

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
29 January 2009 (29.01.2009)

PCT

(10) International Publication Number
WO 2009/012555 A1

(51) International Patent Classification:

D21C 5/02 (2006.01) D21C 9/08 (2006.01)
D21C 9/00 (2006.01)

(21) International Application Number:

PCT/CA2007/001306

(22) International Filing Date: 24 July 2007 (24.07.2007)

(25) Filing Language: English

(26) Publication Language: English

(71) Applicant and

(72) Inventor: LANGNER, Herbert, Gunther, Joachim
[CA/CA]; c/o Baycor Fibre Tech Inc., 576 Elgin Street,
Unit D, Brantford, Ontario, N3S 7X2 (CA).

(74) Agent: RICHES MCKENZIE & HERBERT LLP; Suite
1800, 2 Bloor Street East, Toronto, Ontario M4w 3J5 (CA).

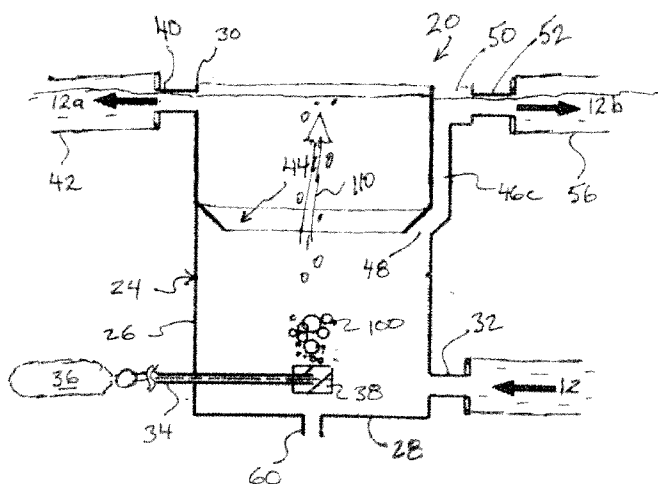
(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— with international search report

(54) Title: METHOD AND APPARATUS FOR SEPARATING WASTE PRODUCTS FROM CELLULOSE FIBRES IN A PAPER RECYCLING PROCESS

FIG. 5



(57) Abstract: A contaminate separation apparatus for use in separating contaminant materials from cellulose and/or paper fibres in a paper recycling process includes a reservoir for receiving a waste paper slurry therein. The reservoir is provided with an inlet opening for the input of the slurry, one or more fibre discharge outlets or passages, and at least one waste outlet positioned vertically above the fibre discharge outlet opening. An agitator provided in a lower portion of the reservoir generates differential flow currents within the reservoir, to selectively divert plastics, waxes, adhesives and/or other sticky waste materials outwardly towards the waste outlet, while providing a flow of suspended paper and/or cellulose fibres to one or more of the fibre discharge outlets.

METHOD AND APPARATUS FOR SEPARATING WASTE PRODUCTS FROM CELLULOSE FIBRES IN A PAPER RECYCLING PROCESS

SCOPE OF THE INVENTION

The present invention relates to an apparatus for use in a paper recycling process to separate waste and contaminant materials from paper and cellulose fibres, and a method for using same.

BACKGROUND OF THE INVENTION

The diversion of paper, cardboard and other cellulose-based products from municipal and commercial waste for use in the manufacture of recycled paper has been widely adopted as a method of reducing the volume of garbage and waste material to be landfilled. Approximately 60 to 70% of conventional paper waste such as newspapers, office letterhead, stationery, box board and/or cardboard is of a sufficiently high quality grade to enable its direct recycling for use in the remanufacturing of recycled paper products.

A significant portion of diverted paper waste, however, contains contaminants which hinders use in recycled paper manufacturing processes. For example, frequently paper waste includes contaminant materials such as gum labels, soluble and insoluble adhesives, hot melt glues, adhesive bindings, wax coatings, window envelopes and/or laminated papers and residues. The presence of such contaminant materials has heretofore resulted in a significant portion of diverted paper waste being deemed unsuitable for recycling applications, necessitating its incineration and/or landfill.

SUMMARY OF THE INVENTION

The present invention seeks to provide an apparatus which may be economically manufactured and used to separate contaminants such as plastics, waxes, glues, adhesives and other such sticky residues from recycled waste paper or cellulose fibres for further use in paper recycling processes.

Another object of the invention is to provide a system for recycling paper waste which provides improved efficiencies in the separation of paper and/or cellulose fibres from plastics, adhesive residues and other contaminant materials present in the diverted waste material.

