

C23G

CLEANING OR DEGREASING OF METALLIC MATERIAL BY CHEMICAL METHODS OTHER THAN ELECTROLYSIS (polishing compositions [C09G](#); detergents in general [C11D](#))

Definition statement

This place covers:

Methods and compositions for cleaning or pickling metallic material by chemical means, e.g. with acidic, alkaline, neutral solutions or with molten salts ([C23G 1/00](#) - [C23G 1/34](#)).

Regeneration of waste pickling liquors ([C23G 1/36](#)).

Apparatus for cleaning or pickling metallic material ([C23G 3/00](#)).

Apparatus for cleaning or pickling wires, strips, filaments continuously ([C23G 3/02](#)).

Associated apparatus for pretreating or after-treating ([C23G 3/027](#)).

Apparatus for cleaning or pickling pipes ([C23G 3/04](#)).

Other non-mechanical methods for cleaning or de-greasing metallic material e.g. by using gases, plasma, supercritical fluids, metastable compositions, etc., but not only by using a solution ([C23G 5/00](#)).

Methods and compositions for cleaning or de-greasing metallic material with organic solvents ([C23G 5/02](#)).

Apparatus for cleaning or de-greasing metallic material with organic solvents ([C23G 5/04](#)).

Methods, compositions and apparatus for cleaning or de-greasing metallic material with emulsions ([C23G 5/06](#)).

Methods, compositions and apparatus for stripping non-metallic inorganic coatings from metallic substrates ([C23G](#)).

Relationships with other classification places

Particular cleaning of specific articles is not to be classified in this subclass but in the appropriate places, e.g. [B08B](#), [F23J](#), [F28G](#), [F01D](#), [F02M](#), [F02B](#).

Cleaning apparatus receives an additional or only a classification symbol in [B08B](#), [B21B](#), [B65G](#). Apparatus not specially adapted for cleaning metals is not classified in [C23G](#).

Methods for etching metallic materials are classified in [C23F](#) and methods for cleaning or pickling metallic material by chemical means (no attack or removal or dissolution of metal) are classified in [C23G](#).

If a composition is used for specific cleaning or polishing a metallic surface, it will be classified in [C23G](#) (cleaning) or [C23F 3/00](#) (brightening).

Compositions for polishing and cleaning metallic surfaces are classified in [C09G](#) and in [C23F](#), e.g. EP1793016, EP1572821.

Methods and compositions for pickling and brightening metallic surfaces are classified in [C23G](#) and [C23F](#), e.g. WO2008123147, US5538152.

Methods and compositions for pickling and passivating metallic surfaces are classified in [C23F](#) and [C23C 22/00](#), e.g. EP1552035.

Cleaning with azeotropic mixtures is classified in [C11D](#) and receive an additional classification symbol in [C23G](#) only the specific examples of the use of azeotropic cleaning mixtures for cleaning metals, e.g. EP0607969, EP0697452.

References

Limiting references

This place does not cover:

Methods and apparatus for cleaning in general	B08B
Polishing compositions in general	C09G
Detergents in general	C11D
Electrolytic pickling, cleaning or de-greasing	C25F

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:

Separation of solids by wet methods	B01D
Devices for guiding or conveying wires, sheet metal bands in loops or curves	B21B 41/00
Devices for surface cleaning	B21B 45/0269
Devices for de-scaling	B21B 45/04
Devices for winding-up, coiling or winding-off metal wire, metal band or other flexible metal material	B21C 47/00
Cleaning prior to soldering, brazing	B23K 1/206
Apparatus for continuously conveying articles into bath	B65G 49/00
Methods for preparing inorganic compounds	C01
Azeotropic mixtures for cleaning applications	C11D 7/00
Special cleaning and washing methods characterized by the object to be cleaned	C11D 11/0011
Cleaning of semiconductor devices or of parts thereof	H01L 21/02041
Cleaning or polishing of the conductive pattern	H05K 3/26

