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 mecanism }

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