

F01N

GAS-FLOW SILENCERS OR EXHAUST APPARATUS FOR MACHINES OR ENGINES IN GENERAL; GAS-FLOW SILENCERS OR EXHAUST APPARATUS FOR INTERNAL-COMBUSTION ENGINES (arrangements in connection with gas exhaust of propulsion units in vehicles [B60K 13/00](#); combustion-air intake silencers specially adapted for, or arranged on, internal-combustion engines [F02M 35/00](#); protecting against, or damping, noise in general [G10K 11/16](#))

Definition statement

This place covers:

Silencing apparatus in exhaust systems for reducing the noise emitted by machines or engines in general, but more particularly internal combustion engines.

Exhaust or silencing apparatus having means for purifying, rendering innocuous or otherwise treating exhaust. The main apparatus includes particulate filters, absorbents and other catalytic reactors. The means can also be an electric discharge or the addition of air or liquids.

Exhaust or silencing apparatus combined or associated with devices profiting by exhaust energy, mainly the devices using exhaust heat.

Electrical control, monitoring or diagnostic of exhaust gas treating apparatus.

Other constructional features common to the above apparatus or the exhaust conduits including manufacture, assembly, disassembly or material selection.

Relationships with other classification places

The treatment of recirculated exhaust gases [EGR] should be classified only in the [F02M 26/00](#), unless the exhaust purifier also treats exhaust which is not recirculated.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Filters or filtering processes specially modified for separating dispersed particles from gases or vapours	B01D 46/00
Chemical or biological purification of waste gases, e.g. engine exhaust gases, smoke, fumes, flue gases or aerosols	B01D 53/00
Flow mixers; Mixers for falling materials, e.g. solid particles	B01F 25/00
Catalysts, in general, characterised by their form or physical properties	B01J 35/00
Separating dispersed particles from gases or vapour, e.g. air, by electrostatic effect	B03C 3/00
Application of procedures in order to alter the diameter of metal tube ends	B21D 41/00
Making hollow metal objects characterised by the use of the objects	B21D 51/16
Arrangement in connection with combustion air intake or gas exhaust of propulsion units	B60K 13/00
Arrangement in connection with gas exhaust of propulsion units	B60K 13/04
Insulating elements for body-finishing, identifying or decorating, e.g. for sound insulation	B60R 13/08

Arrangements, apparatus and methods for handling exhaust gas in outboard drives, e.g. exhaust gas outlets	B63H 20/24
Shaped ceramic products characterised by their composition; Ceramics compositions	C04B 35/00
Porous mortars, concrete, artificial stone or ceramic ware; Preparation thereof	C04B 38/00
Crankcase ventilating or breathing having means for purifying air before leaving crankcase, e.g. removing oil	F01M 13/04
Electrical control of supply of combustible mixture or its constituents with safety or indicating devices for abnormal conditions	F02D 41/22
Engine-pertinent apparatus for adding exhaust gases to combustion-air, main fuel or fuel-air mixture, e.g. by exhaust gas recirculation [EGR] systems	F02M 26/00
Combustion-air cleaners, air intakes, intake silencers or induction systems specially adapted for, or arranged on, internal-combustion engines	F02M 35/00
Combustion-air cleaners using filters	F02M 35/024
Pipes; Joints or fittings for pipes; Supports for pipes; Means for thermal insulation in general	F16L
Burners using a direct spraying action of liquid droplets or vaporised liquid into the combustion space	F23D 11/00
Arrangements of devices for treating smoke or fumes, e.g. catalytic treatment of flue gases from furnaces burning coal, gas or oil	F23J 15/00
Continuous combustion chambers using liquid or gaseous fuel characterised by the use of catalytic means, e.g. catalytic treatment of gases from exhaust from gas turbines	F23R 3/40
Heat-exchange apparatus having stationary conduit assemblies for one heat-exchange medium only, the media being in contact with different sides of the conduit wall, in which the other heat-exchange medium is a large body of fluid, e.g. domestic or motor car radiators	F28D 1/00
Measuring pressure in inlet or exhaust ducts of internal-combustion engines	G01L 23/24
Sampling; Preparing specimens for investigation	G01N 1/00
Sampling from a flowing stream of gas in a vehicle exhaust	G01N 1/2252
Investigating or analysing materials by investigating resistance	G01N 27/04
Methods or devices for protecting against, or for damping, noise or other acoustic waves in general	G10K 11/16
Generating plasma	H05H 1/24

Special rules of classification

References [B60K 13/00](#), [F02M 35/00](#) and [G10K 11/16](#) are non-limiting in the subclass [F01N](#). CPC will be corrected once this inconsistency is resolved in IPC.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Absorbent	Could also be found under the wording: trap, adsorbent or storage device, e.g. NOx-trap. It is an element which can absorb at least one compound and release/adsorb it again. The reduction or oxidation of the compound in the absorbent may or may not occur, depending of the presence of a suitable catalyst therefore.
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Synonyms and Keywords

In patent documents, the following abbreviations are often used:

SCR	Selective catalytic reduction
DPF	Diesel particulate filter
CRT	Continuous regenerating trap
Absorbent	Trap, adsorber, absorber, occlusion element
Silencer	Muffler

F01N 1/00

Silencing apparatus characterised by method of silencing

Definition statement

This place covers:

Silencing apparatus for reducing or controlling the noise in exhaust emitted by internal combustion engines.

References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Filters for removing solid constituents of exhaust, in combination with exhaust silencers in a single housing	F01N 3/0335
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Catalytic reactors combined or associated with exhaust silencers in a single housing	F01N 3/2885
Means for exhaust-air diffusion or for sound or vibration damping in suction cleaners	A47L 9/0081
Arrangements of noise-damping means of exhaust silencers of portable power-driven percussive tools	B25D 17/12
Arrangements in connection with gas exhaust of propulsion units in vehicles	B60K 13/00
Arrangement or adaptation of acoustic signal devices, e.g. amplifying noise for the vehicle's passengers	B60Q 5/00

