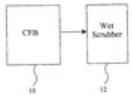
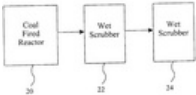
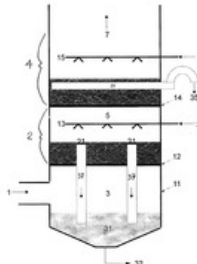
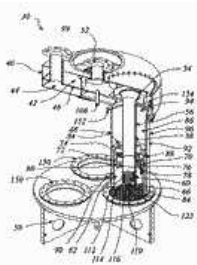
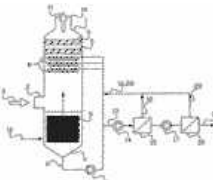
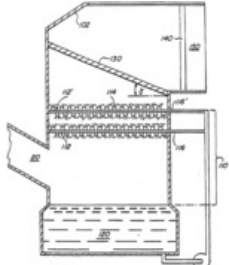
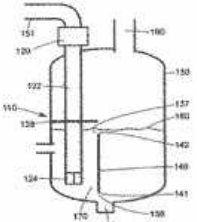
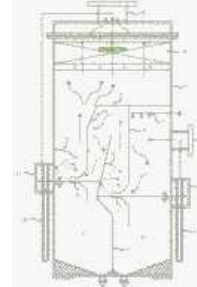
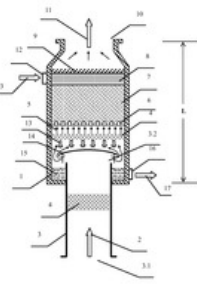
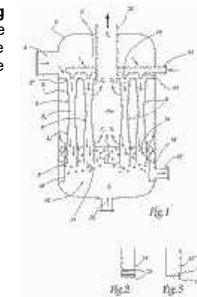
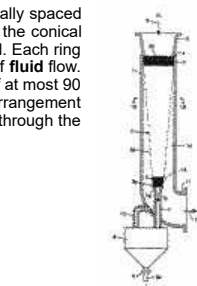
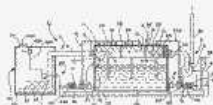
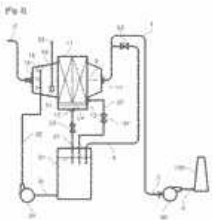
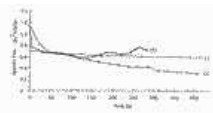
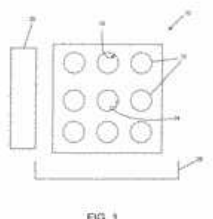
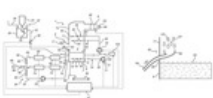
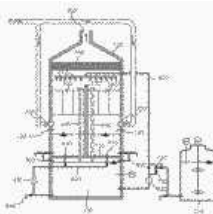
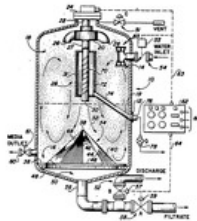
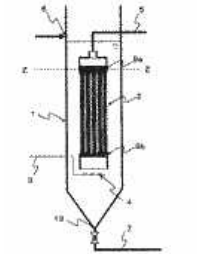
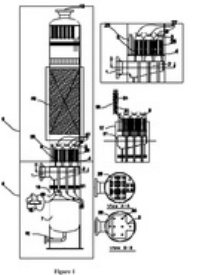
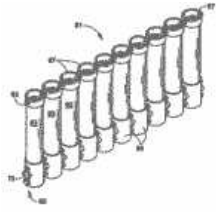
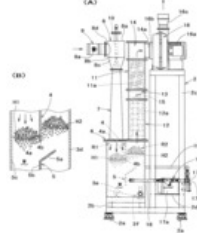
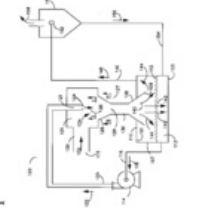


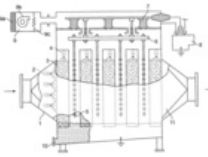
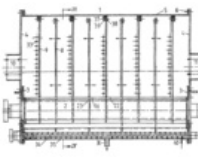
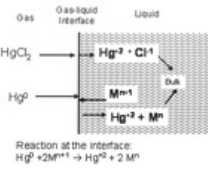
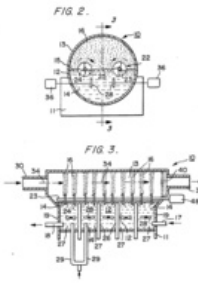
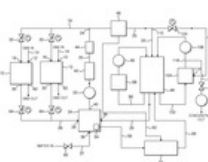
#	 Title	Publication number	1st app. date	Applicant/Assignee	
1.	 Scrubbing systems and methods for coal fired combustion units	US20050084437	2003-10-20	ENVIROSERVE* ENVIROSERVE L L C ENVIROSERVE L SEA	100 %
Systems and methods for removing toxic emissions from flue gas of coal fired combustion units can be achieved. Decreasing sulfur oxide emissions from a coal fired circulating fluidized bed reactor (10) can include treating flue gas unit using a wet scrubber (12). Wet scrubbers can include gas phase scrubbers, liquid phase scrubbers, and gas-liquid phase scrubbers. Additionally, toxic emissions can be reduced from coal fired combustion units (20) such as circulating fluidized beds or pulverized coal units. Particulates can be removed from flue gas of the coal fired combustion unit. The flue gas can then be treated with at least two consecutive wet scrubbers (22,24) to produce a low sulfur flue gas. In addition to sulfur oxides, a wide variety of toxic emissions can be removed such as nitrogen oxides, carbon monoxide, arsenic, beryllium, cadmium, hydrochloric acid, chromium, cobalt, hafnium, lead, manganese, mercury, nickel, selenium, benzo(a)pyrene, and combinations thereof. Such systems and methods provide improved levels of toxic emissions over currently available technologies.  FIG. 1  FIG. 2					
2.	 Multi-level gas scrubber with multiple flooded scrubber heads	CA3022784	2015-11-02	PACIFIC GREEN TECHNOLOGIES*	88 %
The present invention relates to a wet scrubbing head design whose horizontal orientation and flooded operating characteristics allow complete wet scrubbing at multiple interaction zones each with different neutralizing reagents. The capacity for multiple scrubbing zones improves overall pollutant removal efficiency by adding polishing interaction zones for particulate and acid gas removal systems or by broadening the range of pollutants being removed by operating with a different neutralizing solution or a combination of these operating conditions. The flooded head design approach allows a single scrubber to accomplish high levels of removal efficiency for multiple pollutants which reduces cost, and footprint interaction complexities of the multiple devices it replaces. Flooded head scrubbers have application in combustion flue gas pollutant removal and in chemical and industrial applications that generate dust, odors and acid gases.  FIG. 3					
3.	 Gas scrubber	WO9919046	1998-10-07	TRIVETT ANDREW D	85 %
An exhaust gas scrubber including a tank of scrubbing liquid into which a downcomer pipe(s) feeds inlet gas and fresh scrubbing liquid from a plenum. The inlet gas flows through slotted vortex generators forming fine-scale bubbles encapsulated within a scrubbing liquid. The bubbles mix and coalesce in a turbulent motion, and are then passed through another set of vortex generators which break up coalesced bubbles and form fresh fine sized bubbles, and impart an angular velocity to the mixture. Formation and coalescence of the bubbles produce gas phase to liquid phase mixing and scrubbing. Centrifugal forces created through the slotted vortex generator produce liquid circulation and recycle. The bubbly mixture then rises, bubbles coalesce and break, and the liquid scrubbing solution falls back, flowing into a relatively quiescent down flow zone around the perimeter of the scrubber outside of an overflow weir or weirs. The outlet gas rises into a freeboard section where de-mister and heat exchanger pipes remove scrubbing vapour from the outlet gas. The scrubbing liquid flows downward into a quiescent settling tank where honeycomb vortex breakers inhibit turbulence to ensure settling of particulate into the sediment. Internal solids separation is accomplished in quiescent zones between the outer walls of the overflow dam(s) and the inner walls of the housing, and below the honeycomb vortex inhibitors. A conical bottom to the tank permits the settling sediment to be flushed out of the scrubber with the outlet scrubbing liquid. Scrubber solution liquid level is controlled by a flow and level control valving arrangement. Scrubber solution temperature is controlled by a complementary arrangement of flow controls.  FIG. 4					
4.	 Method for removing a nitrogen oxide from a gas	WO03084645	2003-03-25	AKZO NOBEL*	85 %
The invention pertains to a method and an apparatus for removing a nitrogen oxide (NOx) from a gas by bringing the gas into contact with a scrub liquid in a scrubber for converting the nitrogen oxide into molecular nitrogen (N2) wherein the scrub liquid comprises a metal ion chelate and a biomass, after which at least a portion of the scrub liquid is subjected to a membrane separation process for separating at least part of the metal ion chelate, and the biomass and other solidified components, from dissolved components, wherein the membrane separation process comprises: a) filtering at least a portion of the scrub liquid using a first membrane capable of permeating the metal ion chelate to provide a first retentate liquid comprising the biomass and other solidified components, and a first permeate liquid comprising at least part of the metal ion chelate and dissolved components, and b) nanofiltering the first permeate liquid to give a second retentate liquid comprising the metal ion chelate and a second permeate liquid comprising dissolved components, and c) recycling at least part of the second retentate liquid to the scrubber.  FIG. 5					
5.	 Improved entrainment separator for high velocity gases and reheating of scrubber gases	WO9533552	1995-06-07	ABB ENVIROMENTAL SYSTEMS DIV OF ABB FLAKT ABB ENVIRONMENTAL SYSTEMS BIRM ABB ENVIRONMENTAL SYSTEMS DIV OF ABB FLAKT* ALSTOM POWER	85 %
Sulfur oxides (SOx) are scrubbed from combustion effluents with aqueous limestone slurries with greater efficiency due to the use of an improved entrainment separator (130). In the preferred embodiment of a single-loop, counter-current limestone wet scrubber (100) (preferably with a spray-contacting zone of less than 6 meters in height) operating at bulk gas flow rates of greater than 4.5 meters per second, a vertical stream of flue gas is freed of a substantial portion of slurry droplets and diverted for effective mist removal by a well-drained, horizontal-flow mist eliminator (140). The entrainment separator (130) is a single-pass device with individual blades aligned for effective operation with reduced droplet impingement on the upper walls (e.g., roof) of the scrubber and to permit periodic washing. Use of a vertically-oriented, horizontal-shaft rotary heat exchanger (431) is facilitated and space and duct work requirements are greatly reduced.  FIG. 6					

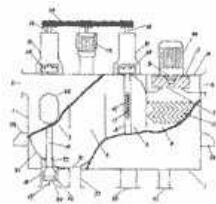
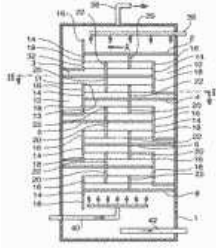
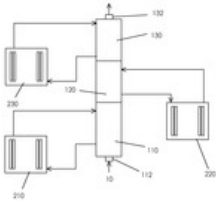
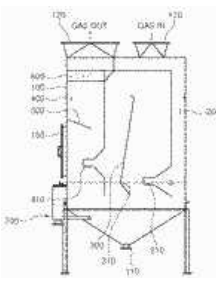
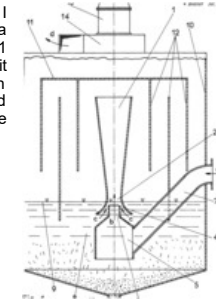
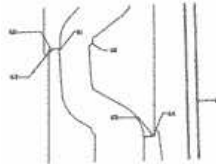
6.	Fluid scrubber	WO2008088347	2007-01-19	DUESEL BERNARD F JR;RUTSCH MICHAEL J	84 %
A fluid scrubber in the form of a, submerged gas reactor includes a reaction vessel, a gas delivery tube partially disposed within the reaction vessel to deliver a gas into the reaction vessel and a scrubbing liquid inlet that provides a scrubbing liquid to the reaction vessel at a rate sufficient to maintain a controlled constant level of fluid within the reaction vessel. A weir is disposed within the reaction vessel adjacent the gas delivery tube to form a first fluid circulation path between a first weir end and a wall of the reaction vessel and a second fluid circulation path between a second weir end and an upper end of the reaction vessel. During operation, gas introduced through the tube mixes with the scrubbing liquid and the combined gas and liquid flow at a high rate with a high degree of turbulence along the first and second circulation paths defined around the weir, thereby promoting vigorous mixing and intimate contact between the gas and the scrubbing liquid. This turbulent flow develops a significant amount of interfacial surface area between the gas and the scrubbing liquid resulting in a reduction of the required residence time of the gas within the scrubbing liquid to achieve thermal equilibrium and/or to drive chemical reactions to completion, all of which leads to a more efficient and complete evaporation, chemical reaction, or combined evaporation and chemical reaction process.					
					
