## CLAIMS

1. A fluidized bed spray drying system for drying liquid into powder comprising:

an elongated body 11 supported in an upright position;

an upper end closure arrangement 14 and a lower end closure arrangement 18 at opposite upper and lower ends of the elongated body 11, respectively for forming a drying chamber 12 within said elongated body;

a spray nozzle assembly 16 supported in one of the upper end closure arrangement 14 and lower end closure arrangement 18;

said spray nozzle assembly 16 including a nozzle body 32 having a liquid inlet 38 for coupling to a supply of liquid, a discharge spray tip assembly 34 at a downstream end for directing liquid to be dried into said drying chamber 12 and an electrode 48 for coupling to an electrical source for electrically charging liquid passing through said spray nozzle assembly 16 into said drying chamber 12;

said lower end closure arrangement 18 including a powder collection chamber 21 for collecting powder dried in said drying chamber 12;

said drying chamber 12 having a drying gas inlet 15 for introducing drying gas into said drying chamber 12 for drying liquid directed into the drying chamber 12 into powder;

said drying chamber 12 having an exhaust gas outlet 320 adjacent a lower end thereof;

said lower end closure arrangement having a plurality of cylindrical filter elements 274 communicating with said exhaust gas outlet 320 for filtering drying gas borne powder from drying gas exiting the drying chamber 12 through said filter elements 274 and the exhaust gas outlet 320; and

said cylindrical filter elements 274 each being closed at lower end and having an opposite upper open axial end communicating with said exhaust gas outlet 320 such that drying gas exiting the drying chamber 12 passes through a cylindrical side of the filter element 274 which restrains gas borne powder with drying gas proceeding through the cylindrical side of the filter element 274 and then out said exhaust gas outlet 320.

2. (Canceled).

3. The spray drying system of claim 1 wherein the plurality of cylindrical filter elements 274 are supported from a transverse plate 295 in the lower end closure arrangement 18 that defines at least a portion of an exhaust plenum 282 communicating with the exhaust gas outlet 320.

4. The spray drying system of claim 3 in which said filter elements 274 each are supported in depending relation to said transverse plate 295 with the open axial end at an upper end communicating with said exhaust plenum 282 such that drying gas passes through cylindrical sides of the filter elements 274 and exits the upper open axial ends of the filter elements 274 into the exhaust plenum 282.

5. The spray drying system of claim 1 including a recirculation conduit 165 coupled between said exhaust gas outlet 320 and a drying gas inlet 15 for reintroducing drying gas into the drying chamber 12.

6. The spray drying system of claim 5 wherein the recirculation conduit 165 directs drying gas first through a condenser 166 and then through a heater 169 as gas is recirculated from the exhaust gas outlet 320 to the drying gas inlet 15.

7. (Canceled).

8. The spray drying system of claim 1 including a conical direction cone 275 arranged between the powder collection chamber 271 and said elongated body 11 for directing powder into the powder collection chamber 271.

9. (Canceled).

10. The spray drying system of claim 1 in which said nozzle body 32 has an atomizing gas inlet 39 for coupling to a pressurized gas supply for directing pressurized atomizing air through said nozzle body 32 for atomizing electrostatically charged liquid discharging from the discharge spray tip assembly 16.

11. The spray drying system of claim 1 in which said filter elements 274 each have a respective reverse gas pulse directing device cyclically 322 operateable for directing

pulses of pressurized gas into an interior of the cylindrical filter element 274 for removing the buildup of powder on an outside cylindrical surface thereof.

12. The spray drying system of claim 11 in which each said reverse gas pulse directing device 322 includes an gas directing tube 328 having a discharge end 329 centered above the open axial end of the cylindrical filter element 274, and said gas direction tube 325 of each gas pulse directing device 322 having an upstream end coupled to a respective pressurized control valve 326.

13. (Canceled).

