

ECLA EUROPEAN CLASSIFICATION

F01N

GAS-FLOW SILENCERS OR EXHAUST APPARATUS FOR MACHINES OR ENGINES IN GENERAL; GAS-FLOW SILENCERS OR EXHAUST APPARATUS FOR INTERNAL COMBUSTION ENGINES ([N: evacuation of fumes from the area where they are produced [B08B15/00](#); arrangement of exhaust or silencing apparatus on percussive tools [B25D17/12](#)]; arrangements in connection with gas exhaust of propulsion units in vehicles [B60K13/00](#), [N: on ships or other waterborne vessels [B63H21/32](#), on aircraft [B64D33/04](#); arrangement of exhaust or silencing apparatus on firearms [F41A21/30](#); ground installations for reducing aircraft engine or jet noise [B64F 1/26](#); silencers specially adapted for steam engines [F01B31/16](#); air-intake silencers for gas turbine or jet propulsion plants [F02C7/045](#); jet pipe or nozzles for jet propulsion plants [F02K](#)]; combustion-air intake silencers specially adapted for, or arranged on, internal-combustion engines [F02M35/00](#); [N: combating noise or silencing in positive displacement machines or pumps [F04B39/00D](#), in rotary-piston machines or pumps [F04C29/06](#), in non-positive displacement pumps [F04D29/66](#); means in valves for absorbing noise [F16K47/02](#); noise absorbers in pipe system [F16L55/02](#); conducting smoke or fumes from various locations to the outside [F23J11/00](#); means for preventing or suppressing noise in air-conditioning or ventilation systems [F24F13/24](#)]; protecting against, or damping, noise in general [G10K11/16](#))

[N: **Notes**
[N0403]

1. Attention is drawn to the notes preceding Class F01, especially as regards Note 2(b).
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F01N1/00

Silencing apparatus characterised by method of silencing [N: by cooling [F01N3/02](#); using liquids [F01N3/04](#)]

F01N1/00B

- [N: by using dead chambers communicating with gas flow passages (**resonance chambers** [F01N1/02](#); **chambers containing sound-absorbing materials** [F01N1/24](#))]

F01N1/00B1

- • [N: comprising at least one perforated tube extending from inlet to outlet of the silencer] [N1110]

F01N1/02

- by using resonance

F01N1/02B

- • [N: Helmholtz resonators] [N1110]

F01N1/02C

- • [N: Annular resonance chambers arranged concentrically to an exhaust passage and communicating with it, e.g. via at least one opening in the exhaust passage] [N1110][M1110]

F01N1/04

- • having sound-absorbing materials in resonance chambers

F01N1/06

- by using interference effect

F01N1/06B

- • [N: by using an active noise source, e.g. speakers] [N9506]

F01N1/08

- by reducing exhaust energy by throttling or whirling

F01N1/08B

- • [N: by passing the gases through a mass of particles]

F01N1/08C

- • [N: the gases passing through porous members ([F01N1/08B](#) takes precedence)]

