

# CPC COOPERATIVE PATENT CLASSIFICATION

## F MECHANICAL ENGINEERING; LIGHTING; HEATING; WEAPONS; BLASTING (NOTE omitted)

### LIGHTING; HEATING

## F23 COMBUSTION APPARATUS; COMBUSTION PROCESSES (NOTE omitted)

### F23D BURNERS (generating combustion products of high pressure or high velocity [F23R](#))

#### 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.

<b>1/00</b>	<b>Burners for combustion of pulverulent fuel</b> (disposition of burners <a href="#">F23C</a> )	5/04	. . Pot-type evaporators, i.e. using a partially-enclosed combustion space
1/005	. {burning a mixture of pulverulent fuel delivered as a slurry, i.e. comprising a carrying liquid (preparing slurries <a href="#">F23K 1/02</a> )}	5/045	. . . {with forced draft}
1/02	. Vortex burners, e.g. for cyclone-type combustion apparatus	5/06	. the liquid forming a film on one or more plane or convex surfaces
1/04	. Burners producing cylindrical flames without centrifugal action	5/08	. . on cascaded surfaces
1/06	. Burners producing sheet flames	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
<b>Combustion of a liquid</b>		<b>7/00</b>	<b>Burners in which drops of liquid fuel impinge on a surface</b>
<b>3/00</b>	<b>Burners using capillary action</b>	<b>9/00</b>	<b>Burners in which a stream of liquid fuel impinges intermittently on a hot surface</b>
3/02	. Wick burners	<b>11/00</b>	<b>Burners using a direct spraying action of liquid droplets or vaporised liquid into the combustion space (spraying in general <a href="#">B05B</a>, <a href="#">B05D</a>)</b>
3/04	. . with flame spreaders ( <a href="#">F23D 3/12</a> takes precedence)	11/001	. {spraying nozzle combined with forced draft fan in one unit (nozzles per se <a href="#">F23D 11/38</a> )}
3/06	. . Inverted wick burners, e.g. for illumination	11/002	. {spraying nozzle arranged within furnace openings (refractory bricks or blocks specially shaped for burner openings <a href="#">F23M 5/025</a> )}
3/08	. . characterised by shape, construction, or material, of wick	11/004	. . {for producing radiant heat}
3/10	. . Blue-flame burners	11/005	. {with combinations of different spraying or vaporising means}
3/12	. . . with flame spreaders	11/007	. . {combination of means covered by sub-groups <a href="#">F23D 11/10</a> and <a href="#">F23D 11/24</a> }
3/14	. . . with mixing of air and fuel vapour in a chamber before the flame	11/008	. . {combination of means covered by sub-groups <a href="#">F23D 5/00</a> and <a href="#">F23D 11/00</a> }
3/16	. . using candles ( <a href="#">candles per se C11C</a> )	11/02	. the combustion space being a chamber substantially at atmospheric pressure
3/18	. . Details of wick burners	11/04	. the spraying action being obtained by centrifugal action
3/20	. . . Flame spreaders	11/06	. . using a horizontal shaft
3/22	. . . Devices for mixing evaporated fuel with air	11/08	. . using a vertical shaft
3/24	. . . Carriers for wicks	11/10	. the spraying being induced by a gaseous medium, e.g. water vapour
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		
<b>5/00</b>	<b>Burners in which liquid fuel evaporates in the combustion space, with or without chemical conversion of evaporated fuel</b>		
5/02	. the liquid forming a pool, e.g. bowl-type evaporators, dish-type evaporators		

