**F01N**  
**GAS-FLOW SILENCERS OR EXHAUST APPARATUS FOR MACHINES OR ENGINES IN GENERAL; GAS-FLOW SILENCERS OR EXHAUST APPARATUS FOR INTERNAL COMBUSTION ENGINES**  
{evacuation of fumes from the area where they are produced B08B 15/00; arrangement of exhaust or silencing apparatus on percussive tools B25D 17/12; arrangements in connection with gas exhaust of propulsion units in vehicles B60K 13/00; on ships or other waterborne vessels B63H 21/32, on aircraft B64D 33/04; arrangement of exhaust or silencing apparatus on firearms F41A 21/30; ground installations for reducing aircraft engine or jet noise B64F 1/26; silencers specially adapted for steam engines F01B 31/16; air-intake silencers for gas turbine or jet propulsion plants F02C 7/045; jet pipe or nozzles for jet propulsion plants F02K; combustion-air intake silencers specially adapted for, or arranged on, internal-combustion engines F02M 35/00; combating noise or silencing in positive displacement machines or pumps F04B 39/0027, in rotary-piston machines or pumps F04C 29/06, in non-positive displacement pumps F04D 29/66; means in valves for absorbing noise F16K 47/02; noise absorbers in pipe system F16L 55/02; conducting smoke or fumes from various locations to the outside F23J 11/00; means for preventing or suppressing noise in air-conditioning or ventilation systems F24F 13/24;}  
{combating noise or silencing in positive, or damping, noise in general G10K 11/16}

**NOTE**  
Attention is drawn to the notes preceding Class F01, especially as regards Note 2(b).

**WARNING**  
In this subclass non-limiting references (in the sense of paragraph 39 of the Guide to the IPC) may still be displayed in the scheme.

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| 1/00 | Silencing apparatus characterised by method of silencing  
(by cooling F01N 3/02; using liquids F01N 3/04) |
| 1/003 | . (by using dead chambers communicating with gas flow passages (resonance chambers F01N 1/02; chambers containing sound-absorbing materials F01N 1/24)) |
| 1/006 | . . (comprising at least one perforated tube extending from inlet to outlet of the silencer) |
| 1/02 | . by using resonance |
| 1/023 | . . (Helmholtz resonators) |
| 1/026 | . . (Annular resonance chambers arranged concentrically to an exhaust passage and communicating with it, e.g. via at least one opening in the exhaust passage) |
| 1/04 | . . having sound-absorbing materials in resonance chambers |
| 1/06 | . by using interference effect |
| 1/065 | . . (by using an active noise source, e.g. speakers) |
| 1/08 | . by reducing exhaust energy by throttling or whirling |
| 1/081 | . . (by passing the gases through a mass of particles) |
| 1/082 | . . (the gases passing through porous members (F01N 1/081 takes precedence)) |
| 1/083 | . . (using transversal baffles defining a tortuous path for the gases or successively throttling gas flow) |
| 1/084 | . . (the gases flowing through the silencer two or more times longitudinally in opposite directions, e.g. using parallel or concentric tubes) |
| 1/085 | . . (using a central core throttling gas passage) |
| 1/086 | . . (having means to impart whirling motion to the gases (with helically or spirally shaped channels F01N 1/12)) |
| 1/087 | . . (using tangential inlets into a circular chamber) |
| 1/088 | . . (using vanes arranged on gas flow path or gas flow tubes with tangentially directed apertures) |
| 1/089 | . . (using two or more expansion chambers in series (F01N 1/083, F01N 1/084, F01N 1/086 take precedence)) |
3/023 . . . using means for regenerating the filters, e.g. by burning trapped particles (by electrically controlling the supply of combustible mixture or its constituents only F02D 41/0235)

3/0231 . . . [using special exhaust apparatus upstream of the filter for producing nitrogen dioxide, e.g. for continuous filter regeneration systems [CRT]]

3/0232 . . . [removing incombustible material from a particle filter, e.g. ash]

3/0233 . . . [periodically cleaning filter by blowing a gas through the filter in a direction opposite to exhaust flow, e.g. exposing filter to engine air intake]

3/0234 . . . [using heat exchange means in the exhaust line]

3/0235 . . . [using exhaust gas throttling means]

3/0236 . . . [using turbine waste gate valve]

3/0237 . . . [for regenerating ex situ]

3/0238 . . . [for regenerating during engine standstill]

