Claims

1. Process for pneumatically conveying a powdery material, in particular a powdery sorbent, the process comprising the steps of:

- pneumatically conveying a powdery material, in particular a powdery sorbent, in a first pneumatic conveying pipeline from a powdery material, in particular a powdery sorbent, storage tank to a recipient zone, said first pneumatic conveying pipeline comprising a pipeline wall and being connected to said powdery material, in particular said powdery sorbent, storage tank and to said recipient zone, said powdery material, in particular said powdery sorbent, being pneumatically transported inside said first pneumatic conveying pipeline and into said recipient zone by a flow generated by a blower connected to said first pneumatic conveying pipeline and blowing conveying fluid inside said first pneumatic conveying pipeline in which particles of said powdery material, in particular said powdery sorbent, are transported,

- dosing, by a dosing means, an amount of said powdery material, in particular said powdery sorbent, when entering from said powdery material, in particular said powdery sorbent, storage tank into said first pneumatic conveying pipeline, said first pneumatic conveying pipeline being connected to said powdery material, in particular said powdery sorbent, storage tank through said dosing means,

- producing a fluctuating pressure drop in said first pneumatic conveying pipeline and/or up to said recipient zone,

- generating, by an infrasound device, infrasonic waves inside said first pneumatic conveying pipeline and/or up to said recipient zone thereby providing a counteraction to said fluctuating pressure drop, wherein the infrasound device comprises a first chamber and a second chamber connected to each other by a tube,

- blowing, by said blower, said conveying fluid at least partially through said infrasound device,

- generating, by an exciter inside the first chamber, said infrasonic waves thereby providing infrasound pulses to said conveying fluid blown at least partially inside said first chamber, said generated infrasonic waves being transported through the tube to reach the second chamber, and

- distributing said conveying fluid blown by said blower into a first portion and a second portion, said first portion being transported through said tube from said first chamber to said second chamber while said second portion is derived and introduced inside said second chamber.

2. Process for pneumatically conveying a powdery material, in particular a powdery sorbent, according to claim 1, wherein said infrasound device provides a counteraction to said fluctuating pressure drop by providing a smoothing action and/or a masking action to said fluctuating pressure drop.

3. Process for pneumatically conveying a powdery material, in particular a powdery sorbent, according to claim 1 or 2, wherein the first chamber is divided into a first compartment and a second compartment, said first compartment being in connection to said second compartment through a passing hole, said first compartment comprising an internal channel inside which a moving piston is moved from a first position to a second position and from said second position to said first position by a power source, located externally with respect to the first chamber and forming the exciter, said internal channel being concentrically installed inside said first compartment, said infrasonic waves being generated by the moving piston and transported by said conveying fluid from said first compartment, to said second compartment, through the passing hole before being transported through the tube to reach the second chamber.

4. Process for pneumatically conveying a powdery material, in particular a powdery sorbent, according to any one of the claims 1 to 3, wherein the powdery material, in particular the powdery sorbent, is selected from the group consisting of hydrated lime, hydrated or semi-hydrated dolime, limestone, dolomite, quick lime, quick dolime, sodium

carbonate or bicarbonate, sodium sesquicarbonate dehydrate, halloysite, sepiolite, a carbonaceous organic compound selected from active carbon and lignite coke, fly ash or a mixture of any of these compounds.

5. Process for pneumatically conveying a powdery material, in particular a powdery sorbent, according to anyone of the claims 1 to 4, wherein said conveying fluid is air, inert gas, exhaust gases, or mixture thereof.

6. Process for pneumatically conveying a powdery material, in particular a powdery sorbent, according to anyone of the claims 1 to 5, wherein infrasonic waves transported inside said first pneumatic conveying pipeline during said transport of powdery material, in particular of powdery sorbent, also contact said dosing means.

7. Process for pneumatically conveying a powdery material, in particular a powdery sorbent, according to anyone of the claims 1 to 6, wherein infrasonic waves travel inside said first pneumatic conveying pipeline during said transport of powdery material, in particular of powdery sorbent and preferably also travel up to the recipient zone.

8. Process for pneumatically conveying a powdery material, in particular a powdery sorbent, the process comprising the steps of:

- pneumatically conveying a powdery material, in particular a powdery sorbent, in a first pneumatic conveying pipeline from a powdery material, in particular a powdery sorbent, storage tank to a recipient zone, said first pneumatic conveying pipeline comprising a pipeline wall and being connected to said powdery material, in particular said powdery sorbent, storage tank and to said recipient zone, said powdery material, in particular said powdery sorbent, being pneumatically transported inside said first pneumatic conveying pipeline and into said recipient zone by a flow generated by a blower connected to said first pneumatic conveying pipeline and blowing conveying fluid inside said first pneumatic conveying pipeline in which particles of said powdery material, in particular said powdery sorbent, are transported,

- dosing, by a dosing means, an amount of said powdery material, in particular said powdery sorbent, when entering from said powdery material, in particular said powdery sorbent, storage tank into said first pneumatic conveying pipeline, said first pneumatic conveying pipeline being connected to said powdery material, in particular said powdery sorbent, storage tank through said dosing means,