Insulating elements for mounting around noise sources, e.g. air blowers	B60R 13/0884
Silencer devices of power brake systems	B60T 17/008
Arrangement of marine propulsion power-unit exhaust uptakes	B63H 21/32
Arrangement of aircraft exhaust outlets or jet pipes	B64D 33/04
Ground installations for reducing aircraft engine or jet noise	B64F 1/26
Silencers specially adapted for steam engines	F01B 31/16
Use of kinetic or wave energy of charge in induction systems, or of combustion residues in exhaust systems, for improving quantity of charge or for increasing removal of combustion residues, in exhaust systems only, e.g. for sucking-off combustion gases	F02B 27/04
Acoustic insulation of combustion engines	F02B 77/13
Air-intakes for gas-turbine plants or jet-propulsion plants having provisions for noise suppression	F02C 7/045
Throttle valves specially adapted for controlling engines by throttling air or fuel-and-air induction conduits or exhaust conduits; Arrangements of such valves in conduits	F02D 9/08
Combustion-air intake silencers specially adapted for, or arranged on, internal-combustion engines	F02M 35/00
Pulsation or noise damping means of positive-displacement machines for liquids or pumps	F04B 39/0027
Silencing of rotary-piston, or oscillating-piston, positive-displacement machines for liquids or positive displacement pumps	F04C 29/06
Combating cavitation, whirls, noise, vibration or the like in non-positive-displacement pumps	F04D 29/66
Means in valves for preventing water-hammer or noise	F16K 47/02
Noise absorbers for use in, or in connection with, pipes or pipe systems	F16L 55/02
Means for preventing or suppressing noise in air-conditioning or ventilation	F24F 13/24
Silencers for smallarms or ordnance	F41A 21/30
Methods or devices for transmitting, conducting or directing sound in general; Methods or devices for protecting against, or for damping, noise or other acoustic waves in general	G10K 11/00

Special rules of classification

Remaining details of the silencers must be classified in the following codes:

- [F01N 2210/00](#) for the combination of silencing methods;
- [F01N 2230/00](#) for the combination of silencers and other devices;
- [F01N 2290/00](#) for movable parts or members in exhaust systems for other than for control purposes;
- [F01N 2470/00](#) for the structure or shape of gas passages, pipes or tubes;
- [F01N 2490/00](#) for the structure, disposition or shape of gas-chambers;
- [F01N 2310/00](#) or [F01N 2450/06](#) for the filling of chambers with sound absorbing material;
- [F01N 2590/00](#) for the particular use, i.e. the type of vehicle or machine.

F01N 1/003**{by using dead chambers communicating with exhaust gas flow passages}****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Silencing by using resonance	F01N 1/02
Silencing by using sound-absorbing materials	F01N 1/24

F01N 1/02**by using resonance****Definition statement***This place covers:*

Exhaust gas silencers with physical dimensions intended to alter, reduce or cancel sound at particular frequencies, often with little or no impedance to the passage of exhaust gas.

Resonance is achieved by placing a chamber or a channel in communication with the exhaust flow without the exhaust flow passing therethrough.

F01N 1/081**{by passing the exhaust gases through a mass of particles}****Definition statement***This place covers:*

Illustrative example of the subject matter classified in this place:

**F01N 1/082****{by passing the exhaust gases through porous members}****Definition statement***This place covers:*

Illustrative example of the subject matter classified in this place:



The Figure illustrates a porous member surrounding the chamber, constructed from, e.g. bronze or ceramics.

F01N 1/083

{using transversal baffles defining a tortuous path for the exhaust gases or successively throttling exhaust gas flow}

Definition statement

This place covers:

Illustrative examples of the subject matter classified in this place:

1.



2.



3.

**F01N 1/084**

{the exhaust gases flowing through the silencer two or more times longitudinally in opposite directions, e.g. using parallel or concentric tubes}

Definition statement

This place covers:

Illustrative examples of the subject matter classified in this place:

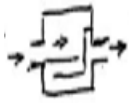
1.



2.



3.



F01N 1/085

{throttling exhaust gas flow using a central core in a flow passage}

Definition statement

This place covers:

Illustrative example of the subject matter classified in this place:



F01N 1/086

{having means to impart a whirling motion to the exhaust gases (with helically or spirally shaped channels [F01N 1/12](#))}

Definition statement

This place covers:

Illustrative example of the subject matter classified in this place:



References

Limiting references

This place does not cover:

Silencing by reducing exhaust energy by throttling or whirling using spirally or helically shaped channels	F01N 1/12
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F01N 1/087

{using tangential inlets into a circular chamber}

Definition statement

This place covers:

Illustrative example of the subject matter classified in this place:



F01N 1/088

{using vanes arranged on the flow path or flow tubes with tangentially directed apertures}

Definition statement

This place covers:

Illustrative example of the subject matter classified in this place:

1a.



1b.



F01N 1/089

{using two or more expansion chambers in series ([F01N 1/083](#), [F01N 1/084](#), [F01N 1/086](#) take precedence)}

Definition statement

This place covers:

Illustrative examples of the subject matter classified in this place:

1.



2.



3.



References

Limiting references

This place does not cover:

Silencing by reducing exhaust energy by throttling or whirling using transversal baffles defining a tortuous path for the gases or successively throttling gas flow	F01N 1/083
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Silencing by reducing exhaust energy by throttling or whirling, the gases flowing through the silencer two or more times longitudinally in opposite directions, e.g. using parallel or concentric tubes	F01N 1/084
Silencing by reducing exhaust energy by throttling or whirling, with means to impart whirling motion to the gases	F01N 1/086

F01N 1/16

by using movable parts

Definition statement

This place covers:

Exhaust gas silencing using movable elements that modify the exhaust flow and its acoustic properties. These mechanisms may function by altering the flow path, varying the flow area, modulating pressure fluctuations, disrupting sound wave propagation or dynamically adjusting flow resistance.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Controlling engines by throttling air or fuel-and-air induction conduits or exhaust conduits	F02D 9/00
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F01N 1/165

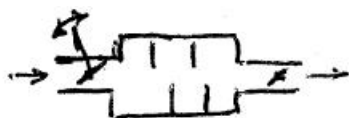
{for adjusting flow area}

Definition statement

This place covers:

Silencing by using movable parts for adjusting flow area, e.g. by means of a valve.

Illustrative example of the subject matter classified in this place:



F01N 1/166

{for changing the flow path through the silencer or for adjusting the dimensions of a chamber or a pipe ([F01N 1/165](#) takes precedence)}

Definition statement

This place covers:

Illustrative examples of the subject matter classified in this place:

1.



2.