3/0239 . . . [using fuel burner or by adding fuel to exhaust]

3/02353 . . . [adding fuel to exhaust gases]

3/0256 . . . [the fuel being ignited by electrical means]

3/027 . . . using electric or magnetic heating means

3/0275 . . . [using electric discharge means]

3/028 . . . using microwaves

3/029 . . . by adding non-fuel substances to exhaust

3/0293 . . . [injecting substances in exhaust stream]

3/0296 . . . [having means for preheating additional substances]

3/031 . . . having means for by-passing filters, e.g. when clogged or during cold engine start

3/032 . . . during filter regeneration only

3/033 . . . [in combination with other devices [(with adsorbents or absorbents F01N 3/0821)]

3/0335 . . . [with exhaust silencers in a single housing]

3/035 . . . with catalytic reactors [, e.g. catalysed diesel particulate filters]

3/037 . . . by means of inertial or centrifugal separators, e.g. of cyclone type, optionally combined or associated with agglomerators

3/038 . . . by means of perforated plates defining expansion chambers associated with condensation and collection chambers, e.g. for adiabatic expansion of gases and subsequent collection of condensed liquids

3/04 . . . using liquids

3/043 . . . [without contact between liquid and exhaust gases]

3/046 . . . [Exhaust manifolds with cooling jacket]

3/05 . . . by means of air, e.g. by mixing exhaust with air (silencers working by addition of air to exhaust F01N 1/14; arrangements for the supply of additional air for the thermal or catalytic conversion of noxious components of exhaust F01N 3/30 ; in tailpipes F01N 13/082))

3/055 . . . [without contact between air and exhaust gases]

3/06 . . . for extinguishing sparks

3/08 . . . for rendering innocuous (using electric or electrostatic separators F01N 3/01; chemical aspects B01D 53/92)
3/206 . . . . . . . {Adding periodically or continuously substances to exhaust gases for promoting purification, e.g. catalytic material in liquid form, NOx reducing agents (F01N 3/2066 takes precedence)}

3/2066 . . . . . . . {Selective catalytic reduction [SCR]}

3/2073 . . . . . . . {with means for generating a reducing substance from the exhaust gases}

3/208 . . . . . . . {Control of selective catalytic reduction [SCR], e.g. dosing of reducing agent}

3/2086 . . . . . . . {Activating the catalyst by light, photocatalysts}

3/2093 . . . . . . . {Periodically blowing a gas through the converter, e.g. in a direction opposite to exhaust gas flow or by reversing exhaust gas flow direction}

3/22 . . . . . . . {Control of additional air supply only, e.g. using by-passes or variable air pump drives}

3/222 . . . . . . . {using electric valves only}

3/225 . . . . . . . {Electric control of additional air supply}

3/227 . . . . . . . {using pneumatically operated valves, e.g. membrane valves}

3/24 . . . . . . . {characterised by constructional aspects of converting apparatus (filtering in combination with catalytic reactors F01N 3/035)}

3/26 . . . . . . . {Construction of thermal reactors}

3/28 . . . . . . . {Construction of catalytic reactors}

3/2803 . . . . . . . {characterised by structure, by material or by manufacturing of catalyst support}

3/2807 . . . . . . . {Metal other than sintered metal (F01N 3/2832 and F01N 3/2835 take precedence)}

3/281 . . . . . . . {Metallic honeycomb monoliths made of stacked or rolled sheets, foils or plates}

3/2814 . . . . . . . {all sheets, plates or foils being corrugated}

3/2817 . . . . . . . {only with non-corrugated sheets, plates or foils}

3/2821 . . . . . . . {the support being provided with means to enhance the mixing process inside the converter, e.g. sheets, plates or foils with protrusions or projections to create turbulence}

3/2825 . . . . . . . {Ceramics (F01N 3/2832, F01N 3/2835 take precedence)}

3/2828 . . . . . . . {Ceramic multi-channel monoliths, e.g. honeycombs}

3/2832 . . . . . . . {granular, e.g. pellets}

3/2835 . . . . . . . {fibrous}

3/2839 . . . . . . . {Arrangements for mounting catalyst support in housing, e.g. with means for compensating thermal expansion or vibration}

3/2842 . . . . . . . {specially adapted for monolithic supports, e.g. of honeycomb type (F01N 3/2833 - F01N 3/2871 take precedence)}

