SECTION F — MECHANICAL ENGINEERING; LIGHTING; HEATING; WEAPONS; BLASTING

F02 COMBUSTION ENGINES; HOT-GAS OR COMBUSTION-PRODUCT ENGINE PLANTS

F02D **CONTROLLING COMBUSTION ENGINES** (vehicle fittings, acting on a single sub-unit only, for automatically controlling vehicle speed B60K 31/00; conjoint control of vehicle sub-units of different type or different function, road vehicle drive control systems for purposes other than the control of a single sub-unit B60W; cyclically operating valves for combustion engines F01L; controlling combustion engine lubrication F01M; cooling internal-combustion engines F01P; supplying combustion engines with combustible mixtures or constituents thereof, e.g. carburettors, injection pumps, F02M; starting of combustion engines F02N; controlling of ignition F02P; controlling gas-turbine plants, jet-propulsion plants, or combustion-product engine plants, see the relevant subclasses for these plants) **[4, 2006.01]**

Note(s) [4]

1. In this subclass, the following term or expression is used with the meanings indicated:
   - "fuel injection" means the introduction of a combustible substance into a space, e.g. cylinder, by means of a pressure source, e.g. a pump, continuously or cyclically acting behind the substance;
   - "supercharging" means supplying to the working space, e.g. cylinder, combustion-air pressurised by means of a pressure source, e.g. a pump.
2. Attention is drawn to the Notes preceding class F01.
3. In this subclass, electrical aspects of control arrangements are classified in groups F02D 41/00-F02D 45/00.

Subclass index

CONTROLLING COMBUSTION ENGINES IN GENERAL
Characterised by action on engine operation
on injection: general; low pressure; other means....1/00, 3/00, 7/00
by throttling air or fuel-and-air induction or exhaust....9/00
on valve-operating cycle; varying compression ratio....13/00, 15/00
cutting-out cylinders, rendering engines inoperative or idling....17/00
on delivery of fuel or combustion-air, not otherwise provided for....33/00
on two or more associated functions not otherwise provided for....37/00
Characterised by initiating or actuating means
non-automatic initiation, e.g. by operator....11/00
initiation by speed-sensing governors or by interior or exterior conditions, not otherwise provided for....31/00, 35/00
Programme control....28/00
CONTROL OF PARTICULAR ENGINES
engines: characterised by fuel; by combustion medium used; by supercharge....19/00, 21/00, 23/00
co-operating engines; reversible engines; engines driving vehicle or particular devices....25/00, 27/00, 29/00
OTHER CONTROL
Non-electrical....39/00
Electrical....41/00-45/00

Controlling, e.g. regulating, fuel injection

1/00 **Controlling fuel-injection pumps, e.g. of high-pressure injection type** (F02D 3/00 takes precedence) **[1, 2, 2006.01]**

1/02 • not restricted to adjustment of injection timing, e.g. varying amount of fuel delivered **[1, 2006.01]**

1/04 • • by mechanical means dependent on engine speed, e.g. using centrifugal governors (F02D 1/08 takes precedence) **[1, 2006.01]**

1/06 • • by means dependent on pressure of engine working fluid (F02D 1/08 takes precedence) **[1, 2006.01]**

1/08 • • Transmission of control impulse to pump control, e.g. with power drive or power assistance **[1, 2006.01]**

1/10 • • • mechanical **[1, 2006.01]**

1/12 • • • non-mechanical, e.g. hydraulic **[1, 2006.01]**

1/14 • • • • pneumatic **[1, 2006.01]**

1/16 • Adjustment of injection timing (F02D 1/02 takes precedence) **[1, 2006.01]**

1/18 • • with non-mechanical means for transmitting control impulse; with amplification of control impulse **[1, 2006.01]**

3/00 Controlling low-pressure fuel injection, i.e. where the air-fuel mixture containing fuel thus injected will be substantially compressed by the compression stroke of the engine, by means other than controlling only an injection pump (carburettors F02M) **[1, 2, 2006.01]**

Note(s) [5]

When the control apparatus or system forms part of the low-pressure fuel-injection apparatus it is classified in group F02M 69/00.

3/02 • with continuous injection or continuous flow upstream of the injection nozzle **[1, 2, 2006.01]**

3/04 • Controlling fuel injection and carburation, e.g. of alternative systems **[1, 2006.01]**

7/00 Other non-electrical fuel injection control [1, 4, 2006.01]

7/02 • Controlling fuel injection where fuel is injected by compressed air **[1, 2006.01]**

9/00 Controlling engines by throttling air or fuel-and-air induction conduits or exhaust conduits [1, 2006.01]

9/02 • concerning induction conduits (throttle valves, or arrangements thereof in conduits F02D 9/08) **[1, 2006.01]**

9/04 • concerning exhaust conduits (throttle valves, or arrangements thereof in conduits F02D 9/08) **[1, 2006.01]**