Informative references

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

Cleaning involving the use of liquid or steam	B08B 3/00
Cleaning by the force of jets or sprays	B08B 3/02
Cleaning involving contact with liquid	B08B 3/04
Cleaning involving contact with a liquid having chemical or dissolving effect	B08B 3/08
Regenerating cleaning liquids	B08B 3/14
Cleaning by other methods	B08B 7/00
Cleaning of pipes or tubes in general	B08B 9/02
Cleaning containers, e.g. tanks	B08B 9/08

Devices for guiding or conveying wires, sheet metal bands in loops or curves	B21B 41/00
Devices for surface cleaning	B21B 45/0269
Devices for surface de-scaling, e.g. of strip material, hydraulically	B21B 45/04 , B21B 45/06 , B21B 45/08
Cleaning prior to soldering, brazing	B23K 1/206
Layered products comprising a layer of metal	B32B 15/00
Cleaning devices	B65G 45/10
Apparatus for continuously conveying articles into bath	B65G 49/00
Special cleaning or washing methods for metals	C11D 11/0029
Special cleaning or washing methods for industrial or commercial equipment, e.g. reactors, tubes, engines	C11D 11/0041
Special cleaning or washing methods for electronic devices, e.g. PCB's	C11D 11/0047
Production or refining of metals, e.g. by wet processes for recovering metals from spent pickling solutions	C22B
Chemical treatment of the metal surface prior to hot-dipping coatings	C23C 2/02
Chemical treatment of the metal surface prior to diffusion coatings	C23C 10/02
Cleaning of the metal surface prior to PVD coatings	C23C 14/021
Cleaning of the metal surface prior to CVD coating	C23C 16/0227
Chemical treatment of metal surfaces prior to coating with enamel	C23D 3/00
Regeneration of process liquids	C25F 7/02
Cleaning of turbomachines	F01D 25/002
Cleaning of combustion engines	F02B 77/04
Cleaning of fuel injection apparatuses	F02M 65/00
Cleaning furnaces tubes	F23J 3/02
Cleaning heat-exchangers or heat-transfer conduits with chemical solvents	F28G 9/00
Chemical or electrochemical decontamination of radioactively contaminated metallic material and apparatus thereof, e.g. removal of metal oxides from the metal surface	G21F 9/004
Cleaning of semiconductor devices or of parts thereof	H01L 21/02041
Cleaning or polishing of the conductive pattern	H05K 3/26

Special rules of classification

This subclass ([C23G](#)) does not cover methods, compositions and apparatus for treatment of non-metallic material.

Classification of additional information

In many cases the classification of additional information is very useful for retrieving the document, and therefore very desirable, although not compulsory.

Well-disclosed and non-trivial aspects are classified.

Well-known (trivial) aspects or features are not classified.

Subgroups and head groups

Apparatus is classified in the groups or subgroups for apparatus, if such groups or subgroups exist, if not the apparatus is classified in the head group.

Cleaning or pickling /de-greasing compositions for are classified in the specific subgroups according to the intrinsic nature /function of the mixture or composition, e.g. acidic aqueous cleaning or pickling composition ([C23G 1/02](#)) or alkaline aqueous cleaning or pickling compositions ([C23G 1/14](#)).

An "application-oriented" invention should be classified in an application-oriented place (when it exists). An "application-oriented" invention is considered as:

- a thing "specially adapted for" a particular use or purpose, e.g. an apparatus modified or particularly constructed for cleaning or pickling pipes ([C23G 3/04](#)) or for cleaning strips, wires or filament continuously ([C23G 1/02](#));
- a particular use or application of a thing; e.g. acidic cleaning or pickling of copper or alloys thereof ([C23G 1/103](#)).

If a document concerns embodiments which are covered by several subgroups (e.g. [C23G 1/061](#) - [C23G 1/068](#)) dependent on a higher hierarchy group (head group, e.g. [C23G 1/06](#)), the following rules apply:

the specific technical information relevant for some of the subgroups is classified (EC) in all said subgroups;

if relevant, the combination of the elements covered by the subgroups is classified (EC) in the head group;

analogously, if generic technical information common to all of the subgroups is disclosed and only schematic embodiments of the specific subgroup embodiments are represented, the document is classified (EC) in the head group.