7.	High efficiency multistage vortex type wet scrubber	KR20170135304	2016-05-31	C & S TECHNOLOGY* UNIVERSITY OF ULSAN INDUSTRY ACADEMIC COOPERATION FOUNDATION*	84 %
The present invention relates to a high efficient multi-staged vortex-type wet scrubber comprising: a barrel-like main body; a first chamber accommodating a first cleansing solution; a second chamber accommodating a second cleansing solution; a chamber separation plate installed to separate the first chamber and the second chamber apart; an inlet introducing flow of gas containing air pollutants; at least one cleansing solution spray hole spraying the first cleansing solution; a first collision plate installed to face the inlet at a gap between the chamber separation plate and the inlet; a first nozzle installed at a lateral side of the first collision plate toward the chamber separation plate; a second collision plate installed on a lateral side of the chamber separation plate at a spot higher than the first nozzle; a third collision plate connected to an upper end of the first collision plate; a fourth collision plate separated from the chamber separation plate; a second nozzle installed at a lateral side of the fourth collision plate; a fifth collision plate installed on the other lateral wall of the main body toward the fourth collision plate at a spot higher than the second nozzle; a demister filter installed at an upper portion of the main body at a spot higher than the third collision plate; an outlet installed at an upper end of the main body; a first cleansing solution inlet installed on the lateral wall at the side of the first chamber of the main body; a second cleansing solution inlet installed on the lateral wall at the side of the second chamber of the main body; a first cleansing solution outlet installed on the bottom at the side of the first chamber of the main body; a second cleansing solution outlet installed on the bottom at the side of the second chamber of the main body; a first water level check device connected to the first cleansing solution inlet; and a second water level check device connected to the second cleansing solution inlet.					
					
8.	Washing device and washing method for marine exhaust flue gases	WO2009149602	2008-06-13	JINGYUAN ENVIRONMENTAL ENGINEERING*	83 %
This invention relates to a ship flue gas scrubbing apparatus and scrubbing method. The apparatus includes a housing (1), an upper scrubbing layer (7) at the upper side inside the housing (1), and a liquid collecting pool (15) in the lower side inside the housing (1), a flue gas leading-in port (3.2) between the scrubbing layer (7) and the liquid collecting pool (15), a scrubbing seawater inlet (12) above the scrubbing layer (7), and a cooler (4) located at a flue gas passage between the flue gas inlet (3.1) outside the housing and the scrubbing layer (7). The method includes leading flue gas, cooling, injecting scrubbing seawater, scrubbing and other steps.					
					
9.	Scrubber for cleaning the exhaust gases of a diesel engine, method of operating it and corresponding maritime vehicle	WO2007057573	2005-11-18	LAB*	83 %
The scrubber comprises several gas inlet tubes (8) having an upstream end (8") able to be fed from the gas inlet (4) and a downstream end (8') opening into the scrubbing volume (16), means (10, 12) for spraying scrubbing liquid near the upstream end (8") of the inlet tubes (8) and means (26) for removing the scrubbed gases from the chamber. Each inlet tube (8), which in particular is of the Venturi type, is able to confer upon the gas that is to be scrubbed a pressure that is markedly higher, at the downstream end (8') of the tube, than the pressure of the gas at the upstream end (8") of the tube (8), and the downstream end (8') of each tube (8) in service extends below the free surface (S) of the scrubbing liquid (L).					
					
10.	Device for separating multiple-component fluids	CA2103816	1992-08-20	ENVIRONMENTAL PROTECTION ENVIRONMENT PROTECTION ENVIRONMENTAL PROT ENVIRONMENTAL PROTECTION EPR*	83 %
A device for separating multiple-component fluids includes a truncated cone structure (2) having a conical main section (2a) defined by a plurality of coaxially aligned and axially spaced rings (3) of progressively diminishing inner diameters as viewed in the direction of movement (6) of the fluids being separated. The largest ring (3a) is located at that end of the conical main section at which the fluid is admitted thereto, and the smallest ring (3b) is located at that end of the conical main section at which separated solid particles are discharged. Each ring has an inside surface (13) which is convexly curved in a radial crosssection along the axis of the cone structure and faces in part counter to and in part across the direction of fluid flow. The inside surface of each ring meets the bottom surface (14) of that ring in a sharp edge (14a), with the tangent to the bottom surface at that juncture making an angle alpha of at most 90 DEG with respect to the direction of fluid flow, and with the tangent (T-2) to the inside surface at that juncture being substantially parallel to the axis of the cone structure. The arrangement of the rings causes the solid particles to be concentrated in the axial region of the cone structure for axial discharge therefrom while cleaned fluid exits from the cone structure through the gaps (16) between the rings.					
					

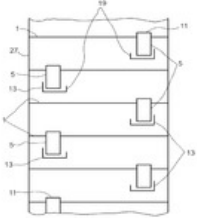
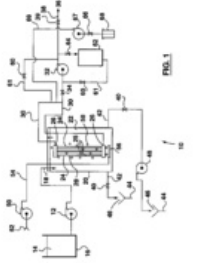
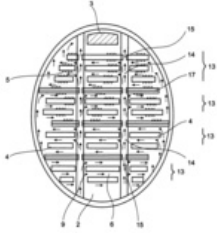
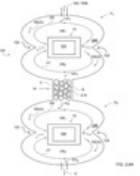
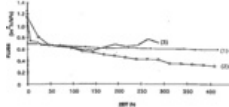
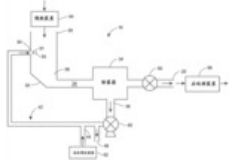
11.	Method and apparatus for filtering contaminants	WO8902776	1988-09-14	HENSLEY CLIFFORD J*	82 %
A stream of contaminated liquid flows into a vessel, through a filter media comprised of at least 50 % pecan hulls, while clean liquid exits the vessel, leaving the contaminants deposited on the filter media. The deposited contaminants are scrubbed from the media by circulating the media along a toroidal flow path within the vessel until the contaminants have been transferred from the media into the liquid. The scrubbing action is achieved by a pump suction which is spaced from a pump discharge. The pump discharges through a perforated nozzle. The nozzle extends through a housing. An annulus is formed between the nozzle and the housing. Dirty scrub water flows from the pump, through the nozzle perforations, into the annulus, and away from the vessel, while at the same time the toroidal flow path is maintained.					
12.	Filter apparatus and method.	WO8804951	1987-01-09	HENSLEY CLIFFORD J WHITTIER FILTRATION*	82 %
A filter device for removing contaminants from liquid flowing therethrough comprising a vessel having an inlet for providing a contaminated liquid flow into the interior thereof and an outlet through which filtered liquid can exit the vessel. A screen means contained within the vessel supports a filter media thereof. A pump has a suction and discharge located within the vessel and respective to the screen whereby the filter media can be fluidized and thereby cleaned without removing the media from the vessel. The scrubbing action transfers the contaminants from the filter media into the scrub water and thereby enables the contaminants to be removed from the vessel by discharging the scrub water therefrom.					
13.	Fluid scrubber	AR059252	2007-01-19	DUESEL BERNARD F HEARTLAND TECHNOLOGY* RUTSCH MICHAEL J	81 %
A fluid scrubber in the form of a submerged gas reactor includes a reaction vessel, a gas delivery lube partially disposed within the reaction vessel to deliver a gas into the reaction vessel and a scrubbing liquid inlet that provides a scrubbing liquid to the reaction vessel at a rate sufficient to maintain a controlled, constant level of fluid within the reaction vessel. A weir is disposed within the reaction vessel adjacent the gas delivery tube to form a first fluid circulation path between a first weir end and a wall of the reaction vessel and a second fluid circulation path between a second weir end and an upper end of the reaction vessel. During operation, gas introduced through the tube mixes with the scrubbing liquid and the combined gas and liquid flow at a high rate with a high degree of turbulence along the first and second, circulation paths defined around the weir, thereby promoting vigorous mixing and intimate contact between the gas and the scrubbing liquid. This turbulent flow develops a significant amount of interfacial surface area between the gas and the scrubbing liquid resulting in a reduction of the required residence time of the gas within the scrubbing liquid to achieve thermal equilibrium and/or to drive chemical reactions to completion, all of which leads to a more efficient and complete evaporation, chemical reaction, or combined evaporation and chemical reaction process.					
14.	Multi-stage hereto-liquid scrubbing plant	CN2749562	2004-08-24	SHANGHAI MUNICIPAL ENGINEERING DESIGN & RESEARCH INSTITUTE*	81 %
The utility model discloses a multi-stage hereto-liquid scrubbing plant, which is characterized in that the multi-stage hereto-liquid scrubbing plant is provided with two scrubbing chambers at least, and bafflers are arranged in the scrubbing chambers; each scrubbing chamber is provided with a liquid collecting pond and a pipeline spraying mechanism, and each liquid collecting pond is provided with an overflow pipe which forms an inverted U shape. The utility model combines more than two scrubbing chambers into one multi-stage hereto-liquid scrubbing plant; different liquid collecting ponds store the spraying liquid with different properties; the mixed gas to be scrubbed goes through each scrubbing chamber step by step, and the mixed gas to be scrubbed is scrubbed by one spraying liquid in one scrubbing chamber; one kind or one type of gas component in the mixed gas generates chemical reaction with the spraying liquid, which changes the quantity of the gas component in the mixed gas; after the mixed gas is scrubbed by the spraying liquid with different properties of the multi-stage scrubbing chamber, the combination scale of various gas components generates variation; thereby, the mixed gas property is changed. The utility model overcomes the uniqueness of gas scrubbing and forms a multi-stage scrubbing, multiple hereto-liquid scrubbing and multiple gas mixing scrubbing device.					
15.	Depth exposed membrane for water extraction	US20080190849	2008-02-12	DEX WATER TECHNOLOGIES DXV WATER TECHNOLOGIES ECONOPURE WATER SYSTEMS*	81 %
A DEMWAX water treatment system includes membrane modules (102) and a collection channel (104). The membrane modules (102) are submerged at depth and tethered to one or more anchors (100) on the ocean floor. A breathing tube (106) extends between the collection channel (104) and a buoy (108) floating on the surface of the ocean to expose the collection channel to atmospheric pressure. A pump (110) pumps the permeate from the collection channel (104) to shore through a permeate pipe (112). One or more permeate storage tanks (114) can optionally be disposed within the system, for example, as part of or extending from the collection channel (104), to provide extra storage.					
16.	Device for purifying exhaust air and method for cleaning exhaust air in a farm animal stable	DE202014002982	2014-04-08	BIG DUTCHMAN* BIG DUTCHMAN INTERNATIONAL GESELL SCHAFT MIT BESHRENTLICH HUFFUNG BIG DUTCHMAN INTERNATIONAL	81 %
The invention relates to an exhaust air purification device for a livestock stable comprising at least one exhaust air scrubber having a filter body that can be wetted with a scrubbing liquid or that can absorb a scrubbing liquid; and a scrubbing liquid container holding a scrubbing liquid; wherein the at least one exhaust air scrubber is arranged on a moving device, the moving device being designed and arranged to immerse the at least one exhaust air scrubber completely or partially into the scrubbing liquid in the scrubbing liquid container. (From US9839194 B2)					
17.	Low operating pressure gas scrubber	US20050072299	2003-10-06	DESERT ENERGY ODESSA TX*	81 %
Provided herein is an apparatus for scrubbing either acidic or alkaline impurities from gas streams, wherein the gas streams to be scrubbed exist at a pressure which is only slightly higher than ambient pressure. An apparatus according to a preferred form of the invention exists substantially in the shape of a rectangular or cubic solid, having an inlet pipe which is directed to an inner chamber having a wall portion which functions as a manifold, including a plurality of gas conduction tubes in fluid contact with the inner chamber, and into which tubes the gas to be scrubbed enters. The gas to be scrubbed passes through holes in the walls of the gas conduction tubes and contacts a liquid absorbent substance present in the interior confines of the apparatus, which liquid is capable of reacting with one or more impurities in the gas stream, thus eliminating the impurities from the gas stream. The gas stream so treated emerges from the apparatus through a gas outlet provision.					