9/06 • • Exhaust brakes **[1, 2006.01]**

9/08 • Throttle valves specially adapted therefor; Arrangements of such valves in conduits (throttle valves modified for use in, or arranged in, carburettors F02M; throttle valves in general F16K) **[1, 2006.01]**

9/10 • • having pivotally-mounted flaps **[1, 2006.01]**

9/12 • • having slidably-mounted valve-members; having valve-members movable longitudinally of conduit **[1, 2006.01]**

9/14 • • • the members being slidable transversely of conduit **[1, 2006.01]**

9/16 • • • the members being rotatable **[1, 2006.01]**

9/18 • • having elastic-wall valve-members **[1, 2006.01]**

11/00 Arrangements for, or adaptations to, non-automatic engine control initiation means, e.g. operator initiated (specially for reversing F02D 27/00; arrangement or mounting of prime-mover control devices in vehicles B60K 26/00) **[1, 2, 5, 2006.01]**

11/02 • characterised by hand, foot, or like operator controlled initiation means **[1, 5, 2006.01]**

11/04 • characterised by mechanical control linkages (with power drive or assistance F02D 11/06) **[1, 5, 2006.01]**

11/06 • characterised by non-mechanical control linkages, e.g. fluid control linkages or by control linkages with power drive or assistance **[1, 5, 2006.01]**

11/08 • • of the pneumatic type **[1, 5, 2006.01]**

11/10 • • of the electric type **[1, 5, 2006.01]**

13/00 Controlling the engine output power by varying inlet or exhaust valve operating characteristics, e.g. timing (modifying valve gear F01L) **[1, 2006.01]**

13/02 • during engine operation **[1, 2006.01]**

13/04 • • using engine as brake **[1, 2006.01]**

13/06 • • Cutting-out cylinders **[1, 2006.01]**

13/08 • for rendering engine inoperative or idling **[1, 2006.01]**

15/00 Varying compression ratio (modifying valve-gear F01L) **[1, 2006.01]**

15/02 • by alteration or displacement of piston stroke **[1, 2006.01]**

15/04 • by alteration of volume of compression space without changing piston stroke **[1, 2006.01]**

17/00 Controlling engines by cutting-out individual cylinders; Rendering engines inoperative or idling (controlling or rendering inoperative by varying inlet or exhaust valve operating characteristics F02D 13/00) **[1, 2006.01]**

17/02 • Cutting-out (cutting-out engines in multiple-engine arrangements F02D 25/04) **[1, 2006.01]**

17/04 • rendering engines inoperative or idling, e.g. caused by abnormal conditions (dependent on lubricating conditions F01M 1/22; dependent on cooling F01P 5/14) **[1, 2006.01]**

Controlling peculiar to specified types or adaptations of engines

19/00 Controlling engines characterised by their use of non-liquid fuels, pluralities of fuels, or non-fuel substances added to the combustible mixtures (the non-fuel substances being gaseous F02D 21/00) **[1, 2006.01]**

19/02 • peculiar to engines working with gaseous fuels (apparatus, or control parts thereof, for mixing gas and air F02M) **[1, 2006.01]**

19/04 • peculiar to engines working with solid fuels, e.g. pulverised coal **[1, 2006.01]**

19/06 • peculiar to engines working with pluralities of fuels, e.g. alternatively with light and heavy fuel oil, other than engines indifferent to the fuel consumed **[1, 2006.01]**

19/08 • • simultaneously using pluralities of fuels (F02D 19/12 takes precedence) **[1, 2006.01]**

19/10 • • • peculiar to compression-ignition engines in which the main fuel is gaseous **[1, 2006.01]**

19/12 • peculiar to engines working with non-fuel substances or with anti-knock agents, e.g. with anti-knock fuel (apparatus, or control parts thereof, for delivering such substances or agents F02M) **[1, 2006.01]**

21/00 Controlling engines characterised by their being supplied with non-airborne oxygen or other non-fuel gas [1, 2006.01]

21/02 • peculiar to oxygen-fed engines **[1, 2006.01]**

21/04 • • with circulation of exhaust gases in closed or semi-closed circuits **[1, 2006.01]**

21/06 • peculiar to engines having other non-fuel gas added to combustion-air **[1, 2006.01]**

21/08 • • the other gas being the exhaust gas of engine (circulation of exhaust gas in oxygen-fed engines F02D 21/04) **[1, 2006.01]**

21/10 • • having secondary air added to fuel-air mixture (apparatus, or control parts thereof, for delivering secondary air F02M) **[1, 2006.01]**

23/00 Controlling engines characterised by their being supercharged [1, 2006.01]

23/02 • the engines being of fuel-injection type **[1, 2006.01]**

25/00 **Controlling two or more co-operating engines [1, 2006.01]**

25/02 • to synchronise speed **[1, 2006.01]**

25/04 • by cutting-out engines **[1, 2006.01]**

27/00 **Controlling engines characterised by their being reversible [1, 2006.01]**

