

**CPC****COOPERATIVE PATENT CLASSIFICATION****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](#)} ; protecting against, or damping, noise in general [G10K 11/16](#))

**NOTE**

Attention is drawn to the notes preceding Class [F01](#), especially as regards Note 2(b).

**F01N 1/00**

**Silencing apparatus characterised by method of silencing** {(by cooling [F01N 3/02](#); using liquids [F01N 3/04](#))}

**F01N 1/003**

- {by using dead chambers communicating with gas flow passages (resonance chambers [F01N 1/02](#); chambers containing sound-absorbing materials [F01N 1/24](#))}

**F01N 1/006**

- • {comprising at least one perforated tube extending from inlet to outlet of the silencer}

**F01N 1/02**

- by using resonance

**F01N 1/023**

- • {Helmholtz resonators}

**F01N 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}

**F01N 1/04**

- • having sound-absorbing materials in resonance chambers

**F01N 1/06**

- by using interference effect

**F01N 1/065**

- • {by using an active noise source, e.g. speakers}

**F01N 1/08**

- by reducing exhaust energy by throttling or whirling

**F01N 1/081**

- • {by passing the gases through a mass of particles}

- F01N 1/082
  - . {the gases passing through porous members ([F01N 1/081](#) takes precedence)}
- F01N 1/083
  - . {using transversal baffles defining a tortuous path for the gases or successively throttling gas flow}
- F01N 1/084
  - . {the gases flowing through the silencer two or more times longitudinally in opposite directions, e.g. using parallel or concentric tubes}
- F01N 1/085
  - . {using a central core throttling gas passage}
- F01N 1/086
  - . {having means to impart whirling motion to the gases (with helically or spirally shaped channels [F01N 1/12](#))}
- F01N 1/087
  - . . {using tangential inlets into a circular chamber}
- F01N 1/088
  - . . {using vanes arranged on gas flow path or gas flow tubes with tangentially directed apertures}
- F01N 1/089
  - . {using two or more expansion chambers in series ([F01N 1/083](#), [F01N 1/084](#), [F01N 1/086](#) take precedence)}
- F01N 1/10
  - . in combination with sound-absorbing materials ([F01N 1/125](#) takes precedence)
- F01N 1/12
  - . using spirally or helically shaped channels ([cyclones B04C](#))
- F01N 1/125
  - . . {in combination with sound-absorbing materials}
- F01N 1/14
  - by adding air to exhaust gases {(in tailpipes [F01N 13/082](#), [F01N 13/20](#))}
- F01N 1/16
  - by using movable parts
- F01N 1/161
  - . {for adjusting resonance or dead chambers or passages to resonance or dead chambers}
- F01N 1/163
  - . . {by means of valves}
- F01N 1/165
  - . {for adjusting flow area}
- F01N 1/166
  - . {for changing gas flow path through the silencer or for adjusting the dimensions of a chamber or a pipe ([F01N 1/165](#) takes precedence)}
- F01N 1/168
  - . {for controlling or modifying silencing characteristics only}
- F01N 1/18
  - . having rotary movement
- F01N 1/20
  - . having oscillating or vibrating movement {(the parts being resilient walls [F01N 1/22](#))}
- F01N 1/22
  - . the parts being resilient walls
- F01N 1/24
  - by using sound-absorbing materials ([F01N 1/04](#), [F01N 1/06](#), [F01N 1/10](#), [F01N 1/14](#), [F01N 1/16](#) take precedence)
- F01N 3/00**

**Exhaust or silencing apparatus having means for purifying, rendering innocuous, or otherwise treating exhaust** (electric control [F01N 9/00](#); monitoring or diagnostic devices for exhaust-gas treatment apparatus [F01N 11/00](#); {collecting or removing exhaust gases of vehicle engines in workshops [B08B 15/00](#), on highways [E01C 1/005](#))
- F01N 3/005
  - {for draining or otherwise eliminating condensates or moisture accumulating in the apparatus ([F01N 3/02](#) takes precedence)}
- F01N 3/01
  - by means of electric or electrostatic separators
- F01N 3/02
  - for cooling, or for removing solid constituents of, exhaust (by means of electric or electrostatic separators [F01N 3/01](#) ; mixing air with exhaust in tailpipes [F01N 13/082](#), [F01N 13/20](#))
- F01N 3/0205
  - . {using heat exchangers}

- F01N 3/021 . . . by means of filters
- F01N 3/0211 . . . {Arrangements for mounting filtering elements in housing, e.g. with means for compensating thermal expansion or vibration}
- F01N 3/0212 . . . {with one or more perforated tubes surrounded by filtering material, e.g. filter candles}
- F01N 3/0214 . . . {with filters comprising movable parts, e.g. rotating filters}
- F01N 3/0215 . . . {the filtering elements having the form of disks or plates}
- F01N 3/0217 . . . {the filtering elements having the form of hollow cylindrical bodies}
- F01N 3/0218 . . . {the filtering elements being made from spirally-wound filtering material}
- F01N 3/022 . . . characterised by specially adapted filtering structure, e.g. honeycomb, mesh or fibrous
  - F01N 3/0222 . . . . {the structure being monolithic, e.g. honeycombs}
  - F01N 3/0224 . . . . {the structure being granular}
  - F01N 3/0226 . . . . {the structure being fibrous}
  - F01N 3/0228 . . . . {the structure being made of foamed rubber or plastics}
- F01N 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](#))
  - F01N 3/0231 . . . . {using special exhaust apparatus upstream of the filter for producing nitrogen dioxide, e.g. for continuous filter regeneration systems [CRT]}
  - F01N 3/0232 . . . . {removing incombustible material from a particle filter, e.g. ash}
  - F01N 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}
  - F01N 3/0234 . . . . {using heat exchange means in the exhaust line}
  - F01N 3/0235 . . . . {using exhaust gas throttling means}
  - F01N 3/0236 . . . . {using turbine waste gate valve}
  - F01N 3/0237 . . . . {for regenerating ex situ}
  - F01N 3/0238 . . . . {for regenerating during engine standstill}
- F01N 3/025 . . . . using fuel burner or by adding fuel to exhaust
  - F01N 3/0253 . . . . . {adding fuel to exhaust gases}
  - F01N 3/0256 . . . . . . {the fuel being ignited by electrical means}
- F01N 3/027 . . . . using electric or magnetic heating means
  - F01N 3/0275 . . . . . {using electric discharge means}
- F01N 3/028 . . . . . using microwaves
- F01N 3/029 . . . . by adding non-fuel substances to exhaust
  - F01N 3/0293 . . . . . {injecting substances in exhaust stream}
  - F01N 3/0296 . . . . . . {having means for preheating additional substances}
- F01N 3/031 . . . having means for by-passing filters, e.g. when clogged or during cold engine start
- F01N 3/032 . . . . during filter regeneration only
- F01N 3/033 . . . in combination with other devices ({with adsorbents or absorbents [F01N 3/0821](#)})

