

## F23R

**GENERATING COMBUSTION PRODUCTS OF HIGH PRESSURE OR HIGH VELOCITY, e.g. GAS-TURBINE COMBUSTION CHAMBERS (fluidised bed combustion apparatus specially adapted for operation at superatmospheric pressures [F23C 10/16](#))**

### Definition statement

*This place covers:*

Combustion chambers that are specially adapted for generation of gaseous combustion products of high pressure or high velocity, and therefore suitable for use as a source of motive power rather than merely a source of heat. Examples of such special adaptations are:

- Specialised configuration in order to be incorporated in a power plant, for example as a combustion chamber between the compressor stage and the turbine stage of a gas turbine plant, or as an afterburner in a jet engine;
- Specialised construction for tolerating high temperatures, for example film cooling or diffusion cooling;
- Specialised arrangements for supplying combustion air, cooling air or dilution air;
- Specialised arrangements for fuel injection.

Methods of combustion in combustion chambers that are specially adapted for generation of combustion products of high pressure or high velocity.

### Relationships with other classification places

This subclass is to be seen as an application place in relation to the function-oriented aspects covered by other subclasses of [F23](#). If a method or apparatus is of general interest for combustion it should be classified in other subclasses of [F23](#), for example subclasses [F23C](#), methods or apparatus for combustion using fluent fuel and [F23D](#), burners. If a detail is of general interest for combustion apparatus it should also be classified in other subclasses of [F23](#), for example subclasses [F23K](#), feeding fuel to combustion apparatus or [F23N](#), regulating or controlling combustion. It is sometimes difficult to decide whether an apparatus or a detail is specially adapted or not. In doubtful situations classification should therefore be made in both this subclass and other subclasses of [F23](#).

This subclass covers the configuration of single combustion chambers or flame tubes, or the mutual, e.g. annular arrangement of several combustion chambers or flame tubes. The incorporation or arrangement of combustion chambers within a power plant is classified in the place for the power plant as a whole, for example in subclasses [F02C](#), gas turbine plants or [F02K](#), jet propulsion plants.

When the control of the combustion is integrated in the control system of an entire power plant it is classified in the place for the control system as a whole, for example in groups [F02C 9/00](#) or [F02K 3/08](#).

### References

#### Limiting references

*This place does not cover:*

|  |                            |
|--|----------------------------|
| Fluidised bed combustion chambers specially adapted for operation at super-atmospheric pressures | <a href="#">F23C 10/16</a> |
|--|----------------------------|

**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:

|   |   |
|---|---|
| Combined gas turbine and steam turbine plants   | <a href="#">F01K 23/00</a>  |
| Gas turbine plants  | <a href="#">F02C</a> , <a href="#">F02C 3/14</a> ,<br><a href="#">F02C 5/02</a> |
| Combustion-product positive-displacement engine plants  | <a href="#">F02G</a>  |
| Jet-propulsion plants   | <a href="#">F02K</a> , <a href="#">F02K 3/10</a>                                |
| Combustion chambers for rocket engine plants, i.e. plants carrying both fuel and oxidant therefor | <a href="#">F02K 9/00</a>   |
| Starting of engines by supplying pressure fluid generated directly by combustion                  | <a href="#">F02N 9/02</a>   |

