CLAIMS:

1. An arrangement for removing catalyst particulates from a gas, the arrangement comprising:

a pressure vessel having a lower region arranged to contain a fluidized bed including catalyst particulates suspended in a gas, an upper region arranged to receive gas and entrained catalyst particulates dispersed from the fluidized bed, and a gas inlet for supplying gas to the lower region containing the fluidized bed;

a filter assembly coupled to the pressure vessel to receive the gas and entrained particulates dispersed from the fluidized bed, wherein the filter assembly includes an inlet, first and second outlets, and a permeable filter medium having a feed side and a filtrate side isolated from the feed side by the filter medium and wherein the filter assembly defines a first flow path between the inlet and the first outlet through the filter medium from the feed side to the filtrate side and a second flow path between the inlet and the second outlet tangentially along the feed side of the filter medium; and

a dip leg having an inlet and an outlet, wherein the second outlet of the filter assembly is fluidly coupled to the inlet of the dip leg.

2. The arrangement of claim 1 wherein the filter assembly is supported within the upper region of the pressure vessel and the dip leg is supported within the pressure vessel below the filter assembly and wherein the pressure vessel includes a filtered gas outlet fluidly communicating with the first outlet of the filter assembly.

3. The arrangement of claim 2 wherein the outlet of the dip leg is positioned in the pressure vessel to discharge catalyst particulates into the lower region containing the fluidized bed.

4. The arrangement of claim 1 wherein the filter assembly and the dip leg are located in a separate housing outside of the pressure vessel, the dip leg being positioned below the filter assembly, wherein the inlet of the filter assembly fluidly communicates with the upper region of the pressure vessel, and wherein the housing has a filtered gas outlet fluidly communicating with the first outlet of the filter assembly.

5. The arrangement of claim 4 wherein the outlet of the dip leg fluidly communicates with the lower region of the pressure vessel containing the fluidized bed.

6. The arrangement of any of claims 1-5 wherein the filter assembly includes first and second tube sheets and a plurality of filter tubes supported between the first and second sheets, each filter tube including a filter medium.

7. The arrangement of claim 6 wherein the feed side of the filter medium includes the inner side of each filter tube and the filtrate side of the filter medium includes the outer side of each filter tube.

8. The arrangement of claim 6 or 7 wherein each filter tube has opposite open ends.

9. The arrangement of any preceding claim further comprising a safety filter positioned in the first flow path between the filter medium and the first outlet of the filter assembly.

10. The arrangement of any preceding claim wherein the pressure vessel comprises a regenerator vessel.

11. The arrangement of claim 10 wherein the regenerator vessel includes a regenerated catalyst particulate outlet in the lower region of the regenerator vessel.

12. The arrangement of claim 10 or 11 further comprising a hot gas supply coupled to the gas inlet of the regenerator vessel.

13. An arrangement for removing catalyst particulates from a gas, the arrangement comprising:

a regenerator vessel having a lower region arranged to contain a fluidized bed including catalyst particulates suspended in a gas, an upper region arranged to receive gas and entrained catalyst particulates dispersed from the fluidized bed, a gas inlet for supplying gas to the lower region containing the fluidized bed, a regenerated catalyst particulate outlet in the lower region, and a filtered gas outlet in the upper region;

a filter assembly supported in the upper region of the regenerator vessel to receive the gas and entrained catalyst particulates dispersed from the fluidized bed, wherein the filter assembly includes an inlet, first and second outlets, and a permeable filter medium having a feed side and a filtrate side isolated from the feed side by the filter medium, wherein the filter assembly defines a first flow path between the inlet and the first outlet through the filter medium from the feed side to the filtrate side, the first outlet fluidly communicating with the filtered gas outlet of the regenerator vessel, and wherein the filter assembly further defines a

second flow path between the inlet and the second outlet tangentially along the feed side of the filter medium; and

a dip leg supported in the regenerator vessel below the filter assembly, the dip leg having an inlet and an outlet, wherein the second outlet of the filter assembly is fluidly coupled to the inlet of the dip leg and the outlet of the dip leg is arranged to discharge catalyst particulates into the lower region containing the fluidized bed.

14. The arrangement of claim 13 wherein the filter assembly includes upper and lower tube sheets and a plurality of filter tubes supported vertically between the upper and lower tube sheets, each filter tube including a filter medium.

15. The arrangement of claim 14 wherein the feed side of the filter medium includes the inner side of the filter tube and the filtrate side of the filter medium includes the outer side of each filter tube.

16. The arrangement of claim 14 or 15 wherein each filter tube has opposite open ends.

17. The arrangement of any of claims 13-16 wherein the filter assembly further includes a safety filter positioned in the first flow path between the filter medium and the first outlet of the filter assembly.

