

**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 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](#))
- Guidance heading:**
- 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