18.	Emergency scrubbing system and method of using same	WO9308899	1992-10-27	RJ ENVIRONMENTAL SIEMENS INDUSTRY* SIEMENS WATER TECHNOLOGIES*	80 %
An emergency scrubbing system guides rapidly escaping noxious fluid under pressure along an irregularly shaped non-linear delay path of travel, and admits a treating substance to the fluid to provide a preliminary treatment therefor to help neutralize the fluid. The preliminarily treated fluid is then treated at the exit end of the delay path for providing a final treatment before releasing it to the atmosphere. The final treatment is prepared as the fluid flows through the delay path for a predetermined period of time substantially equal to the length of time required for the fluid under pressure to flow through the delay path. 					
19.	Wet type scrubber for exhaust gas capable of cleaning eliminator easily	WO2009014285	2007-07-23	ECOGREEN LEE SEOB* MIRAE*	80 %
An easily-cleanable wet type scrubber for exhaust gas includes a scrubbing chamber having an inlet port, an outlet port and a drain hole formed in a bottom wall of the scrubbing chamber. An eliminator is arranged within the scrubbing chamber to divide the interior of the scrubbing chamber into an inlet space and an outlet space, the eliminator having a plurality of spaced- apart blades. The scrubber further includes a fluid reservoir for storing fluid, a first drain pipe having a first end connected to the drain hole and a second end connected to the fluid reservoir, a first valve installed in the first drain pipe for openably closing the drain pipe, a spray nozzle provided within the scrubbing chamber for spraying the fluid into the inlet space of the scrubbing chamber, and a fluid pump for supplying the fluid to the spray nozzle. 					
20.	Gas/liquid contacting devices and the operation thereof	GB1068387	1964-04-23	NORDAC*	80 %
1,068,386. Contacting gases with liquids. NORDAC Ltd. April 23, 1964, No. 16797/64. Heading B1R. In apparatus for contacting a gas with a liquid the gas is passed through a duct 2 containing one or more perforated plates 6 the or each plate 6 being sprayed with liquid from a nozzle 5 to produce an intermate mixture of liquid droplets and gas which passes through the apertures at a velocity between 50 and 400 ft. per second. The apertures in the plates or plates 6 are circular and have a diameter between #'' and 1''. Preferably the pressure drop across a plate is at least 20'' w.g. when the velocity through the apertures is between 100 and 400 ft. per second. The velocity of the gas in the duct 2 is between 15 and 100 ft. per second. When as shown a number of plates 6 are arranged in series plates 7 apertured in their upper halves are provided to check the flow of liquid from one stage to the next. (From GB1068386 A) 					
21.	Gas scrubber	US6402816	2000-04-07	TRIVETT D. ANDREW;TRIVETT GORDON S.	80 %
An exhaust gas scrubber including a tank of scrubbing liquid into which a downcomer pipe(s) feeds inlet gas and fresh scrubbing liquid from a plenum. The inlet gas flows through slotted vortex generators forming file-scale bubbles encapsulated within a scrubbing liquid. The bubbles mix and coalesce in a turbulent motion, and are then passed through another set of vortex generators which break up coalesced bubbles and form fresh fine sized bubbles, and impart an angular velocity to the mixture. Formation and coalescence of the bubbles produce gas phase to liquid phase mixing and scrubbing. Centrifugal forces created through the slotted vortex generator produce liquid circulation and recycle. The bubbly mixture then rises, bubbles coalesce and break, and the liquid scrubbing solution falls back, flowing into a relatively quiescent down flow zone around the perimeter of the scrubber outside of an overflow weir or weirs. The outlet gas rises into a freeboard section where de-mister and heat exchanger pipes remove scrubbing vapour from the outlet gas. The scrubbing liquid flows downward into a quiescent settling tank where honeycomb vortex breakers inhibit turbulence to ensure settling of particulate into the sediment. Internal solids separation is accomplished in quiescent zones between the outer walls of the overflow dam(s) and the inner walls of the housing, and below the honeycomb vortex inhibitors. A conical bottom to the tank permits the settling sediment to be flushed out of the scrubber with the outlet scrubbing liquid. Scrubber solution so liquid level is controlled by a flow and level control valving arrangement. Scrubber solution temperature is controlled by a complementary arrangement of flow controls. 					
22.	Membrane filtration process	WO9706880	1995-08-11	GE BETZDEARBORN CANADA ZENON ENVIRONMENTAL ZENON ENVIRONMENTAL ZENON TECHNOLOGY PARTNERSHIP*	80 %
A membrane filtration device, for withdrawing permeate from a liquid substrate, includes a first solid body (41u); a second solid body (41b); and a plurality of hollow fiber membranes (42) potted in the solid bodies such that the peripheries of the membranes are bounded by an elongated rectangular shape and such that the membranes have open ends flush with or protruding from a permeate discharging face of one or both solid bodies. A permeate collection means (43u, 43b) is arranged to collect permeate in fluid communication with the permeate-discharging face of each solid body (41u, 41b) that has a permeate-discharging face. The membranes (42), the solid bodies (41u, 41b) and the permeate collection means (43u, 43b) together form a submersible assembly. The first solid body (41u) is upper and disposed in vertically spaced-apart relationship above the second solid body (41b). The opposed faces of the solid bodies (41u, 41b) are separated by a vertical distance and the membranes (42) have a length from 0.1% to less than 5% greater than the vertical distance between the opposed faces of the solid bodies (41u, 41b). 					
23.	Removal of carbon dioxide from air	WO2006023743	2005-08-19	COLUMBIA UNIVERSITY GLOBAL RESEARCH TECHNOLOGIES KILIMANJARO ENERGY*	80 %
The present invention is directed to methods for removing carbon dioxide from air, which comprises exposing solvent covered surfaces to air streams where the airflow is kept laminar, or close to the laminar regime. The invention also provides for an apparatus, which is a laminar scrubber, comprising solvent covered surfaces situated such that they can be exposed to air stream. In another aspect, the invention provides a method and apparatus for separating carbon dioxide (CO<SUB>2</SUB>) bound in a solvent. The invention is particularly useful in processing hydroxide solvents containing CO<SUB>2</SUB> captured from air. 					
24.	A method of controlling a wet scrubber useful for removing sulphur dioxide from a process gas	EP2578292	2011-10-07	ALSTOM TECHNOLOGY GENERAL ELECTRIC TECHNOLOGY*	80 %
A wet scrubber (1) for cleaning a process gas containing sulphur dioxide comprises an absorption vessel (2) for contacting the process gas with an absorption liquid to absorb sulphur dioxide from the process gas, a sensor (68,74) for measuring a sulphite concentration in the absorption liquid, and a control unit (52). The control unit (52) is adapted to receive a measurement signal from the sensor (68, 74) and to control, based on the measured sulphite concentration, at least one wet scrubber operating parameter influencing the concentration in the absorption liquid. 					
25.	Scrubber using recyclable ion-exchange fibers.	KR20130052482	2011-12-23	SAE HAN ENV TECHNOLOGY*	80 %
PURPOSE: A gas remover using recyclable ion-exchange fibers is provided to increase process efficiency of foul odor and hydrogen sulfide. CONSTITUTION: A gas remover using recyclable ion-exchange fibers comprises housing(100), a top and bottom partitioning plate(110), a right and left partitioning plate, a left chamber(130), a right chamber(140), a lower chamber(150), a cartridge unit(500,500'), a gas inlet unit(200,200'), and a gas discharge unit(300), and a recycle fluid circulation path. The left chamber and the right chamber are positioned at the upper side of the top and bottom partitioning plate and are positioned on the left side and right side of the right and left partitioning plate. A certain amount of recycle fluid is filled into the left chamber, right chamber, and lower chamber. The lower chamber has a volume bigger than that of the left and right chambers. The cartridge unit is arranged in the right and left chambers and comprises one or more cartridges including ion exchange fibers. The gas inlet unit is positioned on one side of the right chamber and the left chamber and is positioned a part lower than the cartridge unit. 					

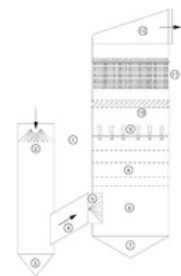
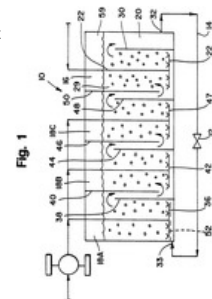
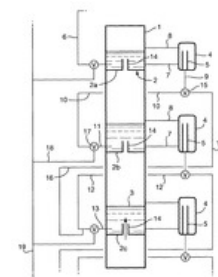
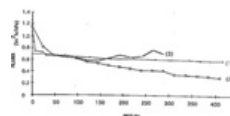
26.	Filter system and scrubber	US4966698	1989-03-30	WHITTIER FILTRATION*	79 %
A stream of contaminated liquid flows into a vessel, and through a filter media, while clean liquid exits the vessel leaving the contaminants deposited on the filter media. The deposited contaminants are scrubbed from the media by circulating the media along a toroidal flow path within the vessel until the contaminants have been transferred from the media into the liquid. The scrubbing action is achieved by a pump suction which is spaced from a pump discharge. The pump discharges through a perforated nozzle. The nozzle extends through a housing. An annulus is formed between the nozzle and the housing. Dirty scrub water flows from the pump, through the nozzle perforations, into the annulus, and away from the vessel, while at the same time the toroidal flow path is maintained.					
					
27.	Membrane filtration apparatus and its operating method	WO2007083723	2007-01-19	TORAY INDUSTRIES*	79 %
This invention provides a membrane filtration apparatus that can realize stable membrane filtration operation at a high percentage operation recovery even for raw water having a relatively high level of turbidity. The membrane filtration apparatus comprises a dipping tank (1) having a raw water supply port in its upper part and a water discharge port in its lower part. A dipping-type hollow fiber membrane module (2) comprising a large number of hollow fiber membranes which have been bundled, is disposed within the dipping tank (1) so that the longitudinal direction of the hollow fiber membrane is a vertical direction. A diffuser tube (3) is disposed below the hollow fiber membrane module. The position of the raw water supply port is located above the hollow fiber membrane module. In a horizontal section of the dipping tank in which the hollow fiber membrane module has been disposed, the proportion of the sectional area of the hollow fiber membrane module to the sectional area within the dipping tank is 60% to 90%, the distance between the diffuser tube and the bottom face of the dipping tank is not less than 200 mm, and the position of the water discharge port is not less than 200 mm below the diffuser tube.					
					
28.	Inlet device for dehydration towers	NO20120414	2012-04-08	CAMERON SYSTEMS*	79 %
An inlet device (17) for a gravity separator (18) for separating a fluid mixture comprising gas and liquid. The inlet device (17) comprises an inlet nozzle (1) for the fluid mixture, a distribution chamber (2) connected to the said inlet nozzle for distributing the fluid mixture to Chimney trays (27) mounted on top of a section plate (4) dividing the vessel into a the lower scrubber section (5) and dehydration section (6), the section plate (4) constituting an integral part of the inlet device (17) by being connected to the distribution chamber.					
					
29.	Filtration with low-fouling, high-flow, low-energy spiral wound membrane cartridges	WO2005070524	2005-01-10	MICRODYN NADIR* TRISEP	79 %
High-flow, low-pressure ultrafiltration or microfiltration spiral wound membrane cartridges (4) are designed for use in submerged water filtration applications. Air (5) is bubbled up through the cartridge to scour and maintain clean membrane surfaces (21). Such a spiral wound membrane cartridge designed for high-flow, low-pressure, submerged operation may utilize either vacuum or static liquid head for drive pressure. By minimizing parasitic pressure losses within the cartridges, water permeate flux rates as high as 90 gallons per square foot per day (gfd) can be obtained at net drive pressures below 10 pounds per square inch. The use of air-scouring, where air is bubbled up through passageways between active membrane surfaces from distributors (16) located below the cartridge, has been found to be surprisingly effective to remove accumulated solids and maintain a clean membrane surface; it allows high flux operation for extended periods between chemical cleanings when operated at a net driving pressure of 1 psi or even as low as 0.5 psi.					
					
30.	Gas cleaning apparatus	CN103170219	2011-12-26	MORIKAWA SANGYO SEN SICHUAN INDUSTRIAL*	79 %
PROBLEM TO BE SOLVED: To improve cleaning performance of a gas cleaning apparatus that cleans an exhaust gas including environmental contaminants. SOLUTION: The gas cleaning apparatus is provided with a partition plate 4 partitioning a space formed above a water tank 3 into a first chamber R1 in which the exhaust gas flows and a second chamber R2 communicating with a gas exhaust port 16c and configured to put the lower end part of a partition plate 4 in a cleaning liquid W, and also provided with differential pressure generation means of generating differential pressure between the first and second chambers R1, R2 and configured to clean the exhaust gas again on the second chamber side by moving the cleaning liquid W through a communication part formed below the partition plate 4 according to generation of the differential pressure, pushing up a second liquid level H2 in the second chamber R2 while lowering a first liquid level H1 in the first chamber R1 down to the position of the communication part, and then guiding the exhaust gas flowing in the first chamber and cleaned into the cleaning liquid on the second chamber side through the communication part below the partition plate.					
					
31.	Method and apparatus for cleaning a gas	US6391100	2001-07-06	HOGAN J. S.	79 %
A system and method of cleaning a gas of undesired particulate, aromas, and gases of the type utilizing a centrifuge with various combinations and apparatus used to liquid wet a gas stream is provided. The gas scrubber of the present invention includes a container for containing a liquid having a surface forming a space between said surface and the container top; a motor having a rotatable vertically mounted shaft mounted above said top with said shaft connected to and rotatable with a centrifuge cylinder having an inlet positioned outside of said container and having an outlet positioned in said space. Said cylinder contains fan blades to draw gas from said cylinder inlet and out said cylinder outlet. A vertically mounted rotatable siphon pipe, connected to said shaft, that has an inlet positioned below said surface and an outlet positioned proximate said centrifuge inlet to draw liquid up and out to the centrifuge inlet and flow down the centrifuge wall to clean the wall and mix with said gas. A throat may be provided at said cylinder outlet to further mix said gas. A moving liquid surface may also be provided in front of said throat outlet to allow the departing gas from said throat to impact and additionally mix said gas.					
					

