

# 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.

1/00	<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
		7/00	<b>Burners in which drops of liquid fuel impinge on a surface</b>
		9/00	<b>Burners in which a stream of liquid fuel impinges intermittently on a hot surface</b>
		11/00	<b>Burners using a direct spraying action of liquid droplets or vaporised liquid into the combustion space</b>
		11/001	. {spraying nozzle combined with forced draft fan in one unit (nozzles per se <a href="#">F23D 11/38</a> )}
		11/002	. {spraying nozzle arranged within furnace openings (refractory bricks or blocks specially shaped for burner openings <a href="#">F23M 5/025</a> )}
		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 <a href="#">F23D 11/10</a> and <a href="#">F23D 11/24</a> }
		11/008	. . {combination of means covered by sub-groups <a href="#">F23D 5/00</a> and <a href="#">F23D 11/00</a> }
		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
		11/101	. . {medium and fuel meeting before the burner outlet}
		11/102	. . . {in an internal mixing chamber}
<b>3/00</b>	<b>Burners using capillary action</b>		
3/02	. Wick burners		
3/04	. . with flame spreaders ( <a href="#">F23D 3/12</a> 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		
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		
<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}

**WARNING**

Group [F23D 11/443](#) is impacted by reclassification into group [F23D 11/445](#). Groups [F23D 11/443](#) and [F23D 11/445](#) should be considered in order to perform a complete search.

- 11/445 . . . . . {the flame and the vaporiser not coming into direct contact}

**WARNING**

Group [F23D 11/445](#) is incomplete pending reclassification of documents from group [F23D 11/443](#).

Groups [F23D 11/443](#) and [F23D 11/445](#) should be considered in order to perform a complete search.

- 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

**WARNING**

Group [F23D 14/12](#) is impacted by reclassification into groups [F23D 14/126](#), [F23D 14/147](#), [F23D 14/148](#), [F23D 14/149](#) and [F23D 14/151](#).

All groups listed in this Warning should be considered in order to perform a complete search.

- 14/125 . . {heating a wall surface to incandescence}
- 14/126 . . {cooperating with refractory wall surfaces}

**WARNING**

Group [F23D 14/126](#) is incomplete pending reclassification of documents from groups [F23D 14/12](#) and [F23D 14/14](#).

All groups listed in this Warning should be considered in order to perform a complete search.

- 14/14 . . . using screens or perforated plates

**WARNING**

Group [F23D 14/14](#) is impacted by reclassification into groups [F23D 14/126](#), [F23D 14/145](#), [F23D 14/147](#), [F23D 14/148](#), [F23D 14/149](#) and [F23D 14/151](#).

All groups listed in this Warning should be considered in order to perform a complete search.

- 14/145 . . . {combustion being stabilised at a screen or a perforated plate}  
**WARNING**  
 Group [F23D 14/145](#) is incomplete pending reclassification of documents from group [F23D 14/14](#).  
 Groups [F23D 14/14](#) and [F23D 14/145](#) should be considered in order to perform a complete search.
- 14/147 . . . {with perforated plates as radiation intensifying means}  
**WARNING**  
 Group [F23D 14/147](#) is incomplete pending reclassification of documents from groups [F23D 14/12](#) and [F23D 14/14](#).  
 All groups listed in this Warning should be considered in order to perform a complete search.
- 14/148 . . . {with grids, e.g. strips or rods, as radiation intensifying means}  
**WARNING**  
 Group [F23D 14/148](#) is incomplete pending reclassification of documents from groups [F23D 14/12](#) and [F23D 14/14](#).  
 All groups listed in this Warning should be considered in order to perform a complete search.
- 14/149 . . . {with wires, threads or gauzes as radiation intensifying means}  
**WARNING**  
 Group [F23D 14/149](#) is incomplete pending reclassification of documents from groups [F23D 14/12](#) and [F23D 14/14](#).  
 All groups listed in this Warning should be considered in order to perform a complete search.
- 14/151 . . {with radiation intensifying means other than screens or perforated plates}  
**WARNING**  
 Group [F23D 14/151](#) is incomplete pending reclassification of documents from groups [F23D 14/12](#) and [F23D 14/14](#).  
 All groups listed in this Warning should be considered in order to perform a complete search.
- 14/16 . . using permeable blocks
- 14/18 . . using catalysis for flameless combustion  
**WARNING**  
 Group [F23D 14/18](#) is impacted by reclassification into group [F23D 14/181](#).  
 Groups [F23D 14/18](#) and [F23D 14/181](#) should be considered in order to perform a complete search.
- 14/181 . . . {with carbon containing radiating surface}  
**WARNING**  
 Group [F23D 14/181](#) is incomplete pending reclassification of documents from group [F23D 14/18](#).  
 Groups [F23D 14/18](#) and [F23D 14/181](#) should be considered in order to perform a complete search.
- 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

