

# CPC COOPERATIVE PATENT CLASSIFICATION

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

### LIGHTING; HEATING

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

### F23D BURNERS

#### 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> )	5/045	. . . {with forced draft}
1/005	. {burning a mixture of pulverulent fuel delivered as a slurry, i.e. comprising a carrying liquid}	5/06	. the liquid forming a film on one or more plane or convex surfaces
1/02	. Vortex burners, e.g. for cyclone-type combustion apparatus	5/08	. . on cascaded surfaces
1/04	. Burners producing cylindrical flames without centrifugal action	5/10	. . on grids
1/06	. Burners producing sheet flames	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</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 ( <a href="#">nozzles per se 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	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	11/101	. . {medium and fuel meeting before the burner outlet}
3/28	. . . Wick-adjusting devices	11/102	. . . {in an internal mixing chamber}
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		
5/04	. . Pot-type evaporators, i.e. using a partially-enclosed combustion space		

- 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; 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
- 11/441 . . . {Vaporising 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
- 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}
- 14/126 . . {cooperating with refractory wall surfaces}
- 14/14 . . using screens or perforated plates
- 14/145 . . . {combustion being stabilised at a screen or a perforated plate}
- 14/147 . . . {with perforated plates as radiation intensifying means}
- 14/148 . . . {with grids, e.g. strips or rods, as radiation intensifying means}
- 14/149 . . . {with wires, threads or gauzes as radiation intensifying means}
- 14/151 . . {with radiation intensifying means other than screens or perforated plates}
- 14/16 . . using permeable blocks
- 14/18 . . using catalysis for flameless combustion
- 14/181 . . . {with carbon containing radiating surface}
- 14/20 . . Non-premix gas burners, i.e. in which gaseous fuel is mixed with combustion air on arrival at the combustion zone (F23D 14/38 takes 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
- 14/36 . . in which the compressor and burner form a single unit
- 14/38 . . Torches, e.g. for brazing or heating (nozzles F23D 14/48)
- 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
- 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, or for heating workpieces
- 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
- 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, or moistening
- 14/70 . . Baffles or like flow-disturbing devices
- 14/72 . . Safety devices, e.g. operative in case of failure of gas supply
- 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
- 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
- 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](#))**
- 91/00 {Burners specially adapted for specific applications, not otherwise provided for}**
- 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**

**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 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
- 2206/0094 . Gas burners adapted for use in illumination and heating
- 2206/10 . Turbines
- 2207/00 Ignition devices associated with burner**
- 2208/00 Control devices associated with burners**
- 2208/005 . Controlling air supply in radiant gas burners
- 2208/10 . Sensing devices
- 2209/00 Safety arrangements**
- 2209/10 . Flame flashback
- 2209/20 . Flame lift-off / stability
- 2209/30 . Purging
- 2210/00 Noise abatement**