3/2846 . . . . . . . {specially adapted for granular supports, e.g. pellets}

3/285 . . . . . . . {specially adapted for fibrous supports, e.g. held in place by screens}
3/2853 . . . . . [using mats or gaskets between catalyst body and housing] 3/2875 . . . . . [by using elastic means, e.g. spring leaves, for retaining catalyst body in the housing (F01N 3/2853; F01N 3/2871 take precedence)]

3/2878 . . . . . [by using non-elastic means for retaining catalyst body in the housing, e.g. a metal chamfer, or by corrugation or deformation of the metal housing]

3/2882 . . . . . [Catalytic reactors combined or associated with other devices, e.g. exhaust silencers or other exhaust purification devices (combined with absorbents or adsorbents only F01N 3/0814; combined with particulate filters F01N 3/035)]

3/2885 . . . . . [with exhaust silencers in a single housing]

3/2892 . . . . . [with heat exchangers in a single housing]

3/2896 . . . . . [Exhaust flow directors or the like, e.g. upstream of catalytic device]

3/30 . . . . . . [Liquid catalyst carrier]

3/303 . . . . . . [Filtering additional air]

3/306 . . . . . . [Preheating additional air]

3/32 . . . . . . [using air pump (using jet air pumps F01N 3/34; pumps in general F04)]

3/323 . . . . . . [Electrically driven air pumps]

3/326 . . . . . . [Engine-driven air pumps]

3/34 . . . . . . [using air conduits or jet air pumps, e.g. near the engine exhaust port]

3/36 . . . . . . [Arrangements for supply of additional fuel]

3/38 . . . . . . [Arrangements for igniting]

5/00 Exhaust or silencing apparatus combined or associated with devices profiting from exhaust energy (using kinetic or wave energy of exhaust gases in exhaust systems for charging F02B; predominant aspects of such devices, see the relevant classes for the devices)

5/02 . . . . the devices using heat

5/025 . . . . [the device being thermoelectric generators]

5/04 . . . . the devices using kinetic energy

9/00 Electrical control of exhaust gas treating apparatus (monitoring or diagnostic devices for exhaust-gas treatment apparatus F01N 11/00; conjoint electrical control of two or more combustion engine functions F02D 43/40)

9/002 . . . [of filler regeneration, e.g. detection of clogging] 9/005 . . . [using models instead of sensors to determine operating characteristics of exhaust systems, e.g. calculating catalyst temperature instead of measuring it directly]

9/007 . . . [Storing data relevant to operation of exhaust systems for later retrieval and analysis, e.g. to research exhaust system malfunctions]

11/00 Monitoring or diagnostic devices for exhaust-gas treatment apparatus (e.g. for catalytic activity (safety, indicating or supervising devices for internal combustion engines F02B 77/08; testing of machines G01M 13/00))

11/002 . . . [the diagnostic devices measuring or estimating temperature or pressure in, or downstream of the exhaust apparatus]

11/005 . . . [the temperature or pressure being estimated, e.g. by means of a theoretical model]

11/007 . . . [the diagnostic devices measuring oxygen or air concentration downstream of the exhaust apparatus]

13/00 Exhaust or silencing apparatus characterised by constructional features (Exhaust or silencing apparatus, or parts thereof, having pertinent characteristics not provided for in, or of interest apart from, groups F01N 1/00 - F01N 5/00, F01N 9/00, F01N 11/00)

13/001 . . . [Gas flow channels or gas chambers being at least partly formed in the structural parts of the engine or machine (using structural parts of the vehicle B60K 13/06)]

13/002 . . . [Apparatus adapted for particular uses, e.g. for portable devices driven by machines or engines]

13/004 . . . [specially adapted for marine propulsion, i.e. for receiving simultaneously engine exhaust gases and engine cooling water (for submerged exhausting F01N 13/12; treating exhaust by using liquids F01N 3/04)]

13/005 . . . [with parts constructed of non-metallic material, e.g. of rubber]

13/007 . . . [Apparatus used as intake or exhaust silencer (silencing methods F01N 1/00; intake silencers F02M 35/12)]

13/008 . . . [Mounting or arrangement of exhaust sensors in or on exhaust apparatus (sensor arrangements for engine control F02D 41/1439)]

13/009 . . . [having two or more separate purifying devices arranged in series]

13/0093 . . . [the purifying devices are of the same type]

13/0097 . . . [the purifying devices are arranged in a single housing]