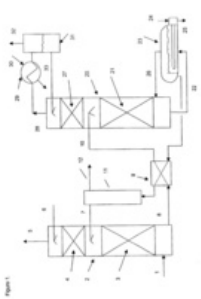
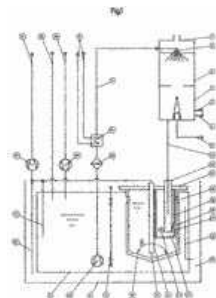
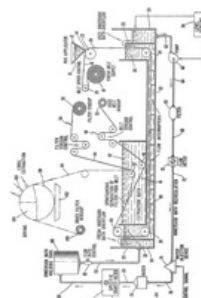
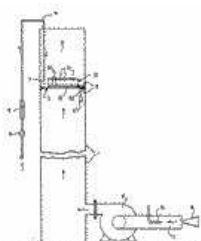
32.	Method and apparatus for particulate removal and undesirable vapor scrubbing from a moving gas stream	US20070009411	2006-07-07	EISENMANN*	78 %
An apparatus and method for removing particulate matter and undesirable vapors from a gas stream including at least one ionizing electrode (5) that negatively charges the particulate matter and condensed droplets of undesirable vapors, at least one scrubbing element (3) including a collecting surface, and at least one liquid applicator (4) operable to apply a liquid film to the collecting surface, wherein a positive charge is applied to the liquid film to attract negatively-charged particulate matter and/or condensed droplets of undesirable vapors to the collecting surface. 					
33.	An apparatus for rectification of liquid mixtures and/or for scrubbing of gases	WO200051702	1999-03-01	ERIK JENSEN	78 %
An apparatus for rectification liquids and/or for scrubbing of gases has an elongated, horizontally extending, cylindrical process chamber or housing (1). A liquid and a gaseous phase are passed counter-currently through the apparatus. The liquid is thrown outwardly towards the peripheral housing wall (5) by means of a rotor (2) extending along the bottom of the housing. Liquid flowing downwards along the peripheral housing wall (5) is collected in an upwardly open channel (25) and the liquid collected therein may be supplied to the rotor via an adjustable slot or opening (28). Transversely extending, axially spaced guide plates (7-9) are arranged within the housing (1) so as to define a tortuous path for the gas phase flowing through the housing. 					
34.	Redox method for capture of total gaseous mercury by wet fgd	WO2011008962	2010-07-15	BABCOCK & WILCOX* BABCOCK & WILCOX ENTERPRISES* BABCOCK & WILCOX TECHNOLOGY* BABCOCK & WILCOX UNIVERSAL* DIAMOND POWER INTERNATIONAL* KOCH & WILLIAM WILCOX POWER GENERATION MEGTEC TURBOSONIC TECHNOLOGIES* US INTERNAL REVENUE SERVICE*	78 %
A method for capturing gaseous elemental mercury in a flue gas wherein a soluble mercury oxidizer is utilized to oxidize gaseous elemental mercury at a gas-liquid interface of a wet scrubber, and oxidized mercury product is removed prior to re-emission. 					
35.	Spraying scrubber and procedure for the gas cleanup	GB8417449	1984-07-09	GENERAL ELECTRIC GENERAL ELECTRIC ENVIRONMENTAL SERVICES*	78 %
Apparatus for effecting intimate contact of gases and liquids comprises a housing containing a liquid in its lower portion and having disc-shaped impellers (24) for spraying liquid into the gas-liquid contact space, which impellers rotate on parallel shafts (23) axially disposed in the housing and supported above the liquid so that the lower portions of the impellers are immersed in it. Fresh liquid may be introduced (17) beneath the point where the gas is removed (32), and spent liquid removed (18) from the reservoir beneath the point where the gas is introduced (30), to provide countercurrent flow. In one embodiment the apparatus is used to remove sulphur dioxide and fly ash from the flue gas generated by burning coal by employing pulverized limestone or lime in water as the liquid spray in the gas-liquid contact space. <IMAGE> (From GB2144650 A) 					
36.	Compact wastewater concentrator and contaminant scrubber	WO2011014617	2010-07-28	HEARTLAND TECHNOLOGY* HEARTLAND TECHNOLOGY LIABILITY KHARTLEHND TEKNOLODZHI LLK KHARTLEND TEKNOLODZHI LLK	78 %
A compact and portable liquid concentrator and contaminant scrubber includes a gas inlet, a gas exit and a flow corridor connecting the gas inlet and the gas exit, wherein the flow corridor includes a narrowed portion that accelerates the gas through the flow corridor. A liquid inlet injects liquid into the gas stream at a point prior to the narrowed portion so that the gas-liquid mixture is thoroughly mixed within the flow corridor, causing a portion of the liquid to be evaporated. A demister or fluid scrubber downstream of the narrowed portion removes entrained liquid droplets from the gas stream and re-circulates the removed liquid to the liquid inlet through a re-circulating circuit. A reagent may be mixed with the liquid to react with contaminants in the liquid. 					
37.	Method of treating a gas stream	GB0624931	2006-12-14	BOC EDWARDS* EDWARDS SYSTEMS TECHNOLOGY EHDVARDS	78 %
In a method of treating a gas stream, an aqueous scrubbing liquor is circulated through an essentially closed loop (20) comprising an electrochemical unit (48) for reducing the acidity of the liquor. A portion of the circulating liquor is diverted away from the closed loop (20) to a gas scrubbing unit (10). The gas stream enters the scrubbing unit (10), wherein an acid, for example HF and solid particulates, for example SiO2 particulates, within the gas stream dissolve in the diverted liquor. The diverted liquor is subsequently returned to the closed loop (20), and is replenished in the scrubbing unit (10) by fresh liquor diverted from the closed loop (20). A device (46) is provided for monitoring the acidity of the liquor at a location within the closed loop (20). The reduction in the acidity of the liquor by the electrochemical cell (48) is controlled depending on the monitored concentration. By controlling the acidity of the liquor, the solubility of the solid particulates within the diverted portion of the liquor may be optimised. This can increase the lifetime of one or more filter cartridges (42) located in the closed loop (20) upstream from the electrochemical unit (48). 					

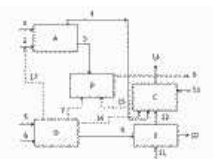
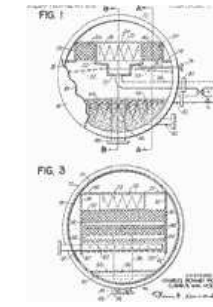
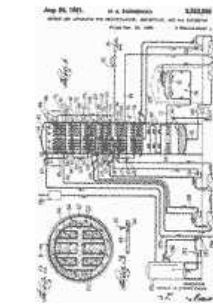
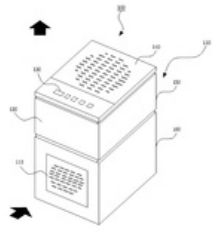
38.	Packaged automatic aerator	CN2574765	2002-10-25	ZHENG JUNLI*	78 %
The utility model relates to an industrial smoke gas cleaning machine for wet type smoke elimination, dust removal and desulfuration. A gas cleaning barn and a vapor settling barn are divided in a function seat tank in advance, and in the process of expansion and rinsing, a gas turning barn and a rinsing barn are divided between the two barns. A blower fan is horizontally installed on a gas outlet of the vapor settling barn, and a dewaterer is installed in the vapor settling barn. A liquid bailing motor and two driving shafts and seats which are connected with the liquid bailing motor are vertically installed on the top of the seat tank, shaft heads of the two driving shafts respectively extend downwards into the gas cleaning and the rinsing barn of the seat tank, and concentric hollow rotary bailing machines are arranged on each of the shaft heads in a splitting mode. Inlet liquid part heads of the rotary bailing machines are additionally provided with fixed eddy plates and are submerged in washing and rinsing liquor in a normal state, and pointed various degrading agents can be filled in the washing and rinsing liquor. In this way, when working, the utility model can effectively reduce and eliminate various target foreign matter in smoke gas.					
					
39.	A liquid/liquid exchange column	US20060169573	2005-02-03	AMT INTERNATIONAL* LEMON PHYLLIS E	78 %
The contact between, for example, ascending liquid droplets of lighter liquid, as the dispersed phase, and heavier liquid, as the continuous phase, flowing across perforated trays in a flooded liquid/liquid contacting column, is enhanced by providing upstanding baffles on lower trays, interspersed with depending baffles from the trays above. The baffles cause the heavy liquid to flow along an undulating path. Flow distributing partitions extend along the undulating flow path, between the baffles, to distribute liquid flow across the trays. The roles of the lighter liquid and the heavier liquid may be reversed as phases.					
					
40.	Methods and system for removing gas components from flue gas	WO2011147085	2010-05-26	ECO SPEC GLOBAL TECHNOLOGY PTE ECOSPEC GLOBAL TECHNOLOGY PTE*	78 %
A method for removing gas components SO_x, NO_x, and CO₂ from a flue gas, comprises the steps of: a) contacting the flue gas with a first liquid medium which provides a first plasma containing reactive electrons or ions in an amount such that the gas molecules SO_x are subjected to impingement of the electrons or ions in the first plasma to enable the dissociation of the gas molecules SO_x so as to remove SO_x from the flue gas; b) contacting the flue gas obtained from step a) with a second liquid medium which provides a second plasma containing reactive electrons or ions in an amount such that the gas molecules CO₂ are subjected to impingement of the electrons or ions in the second plasma to enable the dissociation of the gas molecules CO₂ so as to remove CO₂ from the flue gas, and c) contacting the flue gas obtained from step b) with a third liquid medium which provides a third plasma containing reactive electrons or ions in an amount such that the gas molecules NO_x are subjected to impingement of the electrons or ions in the third plasma to enable the dissociation of the gas molecules NO_x so as to remove NO_x from the flue gas. A system for removing gas components SO_x, NO_x, and CO₂ from a flue gas is also disclosed.					
					
41.	Dust collector	KR101039373	2011-03-04	C & G TECH*	78 %
PURPOSE: A vortex scrubbing dust collector is provided to remove contaminants from gas by mixing the gas with a cleaning solution in a droplet form by generating a vortex in the cleaning solution. CONSTITUTION: A vortex scrubbing dust collector comprises the following: a main body(100) for storing a cleaning solution, including a gas inlet(110) and a gas outlet(120); a first gas spraying path(200) including a first orifice hole(210), for injecting gas flowing through the gas inlet into the cleaning solution; a scattering-collision plate(300) for scattering the mixture of the cleaning solution and the gas into a droplet state; a second gas spraying path(400) including a second orifice hole(410) for spraying scattered gas to the cleaning solution; a gas-liquid separation plate(500) removing contaminants from the gas by colliding the droplets of the cleaning solution to the inner wall of the second gas spraying path; a demister(600) removing the droplets; and a water level controller(700) controlling the level of the cleaning solution.					
					
42.	Gas cleaning apparatus	NL6505034	1964-05-19	KELLER FA OTTO KELLER OTTO*	78 %
1,112,893. Venturi-scrubbers. FIRMA OTTO KELLER. 3 May, 1965 [19 May, 1964; 23 Sept., 1964], No. 18456/65. Heading B1R. In a gas scrubber of the venturi-type a tube I with a divergent section is arranged vertically above a body of liquid contained in the base of a housing 10 and the gas to be scrubbed is passed via pipe 7, chamber 5 and a nozzle 3 into the tube 1, the arrangement being such that liquid is entrained by the gas from the body of liquid and a mixture of gas and liquid is discharged into a cap 11 surrounding the upper end of the tube I and having a series of baffles 12 to provide a tortuous path for the gas as it passes to an outlet 14. The chamber 5 may be omitted or it may be in the form of a box surrounding a gap between the lower end of the tube with a divergent section and the end of a gas inlet pipe, the box preferably being supplied with liquid by one or more pipes from a point or points in the body of liquid free from suspended matter. In one embodiment (Fig. 8 not shown) the box lies outside the housing and in another a series of boxes surrounds the section of the gas inlet pipe below the level of liquid in the housing. The cap surrounding the upper end of the tube with the divergent section may be flared at its lower end and have a trough-like rim to catch disengaged liquid. (From GB1112893 A)					
					
43.	Gas cleaning process and equipment therefor	WO2004039492	2003-10-29	ARCELOMITTAL SOUTH AFRICA BRYLTON SOFTWARE CLEAN GAS TECHNOLOGIES* ISCOR MITTAL STEEL R PAXTON & DR RICHARD G PAXTON*	77 %
The invention relates to equipment for use in the removal of relatively fine particulates from a first substance, using a second substance. The equipment includes a static, co-current contacting mixer section, having a plurality of stages defining a flow path, with a flow profile, for the first and the second substance, at least some of the stages being shaped to define a substantially curved flow path having an effective centre of curvature located to one side of the flow path, and wherein each adjacent stage has a centre of curvature on an opposite side of the flow path to provide a point of inflexion between adjacent stages and whereby, as the substances flow through the reactor between the adjacent stages, particles present in the first substance migrate through the second substance, first in one direction and then in a substantially opposite direction to promote interphasic interaction between the first and the second substance, the flow path characterised in being provided with an edge formation (51,52) between at least two adjacent stages towards the point of inflexion so as to enhance the launch of the second substance on the outside of the curved flow path of one stage at relatively high velocity from the edge formation to the inside of the curved flow path of the adjacent stage, thus increasing the contact between the first and the second substances. The equipment also includes a cyclonic section and a spinner section. The invention also relates to a method for the removal of relatively fine particulates from a gas stream, using a scrubbing fluid, as well as a plastic composite material for the manufacture of the equipment.					
					