- F01N 3/0335 . . . . {with exhaust silencers in a single housing}
- F01N 3/035 . . . . with catalytic reactors, {e.g. catalysed diesel particulate filters}
- F01N 3/037 . . by means of inertial or centrifugal separators, e.g. of cyclone type, optionally combined or associated with agglomerators
- F01N 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
- F01N 3/04 . . using liquids
- F01N 3/043 . . . {without contact between liquid and exhaust gases}
- F01N 3/046 . . . . {Exhaust manifolds with cooling jacket}
- F01N 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](#)})
- F01N 3/055 . . . {without contact between air and exhaust gases}
- F01N 3/06 . . for extinguishing sparks
- F01N 3/08 . . for rendering innocuous (using electric or electrostatic separators [F01N 3/01](#); chemical aspects [B01D 53/92](#))
- F01N 3/0807 . . {by using absorbents or adsorbents}
- F01N 3/0814 . . . {combined with catalytic converters, e.g. NOx absorption/storage reduction catalysts}
- F01N 3/0821 . . . {combined with particulate filters (catalysed diesel particulate filters [F01N 3/035](#))}
- F01N 3/0828 . . . {characterised by the absorbed or adsorbed substances}
- F01N 3/0835 . . . . {Hydrocarbons}
- F01N 3/0842 . . . . {Nitrogen oxides}
- F01N 3/085 . . . . {Sulfur or sulfur oxides}
- F01N 3/0857 . . . . {Carbon oxides}
- F01N 3/0864 . . . . {Oxygen}
- F01N 3/0871 . . . {Regulation of absorbents or adsorbents, e.g. purging (by electrically controlling the supply of combustible mixture or its constituents only [F02D 41/0235](#))}
- F01N 3/0878 . . . . {Bypassing absorbents or adsorbents}
- F01N 3/0885 . . . . {Regeneration of deteriorated absorbents or adsorbents, e.g. desulfurization of NOx traps}
- F01N 3/0892 . . {Electric or magnetic treatment, e.g. dissociation of noxious components (electric filters [F01N 3/01](#); regeneration of exhaust filters [F01N 3/023](#); heating catalytic converters [F01N 3/2006](#))}
- F01N 3/10 . . by thermal or catalytic conversion of noxious components of exhaust (by using other chemical processes, chemical aspects of catalytic conversion, e.g. using specified catalysts, [B01D 53/34](#))
- F01N 3/101 . . . {Three-way catalysts}
- F01N 3/103 . . . {Oxidation catalysts for HC and CO only}
- F01N 3/105 . . . {General auxiliary catalysts, e.g. upstream or downstream of the main catalyst}

F01N 3/106	. . . .	{Auxiliary oxidation catalysts}
F01N 3/108	. . . .	{Auxiliary reduction catalysts}
F01N 3/18	. . .	characterised by methods of operation; Regulation
F01N 3/20	. . . .	specifically adapted for catalytic conversion; {Methods of operation or regulation of catalytic converters} (F01N 3/22 takes precedence)
F01N 3/2006	. . . . .	{Periodically heating or cooling catalytic reactors, e.g. at cold starting or overheating (by electrically controlling the supply of combustible mixture or its constituents only F02D 41/0235)}
F01N 3/2013	. . . . .	{using electric or magnetic heating means}
F01N 3/202	. . . . .	{using microwaves}
F01N 3/2026	. . . . .	{directly electrifying the catalyst substrate, i.e. heating the electrically conductive catalyst substrate by joule effect}
F01N 3/2033	. . . . .	{using a fuel burner or introducing fuel into exhaust duct}
F01N 3/204	. . . . .	{using an exhaust gas igniter, e.g. a spark or glow plug, without introducing fuel into exhaust duct}
F01N 3/2046	. . . . .	{Periodically cooling catalytic reactors}
F01N 3/2053	. . . . .	{By-passing catalytic reactors, e.g. to prevent overheating}
F01N 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)}
F01N 3/2066	. . . . .	{Selective catalytic reduction [SCR]}
F01N 3/2073	. . . . .	{with means for generating a reducing substance from the exhaust gases}
F01N 3/208	. . . . .	{Control of selective catalytic reduction [SCR], e.g. dosing of reducing agent}
F01N 3/2086	. . . . .	{Activating the catalyst by light, photo-catalysts}
F01N 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}
F01N 3/22	. . . .	Regulation of additional air supply only, e.g. using by-passes or variable air pump drives
F01N 3/222	. . . . .	{using electric valves only}
F01N 3/225	. . . . .	{Electric control of additional air supply}
F01N 3/227	. . . . .	{using pneumatically operated valves, e.g. membrane valves}
F01N 3/24	. . .	characterised by constructional aspects of converting apparatus (filtering in combination with catalytic reactors F01N 3/035)
F01N 3/26	. . . .	Construction of thermal reactors
F01N 3/28	. . . .	Construction of catalytic reactors
F01N 3/2803	. . . . .	{characterised by structure, by material or by manufacturing of catalyst support}
F01N 3/2807	. . . . .	{Metal other than sintered metal (F01N 3/2832 and F01N 3/2835 take precedence)}
F01N 3/281	. . . . .	{Metallic honeycomb monoliths made of stacked or rolled sheets, foils or plates}
F01N 3/2814	. . . . .	{all sheets, plates or foils being corrugated}