27/02 • by performing a programme **[1, 2006.01]**

28/00 **Programme-control of engines** (programme-control specific to a type or purpose covered by one of the groups of this subclass, except groups F02D 29/00, F02D 39/00, or by one group of another subclass, e.g. of F01L, see that group) **[2, 2006.01]**

29/00 **Controlling engines, such controlling being peculiar to the devices driven thereby, the devices being other than parts or accessories essential to engine operation, e.g. controlling of engines by signals external thereto [1, 2, 2006.01]**

29/02 • peculiar to engines driving vehicles; peculiar to engines driving variable-pitch propellers **[1, 2, 2006.01]**

29/04 • peculiar to engines driving pumps **[1, 2006.01]**

29/06 • peculiar to engines driving electric generators **[1, 2006.01]**

Other non-electrical control of combustion engines [4]

31/00 **Use of non-electrical speed-sensing governors to control combustion engines, not otherwise provided for [1, 2006.01]**

33/00 **Non-electrical control of delivery of fuel or combustion-air, not otherwise provided for [1, 2006.01]**

33/02 • of combustion-air **[1, 2006.01]**

35/00 **Non-electrical control of engines, dependent on conditions exterior or interior to engines, not otherwise provided for [1, 2006.01]**

35/02 • on interior conditions **[1, 2006.01]**

37/00 **Non-electrical conjoint control of two or more functions of engines, not otherwise provided for [1, 2006.01]**

37/02 • one of the functions being ignition (ignition control per se F02P) **[1, 2006.01]**

39/00 **Other non-electrical control [1, 4, 2006.01]**

39/02 • for four-stroke engines **[1, 2006.01]**

39/04 • for engines with other cycles than four-stroke, e.g. two-stroke **[1, 2006.01]**

39/06 • for engines adding the fuel substantially at end of compression stroke **[1, 2006.01]**

39/08 • for engines adding the fuel substantially before compression stroke **[1, 2006.01]**

39/10 • for free-piston engines; for engines without rotary main shaft **[1, 2006.01]**

Electrical control of combustion engines [4]

Note(s) [4, 6]

1. Groups F02D 41/00-F02D 45/00cover electrical aspects of electrically controlled devices.
2. Groups F02D 41/00-F02D 45/00do not cover:
   - non-electrical aspects of electrically controlled devices, which are covered by groups F02D 1/00-F02D 39/00 or by subclass F02M;
   - both electrical and non-electrical aspects of electrically controlled devices, which are covered by groups F02D 1/00-F02D 39/00 or by subclass F02M.

41/00 **Electrical control of supply of combustible mixture or its constituents** (F02D 43/00 takes precedence) **[4, 2006.01]**

41/02 • Circuit arrangements for generating control signals **[4, 2006.01]**

41/04 • • Introducing corrections for particular operating conditions (F02D 41/14 takes precedence) **[4, 2006.01]**

41/06 • • • for engine starting or warming up **[4, 2006.01]**

41/08 • • • for idling (F02D 41/06, F02D 41/16 take precedence) **[4, 2006.01]**

41/10 • • • for acceleration **[4, 2006.01]**

41/12 • • • for deceleration **[4, 2006.01]**

41/14 • • Introducing closed-loop corrections **[4, 2006.01]**

41/16 • • • for idling **[4, 2006.01]**

41/18 • • by measuring intake air flow (measuring flow, in general G01F) **[4, 2006.01]**

41/20 • Output circuits, e.g. for controlling currents in command coils (current control in inductive loads in general H03K 17/64) **[4, 2006.01]**

41/22 • Safety or indicating devices for abnormal conditions **[4, 2006.01]**

41/24 • characterised by the use of digital means **[4, 2006.01]**

41/26 • • using computer, e.g. microprocessor **[4, 2006.01]**

41/28 • • • Interface circuits **[4, 2006.01]**

41/30 • Controlling fuel injection **[4, 2006.01]**

41/32 • • of the low pressure type **[4, 2006.01]**

41/34 • • • with means for controlling injection timing or duration (ignition timing F02P 5/00) **[4, 2006.01]**

41/36 • • • with means for controlling distribution (arrangement of ignition distributors F02P 7/00) **[4, 2006.01]**

41/38 • • of the high pressure type **[4, 2006.01]**

41/40 • • • with means for controlling injection timing or duration **[4, 2006.01]**

43/00 **Conjoint electrical control of two or more functions, e.g. ignition, fuel-air mixture, recirculation, supercharging, exhaust-gas treatment** (electrical control of exhaust gas treating apparatus per se F01N 9/00) **[4, 2006.01]**

43/02 • using only analogue means **[4, 2006.01]**

43/04 • using only digital means **[4, 2006.01]**

45/00 **Electrical control not provided for in groups F02D 41/00-F02D 43/00** (electrical control of exhaust gas treating apparatus F01N 9/00; electrical control of one of the functions: ignition, lubricating, cooling, starting, intake-heating, see the relevant subclasses for such functions) **[4, 2006.01]**