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<th>Class</th>
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<td>F23D</td>
<td>BURNERS (generating combustion products of high pressure or high velocity F23R)</td>
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**WARNING**

In this subclass non-limiting references (in the sense of paragraph 39 of the Guide to the IPC) may still be displayed in the scheme.

| 1/00 | Burners for combustion of pulverulent fuel (disposition of burners F23C) |
|      | . . . (burning a mixture of pulverulent fuel delivered as a slurry, i.e. comprising a carrying liquid (preparing slurries F23K 1/02)) |
| 1/02 | . . . Vortex burners, e.g. for cyclone-type combustion apparatus |
| 1/04 | . . . Burners producing cylindrical flames without centrifugal action |
| 1/06 | . . . Burners producing sheet flames |

**Combustion of a liquid**

| 3/00 | Burners using capillary action |
| 3/02 | . . . Wick burners |
| 3/04 | . . . with flame spreaders (F23D 3/12 takes precedence) |
| 3/06 | . . . Inverted wick burners, e.g. for illumination |
| 3/08 | . . . characterised by shape, construction, or material, of wick |
| 3/10 | . . . Blue-flame burners |
| 3/12 | . . . with flame spreaders |
| 3/14 | . . . with mixing of air and fuel vapour in a chamber before the flame |
| 3/16 | . . . using candles (candles per se C11C) |
| 3/18 | . . . Details of wick burners |
| 3/20 | . . . Flame spreaders |
| 3/22 | . . . Devices for mixing evaporated fuel with air |
| 3/24 | . . . Carriers for wicks |
| 3/26 | . . . . . . Safety devices thereon |
| 3/28 | . . . . . . Wick-adjusting devices |
| 3/30 | . . . . . . directly engaging with the wick |
| 3/32 | . . . . . . engaging with a tube carrying the wick |
| 3/34 | . . . . . . Wick stop devices; Wick-fixing devices |
| 3/36 | . . . . . . Devices for trimming wicks |
| 3/38 | . . . . . . Devices for replacement of wicks |
| 3/40 | . . . the capillary action taking place in one or more rigid porous bodies |

| 5/00 | Burners in which liquid fuel evaporates in the combustion space, with or without chemical conversion of evaporated fuel |
| 5/02 | . . . the liquid forming a pool, e.g. bowl-type evaporators, dish-type evaporators |

| 5/04 | . . . Pot-type evaporators, i.e. using a partially-enclosed combustion space |
| 5/045 | . . . . . (with forced draft) |
| 5/06 | . . . the liquid forming a film on one or more plane or convex surfaces |
| 5/08 | . . . on cascaded surfaces |
| 5/10 | . . . on grids |
| 5/12 | . . . Details |
| 5/123 | . . . (Inserts promoting evaporation) |
| 5/126 | . . . (Catalytic elements) |
| 5/14 | . . . Maintaining predetermined amount of fuel in evaporator |
| 5/16 | . . . Safety devices |
| 5/18 | . . . Preheating devices |

| 7/00 | Burners in which drops of liquid fuel impinge on a surface |

| 9/00 | Burners in which a stream of liquid fuel impinges intermittently on a hot surface |

| 11/00 | Burners using a direct spraying action of liquid droplets or vapourised liquid into the combustion space (spraying in general B05B, B05D) |
| 11/001 | . . . [spraying nozzle combined with forced draft fan in one unit (nozzles per se F23D 11/38)] |
| 11/002 | . . . [spraying nozzle arranged within furnace openings (refractory bricks or blocks specially shaped for burner openings F23M 5/025)] |
| 11/004 | . . . . . . [for producing radiant heat) |
| 11/005 | . . . . . . [with combinations of different spraying or vaporising means) |
| 11/007 | . . . . . . [combination of means covered by sub-groups F23D 11/10 and F23D 11/24] |
| 11/008 | . . . . . . [combination of means covered by sub-groups F23D 5/00 and F23D 11/00] |
| 11/02 | . . . the combustion space being a chamber substantially at atmospheric pressure |
| 11/04 | . . . the spraying action being obtained by centrifugal action |
| 11/06 | . . . using a horizontal shaft |
| 11/08 | . . . using a vertical shaft |
| 11/10 | . . . the spraying being induced by a gaseous medium, e.g. water vapour |
Combustion of a liquid

14/00  Burners for combustion of a gas, e.g. of a gas stored under pressure as a liquid

14/02  Premix gas burners, i.e. in which gaseous fuel is mixed with combustion air upstream of the combustion zone

14/04  induction type, e.g. Bunsen burner ((atmospheric or aerated gas burner))