14. The spray drying system of claim 1 in which each said cylindrical filter element 160a , 274 has a respective reverse gas pulse filter cleaning device 167 having a selectively operable reverse gas pulse nozzle 240 coupled to a pressurized gas source for directing pressurized gas into the cylindrical filter element 160a for dislodging powder accumulated on an outside surface of the cylindrical filter element 160a, a plunger 249 mounted for movement in a plunger cylinder 250 between an open position that permits the flow of drying gas through said cylindrical filter element 160a and axially through the open axial end communicating with the exhaust outlet 20a and a closing position that interrupts and prevents the flow of drying gas from within the collection chamber 271 to said exhaust outlet 320, and said plunger 249 being moveable from said open position to said closed position as an incident to the direction of pressurized gas through said reverse pulse nozzle 240 for enabling pressurized gas from the reverse pulse nozzle 240 to be directed into the cylindrical filter element 160a and outwardly through the cylindrical sides thereof without the flow of drying gas into said exhaust chamber.

15. The spray drying system of claim 14 in which each said reverse gas pulse nozzle 240 has a hollow construction through which pressurized gas is directed, said reverse pulse gas nozzle 240 having a first portion disposed within an exhaust plenum 164 and a second portion disposed within and extending substantially the length of the cylindrical filter element 160a, and said plunger 249 being supported for movement along said first portion of said reverse pulse nozzle.

16. The spray drying system of claim 15 in which each said reverse gas pulse nozzle first portion is formed with a plurality of apertures for permitting communication of pressurized gas from said reverse pulse nozzle 240 and into said plunger cylinder 250 for

moving said valve plunger 249 to said closing position, and said nozzle second portion being formed with a plurality of apertures smaller in size than the apertures in the first portion for permitting the flow of pressurized air from said reverse pulse nozzle 240 into said cylindrical filter element 160a and outwardly cylindrical sides thereof when said valve plunger 249 is in said second position.

17. A fluidized bed spray drying system for drying liquid into powder comprising:

an elongated body 11 supported in an upright position;

an upper end closure arrangement 14 and a lower end closure arrangement 18 at opposite upper and lower ends of the elongated body 11, respectively for forming a drying chamber 12 within said elongated body;

a spray nozzle assembly 16 supported in one of the upper end closure arrangement 14 and lower end closure arrangement 18;

said spray nozzle assembly 16 including a nozzle body 32 having a liquid inlet 38 for coupling to a supply of liquid and a discharge spray tip assembly 34 at a downstream end for directing liquid to be dried into said drying chamber 12;

said lower end closure arrangement 18 including a powder collection chamber 21 for collecting powder dried in said drying chamber 12;

said drying chamber 12 having a drying gas inlet 15 for introducing drying gas into said drying chamber 12 for drying liquid directed into the drying chamber 12 into powder;

said drying chamber 12 having an exhaust gas outlet 320 adjacent a lower end thereof;

said lower end closure arrangement having a plurality of cylindrical filter elements 274 communicating with said exhaust gas outlet 320 for filtering drying gas borne powder from drying gas exiting the drying chamber 12 through said filter elements 274 and the exhaust gas outlet 320;

said cylindrical filter elements 274 each being closed at a lower end and having an opposite upper open axial end communicating with said exhaust gas outlet 320 such that drying gas exiting the drying chamber 12 passes through a cylindrical side of the filter

element 274 which restrains gas borne powder with drying gas proceeding through the cylindrical side of the filter element and then out said exhaust gas outlet 320; and

a recirculation conduit 165 coupled between said exhaust gas outlet 320 and the drying gas inlet 15 for reintroducing drying gas into the drying chamber 12, wherein the recirculation conduit 165 directs drying gas first through a condenser 166 and then through a heater 169 as gas is recirculated from the exhaust gas outlet 320 to the drying gas inlet 15.

18. The spray drying system of claim 17 wherein a fluid bed screen separator 19c is arranged between the powder collection chamber 21 and the elongated body 11.

19. The spray drying system of claim 17 wherein the plurality of cylindrical filter elements 274 are supported from a transverse plate 295 in the lower end closure arrangement 18 that defines at least a portion of an exhaust plenum 282 communicating with the exhaust gas outlet 320.

20. The spray drying system of claim 19 in which said filter elements 274 each are supported in depending relation to said transverse plate 295 with the open axial end at an upper end communicating with said exhaust plenum 282 such that drying gas passes through cylindrical sides of the filter elements 274 and exits the upper open axial ends of the filter elements 274 into the exhaust plenum 282.

21. The spray drying system of claim 1 including a liner 100 disposed within said elongated body 11 in spaced relation to an inner wall surface of the elongated body 11 for defining the drying chamber within said elongated body 11.