For example:

If a document discloses an acidic cleaning or pickling composition comprising nitrogen- containing compounds and sulfur-containing compounds as organic inhibitors, and the specific technical information is relevant for both organic inhibitors then it is classified in both subgroups [C23G 1/061](#) and [C23G 1/065](#).

A clear difference has to be made between the word "fouling" with the above meaning and the word "fouling" used with the meaning "accumulation of particulates of microorganisms of the surface" classified in [B08B 17/00](#).

A clear difference has to be made between the word "scale" with the above meaning and the word "scale" used with the meaning "white rust" "staining", "incrustation" "carbonate, sulphate, sulphide, silicate, oxalate scale" or "hydrocarbon scale" classified in [C23F 14/00](#), [C23F 15/00](#).

Glossary of terms

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

Metallic material	covers metals and alloys
Pickling of metallic material	Chemical removal or dissolution of surface deposits of inorganic contaminants, such as rust (iron oxides), or scale from ferrous metals, copper or aluminium alloys, or corrosion products from metallic surfaces. Chemical stripping of non-metallic inorganic coatings from metallic substrates, e.g. US2007023943, EP0434622.

De-greasing of metallic material	Non-mechanical removal or dissolution of surface deposits of organic contaminants, such as oils, fats, greases, dust, finger-print contaminations, or similar hydrophobic compounds from metallic surfaces.
----------------------------------	---

Synonyms and Keywords

In patent documents, the following words/expressions are often used as synonyms:

- "pickling", "stripping", "deoxidizing", "cleaning", "derusting", "descaling", "defouling", "detarnishing" and "oxides removal"
- "de-greasing", "cleaning", "deoil", "defating", and "decontaminating"
- "pickling", "cleaning" and "descaling"

In patent documents, the following words/expressions are often used with the meaning indicated:

"etching"	"pickling".
"fouling"	"rusting".
"scale"	"rust" or "scale from ferrous metals, copper or aluminium alloys" or "rust staining".

C23G 1/00

Cleaning or pickling metallic material with solutions or molten salts (with organic solvents [C23G 5/02](#))

Definition statement

This place covers:

Methods and compositions for cleaning or pickling metallic material by chemical means, e.g. with acidic, alkaline, neutral solutions or with molten salts.

Multi-step methods for cleaning or pickling metallic material ([C23G 1/00](#)).

Regeneration of waste pickling liquors ([C23G 1/36](#)).

References

Limiting references

This place does not cover:

Apparatus for cleaning or pickling metallic material	C23G 3/00
Cleaning or de-greasing of metallic material by other non-mechanical means	C23G 5/00
Cleaning or de-greasing of metallic material with organic solvents	C23G 5/02
Cleaning or de-greasing of metallic material with emulsions	C23G 5/06

Informative references

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

Cleaning involving contact with liquid	B08B 3/04
Cleaning with additional treatment of the liquid or of the object being cleaned, e.g. by heat, vibration, electricity, by using propellers, etc.	B08B 3/10

Regenerating cleaning liquids	B08B 3/14
Cleaning of pipes or tubes in general	B08B 9/02
Cleaning containers, e.g. tanks	B08B 9/08
Methods for preparing inorganic compounds	C01G , C01F , C01D
Polishing or cleaning compositions	C09G 1/02 , C09G 1/04 , C09G 1/06
Etching, surface-brightening or pickling composition in general, e.g. for removing metal oxides, nitrides	C09K 13/00
Special cleaning or washing methods for metals	C11D 11/0029
Special cleaning or washing methods for industrial or commercial equipment, e.g. reactors, tubes, engines	C11D 11/0041
Special cleaning or washing methods for electronic devices, e.g. PCB's	C11D 11/0047
Production or refining of metals, e.g. by wet processes for recovering metals from spent pickling solutions	C22B
Chemical treatment of the metal surface prior to diffusion coatings	C23C 10/02
Cleaning of the metal surface prior to PVD coatings	C23C 14/021
Cleaning of the metal surface prior to CVD coating	C23C 16/0227
Chemical treatment of metal surfaces prior to coating with enamel	C23D 3/00
Regeneration of etching compositions	C23F 1/46
Regeneration of process liquids	C25F 7/02
Repairing of turbine blades	F01D 5/005
Cleaning of turbomachines	F01D 25/002
Cleaning furnaces tubes	F23J 3/02
Cleaning heat-exchangers or heat-transfer conduits with chemical solvents	F28G 9/00
Chemical or electrochemical decontamination of radioactively contaminated metallic material and apparatus thereof, e.g. removal of metal oxides from the metal surface	G21F 9/004
Cleaning of semiconductor devices or of parts thereof	H01L 21/02041
Cleaning or polishing of the conductive pattern	H05K 3/26