13/011 . . . [having two or more purifying devices arranged in parallel]

13/017 . . . [the purifying devices are arranged in a single housing]

13/02 . . . [having two or more separate silencers in series]

13/04 . . . [having two or more silencers in parallel, e.g. having interconnections for multi-cylinder engines]

13/06 . . . [specially adapted for star-arrangement of cylinders, e.g. exhaust manifolds]
13/08 . Other arrangements or adaptations of exhaust conduits [(pipes, joints or supports therefor in general F16L; collecting or removing exhaust gases of vehicle engines in workshops B08B 15/00; on highways 01C 1/005)]

13/082 . (of tailpipe, e.g. with means for mixing air with exhaust for exhaust cooling, dilution or evacuation (F01N 13/20 takes precedence))

13/085 . (having means preventing foreign matter from entering exhaust conduit)

13/087 . (having valves upstream of silencing apparatus for by-passing at least part of exhaust directly to atmosphere (valves for changing gas flow path through the silencer F01N 1/166))

13/10 . (of exhaust manifolds (with cooling jacket F01N 3/046)]

13/102 . (having thermal insulation)

13/105 . (having the form of a chamber directly connected to the cylinder head, e.g. without having tubes connected between cylinder head and chamber)

13/107 . (More than one exhaust manifold or exhaust collector)

13/12 . specially adapted for submerged exhausting

13/14 . having thermal insulation (exhaust manifolds F01N 13/102)]

13/141 . (Double-walled exhaust pipes or housings)

13/143 . (with air filling the space between both walls)

13/145 . (with gas other than air filling the space between both walls)

13/146 . (with vacuum in the space between both walls)

13/148 . (Multiple layers of insulating material)

13/16 . Selection of particular materials

13/18 . Construction facilitating manufacture, assembly, or disassembly

13/1805 . (Fixing exhaust manifolds, exhaust pipes or pipe sections to each other, to engine or to vehicle body (pipe joints in general F16L; fixing auxiliaries in motor vehicles in general B60K)]

13/1811 . (with means permitting relative movement, e.g. compensation of thermal expansion or vibration)

13/1816 . (the pipe sections being joined together by flexible tubular elements only, e.g. using bellows or strip-wound pipes)

13/1822 . (for fixing exhaust pipes or devices to vehicle body)

13/1827 . (Sealings specially adapted for exhaust systems (sealings in general F16L 15/00))

13/1833 . (specially adapted for small internal combustion engines, e.g. used in model applications)

13/1838 . (characterised by the type of connection between parts of exhaust or silencing apparatus, e.g. between housing and tubes, between tubes and baffles]

13/1844 . (Mechanical joints)

13/185 . (the connection being realised by deforming housing, tube, baffle, plate, or parts thereof]

13/1855 . (the connection being realised by using bolts, screws, rivets or the like)

13/1861 . (the assembly using parts formed by casting or moulding]

13/1866 . (the channels or tubes thereof being made integrally with the housing)

13/1872 . (the assembly using stamp-formed parts or otherwise deformed sheet-metal)

13/1877 . (the channels or tubes thereof being made integrally with the housing)

13/1883 . (manufactured by hydroforming)

13/1888 . (the housing of the assembly consisting of two or more parts, e.g. two half-shells)

13/1894 . (the parts being assembled in longitudinal direction)

13/20 . having flared outlets, e.g. of fish-tail shape

2210/00 . Combination of methods of silencing

2210/02 . Resonance and interference

2210/04 . Throttling-expansion and resonance

2210/06 . Throttling-expansion and interference

2230/00 . Combination of silencers and other devices

2230/02 . Exhaust filters

2230/04 . Catalytic converters

2230/06 . Spark arresters

2230/08 . Thermal reactors

2240/00 . Combination of association of two or more different exhaust treating devices, or of at least one such device with an auxiliary device, not covered by indexing codes F01N 2230/00 or F01N 2250/00, one of the devices being

2240/02 . a heat exchanger

2240/04 . an electric, e.g. electrostatic, device other than a heater

2240/05 . a magnetic, e.g. electromagnetic, device other than a valve

2240/06 . an inertial, e.g. centrifugal, device

2240/10 . a heat accumulator

2240/12 . a thermal reactor

2240/14 . a fuel burner

2240/16 . an electric heater, i.e. a resistance heater

2240/18 . an adsorber or absorber

2240/20 . a flow director or deflector

2240/22 . a condensation chamber

2240/25 . an ammonia generator

2240/26 . an exhaust gas reservoir, e.g. emission buffer

2240/28 . a plasma reactor

2240/30 . a fuel reformer

2240/32 . a fuel cell

2240/34 . an electrolyser

2240/36 . an exhaust flap

2240/38 . an ozone (O₃) generator, e.g. for adding ozone after generation of ozone from air