**2211/00 Thermal dilatation prevention or compensation****2212/00 Burner material specifications**

- 2212/005 . Radiant gas burners made of specific materials, e.g. rare earths
- 2212/10 . ceramic
- 2212/101 . . Foam, e.g. reticulated
- 2212/103 . . Fibres
- 2212/105 . . Particles
- 2212/20 . metallic
- 2212/201 . . Fibres
- 2212/203 . . Particles

**2213/00 Burner manufacture specifications**

- 2214/00** **Cooling**
- 2900/00** **Special features of, or arrangements for burners using fluid fuels or solid fuels suspended in a carrier gas**
- 2900/00001 . . local catalytic coatings applied to burner surfaces
  - 2900/00002 . . Cleaning burner parts, e.g. burner tips
  - 2900/00003 . . Fuel or fuel-air mixtures flow distribution devices upstream of the outlet
  - 2900/00004 . . Burners specially adapted for generating high luminous flames, e.g. yellow for fuel-rich mixtures
  - 2900/00006 . . Liquid fuel burners using pure oxygen or O<sub>2</sub>-enriched air as oxidant (for gaseous fuels [F23D 14/32](#))
  - 2900/00008 . . 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
  - 2900/01001 . . Pulverised solid fuel burner with means for swirling the fuel-air mixture
  - 2900/03081 . . Catalytic wick burners
  - 2900/03082 . . Wick made of specific material, e.g. ceramic
  - 2900/05001 . . Burner using gel type fuel
  - 2900/05002 . . Use of porous members to convert liquid fuel into vapor
  - 2900/11001 . . Impinging-jet injectors or jet impinging on a surface
  - 2900/11002 . . Liquid fuel burners with more than one nozzle
  - 2900/11101 . . Pulverising gas flow impinging on fuel from pre-filming surface, e.g. lip atomizers
  - 2900/11401 . . Flame intercepting baffles forming part of burner head
  - 2900/11402 . . Airflow diaphragms at burner nozzle
  - 2900/11403 . . Flame surrounding tubes in front of burner nozzle
  - 2900/14 . . Special features of gas burners
  - 2900/14001 . . . Sealing or support of burner plate borders
  - 2900/14002 . . . of premix or non premix types, specially adapted for the combustion of low heating value [LHV] gas
  - 2900/14003 . . . 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
  - 2900/14241 . . . 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
  - 2900/31 . . Air supply for wick burners
  - 2900/31001 . . Wick burners without flame spreaders or burner hood
  - 2900/31002 . . Wick burners with flame spreaders or burner hood
  - 2900/31003 . . Inverted wick burners, Wick burners using preheated air
  - 2900/31004 . . Wick burners using alcohol as a fuel
  - 2900/31005 . . Wick burners using oil as a fuel
  - 2900/31006 . . Details of blue flame wick burners
  - 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
  - 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

## F23D

- 2900/31022 . Alcohol vapour burners
- 2900/31023 . Vapour burners where the vaporiser is heated by conduction