

**CPC****COOPERATIVE PATENT CLASSIFICATION****F02N**

**STARTING OF COMBUSTION ENGINES** (starting of free-piston combustion engines [F02B 71/02](#); starting of gas-turbine plants [F02C 7/26](#));  
**STARTING AIDS FOR SUCH ENGINES, NOT OTHERWISE PROVIDED FOR**

**NOTES**

1. Attention is drawn to the notes preceding class [F01](#).
2. The starting of engines which are not explicitly stated to be combustion engines will be classified in this subclass insofar as their starting is equivalent to that of combustion engines.

**Muscle-operated starting apparatus**

**F02N 1/00**      **Starting apparatus having hand cranks** (with intermediate power storage [F02N 5/00](#) - [F02N 15/00](#))

- [F02N 1/005](#)      . {Safety means ([F02N 1/02](#) takes precedence)}
- [F02N 1/02](#)      . having safety means preventing damage caused by reverse rotation

**F02N 3/00**      **Other muscle-operated starting apparatus** (with intermediate power storage [F02N 5/00](#) - [F02N 15/00](#))

- [F02N 3/02](#)      . having pull-cords
- [F02N 3/04](#)      . having foot-actuated levers

**Power-operated starting apparatus; Muscle-operated starting apparatus with intermediate power storage**

**F02N 5/00**      **Starting apparatus having mechanical power storage**

- [F02N 5/02](#)      . of spring type
- [F02N 5/04](#)      . of inertia type

**F02N 7/00**      **Starting apparatus having fluid-driven auxiliary engines or apparatus**

- [F02N 7/02](#)      . the apparatus being of single-stroke piston type, e.g. pistons acting on racks or pull-cords
- [F02N 7/04](#)      . . the pistons acting on screw-threaded members to effect rotation
- [F02N 7/06](#)      . the engines being of reciprocating-piston type ([of internal-combustion type](#) [F02N 7/10](#))
- [F02N 7/08](#)      . the engines being of rotary type
- [F02N 7/10](#)      . characterised by using auxiliary engines or apparatus of combustion type ([by using explosive cartridges](#) [F02N 13/00](#))
- [F02N 7/12](#)      . . the engines being of rotary type, e.g. turbines ([F02N 7/14](#) takes precedence)
- [F02N 7/14](#)      . . the starting engines being readily removable from main engines, e.g. of portable type

**F02N 9/00**                    **Starting of engines by supplying auxiliary pressure fluid to their working chambers**

- F02N 9/02                    . the pressure fluid being generated directly by combustion (by using explosive cartridges [F02N 13/00](#))
- F02N 9/04                    . the pressure fluid being generated otherwise, e.g. by compressing air

**F02N 11/00**                    **Starting of engines by means of electric motors (arrangement or mounting of prime-movers consisting of electric motors and internal combustion engines for mutual or common propulsion [B60K 6/20](#))**

- F02N 11/003                    . {said electric motor being also used as a drive for auxiliaries, e.g. for driving transmission pumps or fuel pumps during engine stop}
- F02N 11/006                    . {using a plurality of electric motors}
- F02N 11/02                    . the motors having longitudinally-shiftable rotors
- F02N 11/04                    . the motors being associated with current generators
- F02N 11/06                    . . and with ignition apparatus
- F02N 11/08                    . Circuits {or control means} specially adapted for starting of engines
- F02N 11/0803                    . . {characterised by means for initiating engine start or stop ([F02N 11/0814](#) takes precedence)}
- F02N 11/0807                    . . . {Remote means}
- F02N 11/0811                    . . . {using a timer}
- F02N 11/0814                    . . {comprising means for controlling automatic idle-start-stop}
- F02N 11/0818                    . . . {Conditions for starting or stopping the engine or for deactivating the idle-start-stop mode}
- F02N 11/0822                    . . . . {related to action of the driver}
- F02N 11/0825                    . . . . {related to prevention of engine restart failure, e.g. disabling automatic stop at low battery state}
- F02N 11/0829                    . . . . {related to special engine control, e.g. giving priority to engine warming-up or learning}
- F02N 11/0833                    . . . . {Vehicle conditions ([F02N 11/0822](#), [F02N 11/0825](#) take precedence)}
- F02N 11/0837                    . . . . . {Environmental conditions thereof, e.g. traffic, weather or road conditions}
- F02N 11/084                    . . . . . {State of vehicle accessories, e.g. air condition or power steering}
- F02N 11/0844                    . . . {with means for restarting the engine directly after an engine stop request, e.g. caused by change of driver mind}
- F02N 11/0848                    . . {with means for detecting successful engine start, e.g. to stop starter actuation}
- F02N 11/0851                    . . {characterised by means for controlling the engagement or disengagement between engine and starter, e.g. meshing of pinion and engine gear}
- F02N 11/0855                    . . . {during engine shutdown or after engine stop before start command, e.g. pre-engagement of pinion}
- F02N 11/0859                    . . {specially adapted to the type of the starter motor or integrated into it}
- F02N 11/0862                    . . {characterised by the electrical power supply means, e.g. battery}
- F02N 11/0866                    . . . {comprising several power sources, e.g. battery and capacitor or two batteries}