**Informative references**

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

|   |  |
|---|--|
| Generation of pressure gas by chemical means  | <a href="#">C06D 5/00</a>                        |
| Gas turbines  | <a href="#">F01D</a>                             |
| Combustion chambers for internal combustion engines, combustion in internal combustion engines            | <a href="#">F02B</a>                             |
| Cooling of gas turbine plants   | <a href="#">F02C 7/12</a>                        |
| Mounting or supporting of gas turbine plants, accommodating heat expansion or creep in gas turbine plants | <a href="#">F02C 7/20</a>                        |
| Arrangement of seals in gas turbine plants  | <a href="#">F02C 7/28</a>                        |
| Cylinders for combustion engines  | <a href="#">F02F 1/00</a>                        |
| Supplying combustion engines in general with combustible mixtures or constituents thereof                 | <a href="#">F02M</a>                             |
| Steam generation using combustion under pressure substantially exceeding atmospheric pressure             | <a href="#">F22B 1/22</a>                        |
| Methods or apparatus for combustion using fluent fuel in general  | <a href="#">F23C</a>                             |
| Air supply to combustion chambers in general  | <a href="#">F23C 7/00</a> , <a href="#">F23L</a> |
| Burners in general  | <a href="#">F23D</a>                             |
| Feeding fuel to combustion apparatus in general   | <a href="#">F23K</a>                             |
| Details of combustion chambers in general   | <a href="#">F23M</a>                             |
| E.g. walls  | <a href="#">F23M 5/00</a>                        |
| Regulating or controlling combustion in general   | <a href="#">F23N</a>                             |
| Igniting  | <a href="#">F23Q</a>                             |

**Special rules of classification**

In this subclass methods are classified in the groups that cover the apparatus used.

If the invention deals also with methods of controlling the combustion process, then classification in [F23N](#) and/or [F23N](#) shall be considered. In this case, use also code [F23N 2241/20](#).

When classifying in this subclass, add also codes [F23R 2900/00001-F23R 2900/03343](#).

## 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   |
| 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 expression "secondary air" covers "tertiary air" etc.   |
| 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. A burner includes means for feeding air that are arranged in immediate connection with a fuel feeding conduit, for example concentric with it. |
| Combustion         | the direct combination of oxygen gas, e.g. in air, and a burnable substance   |
| 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 a combustion apparatus where the reaction takes place between air and fuel  |
| Flame tube         | The portion of a combustion chamber downstream of the zone where fuel and primary air are mixed.  |
| Fuel               | any combustible material that can be burned, regardless of whether the main purpose of burning it is for releasing energy therefrom or for disposing of it or rendering it less harmful   |
| Pilot flame        | a small flame that is lit or kept alight in order to provide ignition to a more powerful burner   |
| Retention flame    | a small flame that is kept alight in order to maintain the uninterrupted operation of a more powerful burner  |
| Torch              | a burner fired with fuel gas and oxygen and specially adapted to apply heat to a workpiece, for example for use in welding, cutting or brazing  |

## F23R 3/00

### Continuous combustion chambers using liquid or gaseous fuel

#### Definition statement

*This place covers:*

Continuous combustion chambers using liquid or gaseous fuel.

#### References

##### Informative references

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

|                                |                            |
|--------------------------------|----------------------------|
| Ignition in gas turbine plants | <a href="#">F02C 7/264</a> |
| Burners                        | <a href="#">F23D</a>       |

|  |                              |
|--|------------------------------|
| Cooling burner parts in liquid fuel burners  | <a href="#">F23D 11/36</a>   |
| Cooling burner parts in gaseous fuel burners | <a href="#">F23D 14/78</a>   |
| Indexing Code for burner cooling in general  | <a href="#">F23D 2214/00</a> |
| Pilot flame igniters                         | <a href="#">F23Q 9/00</a>    |

## F23R 3/002

{Wall structures ([F23R 3/02](#) and [F23R 3/007](#) take precedence)}

### References

#### Limiting references

*This place does not cover:*

|  |                            |
|--|----------------------------|
| Combustion chambers constructed mainly of ceramic components           | <a href="#">F23R 3/007</a> |
| Combustion chambers characterised by the air or gas flow configuration | <a href="#">F23R 3/02</a>  |

## F23R 3/02

characterised by the air-flow or gas-flow configuration (reverse- flow combustion chambers [F23R 3/54](#); cyclone or vortex type combustion chambers [F23R 3/58](#))

### References

#### Limiting references

*This place does not cover:*

|  |                           |
|--|---------------------------|
| Reverse-flow combustion chambers           | <a href="#">F23R 3/54</a> |
| Cyclone or vortex type combustion chambers | <a href="#">F23R 3/58</a> |