F01N 3/2817	. . . . .	{only with non-corrugated sheets, plates or foils}
F01N 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}
F01N 3/2825	. . . . .	{Ceramics ( <a href="#">F01N 3/2832</a> , <a href="#">F01N 3/2835</a> take precedence)}
F01N 3/2828	. . . . .	{Ceramic multi-channel monoliths, e.g. honeycombs}
F01N 3/2832	. . . . .	{granular, e.g. pellets}
F01N 3/2835	. . . . .	{fibrous}
F01N 3/2839	. . . . .	{Arrangements for mounting catalyst support in housing, e.g. with means for compensating thermal expansion or vibration}
F01N 3/2842	. . . . .	{specially adapted for monolithic supports, e.g. of honeycomb type ( <a href="#">F01N 3/2853</a> to <a href="#">F01N 3/2871</a> take precedence)}
F01N 3/2846	. . . . .	{specially adapted for granular supports, e.g. pellets}
F01N 3/285	. . . . .	{specially adapted for fibrous supports, e.g. held in place by screens}
F01N 3/2853	. . . . .	{using mats or gaskets between catalyst body and housing}
F01N 3/2857	. . . . .	{the mats or gaskets being at least partially made of intumescent material, e.g. unexpanded vermiculite}
F01N 3/286	. . . . .	{the mats or gaskets having corrugations or cavities}
F01N 3/2864	. . . . .	{the mats or gaskets comprising two or more insulation layers}
F01N 3/2867	. . . . .	{the mats or gaskets being placed at the front or end face of catalyst body}
F01N 3/2871	. . . . .	{the mats or gaskets having an additional, e.g. non-insulating or non-cushioning layer, a metal foil or an adhesive layer}
F01N 3/2875	. . . . .	{by using elastic means, e.g. spring leaves, for retaining catalyst body in the housing ( <a href="#">F01N 3/2853</a> to <a href="#">F01N 3/2871</a> take precedence)}
F01N 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}
F01N 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 <a href="#">F01N 3/0814</a> ; combined with particulate filters <a href="#">F01N 3/035</a> )}
F01N 3/2885	. . . . .	{with exhaust silencers in a single housing}
F01N 3/2889	. . . . .	{with heat exchangers in a single housing}
F01N 3/2892	. . . . .	{Exhaust flow directors or the like, e.g. upstream of catalytic device}
F01N 3/2896	. . . . .	{Liquid catalyst carrier}
F01N 3/30	. . . . .	Arrangements for supply of additional air (regulation, e.g. using air by-passes or variable air pump drives <a href="#">F01N 3/22</a> )
F01N 3/303	. . . . .	{Filtering additional air}
F01N 3/306	. . . . .	{Preheating additional air}

- F01N 3/32 . . . . . using air pump (using jet air pumps [F01N 3/34](#); pumps in general [F04](#))
- F01N 3/323 . . . . . {Electrically driven air pumps}
- F01N 3/326 . . . . . {Engine-driven air pumps}
- F01N 3/34 . . . . . using air conduits or jet air pumps, e.g. near the engine exhaust port
- F01N 3/36 . . . . . Arrangements for supply of additional fuel
- F01N 3/38 . . . . . Arrangements for igniting

**F01N 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)

- F01N 5/02 . the devices using heat
- F01N 5/025 . . {the device being thermoelectric generators}
- F01N 5/04 . the devices using kinetic energy

**F01N 9/00 Electrical control of exhaust gas treating apparatus** (monitoring or diagnostic devices for exhaust-gas treatment apparatus [F01N 11/00](#); {electrical control of supply of combustible mixture or its constituents in relation with the state of the exhaust gas treating apparatus [F02D 41/0235](#)}; controlling combustion engines conjoint electrical control of two or more combustion engine functions [F02D 43/00](#))

- F01N 9/002 . {of filter regeneration, e.g. detection of clogging}
- F01N 9/005 . {using models instead of sensors to determine operating characteristics of exhaust systems, e.g. calculating catalyst temperature instead of measuring it directly}
- F01N 9/007 . {Storing data relevant to operation of exhaust systems for later retrieval and analysis, e.g. to research exhaust system malfunctions}

**F01N 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](#))

- F01N 11/002 . {the diagnostic devices measuring or estimating temperature or pressure in, or downstream of the exhaust apparatus}
- F01N 11/005 . . {the temperature or pressure being estimated, e.g. by means of a theoretical model}
- F01N 11/007 . {the diagnostic devices measuring oxygen or air concentration downstream of the exhaust apparatus}

**F01N 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](#) to [F01N 5/00](#), [F01N 9/00](#), [F01N 11/00](#)}**

- F01N 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](#))}
- F01N 13/002 . {Apparatus adapted for particular uses, e.g. for portable devices driven by machines or engines}



- F01N 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](#))}
- F01N 13/005 . . {with parts constructed of non-metallic material, e.g. of rubber}
- F01N 13/007 . {Apparatus used as intake or exhaust silencer (silencing methods [F01N 1/00](#); intake silencers [F02M 35/12](#))}
- F01N 13/008 . {Mounting or arrangement of exhaust sensors in or on exhaust apparatus (sensor arrangements for engine control [F02D 41/1439](#))}
- F01N 13/009 . {having two or more separate purifying devices arranged in series}
- F01N 13/0093 . . {the purifying devices are of the same type}
- F01N 13/0097 . . {the purifying devices are arranged in a single housing}
- F01N 13/011 . {having two or more purifying devices arranged in parallel}
- F01N 13/017 . . {the purifying devices are arranged in a single housing}
- F01N 13/02 . having two or more separate silencers in series
- F01N 13/04 . having two or more silencers in parallel e.g. having interconnections for multi-cylinder engines
- F01N 13/06 . specially adapted for star-arrangement of cylinders, e.g. exhaust manifolds
- F01N 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 [E01C 1/005](#))}
- F01N 13/082 . . {of tailpipe, e.g. with means for mixing air with exhaust for exhaust cooling, dilution or evacuation ([F01N 13/20](#) takes precedence)}
- F01N 13/085 . . {having means preventing foreign matter from entering exhaust conduit}
- F01N 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](#))}
- F01N 13/10 . . of exhaust manifolds {(with cooling jacket [F01N 3/046](#))}
- F01N 13/102 . . . {having thermal insulation}
- F01N 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}
- F01N 13/107 . . . {More than one exhaust manifold or exhaust collector}
- F01N 13/12 . specially adapted for submerged exhausting
- F01N 13/14 . having thermal insulation {(exhaust manifolds [F01N 13/102](#))}
- F01N 13/141 . . {Double-walled exhaust pipes or housings}
- F01N 13/143 . . . {with air filling the space between both walls}
- F01N 13/145 . . . {with gas other than air filling the space between both walls}
- F01N 13/146 . . . {with vacuum in the space between both walls}
- F01N 13/148 . . {Multiple layers of insulating material}
- F01N 13/16 . Selection of particular materials
- F01N 13/18 . Construction facilitating manufacture, assembly, or disassembly
- F01N 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](#))}