- F01N1/08D . . [N: using transversal baffles defining a tortuous path for the gases or successively throttling gas flow]
- F01N1/08F . . [N: the gases flowing through the silencer two or more times longitudinally in opposite directions, e.g. using parallel or concentric tubes]
- F01N1/08G . . [N: using a central core throttling gas passage]
- F01N1/08H . . [N: having means to impart whirling motion to the gases (with helically or spirally shaped channels [F01N1/12](#))]
- F01N1/08H2 . . . [N: using tangential inlets into a circular chamber]
- F01N1/08H3 . . . [N: using vanes arranged on gas flow path or gas flow tubes with tangentially directed apertures]
- F01N1/08K . . [N: using two or more expansion chambers in series ([F01N1/08D](#), [F01N1/08F](#), [F01N1/08H](#) take precedence)]
- F01N1/10 . . in combination with sound-absorbing materials ([F01N1/12B](#) takes precedence)
- F01N1/12 . . using spirally or helically shaped channels (cyclones [B04C](#))
- F01N1/12B . . . [N: in combination with sound-absorbing materials]
- F01N1/14 . . by adding air to exhaust gases [N: (in tailpipes [F01N7/08B](#), [F01N7/20](#))]
- F01N1/16 . . by using movable parts
- F01N1/16A . . [N: for adjusting resonance or dead chambers or passages to resonance or dead chambers] [N1110]
- F01N1/16A1 . . . [N: by means of valves] [N1110]
- F01N1/16B . . [N: for adjusting flow area]
- F01N1/16C . . [N: for changing gas flow path through the silencer or for adjusting the dimensions of a chamber or a pipe ([F01N1/16B](#) takes precedence)]
- F01N1/16D . . [N: for controlling or modifying silencing characteristics only] [N1110]
- F01N1/18 . . having rotary movement
- F01N1/20 . . having oscillating or vibrating movement [N: the parts being resilient walls [F01N1/22](#)]
- F01N1/22 . . the parts being resilient walls
- F01N1/24 . . by using sound-absorbing materials ([F01N1/04](#), [F01N1/06](#), [F01N1/10](#), [F01N1/14](#), [F01N1/16](#) take precedence)

- F01N3/00** **Exhaust or silencing apparatus having means for purifying, rendering innocuous, or otherwise treating exhaust** (electric control [F01N9/00](#); monitoring or diagnostic devices for exhaust-gas treatment apparatus [F01N11/00](#); [N: collecting or removing exhaust gases of vehicle engines in workshops [B08B15/00](#), on highways [E01C1/00C](#)]) [C0001]
- F01N3/00B . . [N: for draining or otherwise eliminating condensates or moisture accumulating in the apparatus ([F01N3/02](#) takes precedence)] [c0809]
- F01N3/01 . . by means of electric or electrostatic separators [N0001]
- F01N3/02 . . for cooling, or for removing solid constituents of, exhaust (by means of electric or electrostatic separators [F01N3/01](#); [N: mixing air with exhaust in tailpipes [F01N7/08B](#), [F01N7/20](#)]) [C0001]
- F01N3/02E . . [N: using heat exchangers] [N1110]

- F01N3/021 . . . by means of filters [N0001]
- F01N3/021B [N: Arrangements for mounting filtering elements in housing, e.g. with means for compensating thermal expansion or vibration] [N0001]
- F01N3/021C [N: with one or more perforated tubes surrounded by filtering material, e.g. filter candles] [N0001]
- F01N3/021D [N: with filters comprising movable parts, e.g. rotating filters] [N0001]
- F01N3/021F [N: the filtering elements having the form of disks or plates] [N1110]
- F01N3/021G [N: the filtering elements having the form of hollow cylindrical bodies] [N1110]
- F01N3/021H [N: the filtering elements being made from spirally-wound filtering material] [N1110]
- F01N3/022 characterised by specially adapted filtering structure, e.g. honeycomb, mesh or fibrous [N0001]
- F01N3/022B [N: the structure being monolithic, e.g. honeycombs] [N0001]
- F01N3/022D [N: the structure being granular] [N0001]
- F01N3/022E [N: the structure being fibrous] [N0001]
- F01N3/022F [N: the structure being made of foamed rubber or plastics] [N0001]
- F01N3/023 using means for regenerating the filters, e.g. by burning trapped particles (by electrically controlling the supply of combustible mixture or its constituents only [F02D41/02C4](#)) [N0001] [C0210]
- F01N3/023B [N: using special exhaust apparatus upstream of the filter for producing nitrogen dioxide, e.g. for continuous filter regeneration systems (CRT)] [N0110]
- F01N3/023C [N: removing incombustible material from a particle filter, e.g. ash] [N1204]
- [N: **WARNING** [N1204]This group is not complete pending a reorganisation. See also [F01N3/023](#)]
- F01N3/023G [N: 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] [N1110]
- F01N3/023J [N: using heat exchange means in the exhaust line] [N1110]
- F01N3/023K [N: using exhaust gas throttling means] [N1110]
- F01N3/023L [N: using turbine waste gate valve] [N1110]
- F01N3/023S [N: for regenerating ex situ] [N1110]
- F01N3/023T [N: for regenerating during engine standstill] [N1110]
- F01N3/025 using fuel burner or by adding fuel to exhaust [N0001]
- F01N3/025B [N: adding fuel to exhaust gases] [N0001]
- F01N3/025B2 [N: the fuel being ignited by electrical means] [N0001]
- F01N3/027 using electric or magnetic heating means [N0001]
- F01N3/027B [N: using electric discharge means] [N0001]
- F01N3/028 using microwaves [N0001]
- F01N3/029 by adding non-fuel substances to exhaust [N0001]
- F01N3/029A [N: injecting substances in exhaust stream] [N1110]
- F01N3/029A1 [N: having means for preheating additional substances] [N1110]
- F01N3/031 having means for by-passing filters, e.g. when clogged or during cold engine start [N0001]