A further object of the invention is to provide an apparatus used for separating contaminant materials from cellulose fibres in a waste stream or slurry and which may be economically operated and/or installed in conventional recycling and/or classification systems.

Another object of the invention is to provide a contaminant separation apparatus which is operable to separate contaminant material from cellulose fibres from a recycled paper slurry supplied to the apparatus as a substantially continuous flow.

To at least partially achieve some of the foregoing objects and/or overcome disadvantages of the prior art, the present invention provides for a contaminate separation apparatus for use in separating contaminant materials from cellulose and/or paper fibres in a paper recycling process. The apparatus includes a reservoir for receiving liquefied slurry of waste, and more preferably diverted paper waste which is to be recycled therein. The reservoir is provided with an inlet opening for receiving a volume of the slurry, one or more fibre discharge outlets or passages, and at least one waste outlet positioned vertically above a fibre discharge passage opening.

An agitator is provided in a lower portion of the reservoir for use in generating differential flow currents within the reservoir to selectively divert plastics, waxes,

adhesives and/or other waste materials outwardly towards the waste outlet, while providing a flow of suspended paper and/or cellulose fibres towards one or more of the fibre discharge outlets. Suitable agitators could, for example, include mechanical agitators, as well as fluid outlet nozzles of different diameters and/or configurations adapted to introduce different water, fluid and/or waste stream flows into the reservoir. In a most simplified construction, the agitator is provided as a gas outlet or nozzle which is selectively operable to supply a gas flow, such as air to a lower region, and most preferably a bottom central region of the reservoir. The applicant has appreciated that the introduction of a gas flow into the reservoir advantageously results in the adhesive, waxes, plastics and other lower density contaminants being entrained with the gas bubbles to differentially move towards the upper regions of the reservoir, while the comparatively denser longer paper fibres tend to settle towards the reservoir sides.

Most preferably, one or more fibre discharge passages are provided which extend from an inlet opening provided in fluid communication with the reservoir interior. The inlet opening is spaced remote from the agitator and intermediate the contaminant waste outlet and the inlet opening through which the waste paper slurry is introduced into the reservoir. Preferably one or more baffle members are provided which extend partway across the interior reservoir. The baffle members are positioned at least in part above one or more of the inlet openings of the discharge passages to assist in the diversion of paper and/or cellulose fibres into the filter discharge passages. Baffle members of various configurations may be used, including horizontal, planar and/or tubular or curved baffles. In one preferred embodiment, a baffle is provided which extends about the interior periphery of the reservoir and which has a substantially planar construction extending angularly downwardly immediately above the inlet openings.

In use, a fluidized waste stream or slurry is supplied into the reservoir, and most preferably into the lower region of the reservoir, in either a batch process or continuously. As the waste slurry is introduced into the reservoir, a gas such as nitrogen, oxygen or air is simultaneously introduced into the bottom of the reservoir via the gas outlet nozzle to generate an upward flow. The gas is provided with a preferred flow rate between about 0.1 and 1 cubic metres per minute, depending on the volume of the reservoir and the flow

rate of the slurry therein. As the gas is introduced, the lower density contaminant materials tend to move with the gas bubbles upwardly towards the upper regions of the reservoir. The liquid along the top of the reservoir may thus be diverted together with the contaminant materials entrained therein into the waste outlet for disposal. Simultaneously, the paper and cellulose fibres in the slurry tend to settle towards the bottom of the reservoir, moving toward the lower reservoir sidewalls where they are diverted via the baffles into the fibre discharge passages.

Accordingly, in one aspect the present invention resides in an apparatus for separating contaminant material from paper or cellulose fibres in a waste stream slurry, the apparatus including,

a reservoir for receiving a volume of said slurry therein, said reservoir including a sidewall extending from a lower edge portion to an upper edge portion,

a slurry infeed opening providing fluid communication between a slurry supply and a lower region of said reservoir,

a contaminate waste outlet spaced toward said upper edge portion and in fluid communication with said reservoir,

at least one baffle member disposed in said reservoir and positioned intermediate said infeed opening and said waste outlet,

at least one fibre discharge passage providing fluid communication between an inlet opening proximate to an underside of a portion of a selected said baffle member and a discharge outlet spaced vertically above said inlet opening, and

a gas nozzle selectively operable to supply a gas flow to said lower region of said reservoir.