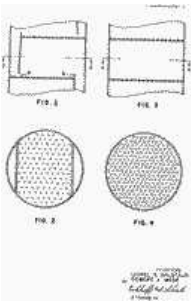
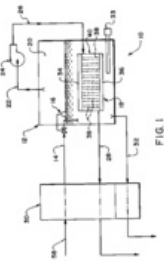
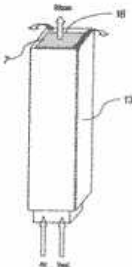
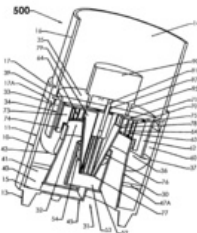
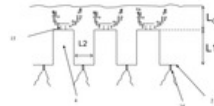
44.	Cross-flow base for a material exchange column, material exchange column and use of the material exchange column for separating a mixture containing (meth)acrylic monomers	DE102015204904	2015-03-18	BASF*	77 %	
The invention relates to a cross-flow base for a material exchange column (27) in which a gas is guided in counterflow to a fluid, wherein the cross-flow base (1) has through openings (3) for the gas and at least two drain shafts (5), wherein the drain shafts (5) project over the upper side of the cross-flow base (1) and a collection cup (13) is arranged underneath each drain shaft (5). The drain shaft (5) projects into the collection cup (13), the minimum horizontal cross-sectional area of the collection cup (13) is 1.2 to 4 times larger than the horizontal cross-sectional area of the drain shaft (5) at the outlet, and the collection cup (13) has a circumferential wall (15) with an overflow device (19). The invention also relates to a material exchange column containing the cross-flow base, and to a use of the material exchange column.						
45.	Water filtration using immersed membranes	WO200030742	1999-11-18	GE ZENON & ELCYL CANADA ONTARIO OAKVILLE DUNDAS STREET WEST 3 2 3 9 ZENON ENVIRONMENTAL ZENON ENVIRONMENTAL ZENON TECHNOLOGY PARTNERSHIP*	77 %	
In a process for filtering water containing solids using filtering membranes (24) in an open tank (120), feed water (14) is introduced into the tank to replace permeate removed (36) from the tank to keep the membranes preferably immersed in water while permeate is withdrawn. From time to time the concentration of solids in the water in the tank is reduced through deconcentration steps in which a volume of water having an increased concentration of solids compared to the initial concentration of solids is drained from the tank and a similar volume of feed water is introduced into the tank. The membranes may remain immersed in water during the deconcentrations by adding feed water to the tank while retentate is withdrawn from the tank. <IMAGE>						
46.	Hydraulically-sealed cross-current material exchange tray	DE10243625	2002-09-19	BASF*	77 %	
The invention relates to a hydraulically-sealed cross-current material exchange tray, separating columns comprising a hydraulically-sealed cross-current material exchange tray and the use of said columns for thermal separation processes.						
47.	Toroidal aeration of liquid medium	WO2014158352	2014-02-05	REVO2 SOLUTIONS*	77 %	
A system for treatment of suspended solids in a liquid medium having a one pond, an apparatus for controlled ventilation and aeration of a liquid medium, the apparatus having a dome supported by a flotation device, a blower, a lower housing supported by the flotation device, the lower housing connected to the dome, an aeration apparatus positioned within the sealed space and partially submerged in the flotation liquid, and having one or more parallel shafts, at least one first disc positioned axially on one of the shafts, at least one second disc positioned axially on another of the shafts, wherein the second disc is interleaved relative to the first disc, and wherein a surface of the first disc rotates in a direction opposite a surface of the second disc relative to each other resulting in a mixing area therebetween, and wherein the apparatus is positioned within the pond to generate a plurality of flow vectors, such as vectors having a torus shape.						
48.	Multi-component liquid micro-filtration apparatus with surface cleaning - has vertical skeins formed of a number of equal length hollow fibres each end held in headers where air discharged at skein base produces bubbles in quantity large enough to sc...	DE29624446	1996-08-08	ZENON ENVIRONMENTAL*	77 %	
A micro-filtration appts. has first and second headers vertically spaced apart at a fixed distance, the lower within the liq. substrate. Each header securely holds one end of a number of hollow fibre membranes each of equal length which is 0.1 to 5% greater than the length between the headers permitting restricted movement of the central fibre portion independent of the movement of another fibre which are subjected to transmembrane pressure differential in the range 0.1 to 50 psi. Also claimed are: (i) permeate collecting means sealing connected in fluid communication with permeate discharge face of each header and a means to withdraw the permeate; (ii) gas scrubbing assembly; (iii) process for maintaining the outer surfaces of the membranes free from build-up; (iv) method of forming a skein; and (v) a header having potted hollow fibre membranes.						
49.	Compact wastewater concentrator and pollutant scrubber	CN105126366	2010-07-29	HEARTLAND TECHNOLOGY*	77 %	
A compact and portable liquid concentrator includes a gas inlet, a gas exit and a flow corridor connecting the gas inlet and the gas exit, wherein the flow corridor includes a narrowed portion that accelerates the gas through the flow corridor. A liquid inlet injects liquid into the gas stream at a point prior to the narrowed portion so that the gas-liquid mixture is thoroughly mixed within the flow corridor, causing a portion of the liquid to be evaporated. A demister or fluid scrubber downstream of the narrowed portion removes entrained liquid droplets from the gas stream and re-circulates the removed liquid to the liquid inlet through a re-circulating circuit. Fresh liquid to be concentrated is also introduced into the re-circulating circuit at a rate sufficient to offset the amount of liquid evaporated in the flow corridor.						

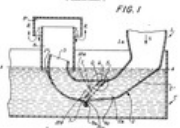
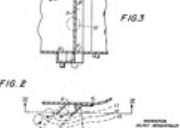
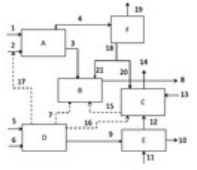
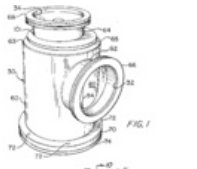
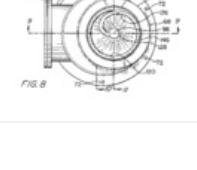
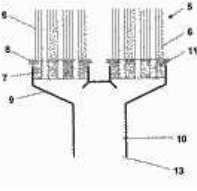
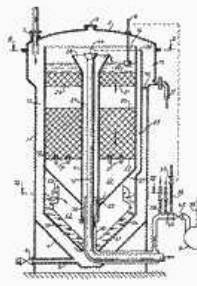
50.	Multi-component liquid micro-filtration apparatus with surface cleaning - has vertical skeins formed of a number of equal length hollow fibres each end held in headers where air discharged at skein base produces bubbles in quantity large enough to sc...	DE29624608	1996-08-08	ZENON ENVIRONMENTAL*	77 %
A micro-filtration appts. has first and second headers vertically spaced apart at a fixed distance, the lower within the liq. substrate. Each header securely holds one end of a number of hollow fibre membranes each of equal length which is 0.1 to 5% greater than the length between the headers permitting restricted movement of the central fibre portion independent of the movement of another fibre which are subjected to transmembrane pressure differential in the range 0.1 to 50 psi. Also claimed are: (i) permeate collecting means sealing connected in fluid communication with permeate discharge face of each header and a means to withdraw the permeate; (ii) gas scrubbing assembly; (iii) process for maintaining the outer surfaces of the membranes free from build-up; (iv) method of forming a skein; and (v) a header having potted hollow fibre membranes.					
51.	Apparatus and method	GB201116382	2011-09-22	DAVY PROCESS TECHNOLOGY* JOHNSON MASHY DAVY TECHNOLOGIES JOHNSON MATTHEY DAVY TECHNOLOGIES*	77 %
An apparatus for use in heterogeneous catalytic reactions comprising a column reactor comprising a plurality of trays mounted one above another, each adapted to hold a predetermined liquid volume and a charge of particles of a solid catalyst thereon; means for introducing a liquid phase reactant above the uppermost tray; means for introducing a vapour phase reactant below the lowermost tray; means for removing a liquid phase post-reaction stream from below the lowermost tray; means for removing a vapour phase post-reaction stream from above the uppermost tray; vapour upcomer means associated with each tray adapted to allow vapour to enter that tray from below; underflow means associated with each tray adapted to remove liquid from that tray and the column reactor before being introduced into the column reactor at a lower tray; means for temporarily directing said liquid removed from a tray to bypass at least one lower tray and be reintroduced to the column reactor at a tray located below said at least one bypassed tray; means for removing the liquid and catalyst from said at least one bypassed tray; and means for replacing a liquid and catalyst inventory on said at least one bypassed tray.					
52.	Continuous autocirculation, multiple zone mass transfer apparatus and method	CA2065549	1991-04-08	ARI TECHNOLOGIES MERICHEM* RFID TECHNOLOGIES US FILTER WASTEWATER* WHEELABRATOR CLEAN AIR SYSTEMS	77 %
An apparatus and method of contacting a liquid with different gases sequentially in separate mass transfer zones within a single vessel, the mass transfer zones operatively connected in liquid communication with each other, including intimately contacting the liquid with a first process gas in cocurrent flow in a first mass transfer zone to effect mass transfer between the first liquid and the process gas, and introducing the liquid into a second mass transfer zone with a second gas, different from the first gas, in cocurrent flow with the second liquid, thereby effecting mass transfer between the second liquid and the second gas. The rate of flow of the liquid from said first mass transfer zone to second mass transfer zone and recirculation to the first mass transfer zone is motivated by the difference in density of the contents of the liquid phase portion of each mass transfer zone and a following liquid downcomer or flow channel connecting it to the next sequential mass transfer zone, such that after passing through the last mass transfer zone, the liquid recirculates to the first mass transfer zone. The apparatus and method are ideally suited to carrying out the process of hydrogen sulfide removal from gases by means of an air-regenerated liquid redox catalyst, such as chelated iron. <IMAGE>					
53.	Vapor compression distillation apparatus	CA2186993	1996-10-02	678102 ALBERTA*	76 %
A vapor compression distillation apparatus includes a vessel for containing a liquid to be distilled and a heat exchanger of the shell and tube type immersed in the liquid. The heat exchanger has top and bottom manifolds and vertical tubes surrounded by a shell. Foraminous vortex-drag induction plates extend across the shell between adjacent rows of tubes for inducing turbulence in the vortices to provide a better heat transfer from vapor passing through the shell to liquid in the tubes. Baffles are provided at selected intervals across the shell, between adjacent rows of tubes to produce a sinuous flow path for the heating medium. Steam injecting sparging tubes extend along the lower manifold of the heat exchanger to inject steam bubbles into the liquid to be evaporated. This produces turbulence in the tubes of the heat exchanger, promotes a better flow through the tubes and scrubs the tube interiors.					
54.	An apparatus and method for particulate capture from gas streams and a method of removing soluble particulate from a gas	CA2930649	2014-11-14	STAMICARBON*	76 %
Disclosed is a method for the removal of soluble particulate matter from a gas stream, such as urea dust from the off-gas of a finishing section of a urea production plant. The method comprises subjecting the off-gas to at least two quenching stages an aqueous quenching liquid. The quenching liquid used in a first, upstream quench stage, is allowed to have a higher concentration of dissolved particulate matter than the quenching liquid in the second, downstream quench stage. The quenched gas is led through a particle capture zone, typically comprising one or more of a wet scrubber, a Venturi scrubber, and a wet electrostatic precipitator.					

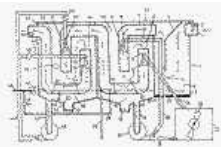
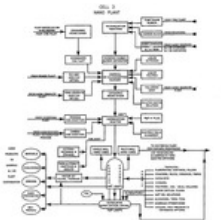
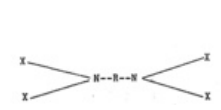
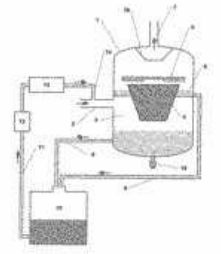
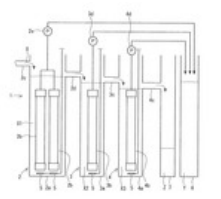
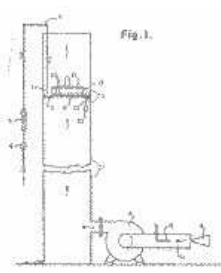
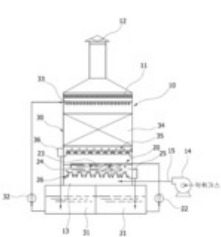