- F01N 13/1811 . . . {with means permitting relative movement, e.g. compensation of thermal expansion or vibration}
- F01N 13/1816 . . . . {the pipe sections being joined together by flexible tubular elements only, e.g. using bellows or strip-wound pipes}
- F01N 13/1822 . . . . {for fixing exhaust pipes or devices to vehicle body}
- F01N 13/1827 . . . {Sealings specially adapted for exhaust systems ([sealings in general F16J 15/00](#))}
- F01N 13/1833 . . {specially adapted for small internal combustion engines, e.g. used in model applications}
- F01N 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}
- F01N 13/1844 . . . {Mechanical joints}
- F01N 13/185 . . . . {the connection being realised by deforming housing, tube, baffle, plate, or parts thereof}
- F01N 13/1855 . . . . {the connection being realised by using bolts, screws, rivets or the like}
- F01N 13/1861 . . {the assembly using parts formed by casting or moulding}
- F01N 13/1866 . . . {the channels or tubes thereof being made integrally with the housing}
- F01N 13/1872 . . {the assembly using stamp-formed parts or otherwise deformed sheet-metal}
- F01N 13/1877 . . . {the channels or tubes thereof being made integrally with the housing}
- F01N 13/1883 . . {manufactured by hydroforming}
- F01N 13/1888 . . {the housing of the assembly consisting of two or more parts, e.g. two half-shells}
- F01N 13/1894 . . . {the parts being assembled in longitudinal direction}
- F01N 13/20 . having flared outlets, e.g. of fish-tail shape

#### **F01N 2210/00 Combination of methods of silencing**

- F01N 2210/02 . Resonance and interference
- F01N 2210/04 . Throttling-expansion and resonance
- F01N 2210/06 . Throttling-expansion and interference

#### **F01N 2230/00 Combination of silencers and other devices**

- F01N 2230/02 . Exhaust filters
- F01N 2230/04 . Catalytic converters
- F01N 2230/06 . Spark arresters
- F01N 2230/08 . Thermal reactors

#### **F01N 2240/00 Combination or 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**

- F01N 2240/02 . a heat exchanger
- F01N 2240/04 . an electric, e.g. electrostatic, device other than a heater
- F01N 2240/05 . a magnetic, e.g. electromagnetic, device other than a valve

- F01N 2240/06 . an inertial, e.g. centrifugal, device
- F01N 2240/10 . a heat accumulator
- F01N 2240/12 . a thermal reactor
- F01N 2240/14 . a fuel burner
- F01N 2240/16 . an electric heater, i.e. a resistance heater
- F01N 2240/18 . an adsorber or absorber
- F01N 2240/20 . a flow director or deflector
- F01N 2240/22 . a condensation chamber
- F01N 2240/25 . an ammonia generator
- F01N 2240/26 . an exhaust gas reservoir, e.g. emission buffer
- F01N 2240/28 . a plasma reactor
- F01N 2240/30 . a fuel reformer
- F01N 2240/32 . a fuel cell
- F01N 2240/34 . an electrolyser
- F01N 2240/36 . an exhaust flap
- F01N 2240/38 . an ozone (O<sub>3</sub>) generator, e.g. for adding ozone after generation of ozone from air
- F01N 2240/40 . a hydrolysis catalyst

**F01N 2250/00****Combinations of different methods of purification**

- F01N 2250/02 . filtering and catalytic conversion
- F01N 2250/04 . afterburning and catalytic conversion
- F01N 2250/06 . afterburning and filtering
- F01N 2250/08 . filtering and inertial particulate separation
- F01N 2250/10 . cooling and filtering
- F01N 2250/12 . absorption or adsorption, and catalytic conversion
- F01N 2250/14 . absorption or adsorption, and filtering

**F01N 2260/00****Exhaust treating devices having provisions not otherwise provided for**

- F01N 2260/02 . for cooling the device
- F01N 2260/022 . . using air
- F01N 2260/024 . . using a liquid
- F01N 2260/04 . for regeneration or reactivation, e.g. of catalyst
- F01N 2260/06 . for improving exhaust evacuation or circulation, or reducing back-pressure
- F01N 2260/08 . for preventing heat loss or temperature drop, using other means than layers of heat-insulating material
- F01N 2260/10 . for avoiding stress caused by expansions or contractions due to temperature variations
- F01N 2260/12 . for resisting high pressure
- F01N 2260/14 . for modifying or adapting flow area or back-pressure
- F01N 2260/16 . for reducing exhaust flow pulsations
- F01N 2260/18 . for improving rigidity, e.g. by wings, ribs

