F23B

METHODS OR APPARATUS FOR COMBUSTION USING ONLY SOLID FUEL (for combustion of fuels that are solid at room temperatures, but burned in melted form, e.g. candle wax, C11C 5/00, F23C, F23D; using solid fuel suspended in air F23C, F23D 1/00; using solid fuel suspended in liquids F23C, F23D 11/00; using solid fuel together with fluid fuel or with solid fuel suspended in air, simultaneously or alternately, F23C, F23D 17/00)

Definition statement

This place covers:

General function-oriented aspects of methods and apparatus for combustion of solid fuel wherein the main body of fuel is either:

- essentially stationary during combustion; or
- mechanically transported, as opposed to pneumatically transported or suspended in air, during combustion;
- and wherein the combustion does not involve liquid or gaseous fuels, or pulverulent fuel burned in suspension.

The solid fuel can be in the form of lumps or pieces, e.g. coal, briquettes or firewood, or pulverulent or granulated, e.g. coal powder, wood pellets or wood chips.

Relationships with other classification places

Relationship between this subclass and application subclasses of class F23

Subclass F23G (Cremation furnaces; Consuming waste by combustion) is to be seen as an application place in relation to the function-oriented aspects of this subclass. In case of doubt, classification should be made in both subclasses, or in both subclass F23G and detail subclasses of class F23.

Classification is made in this subclass if the method or apparatus is:

- of general interest for combustion of different types of solid fuel, for example not specially adapted for a particular fuel, or
- specially adapted for specific solid fuels other than those provided for in subclass F23G, see the list below, for example "normal" commercial fuel, such as coal, firewood, wood chips, wood pellets or straw.

Classification is made in subclass F23G if a method or apparatus is specially adapted for combustion of any of the following types of substances:

- Human corpses or amputated body parts;
- Animal carcasses or their discarded body parts;
- Fuels, e.g. waste, presenting particular fuel-related environmental problems requiring specially adapted methods or apparatus for combustion, for example toxic, explosive, radioactive or corrosive fuels;
- Waste having a special physical form requiring specially adapted methods or apparatus for combustion, for example packaged waste, rubber tyres or discarded cars;
- Low-grade fuels presenting particular problems of combustion requiring specially adapted methods or apparatus for combustion, for example fuels containing high amounts of water or other non-combustible substances;
- Fuels that vary considerably in composition or form and therefore require specially adapted methods or apparatus for combustion;
- Household, municipal or similar waste that is solely or primarily burned for the purpose of its destruction.

Subclass F23R (Generating combustion products of high pressure or high velocity), especially group F23R 5/00, is also to be seen as an application place in relationship to this subclass. Classification is made in subclass F23R if the apparatus or method is specially adapted for generating combustion products of high pressure or high velocity.

Relationship between this subclass and other application places

Combustion of solid fuel is often used for purpose of heating or performing different operations. Apparatus for combustion of solid fuel can be self-contained devices, but are often part of, or used in connection with, heat-consuming apparatus, such as heating boilers. This subclass is therefore related to several places providing for uses of heat. In many of these fields the solid fuel combustion apparatus can be considered a detail of a bigger entity. A non-exhaustive list of examples of such classes or subclasses will be found under the heading "Informative references" below.

Combinations of combustion apparatus with other apparatus, where the combustion apparatus can be seen as a detail of the complete apparatus, e.g. a steam boiler, are classified as a whole, in the place for the other apparatus. Additional classification is made in this subclass only if features relating to the combustion apparatus per se are of interest apart from its application.

Relationship between this subclass and detail subclasses of class F23

Subclasses F23H - F23Q are to be seen as detail places in relation to this subclass. Classification is made in this subclass if the apparatus as a whole is of interest or if a detail is of use only for a particular type of combustion apparatus and not specifically provided for in any of subclasses F23H - F23Q. If a detail of a combustion apparatus is of interest, classification is made in the relevant subclass providing for such matter.

Relationship between this subclass and places for gasification or destructive distillation

Subclass C10B covers destructive distillation of carbonaceous material for production of gas, coke, tar or similar matter.