- F01N3/032 during filter regeneration only [N0001]
- F01N3/033 in combination with other devices [N: with adsorbents or absorbents [F01N3/08B4](#)] [N0001]
- F01N3/033B [N: with exhaust silencers in a single housing] [N0001]
- F01N3/035 with catalytic reactors, [N: e.g. catalysed diesel particulate filters] [N0001] [C0810]
- F01N3/037 . . by means of inertial or centrifugal separators, e.g. of cyclone type, optionally combined or associated with agglomerators [N0001]
- F01N3/038 . . 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 [N0001]
- F01N3/04 . . using liquids
- F01N3/04B [N: without contact between liquid and exhaust gases]
- F01N3/04B2 [N: Exhaust manifolds with cooling jacket]
- F01N3/05 . . by means of air, e.g. by mixing exhaust with air (silencers working by addition of air to exhaust [F01N1/14](#); arrangements for the supply of additional air for the thermal or catalytic conversion of noxious components of exhaust [F01N3/30](#); [N: in tailpipes [F01N7/08B](#)]) [N0001]
- F01N3/05B [N: without contact between air and exhaust gases] [N0805]
- F01N3/06 . . for extinguishing sparks
- F01N3/08 . . for rendering innocuous (using electric or electrostatic separators [F01N3/01](#); chemical aspects [B01D53/92](#)) [C0001]
- F01N3/08B [N: by using absorbents or adsorbents] [N9510]
- F01N3/08B2 [N: combined with catalytic converters, e.g. NOx absorption/storage reduction catalysts] [N9510] [C0810]
- F01N3/08B4 [N: combined with particulate filters (catalysed diesel particulate filters [F01N3/035](#))] [N9510]
- F01N3/08B6 [N: characterised by the absorbed or adsorbed substances] [N1110]
- F01N3/08B6B [N: Hydrocarbons] [N1110]
- F01N3/08B6D [N: Nitrogen oxides] [N1110]
- F01N3/08B6F [N: Sulfur or sulfur oxides] [N1110]
- F01N3/08B6G [N: Carbon oxides] [N1110]
- F01N3/08B6H [N: Oxygen] [N1110]
- F01N3/08B10 [N: Regulation of absorbents or adsorbents, e.g. purging (by electrically controlling the supply of combustible mixture or its constituents only [F02D41/02C4](#))] [N9809] [C0210]
- F01N3/08B10A [N: Bypassing absorbents or adsorbents] [N9809]
- F01N3/08B10B [N: Regeneration of deteriorated absorbents or adsorbents, e.g. desulfurization of NOx traps] [N9809]
- F01N3/08C [N: Electric or magnetic treatment, e.g. dissociation of noxious components (electric filters [F01N3/01](#); regeneration of exhaust filters [F01N3/023](#); heating catalytic converters [F01N3/20B](#))] [N9702]
- F01N3/10 . . 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, [B01D53/34](#))