14/045  (with a plurality of burner bars assembled together, e.g. in a grid-like arrangement)

14/06  with radial outlets at the burner head

14/065  (with injector axis inclined to the burner head axis)

14/08  with axial outlets at the burner head

14/085  (with injector axis inclined to the burner head axis)

14/10  with elongated tubular burner head

14/105  (with injector axis parallel to the burner head axis)

14/12  Radiant burners

14/125  (heating a wall surface to incandescence)

14/14  using screens or perforated plates

14/145  (the burner plate being a screen)

14/16  using permeable blocks

14/18  using catalysis for flameless combustion

14/20  Non-premix gas burners, i.e. in which gaseous fuel is mixed with combustion air on arrival at the combustion zone (F23D 14/30 - F23D 14/44 take precedence)

14/22  with separate air and gas feed ducts, e.g. with ducts running parallel or crossing each other

14/24  at least one of the fluids being submitted to a swirling motion

14/26  with provision for a retention flame (pilot flame igniters F23Q 9/00)

14/28  in association with a gaseous fuel source, e.g. acetylene generator, or a container for liquefied gas

14/30  Inverted burners, e.g. for illumination

14/32  using a mixture of gaseous fuel and pure oxygen or oxygen-enriched air (F23D 14/38 takes precedence)

14/34  Burners specially adapted for use with means for pressurising the gaseous fuel or the combustion air (F23D 14/38 takes precedence)

14/36  in which the compressor and burner form a single unit

14/38  Torches, e.g. for cutting, brazing, welding or heating (nozzles for torches F23D 14/52)

14/40  for welding (F23D 14/44 takes precedence)

14/42  for cutting (F23D 14/44 takes precedence)

14/44  for use under water

14/46  Details (e.g. noise reduction means)

14/465  for torches (F23D 14/52 takes precedence)

14/48  Nozzles (injectors for mixing devices F23D 14/64); for spraying or coating B05B

14/50  Cleaning devices therefor

14/52  for torches; for blow-pipes

14/54  for cutting or welding metal

14/56  for spreading the flame over an area, e.g. for desurfacing of solid material, for surface hardening, for heating workpieces, (scarfing by applying flames B23K 7/00)

14/58  characterised by the shape or arrangement of the outlet or outlets from the nozzle, e.g. of annular configuration

14/583  (of elongated shape, e.g. slits)
Combustion of a liquid fuel

14/586 . . . . {formed by a set of sheets, strips, ribbons or the like}
14/60 . . Devices for simultaneous control of gas and combustion air (regulation of combustion in general F23N)
14/62 . . Mixing devices; Mixing tubes
14/64 . . . with injectors
14/66 . . Preheating the combustion air or gas
14/68 . . Treating the combustion air or gas, e.g. by filtering, by moistening (in general B01)
14/70 . . Baffles or like flow-disturbing devices
14/72 . . Safety devices, e.g. operative in case of failure of gas supply (protection or supervision of pipe-line systems F17D 5/00)
14/725 . . . [Protection against flame failure by using flame detection devices (pilot flame igniters with interlock with main fuel supply F23Q 9/08)]
14/74 . . Preventing flame lift-off (F23D 14/70 takes precedence)
14/76 . . Protecting flame and burner parts
14/78 . . Cooling burner parts
14/80 . . . Selection of a non-toxic gas
14/82 . . . Preventing flashback or blowback (F23D 14/70 takes precedence; [by use of a retention flame F23D 14/26]; in gas feed lines A62C 4/02)
14/825 . . . . . [using valves]
14/84 . . . Flame spreading or otherwise shaping (F23D 14/70 takes precedence)

Other burners
17/00 Burners for combustion conjointly or alternatively of gaseous or liquid or pulverulent fuel
17/002 . . . [gaseous or liquid fuel]
17/005 . . . [gaseous or pulverulent fuel]
17/007 . . . [liquid or pulverulent fuel]
23/00 Assemblies of two or more burners (gas burners with provision for a retention flame F23D 14/26; disposition of burners F23C; for industrial furnaces F27)
91/00 {Burners specially adapted for specific applications, not otherwise provided for}

NOTE
{Combinations of spraying or vapourising means covered by sub-groups F23D 5/00 and F23D 91/00 are classified in F23D 11/008}
91/02 . . . [for use in particular heating operations]
91/04 . . . . . [for heating liquids, e.g. for vapourising or concentrating]
99/00 Subject matter not provided for in other groups of this subclass