F01N 2260/20	<ul style="list-style-type: none"> <li>for heat or sound protection, e.g. using a shield or specially shaped outer surface of exhaust device</li> </ul>
F01N 2260/22	<ul style="list-style-type: none"> <li>for preventing theft of exhaust parts or devices, e.g. anti-theft arrangements</li> </ul>
F01N 2260/24	<ul style="list-style-type: none"> <li>for identifying exhaust parts or devices, e.g. by labels, stickers or directly printing</li> </ul>
F01N 2260/26	<ul style="list-style-type: none"> <li>for preventing enter of dirt into the device</li> </ul>
<b>F01N 2270/00</b>	<b>Mixing air with exhaust gases</b>
F01N 2270/02	<ul style="list-style-type: none"> <li>for cooling exhaust gases or the apparatus</li> </ul>
F01N 2270/04	<ul style="list-style-type: none"> <li>for afterburning</li> </ul>
F01N 2270/06	<ul style="list-style-type: none"> <li>for silencing</li> </ul>
F01N 2270/08	<ul style="list-style-type: none"> <li>for evacuation of exhaust gases, e.g. in tail-pipes</li> </ul>
F01N 2270/10	<ul style="list-style-type: none"> <li>for rendering exhaust innocuous, e.g. by dilution</li> </ul>
<b>F01N 2290/00</b>	<b>Movable parts or members in exhaust systems for other than for control purposes</b>
F01N 2290/02	<ul style="list-style-type: none"> <li>with continuous rotary movement</li> </ul>
F01N 2290/04	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>driven by exhaust gases</li> </ul> </li> </ul>
F01N 2290/06	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>driven by auxiliary drive</li> </ul> </li> </ul>
F01N 2290/08	<ul style="list-style-type: none"> <li>with oscillating or vibrating movement</li> </ul>
F01N 2290/10	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>actuated by pressure of exhaust gases, e.g. exhaust pulses</li> </ul> </li> </ul>
<b>F01N 2310/00</b>	<b>Selection of sound absorbing or insulating material</b>
F01N 2310/02	<ul style="list-style-type: none"> <li>Mineral wool, e.g. glass wool, rock wool, asbestos or the like</li> </ul>
F01N 2310/04	<ul style="list-style-type: none"> <li>Metallic wool, e.g. steel wool, copper wool or the like</li> </ul>
F01N 2310/06	<ul style="list-style-type: none"> <li>Porous ceramics</li> </ul>
F01N 2310/08	<ul style="list-style-type: none"> <li>Exfoliated vermiculite, e.g. zonolite, coke, pumice</li> </ul>
F01N 2310/10	<ul style="list-style-type: none"> <li>Plastic foam</li> </ul>
F01N 2310/12	<ul style="list-style-type: none"> <li>Granular material</li> </ul>
F01N 2310/14	<ul style="list-style-type: none"> <li>Wire mesh fabric, woven glass cloth or the like</li> </ul>
<b>F01N 2330/00</b>	<b>Structure of catalyst support or particle filter</b>
F01N 2330/02	<ul style="list-style-type: none"> <li>Metallic plates or honeycombs, e.g. superposed or rolled-up corrugated or otherwise deformed sheet metal</li> </ul>
F01N 2330/04	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>Methods of manufacturing</li> </ul> </li> </ul>
F01N 2330/06	<ul style="list-style-type: none"> <li>Ceramic, e.g. monoliths</li> </ul>
F01N 2330/08	<ul style="list-style-type: none"> <li>Granular material</li> </ul>
F01N 2330/10	<ul style="list-style-type: none"> <li>Fibrous material, e.g. mineral or metallic wool</li> </ul>
F01N 2330/101	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>using binders, e.g. to form a permeable mat, paper or the like</li> </ul> </li> </ul>
F01N 2330/102	<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>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</li> </ul> </li> </ul> </li> </ul>
F01N 2330/12	<ul style="list-style-type: none"> <li>Metallic wire mesh fabric or knitting</li> </ul>

F01N 2330/14	<ul style="list-style-type: none"> <li>• Sintered material</li> </ul>
F01N 2330/18	<ul style="list-style-type: none"> <li>• Composite material</li> </ul>
F01N 2330/20	<ul style="list-style-type: none"> <li>• Plastics, e.g. polymers, polyester, polyurethane</li> </ul>
F01N 2330/22	<ul style="list-style-type: none"> <li>• Metal foam</li> </ul>
F01N 2330/30	<ul style="list-style-type: none"> <li>• Honeycomb supports characterised by their structural details</li> </ul>
F01N 2330/32	<ul style="list-style-type: none"> <li>• . . characterised by the shape, form or number of corrugations of plates, sheets or foils</li> </ul>
F01N 2330/321	<ul style="list-style-type: none"> <li>• . . . with two or more different kinds of corrugations in the same substrate</li> </ul>
F01N 2330/322	<ul style="list-style-type: none"> <li>• . . . Corrugations of trapezoidal form</li> </ul>
F01N 2330/323	<ul style="list-style-type: none"> <li>• . . . Corrugations of saw-tooth or triangular form</li> </ul>
F01N 2330/324	<ul style="list-style-type: none"> <li>• . . . Corrugations of rectangular form</li> </ul>
F01N 2330/325	<ul style="list-style-type: none"> <li>• . . . Corrugations of omega form</li> </ul>
F01N 2330/34	<ul style="list-style-type: none"> <li>• . . with flow channels of polygonal cross section</li> </ul>
F01N 2330/36	<ul style="list-style-type: none"> <li>• . . with flow channels formed by tubes</li> </ul>
F01N 2330/38	<ul style="list-style-type: none"> <li>• . . flow channels with means to enhance flow mixing, (e.g. protrusions or projections)</li> </ul>
F01N 2330/40	<ul style="list-style-type: none"> <li>• . . made of a single sheet, foil or plate</li> </ul>
F01N 2330/42	<ul style="list-style-type: none"> <li>• . . made of three or more different sheets, foils or plates stacked one on the other</li> </ul>
F01N 2330/44	<ul style="list-style-type: none"> <li>• . . made of stacks of sheets, plates or foils that are folded in S-form</li> </ul>
F01N 2330/48	<ul style="list-style-type: none"> <li>• . . characterised by the number of flow passages, e.g. cell density</li> </ul>
F01N 2330/60	<ul style="list-style-type: none"> <li>• Discontinuous, uneven properties of filter material, e.g. different material thickness along the longitudinal direction; Higher filter capacity upstream than downstream in same housing</li> </ul>
<b>F01N 2340/00</b>	<b>Dimensional characteristics of the exhaust system, e.g. length, diameter or volume of the apparatus; Spatial arrangements of exhaust apparatuses</b>
F01N 2340/02	<ul style="list-style-type: none"> <li>• characterised by the distance of the apparatus to the engine, or the distance between two exhaust treating apparatuses</li> </ul>
F01N 2340/04	<ul style="list-style-type: none"> <li>• characterised by the arrangement of an exhaust pipe, manifold or apparatus in relation to vehicle frame or particular vehicle parts</li> </ul>
F01N 2340/06	<ul style="list-style-type: none"> <li>• characterised by the arrangement of the exhaust apparatus relative to the turbine of a turbocharger</li> </ul>
<b>F01N 2350/00</b>	<b>Arrangements for fitting catalyst support or particle filter element in the housing</b>
F01N 2350/02	<ul style="list-style-type: none"> <li>• Fitting ceramic monoliths in a metallic housing</li> </ul>
F01N 2350/04	<ul style="list-style-type: none"> <li>• . . with means compensating thermal expansion</li> </ul>
F01N 2350/06	<ul style="list-style-type: none"> <li>• . . with means preventing gas flow by-pass or leakage</li> </ul>
F01N 2350/08	<ul style="list-style-type: none"> <li>• with means for compressing granular material</li> </ul>
<b>F01N 2370/00</b>	<b>Selection of materials for exhaust purification</b>
F01N 2370/02	<ul style="list-style-type: none"> <li>• used in catalytic reactors</li> </ul>
F01N 2370/04	<ul style="list-style-type: none"> <li>• . . Zeolitic material</li> </ul>