- 11/101 . . {medium and fuel meeting before the burner outlet}
- 11/102 . . . {in an internal mixing chamber}
- 11/103 . . . . {with means creating a swirl inside the mixing chamber}
- 11/104 . . . {intersecting at a sharp angle, e.g. Y-jet atomiser}
- 11/105 . . . {at least one of the fluids being submitted to a swirling motion}
- 11/106 . . {medium and fuel meeting at the burner outlet}
- 11/107 . . . {at least one of both being subjected to a swirling motion}
- 11/108 . . {medium and fuel intersecting downstream of the burner outlet}
- 11/12 . . characterised by the shape or arrangement of the outlets from the nozzle
- 11/14 . . . with a single outlet, e.g. slit
- 11/16 . . in which an emulsion of water and fuel is sprayed
- 11/18 . . the gaseous medium being water vapour generated at the nozzle
- 11/20 . . . the water vapour being superheated
- 11/22 . . the gaseous medium being vaporised fuel, e.g. for a soldering lamp {, or other gaseous fuel}
- 11/24 . . by pressurisation of the fuel before a nozzle through which it is sprayed by a substantial pressure reduction into a space
- 11/26 . . with provision for varying the rate at which the fuel is sprayed
- 11/28 . . . with flow-back of fuel at the burner, e.g. using by-pass
- 11/30 . . . with return feed of uncombusted sprayed fuel to reservoir
- 11/32 . . by electrostatic means
- 11/34 . . by ultrasonic means {or other kinds of vibrations}
- 11/345 . . {with vibrating atomiser surfaces}
- 11/36 . . Details {, e.g. burner cooling means, noise reduction means}
- 11/38 . . Nozzles (nozzles in general B05B); Cleaning devices therefor
- 11/383 . . . {with swirl means}
- 11/386 . . . {Nozzle cleaning}
- 11/40 . . Mixing tubes {or chambers}; Burner heads
- 11/402 . . . {Mixing chambers downstream of the nozzle}
- 11/404 . . . {Flame tubes (not forming part of the burner F23M 9/06)}
- 11/406 . . . {Flame stabilising means, e.g. flame holders}
- 11/408 . . . {Flow influencing devices in the air tube}
- 11/42 . . Starting devices (igniting F23Q)
- 11/44 . . Preheating devices; Vaporising devices (vaporising devices per se F23K 5/22)
- 11/441 . . . {Vaporizing devices incorporated with burners}
- 11/443 . . . . {heated by the main burner flame}
- 11/445 . . . . . {the flame and the vaporiser not coming into direct contact}
- 11/446 . . . . {heated by an auxiliary flame}
- 11/448 . . . . {heated by electrical means}
- 11/46 . . Devices on the vaporiser for controlling the feeding of the fuel
- 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}

- 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 vaporising 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 vaporising or concentrating}
- 99/00** **Subject matter not provided for in other groups of this subclass**

- 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 vaporiser heated by an auxiliary flame
- 2206/0047 . Vapour burners for illumination by radiation, with vaporiser heated by the main flame
- 2206/0052 . Vapour burners for illumination by radiation, with vaporiser 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