References

Limiting references

This place does not cover:

Silencing by using movable parts for adjusting flow area	F01N 1/165
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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](#))

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Electrical control of exhaust gas treating apparatus	F01N 9/00
Monitoring or diagnostic devices for exhaust-gas treatment apparatus	F01N 11/00
Boiling apparatus for physical or chemical purposes	B01B 1/00
Filtration; Filtering material, regeneration thereof	B01D 24/00 , B01D 25/00 , B01D 27/00 , B01D 29/00 , B01D 33/00 , B01D 35/00 , B01D 36/00 , B01D 37/00 , B01D 39/00 , B01D 41/00 , B01D 43/00
Separating dispersed particles from gases or vapours	B01D 45/00 , B01D 46/00 , B01D 47/00 , B01D 49/00 , B01D 50/00 , B01D 51/00 , B01D 53/00 , B01D 57/00 , B01D 59/00
Catalysts, in general, characterised by their form or physical properties	B01J 35/00
Magnetic or electrostatic separation of solid material from solid materials or fluids; Separation by high-voltage electric fields	B03C
Layered products	B32B
Arrangement in connection with combustion air intake or gas exhaust of propulsion units	B60K 13/00

Arrangement in connection with gas exhaust of propulsion units	B60K 13/04
Arrangement in connection with fuel supply of combustion engines; Mounting or construction of fuel tanks	B60K 15/00
Production of hydrogen or of gaseous mixtures containing hydrogen	C01B 3/02
Preparation of ammonia from nitrogenous organic substances	C01C 1/08
Shaped ceramic products characterised by their composition; Ceramics compositions	C04B 35/00
Non-woven fabrics formed wholly or mainly of staple fibres or like relatively short fibres	D04H 1/00
Pulp or paper, comprising synthetic cellulose or non-cellulose fibres or web-forming material	D21H 13/00
Cooling of machines or engines in general; Cooling of internal-combustion engines	F01P
Engine-pertinent apparatus for adding exhaust gases to combustion-air, main fuel or fuel-air mixture, e.g. by exhaust gas recirculation [EGR] systems	F02M 26/00
Combustion-air cleaners, air intakes, intake silencers or induction systems specially adapted for, or arranged on, internal-combustion engines	F02M 35/00
Heating of pipes or pipe systems	F16L 53/30
Burners using a direct spraying action of liquid droplets or vaporised liquid into the combustion space	F23D 11/00
Arrangements of devices for treating smoke or fumes, e.g. catalytic treatment of flue gases from furnaces burning coal, gas or oil	F23J 15/00
Continuous combustion chambers using liquid or gaseous fuel characterised by the use of catalytic means, e.g. catalytic treatment of gases from exhaust from gas turbines	F23R 3/40
Water heaters, e.g. boilers, continuous-flow heaters or water-storage heaters	F24H 1/00
Indicating or measuring liquid level or level of fluent solid material, e.g. indicating in terms of volume or indicating by means of an alarm	G01F 23/00
Investigating or analysing materials by the use of refractometers	G01N 21/4133
Coupling devices	H01R
Ohmic-resistance heating	H05B 3/00

Special rules of classification

Details of electrical control or of the monitoring of the exhaust gas treating apparatus may also receive classification in [F01N 2900/00](#).

References to [F01N 9/00](#) and [F01N 11/00](#) are non-limiting in main group [F01N 3/00](#). CPC will be corrected once this inconsistency is resolved in IPC.

F01N 3/01**by means of electric or electrostatic separators****Definition statement***This place covers:*

Physically separating particles from the exhaust with electric or electrostatic separators.

References**Informative references***Attention is drawn to the following places, which may be of interest for search:*

Rendering the exhaust gas innocuous with electric or magnetic treatment, e.g. dissociation of noxious components	F01N 3/0892
Separating dispersed particles from gases or vapour, e.g. air, by electrostatic effect	B03C 3/00

F01N 3/0211**{Arrangements for mounting filtering elements in housing, e.g. with means for compensating thermal expansion or vibration}****Special rules of classification**Mats that can be used as either a filter or a catalyst between a monolithic body and a housing should be classified in [F01N 3/2853](#), and not in [F01N 3/0211](#).**F01N 3/022****characterised by specially adapted filtering structure, e.g. honeycomb, mesh or fibrous****Special rules of classification**Structural details of catalyst supports or particle filters may be classified further in [F01N 2330/00](#).**F01N 3/0222****{the structure being monolithic, e.g. honeycombs}****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Particle separators, e.g. dust precipitators, using rigid hollow filter bodies characterised by the physical shape or structure of the filtering element	B01D 46/2403
Shaped ceramic products characterised by their composition; Ceramics compositions; Processing powders of inorganic compounds preparatory to the manufacturing of ceramic products	C04B 35/00
Ceramic honeycomb structures	C04B 38/0006

Special rules of classification

Structural details of honeycomb supports may be classified further in [F01N 2330/30](#).

F01N 3/023

using means for regenerating the filters, e.g. by burning trapped particles

Relationships with other classification places

Regeneration of a particulate filter by introducing corrections to engine control signals, e.g. by modifying the injection time delay or the exhaust/intake valve timing, are covered by [F02D 41/029](#).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Electrical control of filter regeneration, e.g. detection of clogging	F01N 9/002
Electrical control of supply of combustible mixture or its constituent with circuit arrangements for generating control signals to introduce corrections in relation with the state of the exhaust gas treating apparatus	F02D 41/0235

Special rules of classification

Catalytic coatings applied on filters to lower soot ignition temperature or otherwise promote soot ignition may be further classified in [F01N 2510/065](#).

F01N 3/031

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

Special rules of classification

Details of bypassing exhaust may be further classified in [F01N 2410/00](#).

F01N 3/032

during filter regeneration only

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Electrical control of filter regeneration, e.g. detection of clogging	F01N 9/002
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F01N 3/035

with catalytic reactors

Definition statement

This place covers:

Cooling, or removing solid constituents of, exhaust by means of filters in combination with catalytic reactors, e.g. catalysed diesel particulate filters.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Regenerating filters, e.g. by burning trapped particles	F01N 3/023
Regenerating filters using special exhaust apparatus upstream of the filter for producing nitrogen dioxide, e.g. for continuous filter regeneration systems [CRT]	F01N 3/0231

Special rules of classification

Catalytic coatings applied on filters may be further classified in [F01N 2510/06](#).