## F23R 3/10

for primary air ([F23R 3/06](#), [F23R 3/045](#) take precedence)

### References

#### Limiting references

*This place does not cover:*

|   |                            |
|---|----------------------------|
| Air inlet arrangements using pipes            | <a href="#">F23R 3/045</a> |
| Arrangement of apertures along the flame tube | <a href="#">F23R 3/06</a>  |

**F23R 3/286**

{having fuel-air premixing devices ([F23R 3/30](#) takes precedence)}

**References****Limiting references**

*This place does not cover:*

|  |                           |
|--|---------------------------|
| Combustion chambers wherein the fuel supply means comprise fuel pre-vaporising devices | <a href="#">F23R 3/30</a> |
|--|---------------------------|

**F23R 3/44**

Combustion chambers comprising a {single} tubular flame tube within a tubular casing (reverse-flow combustion chambers [F23R 3/54](#))

**References****Limiting references**

*This place does not cover:*

|   |                           |
|---|---------------------------|
| Multiple tubular flame tubes within a common casing | <a href="#">F23R 3/46</a> |
| Annular combustion chambers                         | <a href="#">F23R 3/50</a> |
| Reverse-flow combustion chambers                    | <a href="#">F23R 3/54</a> |

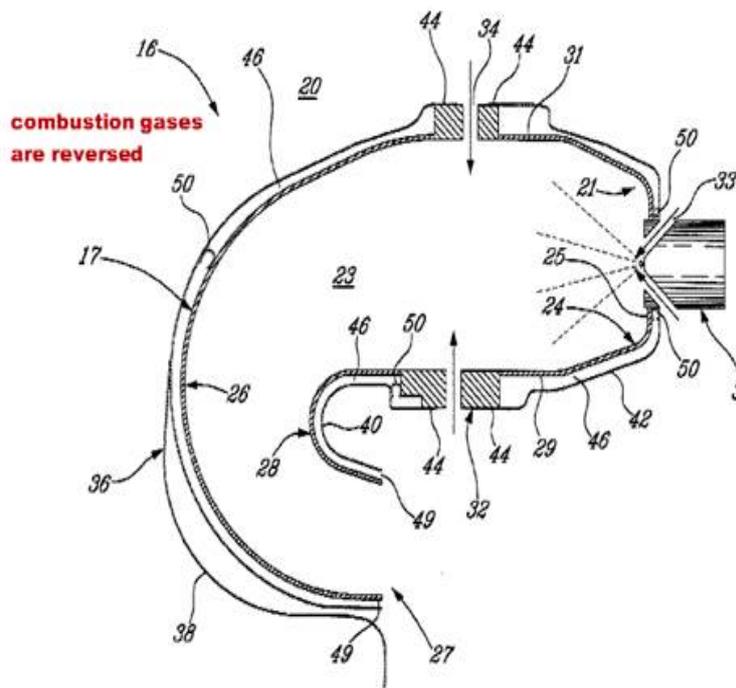
## F23R 3/54

### Reverse-flow combustion chambers

#### Definition statement

*This place covers:*

Combustion gases are reversed in the combustor.



#### References

##### Informative references

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

|  |                           |
|--|---------------------------|
| Combustion chambers comprising a {single} tubular flame tube within a tubular casing   | <a href="#">F23R 3/44</a> |
| Combustion chambers comprising an annular arrangement of {several essentially tubular} flame tubes within a common annular casing or within individual casings | <a href="#">F23R 3/46</a> |

## F23R 5/00

### Continuous combustion chambers using solid or pulverulent fuel

#### Definition statement

*This place covers:*

High pressure or high velocity combustion chambers using solid, e.g. lumps of wood, or pulverulent fuel . e.g. pulverized coal or biomass.

## **F23R 7/00**

### **Intermittent or explosive combustion chambers**

#### **Definition statement**

*This place covers:*

High pressure or high velocity combustion chambers wherein the combustion is pulsating or resonating type, e.g. pulse detonation