**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

2206/0094	• Gas burners adapted for use in illumination and heating	2700/025	• Mixing tubes and burner heads
2206/10	• Turbines	2700/026	• Preheating devices, starting devices
<b>2207/00</b>	<b>Ignition devices associated with burner</b>	2700/027	• Vaporisers with devices for controlling the feeding of the fuel
<b>2208/00</b>	<b>Control devices associated with burners</b>	2700/03	• Alcohol vapour burners
2208/005	• Controlling air supply in radiant gas burners	2700/031	• Vapour burners where the vaporiser is heated by an auxiliary flame
2208/10	• Sensing devices	2700/032	• Vapour burners where the vaporiser is heated by the main flame itself
<b>2209/00</b>	<b>Safety arrangements</b>	2700/033	• Vapour burners where the vaporiser is heated by conduction
2209/10	• Flame flashback	<b>2900/00</b>	<b>Special features of, or arrangements for burners using fluid fuels or solid fuels suspended in a carrier gas</b>
2209/20	• Flame lift-off / stability	2900/00001	• local catalytic coatings applied to burner surfaces
2209/30	• Purging	2900/00002	• Cleaning burner parts, e.g. burner tips
<b>2210/00</b>	<b>Noise abatement</b>	2900/00003	• Fuel or fuel-air mixtures flow distribution devices upstream of the outlet
2210/101	• using noise dampening material	2900/00004	• Burners specially adapted for generating high luminous flames, e.g. yellow for fuel-rich mixtures
<b>2211/00</b>	<b>Thermal dilatation prevention or compensation</b>	2900/00006	• Liquid fuel burners using pure oxygen or O <sub>2</sub> -enriched air as oxidant ( <a href="#">for gaseous fuels F23D 14/32</a> )
<b>2212/00</b>	<b>Burner material specifications</b>	2900/00008	• Burner assemblies with diffusion and premix modes, i.e. dual mode burners
2212/005	• Radiant gas burners made of specific materials, e.g. rare earths	2900/00011	• Burner with means for propagating the flames along a wall surface
2212/10	• ceramic	2900/00012	• Liquid or gas fuel burners with flames spread over a flat surface, either premix or non-premix type, e.g. "Flächenbrenner"
2212/101	• . . Foam, e.g. reticulated	2900/00013	• . with means for spreading the flame in a fan or fishtail shape over a melting bath
2212/103	• . . Fibres	2900/00014	• Pilot burners specially adapted for ignition of main burners in furnaces or gas turbines
2212/105	• . . Particles	2900/00015	• Pilot burners specially adapted for low load or transient conditions, e.g. for increasing stability
2212/20	• metallic	2900/00016	• Preventing or reducing deposit build-up on burner parts, e.g. from carbon
2212/201	• . . Fibres	2900/00017	• Assembled burner modules
2212/203	• . . Particles	2900/00018	• Means for protecting parts of the burner, e.g. ceramic lining outside of the flame tube
<b>2213/00</b>	<b>Burner manufacture specifications</b>	2900/00019	• Outlet manufactured from knitted fibres
<b>2214/00</b>	<b>Cooling</b>	2900/01001	• Pulverised solid fuel burner with means for swirling the fuel-air mixture
<b>2700/00</b>	<b>TBD</b>	2900/03081	• Catalytic wick burners
2700/001	• Air supply for wick burners	2900/03082	• Wick made of specific material, e.g. ceramic
2700/002	• Wick burners without flame spreaders or burner hood	2900/05001	• Burner using gel type fuel
2700/003	• Wick burners with flame spreaders or burner hood	2900/05002	• Use of porous members to convert liquid fuel into vapor
2700/004	• Inverted wick burners, wick burners using preheated air	2900/11001	• Impinging-jet injectors or jet impinging on a surface
2700/005	• Wick burners using alcohol as a fuel	2900/11002	• Liquid fuel burners with more than one nozzle
2700/006	• Wick burners using oil as a fuel	2900/11101	• Pulverising gas flow impinging on fuel from pre-filming surface, e.g. lip atomizers
2700/009	• Details of blue flame wick burners	2900/11401	• Flame intercepting baffles forming part of burner head
2700/01	• Blue flame burners without flame spreader or burner hood	2900/11402	• Airflow diaphragms at burner nozzle
2700/011	• Blue flame burners with flame spreader or burner hood without a bead at the wick carrying tube	2900/11403	• Flame surrounding tubes in front of burner nozzle
2700/012	• Blue flame burners with flame spreader or burner hood with a bead at the wick carrying tube	2900/14	• Special features of gas burners
2700/013	• Blue flame burners with flame on one side only without a bead at the wick carrying tube	2900/14001	• . Sealing or support of burner plate borders
2700/014	• Blue flame burners with flame on one side only and a bead at the wick carrying tube	2900/14002	• . of premix or non premix types, specially adapted for the combustion of low heating value [LHV] gas
2700/015	• Tubes carrying the wick	2900/14003	• . with more than one nozzle
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		

## F23D

- 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