CLAIMS

1. An arrangement for removing catalyst particulates from a gas, the arrangement comprising:

a pressure vessel having a lower region arranged to contain a fluidized bed including catalyst particulates suspended in a gas, an upper region arranged to receive gas and entrained catalyst particulates dispersed from the fluidized bed, and a gas inlet for supplying gas to the lower region containing the fluidized bed;

a filter assembly coupled to the pressure vessel to receive the gas and entrained particulates dispersed from the fluidized bed, wherein the filter assembly includes an inlet, first and second outlets, and a permeable filter medium having a feed side and a filtrate side isolated from the feed side by the filter medium and wherein the filter assembly defines a first flow path between the inlet and the first outlet through the filter medium from the feed side to the filtrate side and a second flow path between the inlet and the second outlet tangentially along the feed side of the filter medium; and a safety filter positioned in the first flow path between the filter medium and the first outlet of the filter assembly; and

a dip leg having an inlet and an outlet, wherein the second outlet of the filter assembly is fluidly coupled to the inlet of the dip leg.

2. The arrangement of claim 1 wherein the filter assembly is supported within the upper region of the pressure vessel and the dip leg is supported within the pressure vessel below the filter assembly and wherein the pressure vessel includes a filtered gas outlet fluidly communicating with the first outlet of the filter assembly.

3. The arrangement of claim 2 wherein the outlet of the dip leg is positioned in the pressure vessel to discharge catalyst particulates into the lower region containing the fluidized bed.

4. The arrangement of claim 1 wherein the filter assembly and the dip leg are located in a separate housing outside of the pressure vessel, the dip leg being positioned below the filter assembly, wherein the inlet of the filter assembly fluidly communicates with the upper region of

the pressure vessel, and wherein the housing has a filtered gas outlet fluidly communicating with the first outlet of the filter assembly.

5. The arrangement of claim 4 wherein the outlet of the dip leg fluidly communicates with the lower region of the pressure vessel containing the fluidized bed.

6. The arrangement of any of claims 1-5 wherein the filter assembly includes first and second tube sheets and a plurality of filter tubes supported between the first and second sheets, each filter tube including a filter medium.

7. The arrangement of claim 6 wherein the feed side of the filter medium includes the inner side of each filter tube and the filtrate side of the filter medium includes the outer side of each filter tube.

8. The arrangement of claim 6 or 7 wherein each filter tube has opposite open ends.

9. The arrangement of any preceding claim wherein the pressure vessel comprises a regenerator vessel.

10. The arrangement of claim 9 wherein the regenerator vessel includes a regenerated catalyst particulate outlet in the lower region of the regenerator vessel.

11. The arrangement of claim 9 or 10 further comprising a hot gas supply coupled to the gas inlet of the regenerator vessel.

12. An arrangement for removing catalyst particulates from a gas, the arrangement comprising:

a regenerator vessel having a lower region arranged to contain a fluidized bed including catalyst particulates suspended in a gas, an upper region arranged to receive gas and entrained catalyst particulates dispersed from the fluidized bed, a gas inlet for supplying gas to the lower region containing the fluidized bed, a regenerated catalyst particulate outlet in the lower region, and a filtered gas outlet in the upper region;

a filter assembly supported in the upper region of the regenerator vessel to receive the gas and entrained catalyst particulates dispersed from the fluidized bed, wherein the filter assembly

includes an inlet, first and second outlets, and a permeable filter medium having a feed side and a filtrate side isolated from the feed side by the filter medium, wherein the filter assembly defines a first flow path between the inlet and the first outlet through the filter medium from the feed side to the filtrate side, the first outlet fluidly communicating with the filtered gas outlet of the regenerator vessel, and wherein the filter assembly further defines a second flow path between the inlet and the second outlet tangentially along the feed side of the filter medium, and wherein the filter assembly further includes a safety filter positioned in the first flow path between the filter medium and the first outlet of the filter assembly; and

a dip leg supported in the regenerator vessel below the filter assembly, the dip leg having an inlet and an outlet, wherein the second outlet of the filter assembly is fluidly coupled to the inlet of the dip leg and the outlet of the dip leg is arranged to discharge catalyst particulates into the lower region containing the fluidized bed.

13. The arrangement of claim 12 wherein the filter assembly includes upper and lower tube sheets and a plurality of filter tubes supported vertically between the upper and lower tube sheets, each filter tube including a filter medium.

14. The arrangement of claim 13 wherein the feed side of the filter medium includes the inner side of the filter tube and the filtrate side of the filter medium includes the outer side of each filter tube.

15. The arrangement of claim 13 or 14 wherein each filter tube has opposite open ends.