2200/00 Burners for fluid fuel
2201/00 Burners adapted for particulate solid or pulverulent fuels
2201/10 . . Nozzle tips
2201/101 . . tiltable
2201/20 . . Fuel flow guiding devices
2201/30. . . Wear protection
2202/00 Liquid fuel burners
2203/00 Gaseous fuel burners
2203/002 . . . . Radiant burner mixing tubes
2203/005 . . . . Radiant burner heads
2203/007 . . . . Mixing tubes, air supply regulation
2203/10 . . . . Flame diffusing means
2203/101 . . . . characterised by surface shape
2203/1012 . . . . tubular
2203/1015 . . . . spherical
2203/1017 . . . . curved
2203/102 . . . . using perforated plates
2203/1023 . . . . . with specific free passage areas
2203/1026 . . . . . . with slotshaped openings
2203/103 . . . . . using screens
2203/104 . . . . . Grids, e.g. honeycomb grids
2203/105 . . . . Porous plates
2203/1055 . . . . . with a specific void range
2203/106 . . . . Assemblies of different layers
2203/107 . . . . coated with catalysts
2203/108 . . . . with stacked sheets or strips forming the outlets
2204/00 Burners adapted for simultaneous or alternative combustion having more than one fuel supply
2204/10 . . . . gaseous and liquid fuel
2204/20 . . . . gaseous and pulverulent fuel
2204/30 . . . . liquid and pulverulent fuel
2205/00 Assemblies of two or more burners, irrespective of fuel type
2206/00 Burners for specific applications
2206/0005 . . . . Liquid fuel burners adapted for use in locomotives
2206/001 . . . . Liquid fuel burners adapted for use in automobile steam boilers
2206/0015 . . . . Gas burners for use in retort furnaces
2206/0021 . . . . Gas burners for use in furnaces of the reverberatory, muffle or crucible type
2206/0026 . . . . Vapour burners adapted for use in illumination devices
2206/0031 . . . . Liquid fuel burners adapted for use in welding lamps
2206/0036 . . . . . Liquid fuel burners adapted for use in welding and cutting metals
2206/0042 . . . . Vapour burners for illumination by radiation, with vapouriser heated by an auxiliary flame
2206/0047 . . . . Vapour burners for illumination by radiation, with vapouriser heated by the main flame
2206/0052 . . . . Vapour burners for illumination by radiation, with vapouriser heated by conduction
2206/0057 . . . . Liquid fuel burners adapted for use in illumination and heating
2206/0063 . . . . . Catalytic burners adapted for use in illumination and heating
2206/0068 . . . . . Gas burners for illumination with slot type nozzles
2206/0073 . . . . . Gas burners for illumination with Argand nozzles
2206/0078 . . . . . Gas burners adapted for use in lamps with preheated air
2206/0084 . . . . . Gas burners adapted for use in ceiling and wagon lamps
2206/0089 . . . . . Gas burners for illumination using acetylene as a fuel
2207/00 Ignition devices associated with burner

2208/00 Control devices associated with burners

2209/00 Safety arrangements

2210/00 Noise abatement

2211/00 Thermal dilatation prevention or compensation

2212/00 Burner material specifications

2213/00 Burner manufacture specifications

2214/00 Cooling

2700/00 TBD

2700/001 Air supply for wick burners

2700/002 Wick burners without flame spreaders or burner hood

2700/003 Wick burners with flame spreaders or burner hood

2700/004 Inverted wick burners, wick burners using preheated air

2700/005 Wick burners using alcohol as a fuel

2700/006 Wick burners using oil as a fuel

2700/009 Details of blue flame wick burners

2700/011 Blue flame burners without flame spreader or burner hood

2700/012 Blue flame burners with flame spreader or burner hood without a bead at the wick carrying tube

2700/013 Blue flame burners with flame spreader or burner hood with a bead at the wick carrying tube

2700/014 Blue flame burners with flame on one side only without a bead at the wick carrying tube

2700/015 Tubes carrying the wick

2700/016 Safety devices for wick carrying tubes

2700/017 Wick adjusting devices directly engaging the wick

2700/018 Wick adjusting devices engaging the tube carrying the wick

2700/019 Wick stop devices and wick fixing devices

2700/02 Devices for mounting the wick to the carrier

2700/021 Burners in which the gas produced in the wick is not burned instantaneously

2700/022 Burners using carburetted gas

2700/023 Gasifying and evaporating devices

2700/024 Nozzles and cleaning devices therefor

2700/025 Mixing tubes and burner heads

2700/026 Preheating devices, starting devices

2700/027 Vaporisers with devices for controlling the feeding of the fuel

2700/03 Alcohol vapour burners

2700/031 Vapour burners where the vaporiser is heated by an auxiliary flame

2700/032 Vapour burners where the vaporiser is heated by the main flame itself

2700/033 Vapour burners where the vaporiser is heated by conduction

2900/00 Special features of, or arrangements for burners using fluid fuels or solid fuels suspended in a carrier gas