- F02N 11/087
  - . . {Details of the switching means in starting circuits, e.g. relays or electronic switches}
- F02N 2011/0874
  - . . . {characterised by said switch being an electronic switch}
- F02N 2011/0877
  - . . . {said switch being used as a series-parallel switch, e.g. to switch circuit elements from series to parallel connection}
- F02N 2011/0881
  - . . {Components of the circuit not provided for by previous groups}
- F02N 2011/0885
  - . . . {Capacitors, e.g. for additional power supply}
- F02N 2011/0888
  - . . . {DC/DC converters}
- F02N 2011/0892
  - . . . {Two coils being used in the starting circuit, e.g. in two windings in the starting relay or two field windings in the starter}
- F02N 2011/0896
  - . . . {Inverters for electric machines, e.g. starter-generators}
- F02N 11/10
  - . Safety devices ([F02N 11/08 takes precedence](#))
- F02N 11/101
  - . . {for preventing engine starter actuation or engagement ([preventing unauthorised use or theft of vehicles B60R 25/04](#))}
- F02N 11/103
  - . . . {according to the vehicle transmission or clutch status}
- F02N 11/105
  - . . . {when the engine is already running ([F02N 11/0848 takes precedence](#))}
- F02N 11/106
  - . . {for stopping or interrupting starter actuation}
- F02N 11/108
  - . . {for diagnosis of the starter or its components}
- F02N 11/12
  - . Starting of engines by means of mobile, e.g. portable, starting sets
- F02N 11/14
  - . Starting of engines by means of electric starters with external current supply ([F02N 11/12 takes precedence](#))
- F02N 13/00**
  - Starting of engines, or driving of starting apparatus by use of explosives, e.g. stored in cartridges**
- F02N 13/02
  - . Cartridges specially adapted therefor ([gas cartridges in general F42B 3/04](#))
- F02N 15/00**
  - Other power-operated starting apparatus; Component parts, details, or accessories, not provided for in, or of interest apart from groups [F02N 5/00](#) to [F02N 13/00](#)**
- F02N 15/003
  - . {Starters comprising a brake mechanism}
- F02N 15/006
  - . {Assembling or mounting of starting devices}
- F02N 15/02
  - . Gearing between starting-engines and started engines; Engagement or disengagement thereof
- F02N 15/021
  - . . {the gearing including disengaging starter jaws}
- F02N 15/022
  - . . {the starter comprising an intermediate clutch}
- F02N 15/023
  - . . . {of the overrunning type}
- F02N 15/025
  - . . . {of the friction type}
- F02N 15/026
  - . . . {of the centrifugal type}
- F02N 15/027
  - . . . {of the pawl type}
- F02N 15/028
  - . . . {of the jaw type}
- F02N 15/04
  - . . the gearing including disengaging toothed gears
- F02N 15/043
  - . . . {the gearing including a speed reducer}
- F02N 15/046
  - . . . . {of the planetary type}

- F02N 15/06 . . . the toothed gears being moved by axial displacement
  - F02N 2015/061 . . . . {said axial displacement being limited, e.g. by using a stopper}
  - F02N 15/062 . . . . {Starter drives}
  - F02N 15/063 . . . . . {with resilient shock absorbers}
  - F02N 15/065 . . . . . {with blocking means}
  - F02N 15/066 . . . . {the starter being of the coaxial type}
  - F02N 15/067 . . . . {the starter comprising an electro-magnetically actuated lever}
  - F02N 15/068 . . . . {starter drive being actuated by muscular force}
  - F02N 15/08 . . the gearing being of friction type
  - F02N 15/10 . Safety devices not otherwise provided for
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**F02N 19/00 Starting aids for combustion engines, not otherwise provided for**

- F02N 19/001 . {Arrangements thereof}
- F02N 2019/002 . {Aiding engine start by acting on fuel}
- F02N 19/004 . {Aiding engine start by using decompression means or variable valve actuation}
- F02N 19/005 . {Aiding engine start by starting from a predetermined position, e.g. pre-positioning or reverse rotation}
- F02N 2019/007 . . {using inertial reverse rotation}
- F02N 2019/008 . . {the engine being stopped in a particular position}
- F02N 19/02 . Aiding engine start by thermal means, e.g. using lighted wicks (using electrically-heated glow-plugs [F02P 19/02](#))
- F02N 19/04 . . by heating of fluids used in engines (heating of lubricants [F01M 5/02](#))
- F02N 19/06 . . . by heating of combustion-air by flame generating means, e.g. flame glow-plugs
- F02N 19/08 . . . . Arrangement thereof
- F02N 19/10 . . . by heating of engine coolants