2210/101	. using noise dampening material	2900/14	. Special features of gas burners
<b>2211/00</b>	<b>Thermal dilatation prevention or compensation</b>	2900/14001	. . Sealing or support of burner plate borders
<b>2212/00</b>	<b>Burner material specifications</b>	2900/14002	. . of premix or non premix types, specially adapted for the combustion of low heating value [LHV] gas
2212/005	. Radiant gas burners made of specific materials, e.g. rare earths	2900/14003	. . with more than one nozzle
2212/10	. ceramic	2900/14004	. . with radially extending gas distribution spokes
2212/101	. . Foam, e.g. reticulated	2900/14005	. . Rotary gas burner
2212/103	. . Fibres	2900/14021	. . Premixing burners with swirling or vortices creating means for fuel or air
2212/105	. . Particles	2900/14041	. . Segmented or straight line assembly of burner bars
2212/20	. metallic	2900/14042	. . Star shaped assembly of burner bars or arms
2212/201	. . Fibres	2900/14061	. . for cooking ranges having a coated burner cap
2212/203	. . Particles	2900/14062	. . for cooking ranges having multiple flame rings
<b>2213/00</b>	<b>Burner manufacture specifications</b>	2900/14063	. . for cooking ranges having one flame ring fed by multiple venturis
<b>2214/00</b>	<b>Cooling</b>	2900/14064	. . Burner heads of non circular shape
<b>2900/00</b>	<b>Special features of, or arrangements for burners using fluid fuels or solid fuels suspended in a carrier gas</b>	2900/1412	. . for radiant burners
2900/00001	. local catalytic coatings applied to burner surfaces	2900/14241	. . Post-mixing with swirling means
2900/00002	. Cleaning burner parts, e.g. burner tips	2900/14381	. . Single operating member opening and closing fuel and oxidant supply valves in torches
2900/00003	. Fuel or fuel-air mixtures flow distribution devices upstream of the outlet	2900/14481	. . Burner nozzles incorporating flow adjusting means
2900/00004	. Burners specially adapted for generating high luminous flames, e.g. yellow for fuel-rich mixtures	2900/14482	. . Burner nozzles incorporating a fluidic oscillator
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> )	2900/14581	. . with outlets consisting of a bed of irregular particles, e.g. glass
2900/00008	. Burner assemblies with diffusion and premix modes, i.e. dual mode burners	2900/14582	. . with outlets consisting of layers of spherical particles
2900/00011	. Burner with means for propagating the flames along a wall surface	2900/14641	. . with gas distribution manifolds or bars provided with a plurality of nozzles
2900/00012	. Liquid or gas fuel burners with flames spread over a flat surface, either premix or non-premix type, e.g. "Flächenbrenner"	2900/14642	. . with jet mixers with more than one gas injection nozzles or orifices for a single mixing tube
2900/00013	. . with means for spreading the flame in a fan or fishtail shape over a melting bath	2900/14681	. . Adding steam or water vapor to primary or secondary combustion air
2900/00014	. Pilot burners specially adapted for ignition of main burners in furnaces or gas turbines	2900/14701	. . Swirling means inside the mixing tube or chamber to improve premixing
2900/00015	. Pilot burners specially adapted for low load or transient conditions, e.g. for increasing stability	2900/21	. Burners specially adapted for a particular use
2900/00016	. Preventing or reducing deposit build-up on burner parts, e.g. from carbon	2900/21001	. . for use in blast furnaces
2900/00017	. Assembled burner modules	2900/21002	. . for use in car heating systems
2900/00018	. Means for protecting parts of the burner, e.g. ceramic lining outside of the flame tube	2900/21003	. . for heating or re-burning air or gas in a duct
2900/00019	. Outlet manufactured from knitted fibres	2900/21004	. . for use in gas fed fireplaces
2900/01001	. Pulverised solid fuel burner with means for swirling the fuel-air mixture	2900/21005	. . for flame deposition, e.g. FHD, flame hydrolysis deposition
2900/03081	. Catalytic wick burners	2900/21006	. . for heating a catalyst in a car
2900/03082	. Wick made of specific material, e.g. ceramic	2900/21007	. . for producing soot, e.g. nanoparticle soot
2900/05001	. Burner using gel type fuel	2900/31	. Air supply for wick burners
2900/05002	. Use of porous members to convert liquid fuel into vapor	2900/31001	. Wick burners without flame spreaders or burner hood
2900/11001	. Impinging-jet injectors or jet impinging on a surface	2900/31002	. Wick burners with flame spreaders or burner hood
2900/11002	. Liquid fuel burners with more than one nozzle	2900/31003	. Inverted wick burners, Wick burners using preheated air
2900/11101	. Pulverising gas flow impinging on fuel from pre-filming surface, e.g. lip atomizers	2900/31004	. Wick burners using alcohol as a fuel
2900/11401	. Flame intercepting baffles forming part of burner head	2900/31005	. Wick burners using oil as a fuel
2900/11402	. Airflow diaphragms at burner nozzle	2900/31006	. Details of blue flame wick burners
2900/11403	. Flame surrounding tubes in front of burner nozzle	2900/31007	. Blue flame burners without flame spreader or burner hood
		2900/31008	. Blue flame burners with flame spreader or burner hood without a bead at the wick carrying tube
		2900/31009	. Blue flame burners with flame spreader or burner hood with a bead at the wick carrying tube
		2900/3101	. Blue flame burners with flame on one side only without a bead at the wick carrying tube

## F23D

- 2900/31011 . Blue flame burners with flame on one side only and a bead at the wick carrying tube
- 2900/31012 . Wick adjusting devices directly engaging the wick
- 2900/31013 . Wick adjusting devices engaging the tube carrying the wick
- 2900/31014 . Wick stop devices and wick fixing devices
- 2900/31015 . Devices for mounting the wick to the carrier
- 2900/31016 . Burners in which the gas produced in the wick is not burned instantaneously
- 2900/31017 . Burners using carburetted gas
- 2900/31018 . Nozzles and cleaning devices therefor
- 2900/31019 . Mixing tubes and burner heads
- 2900/3102 . Preheating devices; Starting devices
- 2900/31021 . Vaporisers with devices for controlling the feeding of the fuel
- 2900/31022 . Alcohol vapour burners
- 2900/31023 . Vapour burners where the vaporiser is heated by conduction