

**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**

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

<b>F02N 9/00</b>	<b>Starting of engines by supplying auxiliary pressure fluid to their working chambers</b>
F02N 9/02	. the pressure fluid being generated directly by combustion (by using explosive cartridges <a href="#">F02N 13/00</a> )
F02N 9/04	. the pressure fluid being generated otherwise, e.g. by compressing air
<b>F02N 11/00</b>	<b>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 <a href="#">B60K 6/20</a>)</b>
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 ( <a href="#">F02N 11/0814</a> 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 ( <a href="#">F02N 11/0822</a> , <a href="#">F02N 11/0825</a> 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 <a href="#">F02P 19/02</a> )
F02N 19/04	..	by heating of fluids used in engines (heating of lubricants <a href="#">F01M 5/02</a> )
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