F01N 3/04

using liquids

Definition statement

This place covers:

Cooling, or removing solid constituents of, exhaust using liquids, e.g. water, and without chemical reactions directly involved.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Cooling an exhaust treating device using a liquid	F01N 2260/024
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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](#))

References

Limiting references

This place does not cover:

Silencers working by addition of air to exhaust gases	F01N 1/14
Arrangements for supply of additional air to thermal or catalytic conversion of noxious components of exhaust	F01N 3/30

Informative references

Attention is drawn to the following places, which may be of interest for search:

Control of additional air supply only to thermal or catalytic conversion of noxious components of exhaust, e.g. using by-passes or variable air pump drives	F01N 3/22
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Other arrangements or adaptations of tailpipes, e.g. with means for mixing air with exhaust for exhaust cooling, dilution or evacuation	F01N 13/082
Cooling exhaust treating devices using air	F01N 2260/022

F01N 3/08

for rendering innocuous (using electric or electrostatic separators [F01N 3/01](#); chemical aspects [B01D 53/92](#))

References

Limiting references

This place does not cover:

Exhaust or silencing apparatus having means for purifying, rendering innocuous or otherwise treating exhaust by means of electric or electrostatic separators	F01N 3/01
Chemical or biological purification of engine exhaust gases	B01D 53/92

Informative references

Attention is drawn to the following places, which may be of interest for search:

Catalysts, in general, characterised by their form or physical properties	B01J 35/00
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F01N 3/0807

{by using absorbents or adsorbents}

Special rules of classification

Arrangements for adding fuel to an absorbent should also receive classification in [F01N 3/36](#) and [F01N 2610/00](#).

F01N 3/0814

{combined with catalytic converters, e.g. NO_x absorption/storage reduction catalysts}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Exhaust or silencing apparatus having means for purifying, rendering innocuous or otherwise treating exhaust by using absorbents or adsorbents, characterised by the absorbed or adsorbed substances	F01N 3/0828
Exhaust treating apparatus eliminating, absorbing or adsorbing specific elements or compounds	F01N 2570/00

F01N 3/0821**{combined with particulate filter}****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Filters in combination with catalytic reactors	F01N 3/035
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F01N 3/0871**{using means for controlling, e.g. purging, the absorbents or adsorbents}****Definition statement***This place covers:*

Control of the regeneration of the absorbent.

References**Informative references***Attention is drawn to the following places, which may be of interest for search:*

Introducing corrections to engine control signals to purge or regenerate exhaust gas treating apparatus	F02D 41/027
Introducing corrections to engine control signals to purge or regenerate NOx traps or adsorbents	F02D 41/0275
Introducing corrections to engine control signals for desulphurisation of NOx traps or adsorbents	F02D 41/028
Introducing corrections to engine control signals to purge or regenerate SOx traps or adsorbents	F02D 41/0285

Special rules of classificationControl of the regeneration of the absorbent for releasing stored NOx is classified in [F01N 3/0871](#).Desulphurisation of NOx traps is classified in [F01N 3/0885](#).**F01N 3/0878****{Bypassing absorbents or adsorbents}****Special rules of classification**Details of bypassing exhaust may be further classified in [F01N 2410/00](#).

F01N 3/0885

{Regeneration of deteriorated absorbents or adsorbents, e.g. desulfurization of NOx traps}

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Introducing corrections to engine control signals for desulphurisation of NOx traps or adsorbents	F02D 41/028
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F01N 3/0892

{Electric or magnetic treatment, e.g. dissociation of noxious components}

Definition statement

This place covers:

Electric or magnetic treatment changing the gas structure at a molecular level, e.g. dissociation of noxious components, including by corona discharge.

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Exhaust or silencing apparatus having electric or electrostatic separators for purifying, rendering innocuous or otherwise treating exhaust	F01N 3/01
Using electric or magnetic heating means for regenerating filters used for cooling, or for removing solid constituents of, exhaust	F01N 3/027
Using electric or magnetic heating means for periodically heating or cooling catalytic reactors	F01N 3/2013

F01N 3/10

by thermal or catalytic conversion of noxious components of exhaust

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Chemical or biological purification of waste gases	B01D 53/34
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F01N 3/106**{Auxiliary oxidation catalysts}****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Exhaust treating apparatus eliminating, absorbing or adsorbing specific elements or compounds	F01N 2570/00
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F01N 3/2053**{By-passing catalytic reactors, e.g. to prevent overheating}****Special rules of classification**Details of bypassing exhaust may be further classified in [F01N 2410/00](#).**F01N 3/206****{Adding periodically or continuously substances to exhaust gases for promoting purification, e.g. catalytic material in liquid form, NO_x reducing agents}****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Using a fuel burner or introducing fuel into exhaust duct for periodically heating or cooling catalytic reactors, e.g. at cold starting or overheating	F01N 3/2033
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F01N 3/2066**{Selective catalytic reduction [SCR]}****Definition statement***This place covers:*

Structural components of a selective catalytic reduction [SCR] system, and their arrangement within the system.

References**Informative references***Attention is drawn to the following places, which may be of interest for search:*

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 an ammonia generator	F01N 2240/25
Sprayers or atomisers used to supply substances to exhaust gases; Arrangement thereof in the exhaust apparatus	F01N 2610/1453

Special rules of classification

Further details of arrangements for supplying substances other than fuel, e.g. ammonia or urea, may be classified in [F01N 2610/00](#). This includes items like pumps, valves, conduits, nozzles and injectors.

F01N 3/2073

{Means for generating a reducing substance from the exhaust gases}

Definition statement

This place covers:

Selective catalytic reduction [SCR] with means for generating a reducing substance from the exhaust gases, e.g. a NO_x absorbent/reducing catalyst.

F01N 3/208

{Control of selective catalytic reduction [SCR], e.g. by adjusting the dosing of reducing agent}

Definition statement

This place covers:

Electronic control of the SCR system.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Sprayers or atomisers used to supply substances to exhaust gases; Arrangement thereof in the exhaust apparatus	F01N 2610/1453
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F01N 3/26

Construction of thermal reactors

Definition statement

This place covers:

- Construction of thermal reactors with afterburning of exhaust gases, often without using a catalyst.
- Supply of fuel to thermal reactors.

F01N 3/28

Construction of catalytic reactors

Definition statement

This place covers:

Construction of catalytic reactors, e.g. radial flow or a tapered catalyst carrier.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Structure of catalyst support or particle filter	F01N 2330/00
Arrangements for fitting catalyst support or particle filter element in the housing	F01N 2350/00
Selection of materials for exhaust purification	F01N 2370/00
Methods or apparatus for fitting, inserting or repairing different elements	F01N 2450/00
Surface coverings	F01N 2510/00

F01N 3/2839

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

Special rules of classification

Simple methods of fitting the honeycomb in the housing may be further classified in [F01N 2350/02](#).