Special rules of classification

In the head group [C23G 1/00](#), the specific technical information is relevant to a multi-step process for cleaning or pickling metallic material with solutions or molten salts, e.g. a two-step pickling method comprising a first treatment step with an alkaline solution and a second treatment step with an acidic solution.

In the subgroup [C23G 1/02](#) the specific technical information is relevant to the cleaning or pickling metallic material with acidic solutions.

In the subgroup [C23G 1/025](#) the specific technical information is relevant to the cleaning or pickling metallic material with acidic pastes.

In the subgroup [C23G 1/04](#) the specific technical information is relevant to the cleaning or pickling metallic material with acidic solutions comprising inhibitors, e.g. inorganic inhibitors or a mixture of inorganic and organic inhibitors.

In the subgroup [C23G 1/06](#) the specific technical information is relevant cleaning or pickling metallic material with acidic solutions comprising only organic inhibitors.

In the subgroup [C23G 1/08](#) the specific technical information is relevant to the cleaning or pickling iron or steel with acidic solutions.

In the range [C23G 1/08](#) - [C23G 1/088](#) the cleaning or pickling iron or steel with acidic compositions are classified in the last appropriate place (last place rule).

In the subgroup [C23G 1/10](#) the specific technical information is relevant to the cleaning or pickling other heavy metals with acidic solutions.

In the subgroup [C23G 1/12](#) the specific technical information is relevant to the cleaning or pickling light metals with acidic solutions.

In the subgroup [C23G 1/14](#) the specific technical information is relevant to the cleaning or pickling metallic material with alkaline solutions.

In the subgroup [C23G 1/16](#) the specific technical information is relevant to the cleaning or pickling metallic material with alkaline solutions comprising inhibitors, e.g. inorganic inhibitors or a mixture of inorganic and organic inhibitors.

In the subgroup [C23G 1/18](#) the specific technical information is relevant cleaning or pickling metallic material with alkaline solutions comprising only organic inhibitors.

In the subgroup [C23G 1/19](#) the specific technical information is relevant to the cleaning or pickling iron or steel with alkaline solutions.

In the subgroup [C23G 1/20](#) the specific technical information is relevant to the cleaning or pickling other heavy metals with alkaline solutions.

In the subgroup [C23G 1/22](#) the specific technical information is relevant to the cleaning or pickling light metals with alkaline solutions.

In the subgroup [C23G 1/24](#) the specific technical information is relevant to the cleaning or pickling metallic material with neutral solutions.

In the subgroup [C23G 1/26](#) the specific technical information is relevant to the cleaning or pickling metallic material with neutral solutions comprising inhibitors, e.g. inorganic inhibitors or a mixture of inorganic and organic inhibitors.

In the subgroup [C23G 1/28](#) the specific technical information is relevant to the cleaning or pickling metallic material with molten salts.

In the subgroup [C23G 1/30](#) the specific technical information is relevant to the cleaning or pickling metallic material with molten salts comprising inhibitors, e.g. inorganic inhibitors or a mixture of inorganic and organic inhibitors, only organic inhibitors are almost impossible, because they will be destroyed by the presence of molten salts. This subgroup is empty (0 documents). It is advised not to be used for classification, if it is, then only in combination with the subgroups [C23G 1/32](#) or [C23G 1/34](#).