2240/40 . a hydrolysis catalyst

2250/00 . Combinations of different methods of purification

2250/02 . filtering and catalytic conversion

2250/04 . afterburning and catalytic conversion

2250/06 . afterburning and filtering

2250/08 . filtering and inertial particulate separation

2250/10 . cooling and filtering

2250/12 . absorption or adsorption, and catalytic conversion

2250/14 . absorption or adsorption, and filtering

2260/00 . Exhaust treating devices having provisions not otherwise provided for

2260/02 . for cooling the device

2260/022 . using air

2260/024 . using a liquid
2260/04  . for regeneration or reactivation, e.g. of catalyst
2260/06  . for improving exhaust evacuation or circulation, or reducing back-pressure
2260/08  . for preventing heat loss or temperature drop, using other means than layers of heat-insulating material
2260/10  . for avoiding stress caused by expansions or contractions due to temperature variations
2260/12  . for resisting high pressure
2260/14  . for modifying or adapting flow area or back-pressure
2260/16  . for reducing exhaust flow pulsations
2260/18  . for improving rigidity, e.g. by wings, ribs
2260/20  . for heat or sound protection, e.g. using a shield or specially shaped outer surface of exhaust device
2260/22  . for preventing theft of exhaust parts or devices, e.g. anti-theft arrangements
2260/24  . for identifying exhaust parts or devices, e.g. by labels, stickers or directly printing
2260/26  . for preventing enter of dirt into the device

2270/00  Mixing air with exhaust gases
2270/02  . for cooling exhaust gases or the apparatus
2270/04  . for afterburning
2270/06  . for silencing
2270/08  . for evacuation of exhaust gases, e.g. in tail-pipes
2270/10  . for rendering exhaust innocuous, e.g. by dilution

2290/00  Movable parts or members in exhaust systems for other than for control purposes
2290/02  . with continuous rotary movement
2290/04  . driven by exhaust gases
2290/06  . driven by auxiliary drive
2290/08  . with oscillating or vibrating movement
2290/10  . acted upon by pressure of exhaust gases, e.g. exhaust pulses

2310/00  Selection of sound absorbing or insulating material
2310/02  . Mineral wool, e.g. glass wool, rock wool, asbestos or the like
2310/04  . Metallic wool, e.g. steel wool, copper wool or the like
2310/06  . Porous ceramics
2310/08  . Exfoliated vermiculite, e.g. zonolite, coke, pumice
2310/10  . Plastic foam
2310/12  . Granular material
2310/14  . Wire mesh fabric, woven glass cloth or the like

2330/00  Structure of catalyst support or particle filter
2330/02  . Metallic plates or honeycombs, e.g. superposed or rolled-up corrugated or otherwise deformed sheet metal
2330/04  . Methods of manufacturing
2330/06  . Ceramic, e.g. monoliths
2330/08  . Granular material
2330/10  . Fibrous material, e.g. mineral or metallic wool
2330/101 . using binders, e.g. to form a permeable mat, paper or the like
2330/102 . fibrous material being fiber reinforced polymer made of plastic matrix reinforced by fine glass or in the form of a loose mass of filaments or fibers
2330/12  . Metallic wire mesh fabric or knitting
2330/14  . Sintered material
2330/18  . Composite material
2330/20  . Plastics, e.g. polymers, polyester, polyurethane

2330/22  . Metal foam
2330/30  . Honeycomb supports characterised by their structural details
2330/32  . characterised by the shape, form or number of corrugations of plates, sheets or foils
2330/321 . with two or more different kinds of corrugations in the same substrate
2330/322 . Corrugations of trapezoidal form
2330/323 . Corrugations of saw-tooth or triangular form
2330/324 . Corrugations of rectangular form
2330/325 . Corrugations of omega form
2330/34  . with flow channels of polygonal cross section
2330/36  . with flow channels formed by tubes
2330/38  . flow channels with means to enhance flow mixing,(e.g. protrusions or projections)
2330/40  . made of a single sheet, foil or plate
2330/42  . made of three or more different sheets, foils or plates stacked one on the other
2330/44  . made of stacks of sheets, plates or foils that are folded in S-form
2330/48  . characterised by the number of flow passages, e.g. cell density
2330/60  . Discontinuous, uneven properties of filter material, e.g. different material thickness along the longitudinal direction; Higher filter capacity upstream than downstream in same housing