F01N 3/2853

{using mats or gaskets between catalyst body and housing}

Definition statement

This place covers:

Mats having a special shape or arrangement in the honeycomb housing.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Working or processing of sheet metal or metal tubes, rods or profiles without essentially removing material; Punching metal	B21D
Shaped ceramic products characterised by their composition; Ceramics compositions; Processing powders of inorganic compounds preparatory to the manufacturing of ceramic products	C04B 35/00
Non-woven fabrics formed wholly or mainly of staple fibres or like relatively short fibres	D04H 1/00

F01N 3/2892

{Exhaust flow directors or the like, e.g. upstream of catalytic device}

Special rules of classification

[F01N 2240/20](#) may be given along with [F01N 3/2892](#) if the flow directors or deflectors are further combined with other exhaust treating devices or auxiliary devices.

F01N 3/2896**{Liquid catalyst carrier}****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Adding substances to exhaust gases	F01N 2610/00
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F01N 3/36**Arrangements for supply of additional fuel****Special rules of classification**Further details of the arrangements for supply of additional fuel may be classified in [F01N 2610/14](#).**F01N 5/00****Exhaust or silencing apparatus combined or associated with devices profiting by exhaust energy (using kinetic or wave energy of exhaust gases in exhaust systems for charging [F02B](#))****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Exhaust or silencing apparatus having means for cooling, or for removing solid constituents of, exhaust using heat exchangers	F01N 3/0205
Construction of catalytic reactors combined or associated with heat exchangers in a single housing	F01N 3/2889
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 a heat exchanger	F01N 2240/02
Movable parts or members in exhaust systems for other than for control purposes	F01N 2290/00
Devices using kinetic or wave energy for charging the engine in exhaust systems only	F02B 27/04
Use of exhaust turbines for charging engines, i.e. turbocharging	F02B 37/00
Engines with prolonged expansion in exhaust turbines	F02B 41/10
Profiting from waste heat of exhaust gases	F02G 5/02
Thermoelectric devices in general	H10N 10/00 , H10N 15/00 , H10N 19/00

Special rules of classificationReference [F02B](#) is non-limiting in the main group [F01N 5/00](#). CPC will be updated/corrected once this inconsistency is resolved in IPC.

F01N 5/04

the devices using kinetic energy

Definition statement

This place covers:

Exhaust or silencing apparatus combined or associated with devices converting the exhaust energy into kinetic energy, e.g. exhaust-driven turbines coupled to electrical generators.

F01N 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 43/00](#))

Definition statement

This place covers:

Methods of electrically controlling exhaust gas treating apparatus and of exhaust devices not provided elsewhere.

References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Control of selective catalytic reduction [SCR], e.g. by adjusting the dosing of reducing agent	F01N 3/208
Electric control of additional air supply	F01N 3/225

Informative references

Attention is drawn to the following places, which may be of interest for search:

By-passing absorbents or adsorbents	F01N 3/0878
Exhaust or silencing apparatus having means for rendering innocuous by thermal or catalytic conversion of noxious components of exhaust characterised by methods of operation or control thereof	F01N 3/18
By-passing catalytic reactors, e.g. to prevent overheating	F01N 3/2053
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
Conjoint electrical control of two or more combustion engine functions	F02D 43/00

Special rules of classification

Details of electrical control or of the monitoring of the exhaust gas treating apparatus may also receive classification in [F01N 2900/00](#).

References [F01N 11/00](#) and [F02D 43/00](#) are non-limiting in the subgroup [F01N 9/00](#). CPC will be updated/corrected once this inconsistency is resolved in IPC.

F01N 11/00

Monitoring or diagnostic devices for exhaust-gas treatment apparatus

Definition statement

This place covers:

Devices like engine control units [ECUs] or sensors used to monitor or diagnose the function of exhaust-gas treatment apparatuses, e.g. for catalytic activity.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Safety, indicating or supervising devices for internal combustion engines	F02B 77/08
Electrical control of supply of combustible mixture or its constituents with safety or indicating devices for abnormal conditions	F02D 41/22
Testing of machine parts	G01M 13/00

Special rules of classification

Classification may occur in both [F01N 9/00](#) and [F01N 11/00](#) when an apparatus or an exhaust gas property is monitored and the results are used to introduce complex changes in the electrical control routine of the exhaust apparatus or to the exhaust flow.

When classifying in the [F01N 11/00](#) group, when appropriate, the codes [F01N 2550/00](#) should be given, to classify the type of apparatus or device being diagnosed.

When classifying in group [F01N 11/00](#), it is desirable to add the indexing codes of group [F01N 2900/00](#), relating to details of electrical monitoring or diagnosing of the exhaust gas treating apparatus.

F01N 13/00

Exhaust or silencing apparatus characterised by constructional features

Definition statement

This place covers:

Joints and assembling details of exhaust parts inside a housing or between exhaust conduits. Selection of particular materials, thermal insulation details, special arrangement of the exhaust conduits or devices on the vehicle or engine. Exhaust manifolds. Exhaust details of engines adapted for particular uses, model applications, marine propulsion.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Handling exhaust gas in outboard drives	B63H 20/24
Sealings in general	F16J 15/00
Pipes; Joints or fittings for pipes; Supports for pipes, cables or protective tubing; Means for thermal insulation in general	F16L

Special rules of classification

Further details of subgroups

Regarding [F01N 13/001](#), passages inside the cylinder head should be classified in [F02F 1/00](#) and not in this subclass.

Regarding [F01N 13/008](#), the construction details of a sensor itself are in [G01N](#). Sensor arrangements in the exhaust of combustion engines, e.g. for temperature, misfire, air/fuel ratio or oxygen sensors: [F02B 77/086](#).

Regarding [F01N 13/007](#), the intake silencers are in [F02M 35/12](#) and silencing methods are to be classified also using [F01N 1/00](#).

Regarding [F01N 13/14](#), other thermal insulation: mats or gaskets between catalyst or filter and housing, [F01N 3/2839](#) or [F01N 3/0211](#); thermal or acoustic insulation of combustion engines: [F02B 77/11](#); insulating elements, e.g. for sound or heat insulation, for vehicles [B60R 13/08](#); for mounting around heat sources, e.g. exhaust pipes: [B60R 13/0876](#); heat shields for motor vehicles: [B62D 25/2072](#); thermal insulation in general: [F16L 59/00](#); means for preventing radiation, e.g. with metal foil: [F16L 59/08](#); arrangements for the insulation of pipes or pipe systems: [F16L 59/14](#).

