

**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**

**NOTE**

Attention is drawn to the notes preceding class [F01](#) .

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.

**Guidance heading:** 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

**Guidance heading:** 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

#### Guidance heading:

### **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 }

#### Guidance heading:

#### 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

**Guidance heading: 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