2340/00  Dimensional characteristics of the exhaust system, e.g. length, diameter or volume of the apparatus; Spatial arrangements of exhaust apparatuses
2340/02  . characterised by the distance of the apparatus to the engine, or the distance between two exhaust treating apparatuses
2340/04  . characterised by the arrangement of an exhaust pipe, manifold or apparatus in relation to vehicle frame or particular vehicle parts
2340/06  . characterised by the arrangement of the exhaust apparatus relative to the turbine of a turbocharger

2350/00  Arrangements for fitting catalyst support or particle filter element in the housing
2350/02  . Fitting ceramic monoliths in a metallic housing
2350/04  . with means compensating thermal expansion
2350/06  . with means preventing gas flow by-pass or leakage
2350/08  . with means for compressing granular material

2370/00  Selection of materials for exhaust purification
2370/02  . used in catalytic reactors
2370/04  . Zeolitic material
2370/22  . used in non-catalytic purification apparatus
2370/24  . Zeolitic material
2370/30  . Materials having magnetic properties
2370/40  . Activated carbon or charcoal

2390/00  Arrangements for controlling or regulating exhaust apparatus
2390/02  . using electric components only
2390/04  . using electropneumatic components
2390/06  . using pneumatic components only
2390/08  . using mechanical components only, e.g. actuated manually

2410/00  By-passing, at least partially, exhaust from inlet to outlet of apparatus, to atmosphere or to other device
Structure or shape of gas passages, pipes or tubes

Methods or apparatus for fitting, inserting or repairing different elements

Influencing exhaust purification, e.g. starting of catalytic reaction, filter regeneration, or the like, by controlling engine operating characteristics

Structure, disposition or shape of gas-chambers

Selection of materials for tubes, chambers or housings

Surface coverings

F01N
2530/26 . Multi-layered walls

2550/00 Monitoring or diagnosing the deterioration of exhaust systems

2550/02 . Catalytic activity of catalytic converters
2550/03 . of sorbing activity of adsorbents or absorbents
2550/04 . Filtering activity of particulate filters
2550/05 . Systems for adding substances into exhaust
2550/06 . By-pass systems
2550/10 . . of catalytic converters
2550/12 . . of particulate filters
2550/14 . Systems for adding secondary air into exhaust
2550/20 . Monitoring artificially aged exhaust systems
2550/22 . . of electric heaters for exhaust systems or their power supply
2550/24 . Determining the presence or absence of an exhaust treating device

2560/00 Exhaust systems with means for detecting or measuring exhaust gas components or characteristics

2560/02 . the means being an exhaust gas sensor
2560/021 . for measuring or detecting ammonia NH₃
2560/022 . for measuring or detecting CO or CO₂
2560/023 . for measuring or detecting HC
2560/024 . for measuring or detecting hydrogen H₂
2560/025 . for measuring or detecting O₂, e.g. lambda sensors
2560/026 . . for measuring or detecting NOx
2560/027 . . for measuring or detecting SOx
2560/028 . . for measuring or detecting humidity or water
2560/05 . . the means being a particulate sensor
2560/06 . . the means being a temperature sensor
2560/07 . . the means being an exhaust gas flow rate or velocity meter or sensor, intake flow meters only when exclusively used to determine exhaust gas parameters
2560/08 . . the means being a pressure sensor
2560/12 . . Other sensor principles, e.g. using electro conductivity of substrate or radio frequency
2560/14 . . having more than one sensor of one kind
2560/20 . . Sensor having heating means

2570/00 Exhaust treating apparatus eliminating, absorbing or adsorbing specific elements or compounds

2570/02 . Lead
2570/04 . Sulfur or sulfur oxides
2570/06 . Zinc
2570/08 . Phosphorus
2570/10 . Carbon or carbon oxides
2570/12 . Hydrocarbons
2570/14 . Nitrogen oxides
2570/145 . . Dinitrogen oxide
2570/16 . Oxygen
2570/18 . Ammonia
2570/20 . Formaldehyde
2570/22 . Water or humidity
2570/24 . Hydrogen sulfide (H₂S)