2900/0001 Local catalytic coatings applied to burner surfaces

2900/0002 Cleaning burner parts, e.g. burner tips

2900/0003 Fuel or fuel-air mixtures flow distribution devices upstream of the outlet

2900/0004 Burners specially adapted for generating high luminous flames, e.g. yellow for fuel-rich mixtures

2900/0006 Liquid fuel burners using pure oxygen or O_2 enriched air as oxidant for gaseous fuels

2900/0008 Burner assemblies with diffusion and premix modes, i.e. dual mode burners

2900/00011 Burner with means for propagating the flames along a wall surface

2900/00012 Liquid or gas fuel burners with flames spread over a flat surface, either premix or non-premix type, e.g. "Flächenbrenner"

2900/00013 with means for spreading the flame in a fan or fishtail shape over a melting bath

2900/00014 Pilot burners specially adapted for ignition of main burners in furnaces or gas turbines

2900/00015 Pilot burners specially adapted for low load or transient conditions, e.g. for increasing stability

2900/00016 Preventing or reducing deposit build-up on burner parts, e.g. from carbon

2900/00017 Assembled burner modules

2900/00018 Means for protecting parts of the burner, e.g. ceramic lining outside of the flame tube

2900/00019 Outlet manufactured from knitted fibres

2900/00010 Pulverised solid fuel burner with means for swirling the fuel-air mixture

2900/00011 Catalytic wick burners

2900/00012 Wick made of specific material, e.g. ceramic

2900/000501 Burner using gel type fuel

2900/000502 Use of porous members to convert liquid fuel into vapor

2900/00011 Impinging-jet injectors or jet impinging on a surface

2900/00011 Liquid fuel burners with more than one nozzle

2900/000111 Pulverising gas flow impinging on fuel from pre-filming surface, e.g. lip atomizers

2900/00011 Flame intercepting baffles forming part of burner head

2900/00011 Airflow diaphragms at burner nozzle

2900/000113 Flame surrounding tubes in front of burner nozzle

2900/00014 Special features of gas burners

2900/000140 Sealing or support of burner plate borders

2900/000141 of premix or non premix types, specially adapted for the combustion of low heating value [LHV] gas

2900/000142 with more than one nozzle
2900/14004 . . with radially extending gas distribution spokes
2900/14005 . . Rotary gas burner
2900/14021 . . Premixing burners with swirling or vortices
 creating means for fuel or air
2900/14041 . . Segmented or straight line assembly of burner
 bars
2900/14042 . . Star shaped assembly of burner bars or arms
2900/14061 . . for cooking ranges having a coated burner cap
2900/14062 . . for cooking ranges having multiple flame rings
2900/14063 . . for cooking ranges having one flame ring fed by
 multiple venturis
2900/14064 . . Burner heads of non circular shape
2900/1412 . . for radiant burners
2900/14121 . . with radiation intensifying means
2900/14122 . . with extra radiation grids, e.g. strips or rods
2900/14123 . . with radiation intensifying perforated plates
2900/14124 . . cooperating with refractory wall surfaces
2900/14125 . . with extra radiation screens, e.g. wires, threads
 or gauzes
2900/14181 . . Catalytic type with carbon containing radiating
 surface
2900/14241 . . Post-mixing with swirling means
2900/14381 . . Single operating member opening and closing
 fuel and oxidant supply valves in torches
2900/14481 . . Burner nozzles incorporating flow adjusting
 means
2900/14482 . . Burner nozzles incorporating a fluidic oscillator
2900/14581 . . with outlets consisting of a bed of irregular
 particles, e.g. glass
2900/14582 . . with outlets consisting of layers of spherical
 particles
2900/14641 . . with gas distribution manifolds or bars provided
 with a plurality of nozzles
2900/14642 . . with jet mixers with more than one gas injection
 nozzles or orifices for a single mixing tube
2900/14681 . . Adding steam or water vapor to primary or
 secondary combustion air
2900/14701 . . Swirling means inside the mixing tube or
 chamber to improve premixing
2900/21 . . Burners specially adapted for a particular use
2900/21001 . . for use in blast furnaces
2900/21002 . . for use in car heating systems
2900/21003 . . for heating or re-burning air or gas in a duct
2900/21004 . . for use in gas fed fireplaces
2900/21005 . . for flame deposition, e.g. FHD, flame hydrolysis
 deposition
2900/21006 . . for heating a catalyst in a car
2900/21007 . . for producing soot, e.g. nanoparticle soot