Subclass C10J covers production of combustible gases containing carbon monoxide from solid carbonaceous fuels.

Classification is made in these subclasses if the combustible substances produced, e.g. gases or coke, are burned in an apparatus separate from the gasification or distillation apparatus.

Classification is made in this subclass if complete combustion takes place in the same apparatus as the gasification, for example in different parts of the same combustion chamber or in an afterburner immediately connected to a primary combustion chamber.

References

Limiting references

This place does not cover:

Combustion of fuels that are solid at room temperatures, but burned in melted form, e.g. candle wax	C11C 5/00, F23C, F23D
Combustion of solid fuel suspended in a stream of air, e.g. combustion in fluidised beds or combustion of pulverised fuel using burners where the fuel is transported into the combustion chamber by an air stream	F23C, F23D 1/00
Combustion of both solid fuel and fluid fuel, simultaneously or alternately	F23C, F23D 17/00
Combustion of solid fuel suspended in a liquid, e.g. combustion of coal-water slurry	F23C, F23D 11/00

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:

Baking ovens	A21B
Cooking apparatus	A47J
Lighting	F21
Generating steam	F22B
Combustion specially adapted for waste or low-grade fuel	F23G
Generating combustion products of high pressure or high velocity	F23R
Domestic stoves or ranges for cooking or local heating	F24B, F24C
Domestic-heating systems or space-heating systems	F24D
Heating of fluids, e.g. air or water	F24H
Drying	F26B
Heat treatment of material or articles	F27

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
Chemical or physical processes or apparatus in general	B01J
Grates, cleaning or raking of grates	F23H
Removal or treatment of combustion products, e.g. flue gases, or combustion residues, e.g. ash	F23J
Feeding fuel	F23K
Supplying air or other non-combustible liquids or gases, e.g. water or steam, to combustion apparatus in general	F23L
Constructional details of combustion chambers, not otherwise provided for	F23M
Regulating or controlling combustion	F23N
Ignition	F23Q
Heat-producing reactions of chemical substances, other than combustion, e.g. of hydrogen peroxide and methane, or iron oxide and aluminium	F24V 30/00

Special rules of classification

In this subclass, the first place priority rule is applied, i.e. at each hierarchical level, classification is made in the first appropriate place.

In this subclass, methods are classified in the groups that cover the apparatus used. Methods that are of general applicability are classified in group F23B 90/00.

When classifying in this subclass, the Indexing Codes below should be considered:

F23B 2101/00;

F23B 2103/00 - F23B 2103/02;

F23B 2900/00001 - F23B 2900/99001.

Glossary of terms

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

air	a mixture of gases containing free oxygen and able to promote or support combustion
ash	means any solid combustion residues, for example remaining in the fuel bed or suspended in the flue gases
burner	a device by which fluid fuel or solid fuel suspended in air is passed to a combustion space where it burns to produce a self-supporting flame
combustion	a heat-producing sequence of chemical reactions between a burnable substance and molecular oxygen, e.g. in air, in most cases generating light in the form of flames or a glow
combustion chamber	a chamber in which fuel is burned to establish a self-supporting fire or flame and which surrounds that fire or flame
combustion zone	the part of the apparatus where the reaction takes place between air and fuel
firebridge	a low wall separating the fuel bed from adjacent flue gas passages in apparatus for combustion of solid fuel, for example in reverberatory furnaces or fire-tube boilers
flue gases	any gaseous products of combustion
grate	a perforated surface, e.g. a grid, which supports or delimits a bed of burning fuel and serves to supply primary air
primary air	air supplied to the burning fuel in order to liberate combustible gases
secondary air	air supplied to the combustible gases liberated by the primary air in order to complete their combustion. The term "secondary air" covers "tertiary air" etc.

Synonyms and Keywords

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

boiler	combustion apparatus
burner	combustion apparatus

F23B 1/00 (Frozen)

{Combustion apparatus using only lump fuel}

Definition statement

This place covers:

Combustion apparatus using only lump fuel.