- producing a fluctuating pressure drop in said first pneumatic conveying pipeline and/or up to said recipient zone,

- generating, by an infrasound device, infrasonic waves inside said first pneumatic conveying pipeline and/or up to said recipient zone thereby providing a counteraction to said fluctuating pressure drop, wherein the infrasound device comprises a first chamber and a second chamber connected to each other by a tube,

- blowing, by said blower, said conveying fluid at least partially through said infrasound device,

- generating, by an exciter inside the first chamber, said infrasonic waves thereby providing infrasound pulses to said conveying fluid blown at least partially inside said first chamber, said generated infrasonic waves being transported through the tube to reach the second chamber, and

- preventing infrasonic waves transported inside said first pneumatic conveying pipeline during said transport of powdery material from reaching the blower due to an Helmholtz bass trap connected to said first chamber or preferably on the pipeline between the blower and the first chamber.

9. Process for pneumatically conveying a powdery material, in particular a powdery sorbent, the process comprising the steps of:

- pneumatically conveying a powdery material, in particular a powdery sorbent, in a first pneumatic conveying pipeline from a powdery material, in particular a powdery sorbent, storage tank to a recipient zone, said first pneumatic conveying pipeline comprising a pipeline wall and being connected to said powdery material, in particular said powdery sorbent, storage tank and to said recipient zone, said powdery material, in

particular said powdery sorbent, being pneumatically transported inside said first pneumatic conveying pipeline and into said recipient zone by a flow generated by a blower connected to said first pneumatic conveying pipeline and blowing conveying fluid inside said first pneumatic conveying pipeline in which particles of said powdery material, in particular said powdery sorbent, are transported,

- dosing, by a dosing means, an amount of said powdery material, in particular said powdery sorbent, when entering from said powdery material, in particular said powdery sorbent, storage tank into said first pneumatic conveying pipeline, said first pneumatic conveying pipeline being connected to said powdery material, in particular said powdery sorbent, storage tank through said dosing means,

- producing a fluctuating pressure drop in said first pneumatic conveying pipeline and/or up to said recipient zone,

- generating, by an infrasound device, infrasonic waves inside said first pneumatic conveying pipeline and/or up to said recipient zone thereby providing a counteraction to said fluctuating pressure drop, wherein the infrasound device comprises a first chamber and a second chamber connected to each other by a tube,

- blowing, by said blower, said conveying fluid at least partially through said infrasound device,

- generating, by an exciter inside the first chamber, said infrasonic waves thereby providing infrasound pulses to said conveying fluid blown at least partially inside said first chamber, said generated infrasonic waves being transported through the tube to reach the second chamber, and

- providing an emergency mode and an operating mode, wherein in emergency mode, the blown conveying fluid is prevented from entering said first chamber and is diverted and blown directly to said first pneumatic conveying pipeline, downstream the infrasound device and wherein in operating mode, the blown conveying fluid is provided at least partially to said first chamber.

10. Process for improving capture of polluting compounds from flue gases comprising the steps of:

- burning fuel and/or a material to be burned or heating a material to be heated or melted, producing flue gases in a flue gas duct,

- pneumatically conveying a powdery sorbent provided for capturing said polluting compounds according to the process of any one of the claims 1 to 9,

- capturing polluting compounds by said powdery sorbent inside said flue gas duct thereby depleting the flue gas from polluting compounds.

11. Device for improving capture of polluting compounds from flue gases, the device comprising:

- a furnace or combustion chamber provided for burning fuel and/or a material to be burned or heated or melted and producing flue gases, said furnace or combustion chamber being connected to a flue gas duct where flue gases generated in said furnace or combustion chamber are directed,

- a powdery sorbent storage tank connected to said flue gas duct by means of a first pneumatic conveying pipeline, said first pneumatic conveying pipeline being further connected to a blower provided for pneumatically conveying said powdery sorbent from said powdery sorbent storage tank in said first pneumatic conveying pipeline to said flue gas duct, said first pneumatic conveying pipeline comprising a pipeline wall and being connected to said flue gas duct, said blower being provided to generate a flow of conveying fluid inside said first pneumatic conveying pipeline in which particles of said powdery sorbent are transported,

- a powdery sorbent dosing means provided for dosing an amount of said powdery sorbent when entering from said powdery sorbent storage tank into said first pneumatic conveying pipeline, said first pneumatic conveying pipeline being connected to said powdery sorbent storage tank

through said dosing means, a controlling device for adjusting said amount of powdery sorbent in response to a first signal,

- an infrasound sonic device connected to said first pneumatic conveying pipeline and provided to generate infrasound sonic waves inside said first pneumatic conveying pipeline and/or up to said flue gas duct, said infrasound sonic device being further provided to counteract on a fluctuation step of the pressure drop in said first pneumatic conveying pipeline and/or up to said flue gas duct, wherein said infrasound device comprises a first and a second chamber, both first and second chamber being connected to each other by a tube, said first chamber comprising an exciter located inside said first chamber, provided to generate said infrasonic waves by providing infrasound pulses to said conveying fluid blown at least partially inside said first chamber.

