

**CPC****COOPERATIVE PATENT CLASSIFICATION****B04C****APPARATUS USING FREE VORTEX FLOW, e.g. CYCLONES (**

{centrifugal separation of water from steam [B01D 45/12](#); } jet mills [B02C 19/06](#); {wind sifters [B07B 7/00](#); } cyclonic type combustion apparatus [F23](#) ; {vortex burners for cyclone-type combustion apparatus [F23D 1/02](#); cyclonic type combustion apparatus for gas turbines [F23R 3/00](#) })

**NOTE**

This subclass covers apparatus for separating, mixing or like treating in which centrifugal effects are generated by free vortex flow, otherwise than by rotary bowls, rotors or curved passages.

**Guidance heading:****B04C 1/00**

**Apparatus in which the main direction of flow follows a flat spiral;** {so-called flat cyclones or vortex chambers }

**B04C 3/00**

**Apparatus in which the axial direction of the vortex { (flow following a screw-thread type line) } remains unchanged** {Also devices in which one of the two discharge ducts returns centrally through the vortex chamber, a reverse-flow vortex being prevented by bulkheads in the central discharge duct (combined with other devices [B04C 9/00](#) ) }

**B04C 2003/003**

- . Shapes or dimensions of vortex chambers

**B04C 2003/006**

- . Construction of elements by which the vortex flow is generated or degenerated

**B04C 3/02**

- . with heating or cooling, e.g. quenching, means

**B04C 3/04**

- . Multiple arrangement thereof { (combined with types according to other groups, [B04C 7/00](#) ) }

**B04C 3/06**

- . Construction of inlets or outlets to the vortex chamber

**B04C 5/00**

**Apparatus in which the axial direction of the vortex is reversed { (combined with other devices [B04C 9/00](#) ) }**

**B04C 5/02**

- . Construction of inlets by which the vortex flow is generated {e.g. tangential admission, the fluid flow being forced to follow a downward path by spirally wound bulkheads, or with slightly downwardly-directed tangential admission } (fluid dynamics in general [F15D](#) )

**B04C 5/04**

- .. Tangential inlets

**B04C 5/06**

- .. Axial inlets

**B04C 5/08**

- . Vortex chamber constructions

**B04C 5/081**

- .. Shapes or dimensions

- B04C 5/085 . . with wear-resisting arrangements
- B04C 5/087 . . with flexible gas-tight walls
- B04C 5/10 . . with perforated walls
- B04C 5/103 . . Bodies or members, e.g. bulkheads, guides, in the vortex chamber (cores [B04C 5/107](#))
- B04C 5/107 . . Cores; Devices for inducing an air-core in hydrocyclones (forming part of the outlet pipe [B04C 5/13](#))
  
- B04C 5/12 . Construction of the overflow ducting, e.g. diffusing or spiral exits
- B04C 5/13 . . formed as a vortex finder and extending into the vortex chamber { (exits with bulkheads preventing reverse flow vortex [B04C 3/00](#)) }; Discharge from vortex finder otherwise than at the top of the cyclone; Devices for controlling the overflow
- B04C 2005/133 . . . Adjustable vortex finder
- B04C 2005/136 . . . Baffles in the vortex finder
  
- B04C 5/14 . Construction of the underflow ducting; Apex constructions; Discharge arrangements; {discharge through sidewall provided with a few slits or perforations (provided with a great number of slits or perforations [B04C 5/10](#)) }
- B04C 5/15 . . with swinging flaps or revolving sluices; Sluices; Check-valves
- B04C 5/16 . . with variable-size outlets from the underflow ducting
- B04C 5/18 . . with auxiliary fluid assisting discharge
- B04C 5/181 . . Bulkheads or central bodies in the discharge opening
- B04C 5/185 . . Dust collectors
- B04C 5/187 . . . forming an integral part of the vortex chamber
  
- B04C 5/20 . with heating or cooling, e.g. quenching, means
  
- B04C 5/22 . with cleaning means
- B04C 5/23 . . using liquids
  
- B04C 5/24 . Multiple arrangement thereof { (combination types according to other /00 groups, [B04C 7/00](#)) }
- B04C 5/26 . . for series flow
- B04C 5/28 . . for parallel flow
- B04C 5/30 . . Recirculation constructions in or with cyclones which accomplish a partial recirculation of the medium, e.g. by means of conduits
  
- B04C 7/00** **Apparatus not provided for in group [B04C 1/00](#), [B04C 3/00](#), or [B04C 5/00](#); Multiple arrangements not provided for in one of the groups [B04C 1/00](#), [B04C 3/00](#), or [B04C 5/00](#); Combinations of apparatus covered by two or more of the groups [B04C 1/00](#), [B04C 3/00](#), or [B04C 5/00](#)**
  
- B04C 9/00** **Combinations with other devices, e.g. fans, {expansion chambers, diffusors, water locks } (with filters [B01D 50/00](#))**
  
- B04C 2009/001 . with means for electrostatic separation
- B04C 2009/002 . with external filters

- B04C 2009/004 . with internal filters, in the cyclone chamber or in the vortex finder
- B04C 2009/005 . with external rotors, e.g. impeller, ventilator, fan, blower, pump
- B04C 2009/007 . with internal rotors, e.g. impeller, ventilator, fan, blower, pump
- B04C 2009/008 . with injection or suction of gas or liquid into the cyclone
- B04C 11/00** **Accessories, e.g. safety or control devices, not otherwise provided for** {e.g. regulators, valves in inlet or overflow ducting } (with electrostatic precipitating arrangements [B03C 3/14](#))