Special rules of classification

F23B 1/00 - F23B 1/12 are not used anymore for classification, please refer to groups F23B 10/00 - F23B 99/00 instead.

F23B 3/00 (Frozen)

{Combustion apparatus which is portable or removable with respect to the boiler or other apparatus which is heated}

Definition statement

This place covers:

Combustion apparatus which is portable or removable with respect to the boiler or other apparatus which is heated.

Special rules of classification

F23B 3/00 is not used anymore for classification, please refer to groups F23B 10/00 - F23B 99/00 instead.

F23B 5/00 (Frozen)

{Combustion apparatus with arrangements for burning uncombusted material from primary combustion (combustion apparatus characterised by the combination of two or more combustion chambers F23C 6/00; the primary combustion being pulverulent fuel F23C 9/003)}

Definition statement

This place covers:

Combustion apparatus with arrangements for burning uncombusted material from primary combustion.

Special rules of classification

F23B 5/00 - F23B 5/04 are not used anymore for classification, please refer to groups F23B 10/00 - F23B 99/00 instead.

F23B 7/00 (Frozen)

{Combustion techniques; Other solid-fuel combustion apparatus}

Definition statement

This place covers:

Combustion techniques; Other solid-fuel combustion apparatus.

Special rules of classification

F23B 7/00 - F23B 7/007 are not used anymore for classification, please refer to groups F23B 10/00 - F23B 99/00 instead.

F23B 10/00

Combustion apparatus characterised by the combination of two or more combustion chambers

Definition statement

This place covers:

Combustion apparatus characterised by the combination of two or more combustion chambers.

References

Informative references

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

Combustion methods including secondary combustion in the same combustion chamber	F23B 90/04

F23B 10/02

including separate secondary combustion chambers

Definition statement

This place covers:

Combustion apparatus including two or more combustion chambers in which one of the combustion chambers works as a secondary combustion chamber.

Combustion apparatus including two or more physically separated combustion zones, e.g. by a perforated partition wall in a single enclosure in which one of the combustion zones works as a secondary combustion chamber.

References

Informative references

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

Combustion apparatus using fluent fuel with two or more combustion chambers in series connection	F23C 6/04
Waste or low grade fuel incinerators with separate secondary combustion chamber	F23G 5/16
Combustion methods or apparatus adapted for combustion of waste gases or noxious gases, e.g. exhaust gases	F23G 7/06

F23B 20/00

Combustion apparatus specially adapted for portability or transportability

References

Informative references

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

Portable or movable incinerators for waste	F23G 5/40

F23B 30/00

Combustion apparatus with driven means for agitating the burning fuel; Combustion apparatus with driven means for advancing the burning fuel through the combustion chamber

Definition statement

This place covers:

Combustion apparatus using, for example, rotary, vibrating or travelling grates, reciprocating bars or pushers, rocking bars, screw conveyors or any other means located inside the combustion chamber for agitating or advancing the fuel.

References

Informative references

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

Combustion grates or details of grates per se	F23H

F23B 30/04

with fuel-supporting surfaces that are rotatable around a horizontal or inclined axis and support the fuel on their inside, e.g. cylindrical grates

References

Informative references

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

Waste incinerators having rotating drums	F23G 5/20
Revolving cylindrical grates per se	F23H 9/02

F23B 30/08

with fuel-supporting surfaces that move through the combustion zone, e.g. with chain grates

References

Informative references

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

Travelling grates per se	F23H 11/00

F23B 30/10

with fuel-supporting surfaces having fuel advancing elements that are movable, but remain essentially in the same place, e.g. with rollers or reciprocating grate bars

References

Informative references

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

Grates with movable bars per se	F23H 7/00, F23H 9/00

F23B 40/00

Combustion apparatus with driven means for feeding fuel into the combustion chamber

Definition statement

This place covers:

Combustion apparatus using, for example, throwing devices, reciprocating pushers, screw conveyors or other driven means located outside the combustion chamber for supplying fuel directly into the combustion chamber.