- F01N 2370/22 . used in non-catalytic purification apparatus
- F01N 2370/24 . . Zeolitic material
- F01N 2370/30 . . Materials having magnetic properties
- F01N 2370/40 . Activated carbon or charcoal

**F01N 2390/00 Arrangements for controlling or regulating exhaust apparatus**

- F01N 2390/02 . using electric components only
- F01N 2390/04 . using electropneumatic components
- F01N 2390/06 . using pneumatic components only
- F01N 2390/08 . using mechanical components only, e.g. actuated manually

**F01N 2410/00 By-passing, at least partially, exhaust from inlet to outlet of apparatus, to atmosphere or to other device**

- F01N 2410/02 . in case of high temperature, e.g. overheating of catalytic reactor
- F01N 2410/03 . in case of low temperature
- F01N 2410/04 . during regeneration period, e.g. of particle filter
- F01N 2410/06 . at cold starting
- F01N 2410/08 . in case of clogging, e.g. of particle filter
- F01N 2410/10 . for reducing flow resistance, e.g. to obtain more engine power
- F01N 2410/12 . in case of absorption, adsorption or desorption of exhaust gas constituents
- F01N 2410/14 . in case of excessive pressure, e.g. using a safety valve

**F01N 2430/00 Influencing exhaust purification, e.g. starting of catalytic reaction, filter regeneration, or the like, by controlling engine operating characteristics**

- F01N 2430/02 . by cutting out a part of engine cylinders
- F01N 2430/04 . by adding non-fuel substances to combustion air or fuel, e.g. additives
- F01N 2430/06 . by varying fuel-air ratio, e.g. by enriching fuel-air mixture
- F01N 2430/08 . by modifying ignition or injection timing
- F01N 2430/085 . . at least a part of the injection taking place during expansion or exhaust stroke
- F01N 2430/10 . by modifying inlet or exhaust valve timing

**F01N 2450/00 Methods or apparatus for fitting, inserting or repairing different elements**

- F01N 2450/02 . Fitting monolithic blocks into the housing
- F01N 2450/04 . Filling or emptying a chamber with granular material
- F01N 2450/06 . Inserting sound absorbing material into a chamber
- F01N 2450/08 . Repairing the housing or pipe-joints
- F01N 2450/10 . Fitting temporarily exhaust apparatus on exhaust conduit, e.g. in confined environment, garage or the like
- F01N 2450/16 . by using threaded joints
- F01N 2450/18 . by using quick-active type locking mechanisms, e.g. clips
- F01N 2450/20 . by mechanical joints, e.g. by deforming housing, tube, baffle plate or parts thereof

- F01N 2450/22 . by welding or brazing
- F01N 2450/24 . by bolts, screws, rivets or the like
- F01N 2450/26 . by bayonet fittings
- F01N 2450/28 . by using adhesive material, e.g. cement
- F01N 2450/30 . Removable or rechargeable blocks or cartridges, e.g. for filters
- F01N 2450/40 . Retrofitting exhaust apparatus

#### **F01N 2470/00 Structure or shape of gas passages, pipes or tubes**

- F01N 2470/02 . Tubes being perforated
- F01N 2470/04 . . characterised by shape, disposition or dimensions of apertures
- F01N 2470/06 . Tubes being formed by assembly of stamped or otherwise deformed sheet-metal
- F01N 2470/08 . Gas passages being formed between the walls of an outer shell and an inner chamber
- F01N 2470/10 . Tubes having non-circular cross section
- F01N 2470/12 . Tubes being corrugated
- F01N 2470/14 . Plurality of outlet tubes, e.g. in parallel or with different length
- F01N 2470/16 . Plurality of inlet tubes, e.g. discharging into different chambers
- F01N 2470/18 . the axis of inlet or outlet tubes being other than the longitudinal axis of apparatus
- F01N 2470/20 . Dimensional characteristics of tubes, e.g. length, diameter
- F01N 2470/22 . Inlet and outlet tubes being positioned on the same side of the apparatus
- F01N 2470/24 . Concentric tubes or tubes being concentric to housing, e.g. telescopically assembled
- F01N 2470/26 . Tubes being formed by extrusion, drawing or rolling
- F01N 2470/28 . Tubes being formed by moulding or casting x
- F01N 2470/30 . Tubes with restrictions, i.e. venturi or the like, e.g. for sucking air or measuring mass flow

#### **F01N 2490/00 Structure, disposition or shape of gas-chambers**

- F01N 2490/02 . Two or more expansion chambers in series connected by means of tubes
- F01N 2490/04 . . the gases flowing longitudinally from inlet to outlet only in one direction
- F01N 2490/06 . . the gases flowing longitudinally from inlet to outlet in opposite directions
- F01N 2490/08 . Two or more expansion chambers in series separated by apertured walls only
- F01N 2490/10 . Two or more expansion chambers in parallel
- F01N 2490/12 . Chambers having variable volumes
- F01N 2490/14 . Dead or resonance chambers connected to gas flow tube by relatively short side-tubes
- F01N 2490/15 . Plurality of resonance or dead chambers
- F01N 2490/155 . . being disposed one after the other in flow direction
- F01N 2490/16 . Chambers with particular shapes, e.g. spherical
- F01N 2490/18 . Dimensional characteristics of gas chambers

- F01N 2490/20
  - Chambers being formed inside the exhaust pipe without enlargement of the cross section of the pipe, e.g. resonance chambers

