distribution nozzles and to the reactor wall air distribution openings. The method and apparatus of the present invention result in higher reactor hydrodynamic turndown ratios than can be achieved with conventional single-bed reactors. For example, a hydrodynamic turndown ratio of 6.6 to 1 can be achieved by the use of the method and apparatus of the present invetion.

4340572

PROCESS FOR RECOVERING HEAT FROM STACK OR FLUE GAS

Da Ben-Shmuel; Philip Zacuto; assigned to Woodside Construction Inc.

A method and apparatus for efficiently recovering heat from a gas stream such as discharged flue gas. The gas stream is countercurrently contacted with a liquid medium in two stages. A first countercurrent contact stage is between a partially cooled gas stream and cold liquid medium in a bed of packing through which the cold liquid medium flows downwards and the partially cooled gas stream flows upwards, so that a warmed liquid medium and fully cooled gas stream are produced. The second countercurrent contact stage is between the warmed liquid medium derived from the first contact stage and the hot initial gas stream in a plurality of parallel vertically oriented passages. The warmed liquid medium flows downward on the inner walls of the vertically oriented passages as a thin liquid film, while the hot initial gas stream flows upward within the vertically oriented passages, so that a fully heated liquid medium and the partially cooled gas stream are produced. The second contact stage accomplished high direct contact heat transfer with low mass transfer, so that minimal heat is lost as heat of vaporization of liquid medium evaporated into the gas stream. The fully heated liquid medium is passed in indirect heat exchange with a fluid, so that the liquid medium is cooled and the fluid, which may be water, air, or a process fluid strea, is heated.

4340566

CATALYST REGENERATION APPARATUS

Gregory Thompson; Anthony Vickers; assigned to UOP Inc.

A catalyst regeneration apparatus for the oxidation of coke from a spent catalyst, said coke being converted to CO, and for the conversion of the CO to CO2. Hot regenerated catalyst is recycled from a dense bed in the regeneration zone to mix with incoming spent catalyst in a mixer zone. The mixer zone operated in dense phase and is supplied with a relatively small amount of a fluidizeing medium, preferably air. After the mixing of spent and fresh catalyst is sustantially completed, a relatively large amount of a regenerating gas, preferably air, is admixed with the catalyst mixture, and some coke oxidation occurs. The balance of coke oxidation takes place in a downstream-situated regeneration zone of substatioally conventially design. There is a transfer section connecting the mixer zone to the regeneration zone through when the relatively large amount of the regenerating gas is admitted. The transfer section is preferably a substantially horizontal surface having an outside perimeter intermediate the outside perimeters of the regeneration and mixer zones. Regeneration gas addition is made through multiple perforations in the transfer section.

4340400

FLUIDIZED BED FILTERING AND/OR HEAT EXCHANGE APPARATUS PARTICULARLY FOR GASEOUS DISCHARGES FROM INTERNAL COMBUSTION ENGINES AND INDUSTRIAL PLANTS