

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