Regarding [F01N 13/002](#), here are mostly uses not covered by the more detailed [F01N 2590/00](#), with the exception of some portable devices, e.g. chainsaws.

Regarding [F01N 13/004](#), this subgroup is used in parallel with [F01N 13/12](#) (submerged exhausting). Treating exhaust by using liquids: [F01N 3/04](#).

Regarding [F01N 13/008](#), to describe the type of sensor use [F01N 2560/00](#), and when fitting exhaust sensors use [F01N 2450/10](#).

Regarding [F01N 13/02](#) and [F01N 13/04](#), these subgroups are for silencers only. Other apparatus, like filters, absorbents and catalysts, are in [F01N 3/02](#) - [F01N 3/04](#).

Regarding [F01N 13/08](#), this subgroup covers pipe details, curvature, deformation, and special position of pipe in relation to a vehicle part, and further details should be also classified in [F01N 2470/00](#).

Regarding [F01N 13/082](#), this subgroup can be used also with the subgroup [F01N 13/20](#). However, [F01N 13/20](#) should be used only for the bell-shaped or flared outlet shape. The remaining should be classified in [F01N 13/082](#).

Regarding [F01N 13/12](#), see above reference to [F01N 13/004](#).

Regarding [F01N 13/16](#), more specific material should be classified in [F01N 2530/00](#).

Regarding [F01N 13/1805](#), this subgroup covers connections of exhaust manifolds, exhaust pipes or pipe sections outside of the housing of a silencer or purifier, in contrast with [F01N 13/1838](#).

Regarding [F01N 13/1838](#), here are the connections regarding the inside of the housing of a silencer or purifier. That is the connection between housing and tubes or tubes and baffles, in contrast with [F01N 13/1805](#).

Regarding [F01N 13/20](#), see above references to [F01N 13/082](#).

F01N 13/1855**{the connection being realised by using bolts, screws, rivets or the like}****References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Methods or apparatus for fitting, inserting or repairing different elements of gas-flow silencers or exhausts apparatus by bolts, screws, rivets or the like	F01N 2450/24
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F01N 2340/04**Arrangement of the exhaust system relative to a vehicle or parts thereof****Definition statement***This place covers:*

Arrangement of the exhaust system, e.g. of the exhaust pipe, exhaust manifold or exhaust apparatus, relative to the vehicle or parts thereof, e.g. relative to the vehicle frame or to the vehicle body.

F01N 2340/08**Series-connected exhaust apparatuses mounted in a side-by-side spatial arrangement, e.g. U- or S-shaped****Definition statement***This place covers:*

Series-connected exhaust apparatuses, e.g. series-connected purifying devices or series-connected silencers, mounted in a side-by-side spatial arrangement, e.g. U- or S-shaped.

Illustrative examples of subject matter classified in this place:

1.

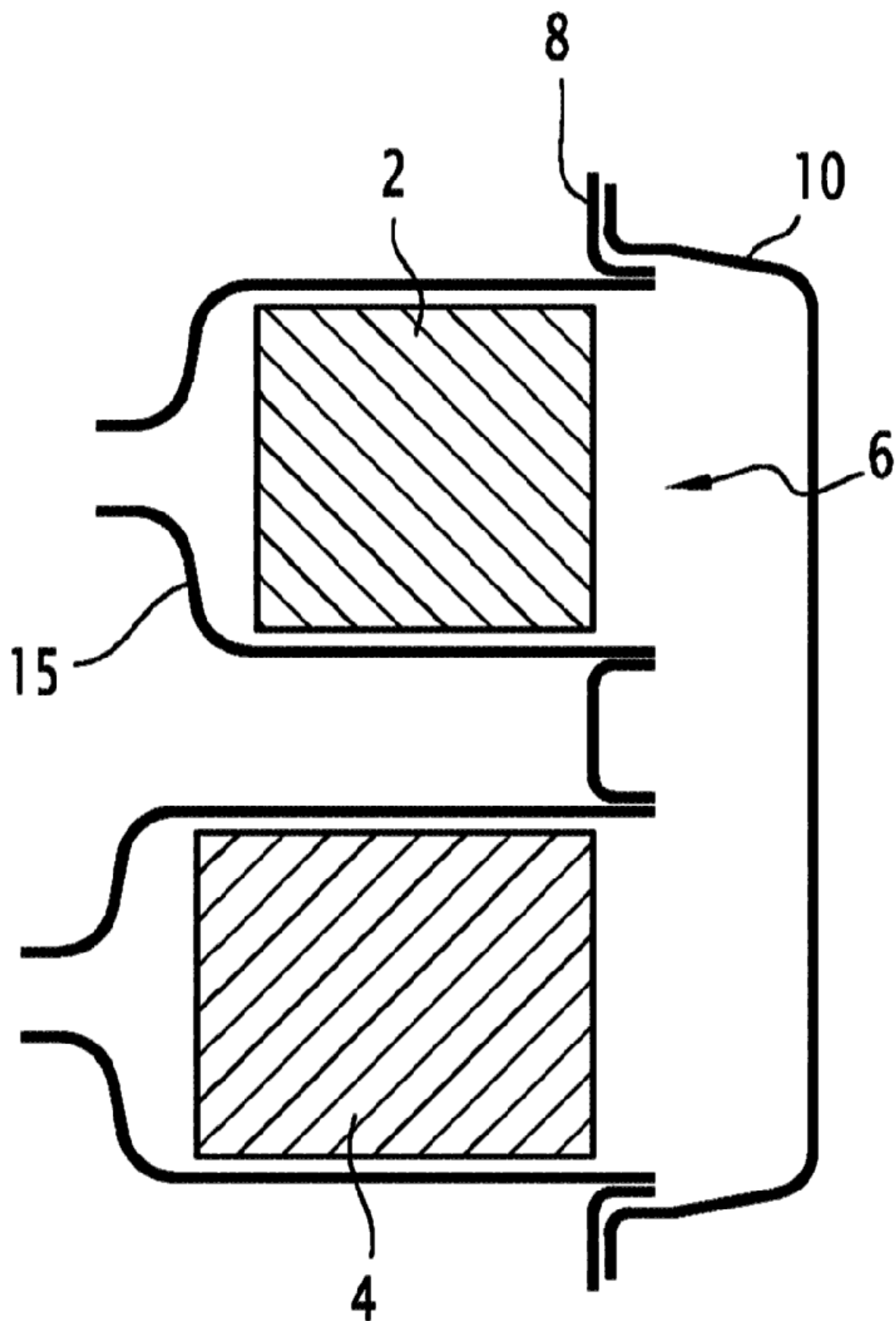


Figure 1 illustrates first and second substrates (2 and 4) mounted in a U-shaped, side-by-side spatial arrangement. The output of the first purification member of the U-shaped purification device is connected to the input of the second purification member.