References

Informative references

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

Combustion apparatus wherein the driven means, located outside the combustion chamber, advance the fuel only up to a location above the burning bed, from where it proceeds by gravity, e.g. on a slide or chute	F23B 50/12

F23B 40/02

the fuel being fed by scattering over the fuel-supporting surface

References

Informative references

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

Pneumatic feeding arrangements per se	F23K 3/02
Spreader stokers per se	F23K 3/18

F23B 40/04

the fuel being fed from below through an opening in the fuel-supporting surface

References

Informative references

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

Under-feed arrangements per se	F23K 3/10

F23B 50/00

Combustion apparatus in which the fuel is fed into or through the combustion zone by gravity, e.g. from a fuel storage situated above the combustion zone

Definition statement

This place covers:

Combustion apparatus using gravity as sole means for feeding the fuel into the combustion zone.

References

Informative references

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

Over-feed arrangements per se	F23K 3/16
Stoves with fuel storage in hoppers	F24B 1/08, F24B 1/16

F23B 60/00

Combustion apparatus in which the fuel burns essentially without moving

Definition statement

This place covers:

Combustion apparatus wherein the fuel is loaded on a grate or on a support on which it rests till complete exhaustion without further move or agitation.

F23B 70/00

Combustion apparatus characterised by means for returning solid combustion residues to the combustion chamber

Definition statement

This place covers:

Combustion apparatus wherein solid combustion residues, e.g. fly ash or ashes, are returned to the combustion chamber for complete burning.

References

Informative references

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

Fluidised bed combustors for solid fuels	F23C 10/002

F23B 80/00

Combustion apparatus characterised by means creating a distinct flow path for flue gases or for non-combusted gases given off by the fuel

Definition statement

This place covers:

Combustion apparatus having either means guiding the flue gas along specific path, e.g. for increasing heat transfer to the heat recovery means or creating longer permanence time of the gases in the combustion chamber, or for flue gas recirculation.

References

Informative references

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

Devices for conducting smoke or fumes per se	F23J 11/00
Flue gas circulation on or around stoves	F24B 5/00

F23B 80/04

by means for guiding the flow of flue gases, e.g. baffles

References

Informative references

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

Baffles or deflectors for combustion products per se	F23M 9/00

F23B 90/00

Combustion methods not related to a particular type of apparatus

Definition statement

This place covers:

Methods for starting the combustion, for staged combustion, i.e. a first combustion in a oxidant deficient atmosphere followed by secondary combustion in oxidant rich atmosphere, or for catalytic combustion.

F23B 90/02

Start-up techniques

References

Informative references

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

Controlling combustion	F23N
Ignition in general	F23Q

F23B 90/04

including secondary combustion (in separate combustion chambers F23B 10/02)

References

Limiting references

This place does not cover:

Combustion apparatus including separate secondary combustion chambers	F23B 10/02

Informative references

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

Waste or low-grade fuel incinerators with secondary combustion	F23G 5/14
Combustion methods or apparatus adapted for combustion of waste gases or noxious gases, e.g. exhaust gases	F23G 7/06
Supplying secondary air	F23L 9/00

F23B 90/06

the primary combustion being a gasification or pyrolysis in a reductive atmosphere

Definition statement

This place covers:

Among combustion methods including secondary combustion, those involving gasification or pyrolysis in a reductive atmosphere in the primary zone, and, involving combustion in an oxidative atmosphere in the secondary zone.

References

Informative references

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

Destructive distillation of carbonaceous materials	C10B 53/00

Combustion methods or apparatus adapted for waste or low grade fuel including pyrolising or gasifying as pretreatment	F23G 5/027

F23B 90/08

in the presence of catalytic material

References

Informative references

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

Combustion apparatus using fluent fuel in which combustion takes place in the presence of catalytic material	F23C 13/00
Combustion methods or apparatus adapted for combustion of waste gases or noxious gases, e.g. exhaust gases, in which combustion takes place in the presence of catalytic material	F23G 7/07