[N: **WARNING**

[N1204]New subgroups of [F01N3/10](#) are not complete pending a reorganisation.
See also [F01N3/10](#)
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- F01N3/10A . . . [N: Three-way catalysts] [N1204]
 - F01N3/10B . . . [N: Oxidation catalysts for HC and CO only] [N1204]
 - F01N3/10C . . . [N: General auxiliary catalysts, e.g. upstream or downstream of the main catalyst] [N1204]
 - F01N3/10C1 [N: Auxiliary oxidation catalysts] [N1204]
 - F01N3/10C3 [N: Auxiliary reduction catalysts] [N1204]
 - F01N3/18 . . . characterised by methods of operation; Regulation
 - F01N3/20 specially adapted for catalytic conversion; [N: Methods of operation or regulation of catalytic converters] ([F01N3/22](#) takes precedence) [C0403]
 - F01N3/20B [N: 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 [F02D41/02C4](#))] [C0210]
 - F01N3/20B2 [N: using electric or magnetic heating means]
 - F01N3/20B2B {7 dots} [N: using microwaves]
 - F01N3/20B2C {7 dots} [N: directly electrifying the catalyst substrate, i.e. heating the electrically conductive catalyst substrate by joule effect] [N9710]
 - F01N3/20B4 [N: using a fuel burner or introducing fuel into exhaust duct] [N9702]
 - F01N3/20B6 [N: using an exhaust gas igniter, e.g. a spark or glow plug, without introducing fuel into exhaust duct] [N9707]
 - F01N3/20B8 [N: Periodically cooling catalytic reactors] [N0805]
 - F01N3/20C [N: By-passing catalytic reactors, e.g. to prevent overheating]
 - F01N3/20D [N: Adding periodically or continuously substances to exhaust gases for promoting purification, e.g. catalytic material in liquid form, NO_x reducing agents ([F01N3/20E](#) takes precedence)] [C0810]
 - F01N3/20E [N: Selective catalytic reduction (SCR)] [N0810]
- [N: **WARNING**
[N1110] This subgroup is not complete pending a reorganisation. See also group [F01N3/20D](#) for documents published before March 2004.
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- F01N3/20E2 [N: with means for generating a reducing substance from the exhaust gases] [N0810]
 - F01N3/20E4 [N: Control of selective catalytic reduction (SCR), e.g. dosing of reducing agent] [N0810]
 - F01N3/20F [N: Activating the catalyst by light, photo-catalysts] [N0110]
 - F01N3/20G [N: Periodically blowing a gas through the converter, e.g. in a direction opposite to exhaust gas flow or by reversing exhaust gas flow direction] [N1110]
 - F01N3/22 Regulation of additional air supply only, e.g. using by-passes or variable air pump drives
 - F01N3/22B [N: using electric valves only [N1110]
 - F01N3/22E [N: Electric control of additional air supply] [N1110]
 - F01N3/22P [N: using pneumatically operated valves, e.g. membrane valves] [N1110]