#### **F01N 2510/00**

##### **Surface coverings**

- F01N 2510/02
  - for thermal insulation
- F01N 2510/04
  - for sound absorption
- F01N 2510/06
  - for exhaust purification, e.g. catalytic reaction
- F01N 2510/061
  - usable with leaded fuels
- F01N 2510/063
  - zeolites
- F01N 2510/065
  - for reducing soot ignition temperature
- F01N 2510/067
  - usable with sulfurised fuels
- F01N 2510/068
  - characterised by the distribution of the catalytic coatings
- F01N 2510/0682
  - having a discontinuous, uneven or partially overlapping coating of catalytic material, e.g. higher amount of material upstream than downstream or vice-versa
- F01N 2510/0684
  - having more than one coating layer, e.g. multi-layered coatings
- F01N 2510/08
  - for corrosion prevention
- F01N 2510/10
  - for preventing carbon deposits, e.g. chromium
- F01N 2510/12
  - for smell removal
- F01N 2510/14
  - for dehydrating

#### **F01N 2530/00**

##### **Selection of materials for tubes, chambers or housings**

- F01N 2530/02
  - Corrosion resistive metals
- F01N 2530/04
  - Steel alloys, e.g. stainless steel
- F01N 2530/06
  - Aluminium or alloys thereof
- F01N 2530/18
  - Plastics material, e.g. polyester resin
- F01N 2530/20
  - reinforced with mineral or metallic fibres
- F01N 2530/22
  - Flexible elastomeric material
- F01N 2530/24
  - Sintered porous material, e.g. bronze, aluminium or the like
- F01N 2530/26
  - Multi-layered walls

#### **F01N 2550/00**

##### **Monitoring or diagnosing the deterioration of exhaust systems**

- F01N 2550/02
  - Catalytic activity of catalytic converters
- F01N 2550/03
  - of sorbing activity of adsorbents or absorbents
- F01N 2550/04
  - Filtering activity of particulate filters
- F01N 2550/05
  - Systems for adding substances into exhaust
- F01N 2550/06
  - By-pass systems
- F01N 2550/10
  - of catalytic converters
- F01N 2550/12
  - of particulate filters
- F01N 2550/14
  - Systems for adding secondary air into exhaust
- F01N 2550/20
  - Monitoring artificially aged exhaust systems
- F01N 2550/22
  - of electric heaters for exhaust systems or their power supply



F01N 2550/24	<ul style="list-style-type: none"> <li>Determining the presence or absence of an exhaust treating device</li> </ul>
<b>F01N 2560/00</b>	<b>Exhaust systems with means for detecting or measuring exhaust gas components or characteristics</b>
F01N 2560/02	<ul style="list-style-type: none"> <li>the means being an exhaust gas sensor</li> </ul>
F01N 2560/021	<ul style="list-style-type: none"> <li>for measuring or detecting ammonia <math>\text{NH}_3</math></li> </ul>
F01N 2560/022	<ul style="list-style-type: none"> <li>for measuring or detecting CO or <math>\text{CO}_2</math></li> </ul>
F01N 2560/023	<ul style="list-style-type: none"> <li>for measuring or detecting HC</li> </ul>
F01N 2560/024	<ul style="list-style-type: none"> <li>for measuring or detecting hydrogen <math>\text{H}_2</math></li> </ul>
F01N 2560/025	<ul style="list-style-type: none"> <li>for measuring or detecting <math>\text{O}_2</math>, e.g. lambda sensors</li> </ul>
F01N 2560/026	<ul style="list-style-type: none"> <li>for measuring or detecting <math>\text{NO}_x</math></li> </ul>
F01N 2560/027	<ul style="list-style-type: none"> <li>for measuring or detecting <math>\text{SO}_x</math></li> </ul>
F01N 2560/028	<ul style="list-style-type: none"> <li>for measuring or detecting humidity or water</li> </ul>
F01N 2560/05	<ul style="list-style-type: none"> <li>the means being a particulate sensor</li> </ul>
F01N 2560/06	<ul style="list-style-type: none"> <li>the means being a temperature sensor</li> </ul>
F01N 2560/07	<ul style="list-style-type: none"> <li>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</li> </ul>
F01N 2560/08	<ul style="list-style-type: none"> <li>the means being a pressure sensor</li> </ul>
F01N 2560/12	<ul style="list-style-type: none"> <li>Other sensor principles, e.g. using electro conductivity of substrate or radio frequency</li> </ul>
F01N 2560/14	<ul style="list-style-type: none"> <li>having more than one sensor of one kind</li> </ul>
F01N 2560/20	<ul style="list-style-type: none"> <li>Sensor having heating means</li> </ul>
<b>F01N 2570/00</b>	<b>Exhaust treating apparatus eliminating, absorbing or adsorbing specific elements or compounds</b>
F01N 2570/02	<ul style="list-style-type: none"> <li>Lead</li> </ul>
F01N 2570/04	<ul style="list-style-type: none"> <li>Sulfur or sulfur oxides</li> </ul>
F01N 2570/06	<ul style="list-style-type: none"> <li>Zinc</li> </ul>
F01N 2570/08	<ul style="list-style-type: none"> <li>Phosphorus</li> </ul>
F01N 2570/10	<ul style="list-style-type: none"> <li>Carbon or carbon oxides</li> </ul>
F01N 2570/12	<ul style="list-style-type: none"> <li>Hydrocarbons</li> </ul>
F01N 2570/14	<ul style="list-style-type: none"> <li>Nitrogen oxides</li> </ul>
F01N 2570/145	<ul style="list-style-type: none"> <li>Dinitrogen oxide</li> </ul>
F01N 2570/16	<ul style="list-style-type: none"> <li>Oxygen</li> </ul>
F01N 2570/18	<ul style="list-style-type: none"> <li>Ammonia</li> </ul>
F01N 2570/20	<ul style="list-style-type: none"> <li>Formaldehyde</li> </ul>
F01N 2570/22	<ul style="list-style-type: none"> <li>Water or humidity</li> </ul>
F01N 2570/24	<ul style="list-style-type: none"> <li>Hydrogen sulfide (<math>\text{H}_2\text{S}</math>)</li> </ul>
<b>F01N 2590/00</b>	<b>Exhaust or silencing apparatus adapted to particular use, e.g. for military applications, airplanes, submarines</b>
F01N 2590/02	<ul style="list-style-type: none"> <li>for marine vessels or naval applications</li> </ul>