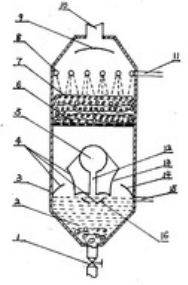
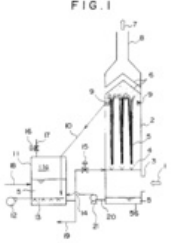
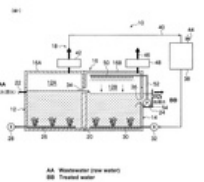
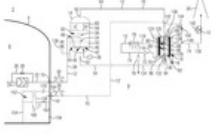
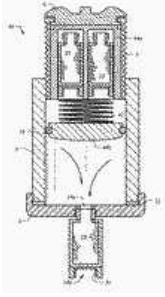
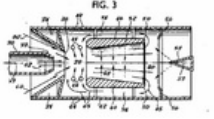
55.	Method for recovery of co2 from gas streams	US20040253159	2003-06-12	CANSOLV TECHNOLOGIES* CANSOLV TECHNOLOGIES* KANSORUBU TECHNOLOGIES CANADA Å· QUEBEC H 3 H3 1 L 4 Å· MONTREAL Å· SUITE 2 0 0 Å· MAJORO WAUB WEST 4 0 0	76 %
The present invention relates to a process for recovering CO 2 from a feed gas stream comprising treating the feed gas stream with a regenerated absorbent comprising at least one tertiary amine absorbent having a pK a for the amino function of from about 6.5 to about 9 in the presence of an oxidation inhibitor to obtain a CO 2 rich stream, maintaining a sufficient oxidation inhibitor concentration in the absorbent to essentially prevent the oxidation of the absorbent by molecular oxygen and subsequently treating the CO 2 rich stream to obtain the regenerated absorbent and a CO 2 rich product stream. 					
56.	Vortex type wet scrubber	KR20180111152	2017-03-31	C & G TECHNOLOGY*	76 %
A vortex-type washing dust collecting device is disclosed. The disclosed device comprises: a main body having a plurality of cleaning solution inlets, a gas inlet, a gas outlet and a plurality of cleaning solution outlets for discharging a cleaning solution after use, and having a chamber in which each cleaning solution is separately stored; a first gas spray path installed in the main body with a lower end part dipped in a first cleaning solution among a plurality of cleaning solutions during an operation, and having a first orifice which is communicated with the gas inlet and allows a gas introduced through the gas inlet to be sprayed into and discharged from the first cleaning solution; a first vortex forming unit installed inside the main body to collide with the gas discharged through the first orifice and the first cleaning solution in a particulate state to form a vortex by the spray and discharge force of the gas; a second gas spray path installed in the main body to communicate with the first vortex forming unit and having a second orifice formed to allow an introduced gas and the first cleaning solution in a particulate state to be sprayed into and discharged from the second cleaning solution; and a second vortex forming unit installed in the main body to collide with the gas discharged through the second orifice and the first and second cleaning solutions in a particulate state to form a vortex while colliding with the inside by the spray and discharge force of the discharged gas. 					
57.	Liquid circulation system for a scrubbing liquid used for neutralisation and separation	EP0968751	1998-06-30	DAS DÜNNSCHICHT ANLAGEN SYSTEME DRESDEN* KUNSTSTOFFSYSTEMS K* VSS UMWELTECHNIK*	76 %
In the liquid cycle, the return flow of the liquid in the container (8) is over an inlet pipe (20) on the floor of the inflow vessel (16). Measuring of the pH-value of the liquid is in the inflow vessel (16) using a pH-sensor. The inflow vessel (16) is arranged in an intermediate vessel (18). The return-flowing liquid communicates and flows from the inflow vessel (16) to the intermediate vessel (18). The liquid overflows by means of an overflow of the intermediate vessel (18) in the volume of the container (8). The removal of the used liquid is by means of a suction pipe (24) from the center of the intermediate vessel (18) in immediate contact with the floor of vessel (18) and satisfies the relationship of volume of container VB, intermediate vessel VZ and inflow vessel VE; VE VZ and VZ VB. In the liquid cycle for the wash phase of a reactor for chemical processes, particularly, in a combustion chamber is used for the purification of harmful exhaust gases and removal of solid, volatile and harmful byproducts in a container for the liquid, a pump is used for the rotation of the liquid over the forward- and back-flow of the wash phase, a heat exchanger is used to cool the liquid, a dosage rate of the chemicals is used for the washing process, fresh water is added, a device to separate solid particles and sludge is used and a suction device is used to separate solid particles and sludge. 					
58.	Processes of making a porous membrane material from polyvinylidene fluoride, and products	DE2822266	1977-05-25	MILLIPORE*	76 %
Covers processes for making microporous membranes and molecular filtration membranes from vinylidene fluoride polymers, and the products so produced. A continuous version of the process consists of applying a layer of a solution of a polyvinylidene fluoride polymer to a rigidly supported surface of a backing belt to form a film, then passing the belt through a formation bath, in which the membrane is formed. To form the polymer solution, the polymer is dissolved in a liquid vehicle that will dissolve up to about 25% by weight of the polymer at a temperature of at least 50.degree. C. but that dissolves substantially less of the polymer at about 20.degree. C. (room temperature). The polymer solution is formed at 50.degree. C. or higher, and the formation bath is maintained at about room temperature. The formation bath is a mixture of the liquid vehicle solvent with a second liquid that is miscible with the solvent but that is not itself a solvent for the polymer. The film is maintained immersed in the formation bath until it has been converted to a porous membrane whose pore structure is essentially fully formed, by leaching of the solvent from the film and its replacement with the non-solvent liquid. Thereafter the residual solvent is extracted from the porous membrane, and after separation of the membrane from the backing belt, the membrane is dried. The preferred solvent - non-solvent system for the formation bath is acetone-water. A preferred formation bath composition is from about 70% to about 80% acetone by volume. 					
59.	Selectively separating esp drying gas mixts - selected constituents permeate from higher side of membrane	DE2327106	1973-05-28	KERTZMAN J SKARSTROM C W SKARSTROM CHARLES*	76 %
Gas mixts. or other fluid mixts. are selectively separated, in particular gas or air is dried, by passing the mixture through a number of generally parallel tubes of semi-permeable, esp. polymer material through the walls of which the selected constituents, esp. water, permeate; the bundle of tubes is contained in an outer sleeve through which there passes, in contraflow to the mixture, a dry or reflux fluid esp. a bled proportion of the discharge from the downstream end of the tube bundle; this reflux mixture is pref. at a considerably lower pressure than the feed mixture thus promoting the permeation of the constituents through the membrane walls. Pref., the downstream end of the appts. (relative to the flow in the tube bundle) is cooled by an external jacket.					
60.	Recycle spray gas-liquid contactor	US5024686	1990-04-20	LERNER BERNARD J	76 %
This invention relates to a novel gas-liquid contacting apparatus and method utilizing recycle spray contact trays disposed within a substantially vertical vessel. Each contact tray contains one or more housings defined by upstanding vertical wall members, said housings being open to gas flow at top and bottom. Within the housings, liquid spray is continuously generated by means of gas flowing upward past a first array of horizontally spaced-apart gas venturi-generating liquid conductors. Liquid flows from the tray floor outside the housing through the liquid conductors, is distributed into the gas, and is entrained upward as spray by the gas venturi action. Horizontally-disposed foraminous or perforated flow-restrictive elements, vertically spaced apart, mounted on top of the housings, cause the liquid spray to coalesce and regenerate at the first flow-restrictive barrier element which occupies the cross-sectional area of the vertical housing. A major portion of the gas and contained spray is then caused to flow laterally, normal to the upward gas flow direction, through the high-voidage space between the elements. The flow-restrictive elements are comprised of foraminous or perforated plates, or anisotropic material such as layered mesh. The spray issuing laterally impinges on the vessel walls and liquid therefrom drains downward or falls by gravity to the tray floor, where the process is repeated. The method of invention encompasses spray contacting with automatic and continuous recirculation of liquid spray in a controlled manner at rates that are multiples of the liquid throughput rate, and is capable of operation at high has velocities and low pressure drop. 					

61.	Use of compositions comprising fluorosurfactants for controlling biofouling	WO9724290	1995-12-27	BUCKMAN*	76 %
The present invention relates to a method and compositions to inhibit bacteria from adhering to a submergible surface. The method contacts the submergible surface with an effective amount of at least one fluorosurfactant to inhibit bacterial adhesion to the submergible surface. The present invention also relates to a method for controlling biofouling of an aqueous system. This method adds an effective amount of at least one fluorosurfactant to inhibit bacteria from adhering to a submerged surface within the aqueous system. This method effectively controls biofouling without substantially killing the bacteria fouling organisms. The fluorosurfactant used in the method of the invention is an anionic or nonionic fluorosurfactant selected from: $\text{RfCH}_2\text{CH}_2\text{SCH}_2\text{CH}_2\text{CO}_2\text{Li}$, $(\text{RfCH}_2\text{CH}_2\text{O})\text{P}(\text{O})(\text{ONH}_4)_2$, $(\text{RfCH}_2\text{CH}_2\text{O})_2\text{P}(\text{O})(\text{ONH}_4)$, $(\text{RfCH}_2\text{CH}_2\text{O})\text{P}(\text{O})(\text{OH})_2$, $(\text{RfCH}_2\text{CH}_2\text{O})_2\text{P}(\text{O})(\text{OH})$, $\text{RfCH}_2\text{CH}_2\text{O}(\text{CH}_2\text{CH}_2\text{O})_x\text{H}$, $\text{RfCH}_2\text{CH}_2\text{O}(\text{CH}_2\text{CH}_2\text{O})_y\text{H}$, $\text{RfCH}_2\text{CH}_2\text{SO}_3\text{H}$, or mixtures thereof. The group Rf is $\text{F}(\text{CF}_2\text{CF}_2)_3\text{-8}$, X varies from 2-20, and y varies from 2-20.					
62.	Urea ammonium nitrate production	CA3009138	2016-12-21	STAMICARBON*	75 %
The invention relates to a process for the production of urea ammonium nitrate, a system and a method of modifying a plant. The process comprises treating ammonia-containing off-gas resulting from the production of ammonium nitrate (AN off-gas) with acidic scrubbing liquid in a finishing treatment section having a gas inlet in fluid communication with a gas outlet of a finishing section of a urea production unit, wherein the finishing section is adapted to solidify urea liquid, and wherein said finishing treatment section is adapted to subject ammonia-containing off-gas of the finishing section to treatment with an acidic scrubbing liquid.					
63.	Evaporating-concentrating apparatus and method	US3699007	1971-03-12	AMF - AMERICAN MACHINE & FOUNDRY*	75 %
No abstract available  					
64.	Method and apparatus for rectification, absorption, and gas scrubbing	US2253925	1939-12-20	ZIMMERMAN MERLE A	75 %
No abstract available 					
65.	Wet type air washer	KR101791677	2016-09-12	RYU HAN UK;RYU HANWOOK;RYU LEE HA;RYU LEEHA	75 %
The present invention relates to a wet type air washer, in which a water membrane of water, a salt solution, a basic solution, or an organic acid solution as a washing liquid is formed on a fine net and then the air contaminated with fine dust, ozone, mold, bacteria, harmful gas, and organic and inorganic materials is passed through the water membrane, thereby removing the contaminants through adhesion, adsorption, and dissolution of the contaminants with respect to the water membrane of the washing liquid, so that the wet type air washer increases the removal efficiency of the contaminants, is free from the controversy of harmfulness to human body by using a salt, a base, or an organic acid, which is a food additive, for antibacterial and bacteriostatic actions, and furthermore facilitates maintenance and internal washing. 					
66.	Making porous membranes and the membrane products	DE2822265	1977-05-25	MILLIPORE*	75 %
Covers a continuous process for making a polymeric membrane having at least 60% or more of its volume taken up by intercommunicating pores of substantially uniform size below about 25 micrometers. Consists of applying a layer of a polymer solution on a rigidly supported backing belt, then passing the belt through a formation bath that includes solvent plus a non-solvent for the polymer that is miscible with its solvent. The bath is recirculated at a substantially constant, preselected composition. The porous structure of the membrane is substantially completely formed in the formation bath. Includes extracting any residual solvent from the porous membrane, then drying the membrane. To produce membrane material of consistent, uniform characteristics and quality, the formation bath is maintained at the preselected composition. Either skinned molecular filtration membranes or microporous membranes may be produced by adjusting process parameters, such as the composition of the formation bath. 					

67.	Method of removing carbon dioxide from gases	BE679684	1965-04-19	BECHTEL* BECHTEL INT BECHTEL INTERNATIONAL	75 %
1,133,230. Treating gases with liquids; extracting gases with liquids; contacting mutuallyimmiscible liquids. BECHTEL INTERNATIONAL CO. 14 April, 1966, No. 16390/66. Headings B1F, B1L and B1R. In a process for extracting one or more components of a gaseous or liquid mixture the fluid mixture is passed upwardly and successively through a first and second zone in countercurrent to a liquid capable of absorbing the component(s), the first zone being a tower containing sieve-type trays without downcomers and operated at a higher temperature than the second zone which is a tower containing downcomer-type trays with high weirs. The liquid effluent containing the extracted component(s) may be partially or completely regenerated. A partially regenerated extracting liquid may be fed to the first zone and a completely regenerated extracting liquid fed to the second zone. The amount of extracting liquid fed to the second zone may be between 10 and 45% of the total volume of extracting liquid employed and the extracting liquid leaving the second zone may be fed into the first zone. The first and second zones may be the lower and upper portion respectively of a single tower and in operation the sieve-type trays without downcomers may be maintained in a flooded condition. The process may be applied to the removal of CO 2 from a gaseous mixture by means of an alkaline solution. (From GB113230 A)					
68.	Vapor compression distillation apparatus	US5814192	1996-10-03	TERRA MANNIX*	75 %
A vapor compression distillation apparatus includes a vessel for containing a liquid to be distilled and a heat exchanger of the shell and tube type immersed in the liquid. The heat exchanger has top and bottom manifolds and vertical tubes surrounded by a shell. Foraminous vortex-drag induction plates extend across the shell between adjacent rows of tubes for inducing turbulence in the vortices to provide a better heat transfer from vapor passing through the shell to liquid in the tubes. Baffles are provided at selected intervals across the shell, between adjacent rows of tubes to produce a sinuous flow path for the heating medium. Steam injecting sparging tubes extend along the lower manifold of the heat exchanger to inject steam bubbles into the liquid to be evaporated. This produces turbulence in the tubes of the heat exchanger, promotes a better flow through the tubes and scrubs the tube interiors.					
69.	Submerged cross-flow filtration	WO2006047814	2005-10-26	EVOQUA WATER TECHNOLOGIES* SIEMENS TREATED WATER OUTSOURCING* SIEMENS WATER TECHNOLOGIES US FILTER WASTEWATER WTG HOLDINGS II* WTG HOLDINGS III*	75 %
A membrane filtration module (5) of the type having a plurality of permeable, hollow membranes (6) mounted therein, wherein, in use, a pressure differential is applied across the walls of the permeable, hollow membranes (6) immersed in a liquid suspension containing suspended solids, said liquid suspension being applied to one surface of the permeable, hollow membranes (6) to induce and sustain filtration through the membrane walls wherein some of the liquid suspension passes through the walls of the membranes to be drawn off as clarified liquid or permeate, and at least some of the solids are retained on or in the permeable, hollow membranes (6) or otherwise as suspended solids within the liquid suspension, the module (5) including a fluid retaining means (13) at least partially surrounding the membrane module (5) for substantially retaining at least part of fluid flowed into the membrane module (5).					
70.	Method and apparatus for cleaning a gas	US20050061153	2003-06-23	HOGAN JIM S.	75 %
A system and method of cleaning a gas of undesired particulate, aromas, and gases is disclosed. The invention uses a centrifugal scrubbing space to liquid wet a gas and includes a container for containing a liquid with a pump to circulate the liquid. The gas is pumped from outside the container, through an inlet cylinder, a fan wheel, a scrubbing space, over a surface of the liquid, through a cyclone space, and out a top outlet. The liquid may be pumped with a standard pump, a cone-shaped rotatable case attached to the fan wheel, or a pump with a non-case rotatable case and an impeller attached to a same shaft as the fan wheel. The gas inlet may be positioned below or above the apparatus, and the fan motor may be positioned inside or outside the apparatus.					
71.	Dispenser tray for material and/or heat exchange column comprising bubbling means	CA2915347	2014-12-19	IFP ENERGIES NOUVELLES IFP ENERGIES NOW* YEPPE ENERGY NEUVEL IFP ENERGIES NOUVELLES	75 %
The invention relates to a collector/distributor/exchanger tray 2 of a column for heating and/or material exchange between a gas and a liquid, comprising liquid passage means 14 and gas passage casings 4 to which gas bubbling means 15 are attached. The bubbling means allow an emulsion zone to be created in the upper part of distributor/exchanger tray 2. The invention also relates to an exchange column comprising the distributor tray and to the use of the same. (From US2016175734 A1)					