2.

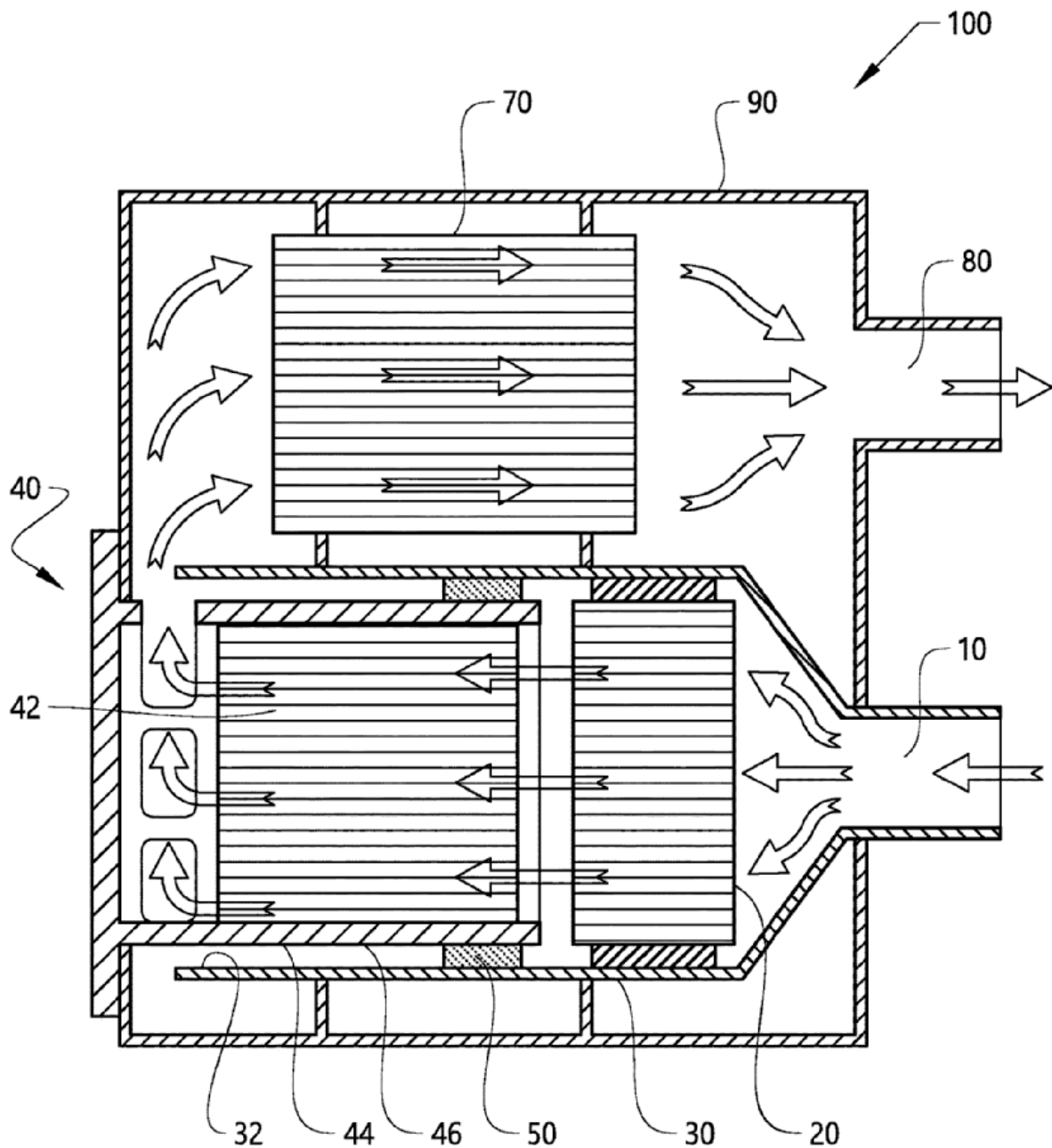


Figure 2 shows the second additional exhaust aftertreatment unit (70) arranged downstream the first exhaust aftertreatment unit (40). Both exhaust aftertreatment units (40 and 70) are mounted in a U-shaped, side-by-side spatial arrangement.

3.