Synonyms and Keywords

In patent documents, the following words/expressions are often used as synonyms:

- " pickling ", " stripping", "deoxidizing", "cleaning", "derusting", "descaling", "defouling", "detarnishing" and "oxides removal"

C23G 3/00

Apparatus for cleaning or pickling metallic material (with organic solvents [C23G 5/04](#); apparatus for continuously conveying articles into baths [B65G](#))

Definition statement

This place covers:

Apparatus for cleaning or pickling metallic material by chemical means, e.g. with acidic, alkaline, neutral solutions or with molten salts ([C23G 3/00](#)).

Apparatus for cleaning or pickling wires, strips, filaments, continuously by chemical means, e.g. with acidic, alkaline, neutral solutions or with molten salts ([C23G 3/02](#)).

Associated apparatus for pretreating or after-treating ([C23G 3/027](#)).

Apparatus for cleaning or pickling metallic pipes by chemical means, e.g. with acidic, alkaline, neutral solutions or with molten salts ([C23G 3/04](#)).

References

Limiting references

This place does not cover:

Other apparatus for non-mechanical cleaning or de-greasing metallic material	C23G 5/00
Apparatus for cleaning or de-greasing metallic material with organic solvents	C23G 5/04
Apparatus for cleaning or de-greasing metallic material with emulsions	C23G 5/06

Informative references

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

Cleaning travelling work	B08B 3/022 , B08B 3/041 , B08B 3/123
Cleaning with additional treatment of the liquid or of the object being cleaned, e.g. by heat, vibration, electricity, by using propellers, etc.	B08B 3/10 , B08B 3/102
Devices for guiding or conveying wires, sheet metal bands in loops or curves	B21B 41/00
Devices for surface cleaning	B21B 45/0269
Devices for surface de-scaling, e.g. of strip material, hydraulically	B21B 45/04 , B21B 45/06 , B21B 45/08
Apparatus for continuously conveying articles into bath	B65G 49/00
Investigating or analyzing materials by optical means	G01N 21/00
Investigating or analyzing materials by electric, electro-chemical or magnetic means	G01N 27/00
Investigating or analyzing metals by specific methods	G01N 33/20

Special rules of classification

In the head group [C23G 3/00](#), the specific technical information is relevant to apparatus for cleaning or pickling metallic material, such as pieces, wafers, articles, etc., with solutions or molten salts.

In the subgroup [C23G 3/02](#) the specific technical information is relevant to apparatus for cleaning or pickling metallic wires, strips, filaments continuously with solutions or molten salts.

In the subgroup [C23G 3/027](#) the specific technical information is relevant to associated apparatus for pretreating or after-treating metallic wires, strips, filaments continuously with solutions or molten salts.

In the subgroup [C23G 3/04](#) the specific technical information is relevant to apparatus for cleaning or pickling pipes with solutions or molten salts.

Glossary of terms

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

Pickling wires, strips, filaments continuously	pickling coiled wires, strips, filaments or pickling metallic material of continuous length, but not wafers, pieces, articles.
--	--

Synonyms and Keywords

In patent documents, the following words/expressions are often used as synonyms:

- " continuous length " and " coiled "

C23G 5/00

Cleaning or de-greasing metallic material by other methods; Apparatus for cleaning or de-greasing metallic material with organic solvents

Definition statement

This place covers:

Other methods, compositions and apparatus for non-mechanical cleaning or de-greasing metallic material e.g. by using gases, ion beams, plasma, freezing or cooling, supercritical fluids, melts (applying a coating which is a fondant for another coating), ultrasonic's, by removing liquid contaminants by suction, by using reactive solids, followed by heating, two-phase cleaning mixtures, e.g. air under pressure in combination with an aqueous solution ([C23G 5/00](#)).

Methods and compositions for cleaning or de-greasing metallic material with organic solvents ([C23G 5/02](#)).

Apparatus for cleaning or de-greasing metallic material with organic solvents ([C23G 5/04](#)).

Methods, compositions and apparatus for cleaning or de-greasing metallic material with emulsions ([C23G 5/06](#)).