F01N3/24	. . .	characterised by constructional aspects of converting apparatus (filtering in combination with catalytic reactors F01N3/035) [C0001]
F01N3/26	. . . .	Construction of thermal reactors
F01N3/28	. . . .	Construction of catalytic reactors
F01N3/28B	. . . . .	[N: characterised by structure, by material or by manufacturing of catalyst support]
F01N3/28B2	. . . . .	[N: Metal other than sintered metal (F01N3/28B6 and F01N3/28B8 take precedence)]
F01N3/28B2B	. . . . .	{7 dots} [N: Metallic honeycomb monoliths made of stacked or rolled sheets, foils or plates]
F01N3/28B2B1	. . . . .	{8 dots} [N: all sheets, plates or foils being corrugated] [N9710]
F01N3/28B2B2	. . . . .	{8 dots} [N: only with non-corrugated sheets, plates or foils] [N9710] [C0210]
F01N3/28B2B3	. . . . .	{8 dots} [N: 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] [N9710]
F01N3/28B4	. . . . .	[N: Ceramics (F01N3/28B6 , F01N3/28B8 take precedence)] [C0102]
F01N3/28B4B	. . . . .	{7 dots} [N: Ceramic multi-channel monoliths, e.g. honeycombs]
F01N3/28B6	. . . . .	[N: granular, e.g. pellets]
F01N3/28B8	. . . . .	[N: fibrous]
F01N3/28C	. . . . .	[N: Arrangements for mounting catalyst support in housing, e.g. with means for compensating thermal expansion or vibration]
F01N3/28C2	. . . . .	[N: specially adapted for monolithic supports, e.g. of honeycomb type (F01N3/28C10 to F01N3/28C10F take precedence)] [C1203]
F01N3/28C6	. . . . .	[N: specially adapted for granular supports, e.g. pellets]
F01N3/28C8	. . . . .	[N: specially adapted for fibrous supports, e.g. held in place by screens]
F01N3/28C10	. . . . .	[N: using mats or gaskets between catalyst body or housing] [N1204]
F01N3/28C10B	. . . . .	{7 dots} [N: the mats or gaskets being at least partially made of intumescent material, e.g. unexpanded vermiculite] [N1204]
F01N3/28C10C	. . . . .	{7 dots} [N: the mats or gaskets having corrugations or cavities] [N1204]
		[N: WARNING [N1204]This group is not complete pending a reorganisation. See also F01N3/28C10 and F01N3/28C10B]
F01N3/28C10D	. . . . .	{7 dots} [N: the mats or gaskets comprising two or more insulation layers] [N1204]
F01N3/28C10E	. . . . .	{7 dots} [N: the mats or gaskets being placed at the front or end face of catalyst body] [N1204]
		[N: WARNING [N1204]This group is not complete pending a reorganisation. See also F01N3/28C10 and F01N3/28C10B]
F01N3/28C10F	. . . . .	{7 dots} [N: the mats or gaskets having an additional, e.g. non-insulating or non-cushioning layer, a metal foil or an adhesive layer] [N1204]

[N: **WARNING**

[N1204]This group is not complete pending a reorganisation. See also [F01N3/28C10](#) and [F01N3/28C10B](#)]

- F01N3/28C12 [N: by using elastic means, e.g. spring leaves, for retaining catalyst body in the housing ([F01N3/28C10](#) to [F01N3/28C10F](#) take precedence)] [N1204]
- F01N3/28C14 [N: 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] [N1204]
- F01N3/28D [N: Catalytic reactors combined or associated with other devices, e.g. exhaust silencers or other exhaust purification devices (combined with absorbents or adsorbents only [F01N3/08B2](#); combined with particulate filters [F01N3/035](#))] [C0001]
- F01N3/28D2 [N: with exhaust silencers in a single housing]
- F01N3/28D6 [N: with heat exchangers in a single housing]
- F01N3/28E [N: Exhaust flow directors or the like, e.g. upstream of catalytic device]
- F01N3/28F [N: Liquid catalyst carrier] [N1110]
- F01N3/30 Arrangements for supply of additional air (regulation, e.g. using air by-passes or variable air pump drives [F01N3/22](#))
- F01N3/30F [N: Filtering additional air] [N1110]
- F01N3/30P [N: Preheating additional air] [N1110]
- F01N3/32 using air pump (using jet air pumps [F01N3/34](#); pumps in general [F04](#))
- F01N3/32B [N: Electrically driven air pumps] [N1110]
- F01N3/32C [N: Engine-driven air pumps] [N1110]
- F01N3/34 using air conduits or jet air pumps, e.g. near the engine exhaust port
- F01N3/36 Arrangements for supply of additional fuel
- F01N3/38 Arrangements for igniting