- F01N 2590/021 . . for outboard engines
- F01N 2590/022 . . for jetskis
- F01N 2590/04 . for motorcycles
- F01N 2590/06 . for hand-held tools or portables devices
- F01N 2590/08 . for heavy duty applications, e.g. trucks, buses, tractors, locomotives
- F01N 2590/10 . for stationary applications
- F01N 2590/11 . for hybrid vehicles

**F01N 2610/00****Adding substances to exhaust gases**

- F01N 2610/01 . the substance being catalytic material in liquid form
- F01N 2610/02 . the substance being ammonia or urea
- F01N 2610/03 . the substance being hydrocarbons, e.g. engine fuel
- F01N 2610/04 . the substance being hydrogen
- F01N 2610/05 . the substance being carbon monoxide
- F01N 2610/06 . the substance being in the gaseous form
- F01N 2610/08 . with prior mixing of the substances with a gas, e.g. air
- F01N 2610/085 . . Controlling the air supply
- F01N 2610/10 . the substance being heated, e.g. by heating tank or supply line of the added substance
- F01N 2610/102 . . after addition to exhaust gases, e.g. by a passively or actively heated surface in the exhaust conduit
- F01N 2610/105 . . Control thereof
- F01N 2610/107 . . using glow plug heating elements
- F01N 2610/11 . the substance or part of the dosing system being cooled
- F01N 2610/12 . the substance being in solid form, e.g. pellets or powder
- F01N 2610/14 . Arrangements for the supply of substances, e.g. conduits
- F01N 2610/1406 . . Storage means for substances, e.g. tanks or reservoirs
- F01N 2610/1413 . . . Inlet and filling arrangements therefore
- F01N 2610/142 . . . Controlling the filling of the tank
- F01N 2610/1426 . . Filtration means
- F01N 2610/1433 . . Pumps
- F01N 2610/144 . . . Control thereof
- F01N 2610/1446 . . Means for damping of pressure fluctuations in the delivery system, e.g. by puffer volumes or throttling
- F01N 2610/1453 . . Sprayers or atomisers; Arrangement thereof in the exhaust apparatus
- F01N 2610/146 . . . Control thereof, e.g. control of injectors or injection valves
- F01N 2610/1466 . . Means for venting air out of conduits or tanks
- F01N 2610/1473 . . Overflow or return means for the substances, e.g. conduits or valves for the return path
- F01N 2610/148 . . Arrangement of sensors
- F01N 2610/1486 . . Means to prevent the substance from freezing

F01N 2610/1493 . . Purging the reducing agent out of the conduits or nozzle

**F01N 2900/00 Details of electrical control or of the monitoring of the exhaust gas treating apparatus**

- F01N 2900/04 . Methods of control or diagnosing
- F01N 2900/0402 . . using adaptive learning
- F01N 2900/0404 . . using a data filter
- F01N 2900/0406 . . using a model with a division of the catalyst or filter in several cells
- F01N 2900/0408 . . using a feed-back loop
- F01N 2900/0411 . . using a feed-forward control
- F01N 2900/0412 . . using pre-calibrated maps, tables or charts
- F01N 2900/0414 . . using a state observer
- F01N 2900/0416 . . using the state of a sensor, e.g. of an exhaust gas sensor
- F01N 2900/0418 . . using integration or an accumulated value within an elapsed period
- F01N 2900/0421 . . using an increment counter when a predetermined event occurs
- F01N 2900/0422 . . measuring the elapsed time
- F01N 2900/06 . Parameters used for exhaust control or diagnosing
- F01N 2900/0601 . . being estimated
- F01N 2900/0602 . . Electrical exhaust heater signals
- F01N 2900/08 . . said parameters being related to the engine
- F01N 2900/10 . . said parameters being related to the vehicle or its components
- F01N 2900/102 . . . Travelling distance
- F01N 2900/104 . . . Battery status
- F01N 2900/12 . . said parameters being related to the vehicle exterior
- F01N 2900/14 . . said parameters being related to the exhaust gas
- F01N 2900/1402 . . . Exhaust gas composition
- F01N 2900/1404 . . . Exhaust gas temperature
- F01N 2900/1406 . . . Exhaust gas pressure
- F01N 2900/1411 . . . Exhaust gas velocity
- F01N 2900/16 . . said parameters being related to the exhaust apparatus, e.g. particulate filter or catalyst
- F01N 2900/1602 . . . Temperature of exhaust gas apparatus
- F01N 2900/1606 . . . Particle filter loading or soot amount
- F01N 2900/1611 . . . Particle filter ash amount
- F01N 2900/1612 . . . SO<sub>x</sub> amount trapped in catalyst
- F01N 2900/1614 . . . NO<sub>x</sub> amount trapped in catalyst
- F01N 2900/1616 . . . NH<sub>3</sub>-slip from catalyst
- F01N 2900/1618 . . . HC-slip from catalyst
- F01N 2900/1621 . . . Catalyst conversion efficiency
- F01N 2900/1622 . . . Catalyst reducing agent absorption capacity or consumption amount
- F01N 2900/1624 . . . Catalyst oxygen storage capacity

- F01N 2900/1626 . . . Catalyst activation temperature
- F01N 2900/1628 . . . Moisture amount in exhaust apparatus
- F01N 2900/1631 . . . Heat amount provided to exhaust apparatus
- F01N 2900/18 . . said parameters being related to the system for adding a substance into the exhaust
- F01N 2900/1804 . . . Properties of secondary air added directly to the exhaust
- F01N 2900/1806 . . . Properties of reducing agent or dosing system
- F01N 2900/1808 . . . . Pressure
- F01N 2900/1811 . . . . Temperature
- F01N 2900/1812 . . . . Flow rate
- F01N 2900/1814 . . . . Tank level
- F01N 2900/1818 . . . . Concentration of the reducing agent
- F01N 2900/1821 . . . . Injector parameters
- F01N 2900/1822 . . . . Pump parameters
- F01N 2900/1824 . . . . Properties of the air to be mixed with added substances, e.g. air pressure or air temperature