellant charges [F02K 9/10](#); starting or ignition means or arrangements [F02K 9/95](#); rocket nozzles [F02K 9/97](#))
- F02K 9/34 . . . Casings; Combustion chambers; Liners thereof
- F02K 9/343 . . . . {Joints, connections, seals therefor}
- F02K 9/346 . . . . {Liners, e.g. inhibitors}
- F02K 9/36 . . . Propellant charge supports



- F02K 9/38 . . . Safety devices, e.g. to prevent accidental ignition
- F02K 9/40 . . . Cooling arrangements {(for nozzles F02K 9/972)}
- F02K 9/42 . using liquid or gaseous propellants (F02K 9/72 takes precedence)
- F02K 9/425 . . {propellants (C06B, C06D, take precedence)}
- F02K 9/44 . . Feeding propellants
- F02K 9/46 . . . using pumps (pumps per se F04 {control of propellant feed pumps F02K 9/563})
- F02K 9/48 . . . . driven by a gas turbine fed by propellant combustion gases {or fed by vaporized propellants or other gases}
- F02K 9/50 . . . using pressurised fluid to pressurise the propellants
- F02K 9/52 . . . Injectors (in general B05B)
- F02K 9/54 . . . Leakage detectors; Purging systems; Filtration systems (filters per se B01D)
- F02K 9/56 . . . Control
- F02K 9/563 . . . . {of propellant feed pumps}
- F02K 9/566 . . . . {elements and safety devices e.g. pressure relief valves}
- F02K 9/58 . . . . Propellant feed valves (valves in general F16K)
- F02K 9/60 . . Constructional parts; Details (starting or ignition means or arrangements F02K 9/95; rocket nozzles F02K 9/97)
- F02K 9/605 . . . {Reservoirs}
- F02K 9/62 . . . Combustion or thrust chambers
- F02K 9/64 . . . . having cooling arrangements
- F02K 9/66 . . . . of the rotary type
- F02K 9/68 . . . Decomposition chambers
- F02K 9/70 . using semi- solid or pulverulent propellants
- F02K 9/72 . using liquid and solid propellants, i.e. hybrid rocket-engine plants
- F02K 9/74 . combined with another jet-propulsion plant
- F02K 9/76 . . with another rocket-engine plant; Multistage rocket-engine plants
- F02K 9/763 . . . {with solid propellant}
- F02K 9/766 . . . {with liquid propellant}
- F02K 9/78 . . with an air-breathing jet-propulsion plant (with a ram-jet engine F02K 7/18)
- F02K 9/80 . characterised by thrust or thrust vector control (F02K 9/26, F02K 9/56, F02K 9/94 take precedence)
- F02K 9/805 . . {servo-mechanisms or control devices therefor}
- F02K 9/82 . . by injection of a secondary fluid into the rocket exhaust gases
- F02K 9/84 . . using movable nozzles
- F02K 9/86 . . using nozzle throats of adjustable cross- section {(F02K 9/978 takes precedence)}
- F02K 9/88 . . using auxiliary rocket nozzles
- F02K 9/90 . . using deflectors (F02K 9/82 takes precedence)
- F02K 9/92 . . incorporating means for reversing or terminating thrust



- F02K 9/94
  - Re-ignitable or restartable rocket- engine plants; Intermittently operated rocket- engine plants
- F02K 9/95
  - characterised by starting or ignition means or arrangements ([safety devices F02K 9/38](#))
- F02K 9/96
  - characterised by specially adapted arrangements for testing or measuring
- F02K 9/97
  - Rocket nozzles ([thrust or thrust vector control F02K 9/80](#))
- F02K 9/972
  - • {Fluid cooling arrangements for nozzles ([F02K 9/64 takes precedence](#))}
- F02K 9/974
  - • {Nozzle- linings; Ablative coatings}
- F02K 9/976
  - • {Deployable nozzles}
- F02K 9/978
  - • {Closures for nozzles; Nozzles comprising ejectable or discardable elements}
- F02K 99/00**
  - **Subject matter not provided for in other groups of this subclass**