F01N5/00 Exhaust or silencing apparatus combined or associated with devices profiting by exhaust energy (predominant aspects of such devices, see the relevant classes for the devices; using kinetic or wave energy of exhaust gases in exhaust systems for charging F02B) [M1204]

[N: **Note**

- in this group the following indexing code is used: [R02M700/31](#)]

- F01N5/02 the devices using heat
- F01N5/02B [N: the device being thermoelectric generators] [N1204]

[N: **WARNING**

[N1204]This group is not complete pending a reorganisation. See also [F01N5/02](#)]

- F01N5/04 the devices using kinetic energy

F01N9/00 Electrical control of exhaust gas treating apparatus (monitoring or diagnostic devices for exhaust-gas treatment apparatus [F01N11/00](#); [N: electrical control of supply of combustible mixture or its constituents in relation with the state of the exhaust gas

treating apparatus [F02D41/02C4](#)]; controlling combustion engines conjoint electrical control of two or more combustion engine functions [F02D43/00](#)] [\[C0210\]](#)

- F01N9/00F
 - [N: of filter regeneration, e.g. detection of clogging]
- F01N9/00M
 - [N: using models instead of sensors to determine operating characteristics of exhaust systems, e.g. calculating catalyst temperature instead of measuring it directly] [\[N1110\]](#) [\[M1110\]](#)
- F01N9/00S
 - [N: Storing data relevant to operation of exhaust systems for later retrieval and analysis, e.g. to research exhaust system malfunctions] [\[N1110\]](#)
- F01N11/00**
 - **Monitoring or diagnostic devices for exhaust-gas treatment apparatus, [N: e.g. for catalytic activity (safety, indicating or supervising devices for internal combustion engines [F02B77/08](#); testing of machines [G01M13/00](#))] [\[N0001\]](#)**
- F01N11/00B
 - [N: the diagnostic devices measuring or estimating temperature or pressure in, or downstream of the exhaust apparatus] [\[N0001\]](#)
- F01N11/00B1
 - [N: the temperature or pressure being estimated, e.g. by means of a theoretical model] [\[N0001\]](#)
- F01N11/00C
 - [N: the diagnostic devices measuring oxygen or air concentration downstream of the exhaust apparatus] [\[N0001\]](#)
- F01N13/00**
 - **Exhaust or silencing apparatus characterised by constructional features; [N: Exhaust or silencing apparatus, or parts thereof, having pertinent characteristics not provided for in, or of interest apart from, groups [F01N1/00](#) to [F01N5/00](#), [F01N9/00](#), [F01N11/00](#)] [\[N1001\]](#)**
- F01N13/00A
 - [N: 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 [B60K13/06](#))] [\[N1001\]](#)
- F01N13/00B
 - [N: Apparatus adapted for particular uses, e.g. for portable devices driven by machines or engines] [\[N1001\]](#)
- F01N13/00C
 - [N: specially adapted for marine propulsion, i.e. for receiving simultaneously engine exhaust gases and engine cooling water (for submerged exhausting [F01N13/12](#); treating exhaust by using liquids [F01N3/04](#))] [\[N1001\]](#)
- F01N13/00C2
 - [N: with parts constructed of non-metallic material, e.g. of rubber] [\[N1001\]](#)
- F01N13/00D
 - [N: Apparatus used as intake or exhaust silencer (silencing methods [F01N1/00](#); intake silencers [F02M35/12](#))] [\[N1001\]](#)
- F01N13/00E
 - [N: Mounting or arrangement of exhaust sensors in or on exhaust apparatus (sensor arrangements for engine control [F02D41/14D1](#))] [\[N1001\]](#)
- F01N13/02
 - having two or more separate silencers in series [\[N1001\]](#)
- F01N13/04
 - having two or more silencers in parallel e.g. having interconnections for multi-cylinder engines [\[N1001\]](#)