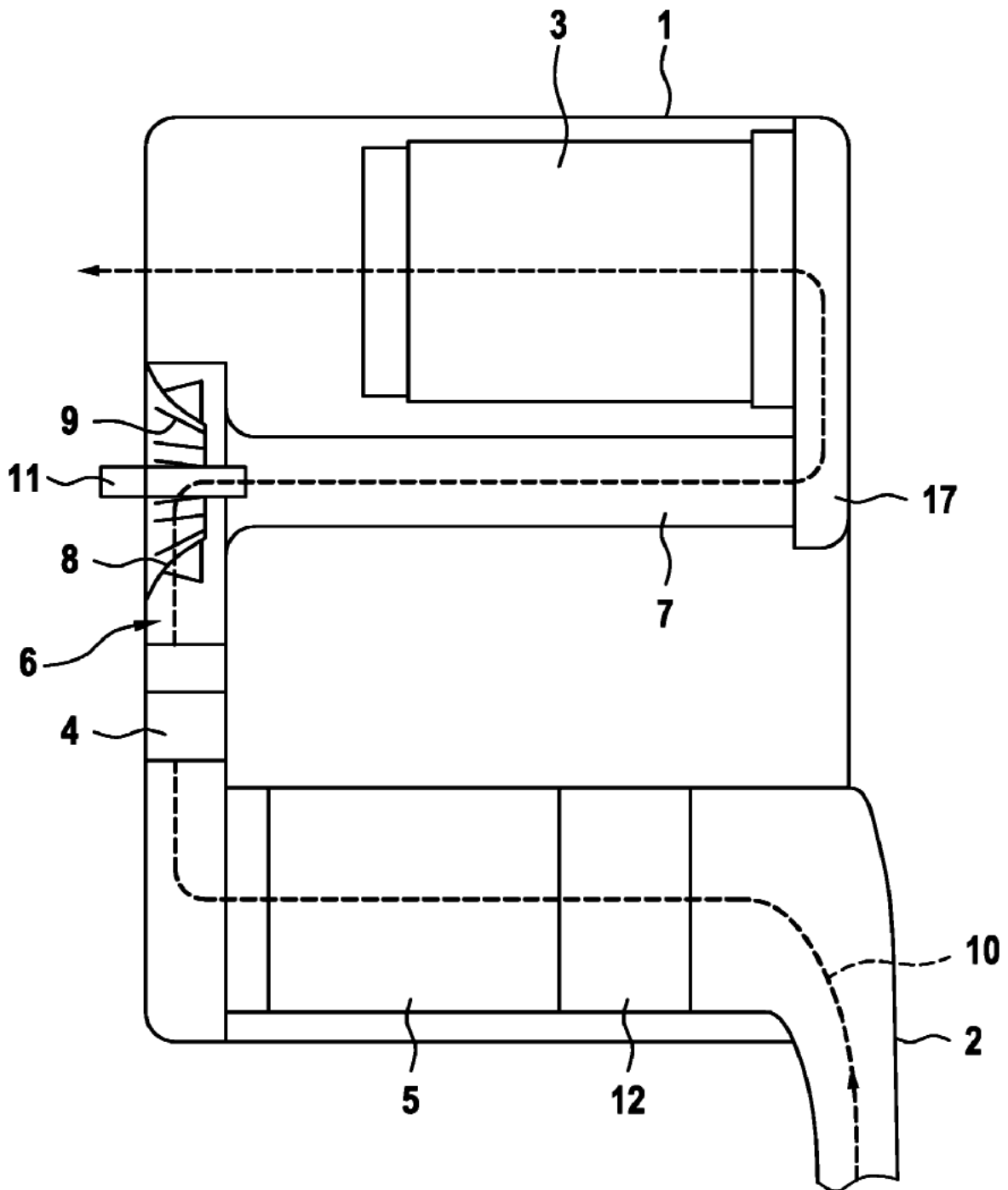


Figure 3 shows series-connected particle filter (5) and SCR catalyst (3) mounted in an S-shaped, side-by-side spatial arrangement.

4.

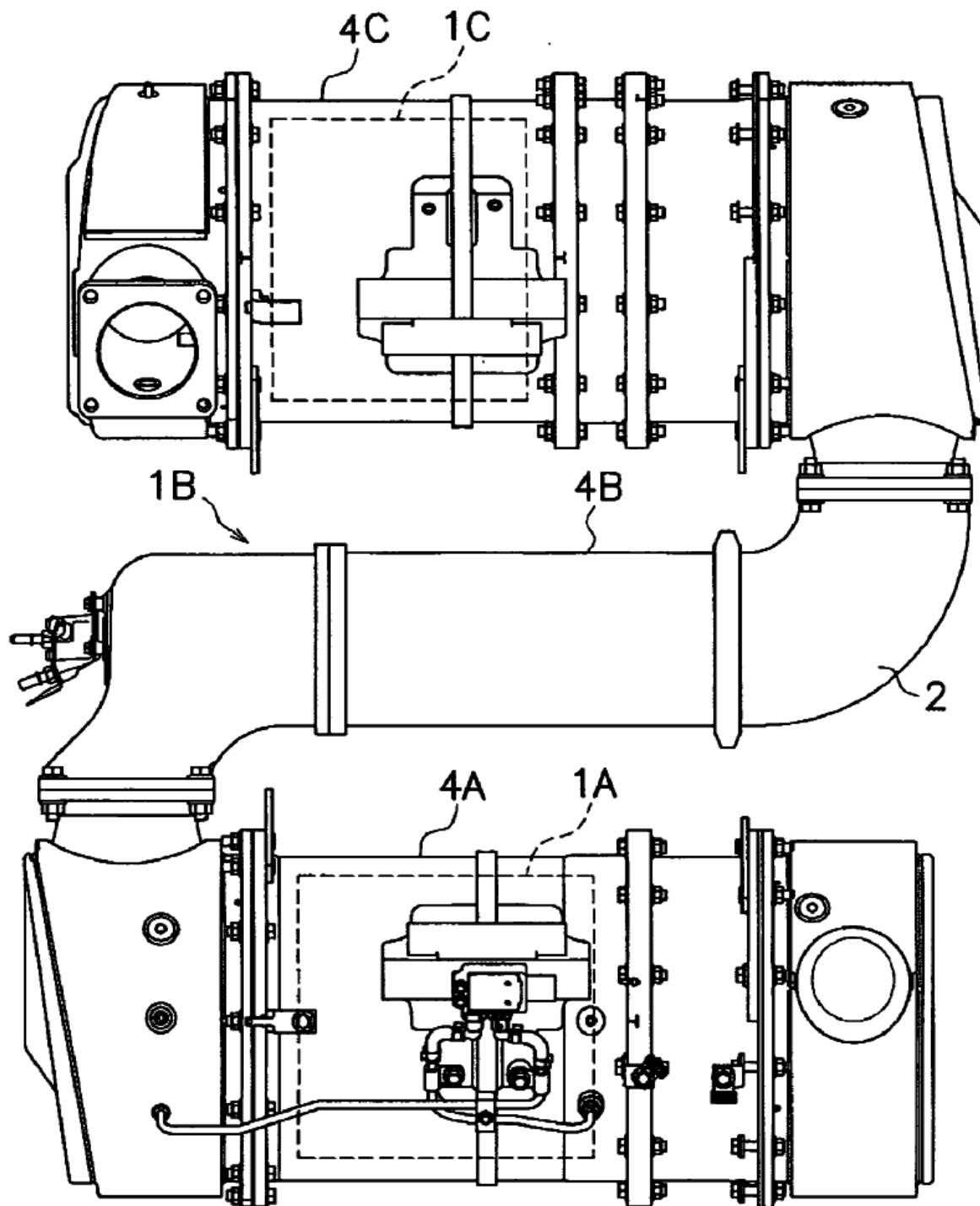


Figure 4 shows series-connected particle filter (1A) and SCR catalyst (1C) mounted in an S-shaped, side-by-side spatial arrangement.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Exhaust or silencing apparatus having two or more separate purifying devices arranged in series	F01N 13/009
Exhaust or silencing apparatus having two or more separate silencers in series	F01N 13/02

F01N 2450/24

by bolts, screws, rivets or the like

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Connection being realised by using bolts, screws, rivets or the like between parts of exhaust or silencing apparatus, e.g. between housing and tubes, between tubes and baffles	F01N 13/1855
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