2590/00 Exhaust or silencing apparatus adapted to particular use, e.g. for military applications, airplanes, submarines

2590/02 . . for military applications, airplanes, submarines
2590/021 . . for marine vessels or naval applications
2590/022 . . for jetskis
2590/04 . for motorcycles
2590/06 . for hand-held tools or portables devices
2590/08 . for heavy duty applications, e.g. trucks, buses, tractors, locomotives
2590/10 . . for stationary applications
2590/11 . . for hybrid vehicles

2610/00 Adding substances to exhaust gases

2610/01 . . the substance being catalytic material in liquid form
2610/02 . . the substance being ammonia or urea
2610/03 . . the substance being hydrocarbons, e.g. engine fuel
2610/04 . . the substance being hydrogen
2610/05 . . the substance being carbon monoxide
2610/06 . . the substance being in the gaseous form
2610/08 . . with prior mixing of the substances with a gas, e.g. air
2610/085 . . Controlling the air supply
2610/10 . . the substance being heated, e.g. by heating tank or supply line of the added substance
2610/102 . . after addition to exhaust gases, e.g. by a passively or actively heated surface in the exhaust conduit
2610/105 . . Control thereof
2610/107 . . using glow plug heating elements
2610/111 . . using a state observer
2610/11 . . the substance or part of the dosing system being cooled
2610/12 . . the substance being in solid form, e.g. pellets or powder
2610/14 . . Arrangements for the supply of substances, e.g. conduits
2610/1406 . . Storage means for substances, e.g. tanks or reservoirs
2610/1413 . . Inlet and filling arrangements therefore
2610/142 . . Controlling the filling of the tank
2610/1426 . . Filtration means
2610/1433 . . Pumps
2610/144 . . Control thereof
2610/1446 . . Means for damping of pressure fluctuations in the delivery system, e.g. by puffer volumes or throttling
2610/1453 . . Sprayers or atomisers; Arrangement thereof in the exhaust apparatus
2610/146 . . Control thereof, e.g. control of injectors or injection valves
2610/1466 . . Means for venting air out of conduits or tanks
2610/1473 . . Overflow or return means for the substances, e.g. conduits or valves for the return path
2610/148 . . Arrangement of sensors
2610/1486 . . Means to prevent the substance from freezing
2610/1493 . . Purging the reducing agent out of the conduits or nozzle

2900/00 Details of electrical control or of the monitoring of the exhaust gas treating apparatus

2900/04 . . Methods of control or diagnosing
2900/0402 . . using adaptive learning
2900/0404 . . using a data filter
2900/0406 . . using a model with a division of the catalyst or filter in several cells
2900/0408 . . using a feed-back loop
2900/0411 . . using a feed-forward control
2900/0412 . . using pre-calibrated maps, tables or charts
2900/0414 . . using a state observer
using the state of a sensor, e.g. of an exhaust gas sensor
using integration or an accumulated value within an elapsed period
using an increment counter when a predetermined event occurs
measuring the elapsed time
Parameters used for exhaust control or diagnosing
being estimated
Electrical exhaust heater signals
said parameters being related to the engine
said parameters being related to the vehicle or its components
Travelling distance
Battery status
said parameters being related to the vehicle exterior
said parameters being related to the exhaust gas
Exhaust gas composition
Exhaust gas temperature
Exhaust gas pressure
Exhaust gas flow rate, e.g. mass flow rate or volumetric flow rate
said parameters being related to the exhaust apparatus, e.g. particulate filter or catalyst
Temperature of exhaust gas apparatus
Particle filter loading or soot amount
Particle filter ash amount
SOx amount trapped in catalyst
NOx amount trapped in catalyst
NH3-slip from catalyst
HC-slip from catalyst
Catalyst conversion efficiency
Catalyst reducing agent absorption capacity or consumption amount
Catalyst oxygen storage capacity
Catalyst activation temperature
Moisture amount in exhaust apparatus
Heat amount provided to exhaust apparatus
said parameters being related to the system for adding a substance into the exhaust
Properties of secondary air added directly to the exhaust
Properties of reducing agent or dosing system
Pressure
Temperature
Flow rate
Tank level
Concentration of the reducing agent
Injector parameters
Pump parameters
Properties of the air to be mixed with added substances, e.g. air pressure or air temperature