References

Limiting references

This place does not cover:

Cleaning or pickling metallic material with solutions or molten salts	C23G 1/00
Apparatuses for cleaning or de-greasing metallic material with solutions or molten salts	C23G 3/00

Informative references

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

Cleaning involving the use of liquid or steam	B08B 3/00
---	---------------------------

Cleaning involving contact with a liquid having chemical or dissolving effect	B08B 3/08
Other cleaning methods	B08B 7/00
Cleaning by incorporation in a layer which is removed with the contaminants	B08B 7/0014
Cleaning by using liquid gases or supercritical fluids	B08B 7/0021
Cleaning by using radiant energy, e.g. by using plasma, laser	B08B 7/0035 , B08B 7/0042
Cleaning by temperature changes; by heating or by cooling	B08B 7/0064
Devices for surface descaling, e.g. of strip material	B21B 45/04 , B21B 45/06
Cleaning prior to soldering or brazing	B23K 1/206
Apparatus for continuously conveying articles into bath	B65G 49/00
Azeotropic mixtures for cleaning applications	C11D 7/00
Repairing of turbine blades	F01D 5/005
Cleaning of turbomachines	F01D 25/002
Cleaning furnaces tubes	F23J 3/02
Drying a solid material by other processes not by heating, e.g., by treating with a chemical liquid, by freezing, suction	F26B 5/00
Cleaning heat-exchangers or heat-transfer conduits with chemical solvents	F28G 9/00
Investigating or analyzing materials by optical means	G01N 21/00
Cleaning of semiconductor devices or of parts thereof	H01L 21/02041

Special rules of classification

In the head group [C23G 5/00](#), the specific technical information is relevant to other methods, compositions and apparatuses for non-mechanical cleaning or de-greasing metallic material, e.g. by using:

gases such as a halogenous gas mixture (EP2192209), a fluoride ion cleaning (US2007087208), a carbon dioxide cleaning (EP1618970);

ion beams (EP0506304);

plasma (WO2011045667, EP0483839);

freezing or cooling (US2003188766);

supercritical fluids (US2005189001);

melts (by applying a coating which is a fondant for another coating) (US3552404);

ultrasonic's (US3096774, GB973661, US4100926, US5345958);

by removing liquid contaminants by suction (EP1757677, WO03080261, US5565070);

by using reactive solids followed by heating (US5405428, WO9201825); or

by using two-phase cleaning mixtures, e.g. air under pressure in combination with an aqueous solution;

but not only by using a solution.

In subgroups [C23G 5/02](#) - **C23G5/36**, cleaning with organic solvents, in the absence of an indication to the contrary, classification is made in the last appropriate place (last place rule).

In subgroups [C23G 5/02](#) - **C23G5/36**, the mixtures of organic solvents are classified according to the major component in the mixture.

The subgroup [C23G 5/02854](#), cleaning or de-greasing metallic material with organic solvents containing halogenated hydrocarbons characterized by the stabilising or corrosion inhibiting additive, contains only 5 documents. It is advised not to be used for classification, if the specific technical information is relevant to the corrosion inhibiting additive, then it is classified with the subgroups [C23G 5/02858](#) - [C23G 5/02896](#).

In the subgroup [C23G 3/04](#) the specific technical information is relevant to apparatuses for cleaning or de-greasing metallic material with organic solvents.

In the subgroup **C23G3/06** the specific technical information is relevant to apparatus for cleaning or de-greasing metallic material with emulsions, e.g. aqueous emulsions.

In the group [C23G 5/00](#) only specific examples of the use of azeotropic cleaning mixtures for cleaning metals are classified:

For example cleaning using azeotropic mixture of dichloro-pentafluoropropane and 1,1-dichloroethane is classified in [C11D 7/5059](#), [C11D 7/5081](#) and also in [C23G 5/02851](#) (EP0450856).

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

Supercritical fluids	dense fluids
Azeotropic mixture	constant boiling mixtures, mixing solvents, stable non-flammable mixture
Cryogenic fluids	cryogenic aerosols
Plasma	discharge, reactive ion etching, DC, AC, RF, HF, UHF, MW, Hz, MHz, GHz