**F02N 99/00 Subject matter not provided for in other groups of this subclass**

- F02N 99/002 . {Starting combustion engines by ignition means}
- F02N 99/004 . . {Generation of the ignition spark}
- F02N 99/006 . . {Providing a combustible mixture inside the cylinder}
- F02N 99/008 . . {Providing a combustible mixture outside the cylinder}

**F02N 2200/00 Parameters used for control of starting apparatus**

- F02N 2200/02 . said parameters being related to the engine
- F02N 2200/021 . . Engine crank angle
- F02N 2200/022 . . Engine speed
- F02N 2200/023 . . Engine temperature
- F02N 2200/024 . . Engine oil temperature
- F02N 2200/025 . . Engine oil pressure
- F02N 2200/026 . . Catalyst temperature
- F02N 2200/04 . said parameters being related to the starter motor

F02N 2200/041	. . Starter speed
F02N 2200/042	. . Starter torque
F02N 2200/043	. . Starter voltage
F02N 2200/044	. . Starter current
F02N 2200/045	. . Starter temperature or parameters related to it
F02N 2200/046	. . Energy or power necessary for starting
F02N 2200/047	. . Information about pinion position
F02N 2200/048	. . Information about pinion speed, both translational or rotational speed
F02N 2200/06	. said parameters being related to the power supply or driving circuits for the starter
F02N 2200/061	. . Battery state of charge [SOC]
F02N 2200/062	. . Battery current
F02N 2200/063	. . Battery voltage
F02N 2200/064	. . Battery temperature
F02N 2200/065	. . Relay current
F02N 2200/066	. . Relay temperature
F02N 2200/08	. said parameters being related to the vehicle or its components
F02N 2200/0801	. . Vehicle speed
F02N 2200/0802	. . Transmission state, e.g. gear ratio or neutral state
F02N 2200/0803	. . Parking brake state
F02N 2200/0804	. . Temperature inside the vehicle cabin
F02N 2200/0805	. . Detection of vehicle emergency state, e.g. from ABS, ESP, external sensors
F02N 2200/0806	. . Air condition state
F02N 2200/0807	. . Brake booster state
F02N 2200/0808	. . Steering state, e.g. state of power assisted steering
F02N 2200/0809	. . Electrical loads
F02N 2200/0811	. . Heating state
F02N 2200/0812	. . Power-take-off state
F02N 2200/0813	. . Windscreen wiper state
F02N 2200/0814	. . Bonnet switches
F02N 2200/0815	. . Vehicle door sensors
F02N 2200/10	. said parameters being related to driver demands or status
F02N 2200/101	. . Accelerator pedal position
F02N 2200/102	. . Brake pedal position
F02N 2200/103	. . Clutch pedal position
F02N 2200/104	. . Driver's intention to turn, e.g. by evaluating direction indicators
F02N 2200/105	. . Driver behaviours or types, e.g. sportive or economic type driver
F02N 2200/106	. . Driver presence, e.g. detected by door lock, seat sensor or belt sensor
F02N 2200/12	. said parameters being related to the vehicle exterior
F02N 2200/121	. . Atmospheric pressure, e.g. for determination of geodetic height

- F02N 2200/122 . . Atmospheric temperature
- F02N 2200/123 . . Information about vehicle position, e.g. from navigation systems or GPS signals
- F02N 2200/124 . . Information about road conditions, e.g. road inclination or surface
- F02N 2200/125 . . Information about other vehicles, traffic lights or traffic congestion
- F02N 2200/14 . said parameter being related to wear of starter or other components, e.g. based on total number of starts or age

### **Muscle-operated starting apparatus**

#### **F02N 2250/00 Problems related to engine starting or engine's starting apparatus**

- F02N 2250/02 . Battery voltage drop at start, e.g. drops causing ECU reset
- F02N 2250/04 . Reverse rotation of the engine
- F02N 2250/06 . Engine stall and related control features, e.g. for automatic restart
- F02N 2250/08 . Lubrication of starters; Sealing means for starters

#### **F02N 2300/00 Control related aspects of engine starting**

- F02N 2300/10 . characterised by the control output, i.e. means or parameters used as a control output or target
- F02N 2300/102 . . Control of the starter motor speed; Control of the engine speed during cranking
- F02N 2300/104 . . Control of the starter motor torque
- F02N 2300/106 . . Control of starter current
- F02N 2300/108 . . Duty cycle control or pulse width modulation [PWM]
- F02N 2300/20 . characterised by the control method
- F02N 2300/2002 . . using different starting modes, methods, or actuators depending on circumstances, e.g. engine temperature or component wear
- F02N 2300/2004 . . using adaptive control
- F02N 2300/2006 . . using prediction of future conditions
- F02N 2300/2008 . . using a model
- F02N 2300/2011 . . Control involving a delay; Control involving a waiting period before engine stop or engine start
- F02N 2300/30 . characterised by the use of digital means
- F02N 2300/302 . . using data communication
- F02N 2300/304 . . . with other systems inside the vehicle
- F02N 2300/306 . . . with external senders or receivers, e.g. receiving signals from traffic lights, other vehicles or base stations