- F01N13/06 . specially adapted for star-arrangement of cylinders, e.g. exhaust manifolds [N1001]
- F01N13/08 . Other arrangements or adaptations of exhaust conduits ([N: pipes, joints or supports therefor in general F16L; collecting or removing exhaust gases of vehicle engines in workshops [B08B15/00](#), on highways [E01C1/00C](#)]) [N1001]
- F01N13/08B . . [N: of tailpipe, e.g. with means for mixing air with exhaust for exhaust cooling, dilution or evacuation ([F01N13/20](#) takes precedence)] [N1001]
- F01N13/08C . . [N: having means preventing foreign matter from entering exhaust conduit] [N1001]
- F01N13/08D . . [N: 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 F01N1/16C](#))] [N1001]
- F01N13/10 . . of exhaust manifolds [N: ([with cooling jacket F01N3/04B2](#))] [N1001]
- F01N13/10B . . . [N: having thermal insulation] [N1001]
- F01N13/10C . . . [N: having the form of a chamber directly connected to the cylinder head, e.g. without having tubes connected between cylinder head and chamber] [N1001]
- F01N13/10E . . . [N: More than one exhaust manifold or exhaust collector] [N1001]
- F01N13/12 . specially adapted for submerged exhausting [N1001]
- F01N13/14 . having thermal insulation [N: ([exhaust manifolds F01N13/10B](#))] [N1001]
- F01N13/14B . . [N: Double-walled exhaust pipes or housings] [N1001]
- F01N13/14B2 . . . [N: with air filling the space between both walls] [N1001]
- F01N13/14B4 . . . [N: with gas other than air filling the space between both walls] [N1001]
- F01N13/14B6 . . . [N: with vacuum in the space between both walls] [N1001]
- F01N13/14D . . [N: Multiple layers of insulating material] [N1001]
- F01N13/16 . Selection of particular materials [N1001]
- F01N13/18 . Construction facilitating manufacture, assembly, or disassembly [N1001]
- F01N13/18B . . [N: 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)] [N1001]
- F01N13/18B1 . . . [N: with means permitting relative movement, e.g. compensation of thermal expansion or vibration] [N1001]
- F01N13/18B1C [N: the pipe sections being joined together by flexible tubular elements only, e.g. using bellows or strip-wound pipes] [N1001]
- F01N13/18B1F [N: for fixing exhaust pipes or devices to vehicle body] [N1001]
- F01N13/18B2 . . . [N: Sealings specially adapted for exhaust systems ([sealings in general F16J15/00](#))] [N1001]
- F01N13/18C . . [N: specially adapted for small internal combustion engines, e.g. used in model applications] [N1001]
- F01N13/18D . . [N: characterised by the type of connection between parts of exhaust or silencing apparatus, e.g. between housing and tubes, between tubes and baffles] [N1001]
- F01N13/18D1 . . . [N: Mechanical joints] [N1001]
- F01N13/18D1A [N: the connection being realised by deforming housing, tube, baffle, plate, or parts thereof] [N1001]
- F01N13/18D1B [N: the connection being realised by using bolts, screws, rivets or the like] [N1001]

- F01N13/18E . . [N: the assembly using parts formed by casting or moulding] [N1001]
- F01N13/18E1 . . . [N: the channels or tubes thereof being made integrally with the housing] [N1001]
- F01N13/18F . . [N: the assembly using stamp-formed parts or otherwise deformed sheet-metal] [N1001]
- F01N13/18F1 . . . [N: the channels or tubes thereof being made integrally with the housing] [N1001]
- F01N13/18P . . [N: manufactured by hydroforming] [N1110]
- F01N13/18S . . [N: the housing of the assembly consisting of two or more parts, e.g. two half-shells] [N1110]
- F01N13/18S1 . . . [N: the parts being assembled in longitudinal direction] [N1110]
- F01N13/20 . having flared outlets, e.g. of fish-tail shape [N1001]