

**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.

**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 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 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 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](#))
- [B04C 2003/00](#)** 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 2005/00** **Apparatus in which the axial direction of the vortex is reversed** {(combined with other devices [B04C 9/00](#))}
- B04C 2005/12 . Construction of the overflow ducting, e.g. diffusing or spiral exits
- B04C 2005/13 . . . . . 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 2009/00** **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