12. Device for improving capture of polluting compounds from flue gases according to claim 11, further comprising a mixing or connecting device located between said dosing means and said first pneumatic conveying pipeline, provided to mix said powdery sorbent in said conveying fluid.

13. Device for improving capture of polluting compounds from flue gases according to claim 11 or claim 12, further comprising a cooling device located between said blower and said first pneumatic conveying pipeline.

14. Device for improving capture of polluting compounds from flue gases according to any one of claims 11 to 13, wherein said generated infrasonic waves are transported through the tube acting as a resonance pipeline to reach the second chamber.

15. Device for improving capture of polluting compounds from flue gases according to any one of claims 11 to 14, wherein the first chamber is divided into a first compartment and a second compartment, said first compartment being in connection to said second compartment through a passing hole, said first compartment comprising an internal channel inside

which a moving piston is moved from a first position to a second position and from said second position to said first position by a power source, located externally with respect to the first chamber and forming the exciter, said internal channel being concentrically installed inside said first compartment, said infrasonic waves being generated by the moving piston and transported by said conveying fluid from said first compartment, to said second compartment, through the passing hole before being transported through the tube to reach the second chamber.

16. Device for improving capture of polluting compounds from flue gases according to any one of the claims 11 to 15, wherein said sonic device is connected to said blower and to the first pneumatic conveying pipeline.

17. Device for improving capture of polluting compounds from flue gases according to any one of the claims 11 to 15, wherein said sonic device is connected to a second blower and to the first pneumatic conveying pipeline between the powdery sorbent storage tank and the flue gas duct.

18. Device for improving capture of polluting compounds from flue gases according to any one of the claims 11 to 15, wherein said sonic device is connected to a second blower and to the first pneumatic conveying pipeline between the powdery sorbent storage tank and the blower.

19. Device for improving capture of polluting compounds from flue gases according to any one of the claims 15 to 18, further comprising an adjustable flowrate distributor pipe connected at a first end either to the blower, between the blower and the first chamber or to the first chamber, preferably to the first compartment of the first chamber and at a second end to the second chamber, said adjustable flowrate distributor pipe being provided for deriving a portion of said conveying fluid blown by the blower and introducing it inside the second chamber.

20. Device for improving capture of polluting compounds from flue gases according to any one of the claims 11 to 19, wherein the powdery sorbent storage tank is a powdery sorbent storage tank of powdery sorbent selected from the group consisting of hydrated lime, hydrated or semi-hydrated dolime, limestone, dolomite, quick lime, quick dolime, sodium carbonate or bicarbonate, sodium sesquicarbonate dehydrate, halloysite, sepiolite, a carbonaceous organic compound selected from active carbon and lignite coke, fly ash or a mixture of any of these compounds.

21. Device for improving capture of polluting compounds from flue gases according to any one of the claims 11 to 20, wherein said conveying fluid is air, inert gas, exhaust gases, or mixture thereof.

22. Device for improving capture of polluting compounds from flue gases according to anyone of the claims 14 to 21, further comprising an Helmholtz bass trap connected to said first chamber or preferably on the pipeline between the blower and the first chamber, provided to prevent infrasonic waves transported inside said first pneumatic conveying pipeline during said transport of powdery sorbent to reach the blower.

23. Device for improving capture of polluting compounds from flue gases according to anyone of the claims 14 to 22, comprising an emergency device having a first position being an emergency position and a second position being an operating position, said emergency device comprising a switch connected to an emergency pipe connecting directly the blower to the first pneumatic conveying pipeline, downstream the infrasound device, said emergency position being a position wherein the switch prevents the blown conveying fluid from entering said first chamber and diverting it directly to said first pneumatic conveying pipeline, downstream the infrasound device and wherein the operating position is a position wherein the blown conveying fluid is provided at least partially to said first chamber.

24. Device for improving capture of polluting compounds from flue gases according to anyone of the claims 11 to 23, wherein said first signal is such as wind speed of environment at the outlet of the chimney, atmospheric pressure of environment at the outlet of the chimney or outside said flue gas duct, temperature of the flue gas, nature of the fuel, sulfur content of the fuel, sulfur content of the flue gas, chloride content of the flue gas, mercury content of the flue gas, chloride content of material to be burned or to be heated or melted, sulfur content of material to be burned or to be heated or melted, mercury content of material to be burned or to be heated or melted, and their combination.

25. Device for improving capture of polluting compounds from flue gases according to anyone of the claims 11 to 24, wherein said dosing means is selected from a dosing screw, a rotating valve with a vertical shaft or an horizontal shaft, an air slide, a jet feeder, a screw-feeder, an airlock-feeder, a screw pump, a pressure vessel, an air lift, said dosing means being located between said powdery sorbent storage tank and said first pneumatic conveying pipeline being provided to be contacted by sonic waves transported inside said first pneumatic conveying pipeline during said transport of powdery sorbent.