72.	Apparatus for scrubbing of gaseous fluids	DE1903985	1969-01-28	KELLER FA OTTO KELLER O* KELLER OTTO	75 %
Apparatus for scrubbing of gases wherein the duct through which a gas stream to be treated is conveyed includes a section located below the level of liquid in a tank. The narrowest part of the duct section accommodates at least one transversely extending barrier which produces turbulence in a portion of the interior of the duct located immediately downstream of the barrier, and such portion of the interior of the duct communicates with one or more relatively large openings which admit liquid from the tank into the turbulent gas stream whereby the liquid is atomized and dust or other particles in the gas stream react with or are surrounded by globules of atomized liquid. Such globules are segregated from the thus cleaned gas stream in a cyclone diffuser or other separating device.					
 					
73.	Urea ammonium nitrate production comprising condensation	WO2017111588	2016-12-21	STAMICARBON*	75 %
The invention relates to a process for the production of urea ammonium nitrate, a system and a method of modifying a plant. The process comprises subjecting ammonia-containing off-gas resulting from the production of ammonium nitrate (AN off-gas) to condensation under acidic conditions so as to form an acidic condensate, and using at least part of the acidic condensate as an acidic scrubbing liquid in a finishing treatment section having a gas inlet in fluid communication with a gas outlet of a finishing section of a urea production unit, wherein the finishing section is adapted to solidify urea liquid, and wherein said finishing treatment section is adapted to subject ammonia-containing off-gas of the finishing section to treatment with an acidic scrubbing liquid.					
					
74.	Liquid cooled trap	WO9728886	1996-02-09	M K S INSTRUMENT MKS INSTRUMENTS*	75 %
The liquid cooled trap for effectively and efficiently collecting condensable vapor in a chemical vapor reaction system includes two stages. The first stage includes an entrance area to the trap that is purposely designed to be large in space and a very poor heat exchanger in order to avoid condensation and resulting solid deposits that could clog the entrance port to the trap. The second stage comprises a better heat exchanger to spread the condensation and deposits efficiently over a larger surface area and a longer flow path. The second stage is a very efficient heat exchanger to clean up and remove whatever small amount of condensable vapor remains after the first stage of the trap. The second stage includes cooling coil tubes and cooling cones or fins to increase the overall efficiency of the trap by increasing the interior surfaces upon which the flowing condensable vapor can condense, while not significantly reducing the flow conductance of the trap.					
 					
75.	Mixing chamber	AU2002953111	2002-12-05	EVOQUA WATER TECHNOLOGIES* SIEMENS TREATED WATER OUTSOURCING* SIEMENS WATER TECHNOLOGIES U S FILTER WASTEWATER US FILTER WASTEWATER USFILTER WATER & WASTEWATER WTG HOLDINGS II* WTG HOLDINGS III*	75 %
A membrane module (5) including a plurality of porous membranes (6) extending in an array and mounted, at least at one end, in a header (8). The header (8) has a number of distribution apertures (11) for distributing a fluid into the module (5) and along a surface or surfaces of the membranes (6). An elongate chamber (10) having one open end (13) and another end is in fluid communication with the distribution apertures (11) for distributing the fluid to the distribution apertures (11).					
					
76.	Separator for two immiscible liquids	IT7820529	1977-02-23	EXXONMOBIL RESEARCH & ENGINEERING REALISATIONS D EQUIPE MENTS REALISATIONS D EQUIPEMENTS SOC SEREP* SEREP SOC ETUDES REALISATIONS SOCIETE D ETUDES & DE REALISATIONS D EQUIPEMENTS PETROLIERS S & R & P	75 %
A separator suitable for the separation of a first liquid of relatively lower specific gravity and a second liquid of relatively higher specific gravity from a liquid mixture containing both liquids, the liquids being mutually immiscible, the separator comprising an inlet for introducing the mixture into a first separation zone so constructed and arranged as to promote the separation by gravity of a substantial part of the first liquid from the mixture, a first liquid outlet for the discharge of separated first liquid from the separator, a second liquid outlet for the discharge of separated second liquid from the separator, means for causing first liquid separated in the first separation zone to pass to the first liquid outlet, means for causing the remaining liquid mixture containing a minor proportion of the first liquid and a major proportion of the second liquid to pass towards the second liquid outlet along a flow path including a part extending downwardly through a second separation zone partially filled with a liquid-permeable bed of powdered filter material which is active for retaining and coalescing droplets of the first liquid, and means for causing the resulting liquid to pass from the bottom of the liquid-permeable bed to the second liquid outlet.					
					

77.	Method and apparatus for cooling, neutralizing, and removing particulates from the gaseous products of combustion	US5041274	1990-09-07	KAGI SR THOMAS;KAGI THOMAS SR	75 %	
The present invention discloses a method and apparatus for cooling and removing the toxic particulates, heavy metals, noxious fumes, and acid from the gaseous products of the combustion of materials high in impurities and/or toxic substances. Said invention accomplishes the above when dense exhaust and smoke emitted by a furnace are drawn through a series of three treatment chambers by the tremendous vacuum effect of extremely high-velocity vertical water and alkaline solution jets. The hydraulic pressure of the water and alkaline solution jets, in addition to providing draft, forces impurities in the gaseous waste to hydraulically dilute or dissolve in a turbulent liquid bath below. The apparatus improves the efficiency of any furnace to which it is attached by channeling exhaust-heated water through an external radiator, thereby supplementing the heat output of the furnace to which the device is attached.						
78.	New and improved system for processing various chemicals and materials	WO2014153570	2014-05-15	TRANSTAR*	74 %	
Eco-friendly systems, methods and processes/processing (EFSMP) or an integrated Matrix encompasses stand-alone and/or interconnected modules for completely self-sustained, closed-loop, emission-free processing of multiple source feedstock that can include pretreatment, with poisoning materials isolated during pretreatment being further recycled to provide useful materials such as, for example, separated metals, carbon and fullerenes for production of nano materials, sulfur, water, sulfuric acid, gas, heat and carbon dioxide for energy production, and production of refined petroleum, at a highly-reduced cost over the best state-of-the-art refining methods/systems that meets new emissions standards as well as optimizes production output with new ultra-speed cycle times. By-products from the petroleum refining process which were previously discarded also now are recycled as renewable sources of energy (water, waste oil and rubber/coal derived pyrolytic (pyro lysis) oil, carbon gases and process gases), or recyclable resources, such as metals and precious metals, oxides, minerals, etc., can be obtained.						
79.	Regeneration of chelated polyvalent metal solutions by controlled potential electrolysis.	US4832937	1988-09-28	DOW CHEMICAL*	74 %	
Electrochemical regeneration in an electrochemical cell of spent scrubbing solutions containing polyvalent metal chelates is accomplished without substantial degradation of the chelate by controlling the anolyte pH and maintaining the anode potential of the cell above the oxidation potential of the polyvalent metal chelate but below the oxidation potential of the chelate portion of the polyvalent metal chelate.						
80.	Diesel particulate removal device	WO2004067926	2004-01-29	AKTINA*	74 %	
The invention relates to an apparatus and method for the removal of particulates from exhaust or combustion gases, in particular from exhaust gases from diesel engines. The invention comprises injecting a liquid into the exhaust gas stream so as to form a highly dispersed gas/liquid mixture; passing the mixture through a scrubber cone (4) packed with wire mesh filling, and separating the liquid from the exit gas stream, wherein the liquid is continuously re-circulated and cooled before re-entering the process. It may optionally include a liquid filtration system and can also act as a sound silencing system.						
81.	Filtration apparatus, and immersion-type filtration method using same	CA2936032	2015-03-03	SUMITOMO ELECTRIC INDUSTRIES*	74 %	
The purpose of the present invention is to provide: a filtration apparatus having excellent processing efficiency and cost performance; and an immersion-type filtration method using the filtration apparatus. The filtration apparatus according to the present invention is an immersion-type filtration apparatus which can purify a solution of interest using a filtration membrane. The filtration apparatus is equipped with multiple filtration units, wherein each of the multiple filtration units is equipped with a filtration vessel and one or more filtration membrane modules immersed in the filtration vessel, and wherein the filtration units are arranged tandemly. It is preferred that the solution of interest is supplied from the former-stage filtration unit into the subsequent-stage filtration unit by the action of the overflowing of the solution. It is also preferred that the filtration apparatus is additionally equipped with an air bubble supplier by which air bubbles can be supplied from under each of the filtration membrane modules. The immersion-type filtration method according to the present invention utilizes the filtration apparatus, and comprises supplying a portion of a solution of interest in the former-stage filtration unit into the subsequent-stage filtration unit to purify the solution.						
82.	Gas-liquid contactor and method for gas-liquid contacting.	EP0510275	1991-05-03	LERNER BERNARD J*	74 %	
This invention relates to a gas-liquid contacting apparatus which includes at least one tray (2). Each contact tray (2) contains one or more housings (13) defined by upstanding vertical wall members, said housings (13) being open to gas flow at top and bottom. Within the housings (13), liquid spray is continuously generated by means of gas flowing upward past a first array of horizontally spaced-apart gas venturi-generating liquid conductors (16). Liquid flows from the tray (2) floor outside the housing (13) through the liquid conductors, and is distributed into the gas, and is entrained upward as spray by the gas venturi action. Horizontally-disposed foraminous or perforated flow-restrictive elements (21), vertically spaced apart, mounted on top of the housing (13), cause the liquid spray to coalesce and regenerate at the first flow-restrictive barrier element (21). A major portion of the gas and contained spray is then caused to flow laterally, normal to the upward gas flow direction, and impinges on the vessel walls and liquid therefrom drains downward or falls by gravity to the tray (2) floor, where the process is repeated. <IMAGE>						
83.	2 simultaneous cleaning and deodorizing tower with 2-component simultaneous cleaning and deodorizing function	KR101893358	2018-06-20	EHWA ECO SYSTEM*	74 %	
The present invention relates to a two-solution simultaneous cleaning deodorization tower having a function of reducing the inflow resistance of an odor gas, which comprises: a main body including a mist collecting unit, a purge gas outlet, a gas distribution chamber, and a gas inflow pipe; a first stage cleaning unit including a first cleaning solution storage tank, a first cleaning solution circulation pump, a first cleaning solution supply pipe, a minute jet nozzle cleaning unit, and a first cleaning solution level control unit; and a second stage cleaning unit including a second cleaning solution storage tank, a second cleaning solution circulation pump, a second cleaning solution injection pipe, a second cleaning pack bed unit, a second cleaning solution collection unit, and a second cleaning solution circulation unit.						

84.	High performance desulfurized dust collector	CN2440570	2000-08-16	LÜ YONGPING	74 %
The utility model discloses a high performance desulfurized dust collector, which comprises a casing, a smoke inlet and a smoke outlet, wherein, absorbing liquid is arranged on the lower part of the casing; the upper part of the casing is provided with a shower pipe. The utility model is characterized in that a labyrinth type flow guiding plate which is communicated with a smoke inlet is arranged above the absorption solution; a pattern plate is arranged on the flow guiding plate; a plurality of fillers are placed on the pattern plate. Smoke can reiteratively impact the absorbing liquid under the guiding action of the flow guiding plate after entering the device, causing that the absorption liquid can sufficiently absorb SO₂, NO_x and dust in the smoke; the residual part can be quadratically absorbed after passing the fillings on the pattern plate; thereby, the goal of high performance for desulfurizing and collecting dust can be achieved.					
					
85.	A wet gas processing method and the apparatus using the same	WO9924148	1998-11-10	MITSUBISHI HEAVY INDUSTRIES* TOYO KOHAN	74 %
A wet gas processing apparatus in which an absorption liquid (5) which is collected in the bottom of an absorption tower (2) is sprayed from a set of spray nozzles (4) in said absorption tower, said sprayed absorption liquid is brought into contact with the exhaust gases (1) conducted into said absorption tower, the targeted components in said exhaust gases are absorbed and removed by said absorption liquid, and said absorption liquid entrained to said exhaust gases in the form of mist is captured by a mist eliminator (6) in the top of said absorption tower (2); comprising: a receptacle (80) provided at the bottom of said mist eliminators (6) to receive absorption liquid fallen down from said mist eliminator; and a pipe (81) extending from said bottom of said mist eliminator (6) to a given position in said absorption tower (2) to release said absorption liquid (5) from a lower opening (82) of said pipe. <IMAGE>					
					
86.	Method for treating 1,4-dioxane-containing wastewater, and treatment device	WO2012108437	2011-02-07	HITACHI HITACHI PLANT TECHNOLOGIES*	74 %
The conventional problem in which the degradation efficiency of 1,4-dioxane decreases and in which 1,4-dioxane becomes released into the atmosphere when treating 1,4-dioxane-containing wastewater by using 1,4-dioxane-degrading bacteria is solved. A treatment device (10) is provided with: a first biological treatment tank (12) which is equipped with a first aeration means (26, 28) for aerating wastewater, has at least organic substance-degrading bacteria for biologically degrading organic substances other than 1,4-dioxane, and obtains primary wastewater by bringing the wastewater into contact with the organic substance-degrading bacteria while aerating the wastewater; a second biological treatment tank (14) which is equipped with a second aeration means (30, 32) for aerating the primary wastewater, has at least 1,4-dioxane-degrading bacteria for degrading 1,4-dioxane, and brings the primary wastewater into contact with the 1,4-dioxane-degrading bacteria while aerating the primary wastewater; a collection means (16) which collects gas released from the wastewater as a consequence of aerating the wastewater in the first biological treatment tank (12); and an introduction means (18) for introducing the entire collected gas or a portion of the collected gas into the second biological treatment tank (14).					
					
87.	Method for depressurizing a nuclear power plant, depressurization system for a nuclear power plant, and associated nuclear power plant	CA2806390	2010-08-25	ALEVA GESELLSCHAFT MITT BESHRENKTEL HUFTUNG AREVA AREFA AREVA AREVA NP*	74 %
The invention relates to a method and corresponding device for depressurizing a nuclear power plant (2) having a containment shell (4) for containing activity carriers and having an outlet (10, 10') for a depressurization flow, wherein the depressurization flow is conducted out of the containment shell (4) into the atmosphere via a depressurization line (12, 12') provided with a filter system, wherein the filter system comprises a filter chamber (16) having a filter chamber inlet (124), a filter chamber outlet (128), and a sorbent filter (18) lying therebetween, and wherein the depressurization flow is first conducted in a high-pressure section (70), then is depressurized by means of expansion at a throttle device (72), then conducted at least partially through the filter chamber (16) having the sorbent filter (18), and finally blown out into the atmosphere. In order to enable an especially efficient and effective retention of activity carriers contained in the depressurization flow, in particular organic compounds containing iodine, the depressurization flow depressurized by the throttle device (72) is conducted through a superheating section (80) immediately before the depressurization flow enters the filter chamber (16), in which superheating section the depressurization flow is heated by direct or indirect heat transfer from the depressurization flow not yet depressurized in the high-pressure section (70) to a temperature that is at least 10 °C, preferably 20 °C to 50 °C, above the dew point temperature present there.					
					
88.	Pressurized water filtration system	US20120292238	2012-08-02	INSTAPURE BRANDS*	74 %
A piston pressurized water filter activated by the user or external source. The water filter assembly includes a hollow cylindrical water reservoir, a hollow cylindrical piston threaded into the top of the water reservoir, and a water filter threaded into the bottom of the water reservoir. The interior of the water reservoir is sealed by the piston and water filter. When the water reservoir is filled with unfiltered water, the piston can be threaded down into the water reservoir to create sufficient pressure on the unfiltered water and force the water into the water filter. The water filter can include any combination of carbon, ceramic or other filtering material in a block or disk form. Water is forced into the water filter, through the carbon or ceramic filter mass, and into a container that may or may not be coupled to the water filter.					
					
89.	Proce	DE2322336	1973-05-02	TELLER ENVIRONMENTAL SYSTEMS*	74 %
Process and apparatus for treating hot exhaust gases having high noise level and containing solid and/or liquid particles therein, such as exhausts of jet engines being tested on jet test stands are shown. The process involves the combination of sonic vibrations, augmentation with air and water, nucleation and crossflow scrubbing in a packing which offers impinging surfaces without too great impedance of gas flow. The combination of vibration, augmentation, nucleation by condensing water on the particles and crossflow scrubbing produces a synergistic effect in the removal of particles, reduction of the amount of air augmentation required and noise abatement, thereby producing results greater than would be expected from the use of the individual process steps and apparatus. (From US3839846 A)					
					

90.	Systems including a condensing apparatus such as a bubble column condenser	CA2924211	2014-09-12	GRADIANT*	74 %
Condensing apparatuses and their use in various heat and mass exchange systems are generally described. The condensing apparatuses, such as bubble column condensers, may employ a heat exchanger positioned external to the condensing vessel to remove heat from a bubble column condenser outlet stream to produce a heat exchanger outlet stream. In certain cases, the condensing apparatus may also include a cooling device positioned external to the vessel configured and positioned to remove heat from the heat exchanger outlet stream to produce a cooling device outlet stream. The condensing apparatus may be configured to include various internal features, such as a vapor distribution region and/or a plurality of liquid flow control weirs and/or chambers within the apparatus having an aspect ratio of at least 1.5. A condensing apparatus may be coupled with a humidifier to form part of a desalination system, in certain cases.					
91.	Vacuum draft submerged combustion separation system	US5032230	1988-08-22	ANTHONY SETH R*	74 %
A vacuum draft submerged combustion system and method for separating combustible hydrocarbons and other components or liquid solutions from their solvents, usually water, includes evaporating volatile components by a submerged combustion burner and condensing the vaporized volatile components under a partial vacuum. The hot gases from the burner are injected under partial vacuum into the first tank. The hot gases bubbled through the solution cause volatile components in the liquid to be evaporated and collected above the level of the liquid. The collected gasses are drawn into a condensing tank where the condensable particulates are condensed and collected.					
92.	A controlled process for precipitating polymorphs of calcium carbonate	WO2016115398	2016-01-14	EYE MARYS IMERY*	74 %
A process for converting gypsum into precipitated calcium carbonate including reacting a mixture comprising gypsum and a seed, a mineral acid, or both with at least one carbonate source, whereby precipitated calcium carbonate is produced in the form of calcite and/or aragonite directly without conversion from a vaterite polymorph. Also, a process for converting gypsum into precipitated calcium carbonate including providing a mixture comprising i) gypsum ii) a seed, a mineral acid, or both iii) at least one additive selected from the group consisting of ammonium sulfate, an organic acid, or an iron material, and reacting the mixture with at least one carbonate source to produce precipitated calcium carbonate in the form of vaterite. The precipitated calcium carbonates having desired and unique composition, polymorph and crystal size characteristics formed by these processes.					
93.	Purification device	BE834333	1975-09-26	PIELKENROOD VINITEX*	74 %
Devices to remove polluting components from waste liquids are usually designed to operate satisfactorily as long as the input flow rate remains less than some maximum allowed value. Greater flow rates will cause inadequate purification and resulting downstream pollution, as well as possible damage to the device. An emergency overflow weir may be provided to divert excessive input flow into a buffer vessel or alternative discharge channel. The weir will divert a part of the excess flow, but the remainder will pass through the device; the relative portions depend on the relative flow resistance of the weir and of the device, respectively. The present invention enhances the flow resistance of the device when the flow rate through it is greater than the maximum allowed value, so that a greater fraction of the excess flow will be diverted by the emergency overflow weir.					
94.	Submerged cross flow filtration	AU2006216078	2006-09-19	SIEMENS WATER TECHNOLOGIES*	74 %
A membrane filtration module (5) having a plurality of permeable, hollow membranes (6) is disclosed. In use, a pressure differential is applied across the 5 walls of the permeable, hollow membranes (6) when immersed in a liquid suspension containing suspended solids. Some of the liquid suspension passes through the walls of the membranes (6) to be drawn off as clarified liquid or permeate, and at least some of the solids are retained on or in the permeable, hollow membranes (6) or otherwise as suspended solids within the liquid 10 suspension. The module (5) has a shell or similar structure (13) that at least partially surrounds the membrane module (5) and substantially effects retaining at least portion of fluid flowed into the membrane module (5). 13 -15 10 8 8 *8 11 10 211 1 12 12 10i2 Fig. 1 a Fig. 1 b Fig. 1 c					
95.	Elimination of a con	BE838296	1976-01-27	INVENSYS*	74 %
1488606 Gas scrubbing BTR INDUSTRIES Ltd 27 Jan 1976 [6 Feb 1975] 5159/75 Heading B1R [Also in Division C] Unwanted constituents are removed from a gas by passing it through a first-portion of liquid 10, in which the constituent is soluble or with which the constituent reacts, as a first series of bubbles and then passing the gas through a second portion of the liquid 10 as a second series of bubbles, wherein the second and preferably both portions of the liquid wets and agitates a plurality of spherical bodies 7 which slow the passage of gas therethrough. The liquid 10 is supported on perforate plates 6 and the bodies 7, preferably hollow polypropylene on adjustable plates 5 (From GB1488606 A)					
96.	Exchange device with potted hollow conduits and methods of application	WO2005063366	2004-12-21	ADVANCED TECHNOLOGY MATERIALS ATMI ENTEGRIS* MYKROLIS POCO GRAPHITE	74 %
The present invention relates to potted exchange devices including hollow conduits and or hollow porous membranes wherein the housing includes recessed channels or grooves. The recessed channels or grooves are filled by the potting material during the potting process and form a unitary end structure with the potting material. The grooves or channels formed on the inside of the housing maintains the integrity of the potting with the housing under a wide range of mechanical and thermal conditions.					
97.	Liquid-gas contactor and liquid-gas contact process	NL7800331	1977-01-17	JAPAN GASOLINE JGC* JGC TOKIO TOKYO JGC TOKYO	74 %
A liquid-gas contactor which comprises a first liquid-gas contacting region of which the lower part is provided with a gas inlet and the upper part is provided with a liquid feed inlet and a second region through which flows a gaseous fluid comprised of particles of at least a portion of the liquid fed into said first contacting region suspended in the greater part of the gas supplied through the gas inlet. The first and second regions are interconnected in the form of an inverted U-shape, the bottom ends of both regions opening into a liquid tank and at least the bottom end of the first liquid-gas contacting region being submerged in the liquid in the tank. A liquid-gas contact process employs this contactor.					

98.	High temp. heat exchange and sulphur cpds. removal from gas - by sprayed heavy metals or inorganic salts	FR2301794	1975-02-18	INSTITUTE OF GAS TECHNOLOGY*	74 %
High temp. heat exchange comprises passing a gas through a duct in which numerous droplets of molten (heavy) metal or heavy inorganic salts are contacted with the gas, then recovering these droplets after the thermal exchange, readjusting the temp. (upwards or downwards) of the liquid recovered and recycling it as droplets. The liquid is pref. collected in a bath below the gas duct is electrically conducting and is kept at a high potential so that the droplets become electrically charged and remove solid and liquid particles from the gas. Method is esp. for removing sulphur compounds from a gas, to reduce its corrosive action.					
99.	System and method for removing harmful gas in discharged cleaning solution of exhaust gas treatment apparatus	WO2018212506	2017-05-18	PANASIA*	74 %
The present invention relates to a system and a method for removing a harmful gas in a discharged cleaning solution of an exhaust gas treatment apparatus and, more specifically, to a system and a method, for removing a harmful gas in a discharged cleaning solution of an exhaust gas treatment apparatus, characterized by enabling the adjustment of a cleaning solution discharge flow rate of a harmful gas removal unit, which removes a harmful gas remaining in a gas state in a cleaning solution being discharged from an exhaust gas treatment apparatus and discharges the cleaning solution from which the harmful gas in a gas state has been removed, to be performed on the basis of a measurement result of a cleaning solution level in the harmful gas removal unit.					
100.	Apparatus for separation and processing of materials	GB201116366	2011-09-22	BRUNETTI URSULA ANTONELLA DAVEY CYDAF TECHNOLOGIES CYDAF TECHNOLOGY* PAXTON RICHARD G	73 %
This invention relates to a tubular cyclonic separation device the style of which was presented in PCT/ZA2003/000160 and which enables all of the inlet and outlet connections to be completely contained within a tubular profile, the diameter of which is that of the body of the cyclonic section. This disclosure adds further novel and inventive developments to the cyclonic device which enable it to be used as a separating device for systems involving all three phases (gas, liquid and solid) and where two, three or more different product streams may be separated, all within the same cylindrical profile. These further inventive developments also relate to the use of externally supplied gas and / or additional liquid phases which are injected through the walls of the cyclonic body using specifically located slots and / or holes in combination with specifically located stepped edges. These further novel and inventive developments enable the concepts of froth floatation (FF) and Dispersed Air Floatation (DAF) to be exploited within an enhanced gravitational field together with the options for washing the separated froth and / or the separated heavier fractions, all within the same cyclonic unit. As part of the novel and inventive introduction of the stepped edges, means are provided whereby gas bubbles smaller than 30 microns can be created on a large scale and with a reduced energy input relative to typical conventional equipment. Also, the size of the gas bubbles may be controlled together with the intensity of any particle on particle interactions that may be created. This latter has many potential applications within FF and / or DAF processes, including applications within oil and tar separation from solid surfaces and within many ore preparation and ore leaching processes. The tubular profile enables processing and separation to be achieved "within the pipe line" or for very closely packed arrangements to be assembled within carrier vessels.					