In another aspect, the present invention resides in use of a separation apparatus for separating contaminants from cellulose fibres in a slurry, the apparatus comprising

a reservoir for receiving a volume of said slurry therein, said reservoir including a sidewall extending from a lower edge portion to an upper edge portion,

a slurry infeed opening providing fluid communication between a slurry supply and a lower region of said reservoir,

a waste outlet spaced toward said upper edge portion and in fluid communication with said reservoir,

at least one baffle member disposed in said reservoir and positioned intermediate said infeed opening and said waste outlet,

at least one fibre discharge passage providing fluid communication between a passage inlet opening proximate to an underside of a portion of a selected said baffle member and a discharge outlet spaced vertically above said inlet opening, and

a gas nozzle selectively operable to supply a gas flow to said lower region of said reservoir,

and wherein said waste stream slurry comprises at least about 90% water and is fed into said reservoir through said infeed opening at a rate selected at between about 0.2 and 5 cubic metres per minute.

In a further aspect, the present invention resides in an apparatus for separating plastic and adhesive materials from paper fibres in a recycled paper waste slurry, the apparatus including,

a reservoir for receiving said slurry therein, said reservoir including a generally cylindrical sidewall extending along an axis from a lower edge portion to an upper edge portion,

an infeed opening through said sidewall and providing fluid communication between a slurry supply and a lower region of said reservoir,

a contaminant waste outlet spaced toward said upper edge portion and providing fluid communication between said reservoir and a waste discharge,

a baffle member disposed in said reservoir and projecting radially about said sidewall part way towards said axis, said baffle member being positioned intermediate said infeed opening and said waste outlet,

a plurality of fibre discharge passages, said discharge passages being radially spaced about said axis and providing fluid communication between a respective passage inlet opening proximate to an underside of said baffle member and a discharge channel spaced vertically a distance above the passage inlet opening,

a gas nozzle selectively operable to supply a gas flow to said lower region of said reservoir.

BRIEF DESCRIPTION OF THE DRAWINGS

Reference may now be had to the following detailed description taken together with the accompanying drawings in which:

Figure 1 illustrates schematically a system for the removal of contaminate materials from paper waste in a paper recycling process, in accordance with a preferred embodiment of the invention;

Figure 2 shows a perspective view of a contaminant separation apparatus used to separate contaminant materials from paper fibres in operation of the system of Figure 1;

Figure 3 shows a perspective top view of the apparatus of Figure 2;

Figure 4 illustrates a perspective front view of the apparatus of Figure 2; and

Figure 5 illustrates schematically an enlarged cross-sectional view of the apparatus of Figure 2 taken along lines 5-5 in operation.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Figure 1 illustrates schematically a system 8 used in the removal of contaminant material such as plastics, adhesives, wax residues, hot melt glues and binding remnants from paper fibres in waste paper, which has been diverted from municipal and/or commercial waste streams for recycling as remanufactured paper products. In the embodiment shown, the system 8 includes a homogenizing or mixing tank 10, a contaminant separation apparatus 20, a primary fibre washing/thickening station 70, a secondary fibre washing/thickening station 80, and a residual ash removal station 90. Suitable washing/thickening stations 70,80 and ash removal station 90 include, for example, conventional rotating screening apparatus similar to the type which, for example, are disclosed in issued Canadian Patent No. 2,182,833 to Langner. The liquid material and suspended solids are fed into the interior of a rotating screening cylinder to effect filtration and separation of particulate material from the water filtrate.

As will be described, most preferably, the system 8 operates as a substantially continuous flow process. It is to be appreciated, however, that in a less preferred mode of operation, the system 8 could be operated either partially or in entirety as a batch operation.

Initially, diverted paper material is shredded and fed into a mixing tank 10 where it is mechanically admixed with water to form a homogenous slurry 12. Most preferably, the slurry 12 is formed having a water content selected at between about 90 and 98%, and more preferably between about 96 and 97%.

Following its homogenization, the slurry 12 is pumped from the mixing tank 10 into the contaminant separation apparatus 20 which is used to classify the slurry 12 into separately fluidized streams, one stream (12a) containing primarily separate contaminate material, and the other stream (12b) containing primarily paper fibres (Figure 5). The fluid stream 12b containing the purified paper fibre/water mixture is then fed initially into the primary fibre washing/thickening station 70. The station 70 is used to initially separate larger paper fibres from the infed water/fibre stream 12b for use in the formation of remanufactured paper and/or other recycled paper products. In this regard, the station 70 preferably incorporates a screening drum selected for the primary diversion of larger

paper fibres having a length selected greater than 750 microns. These collected primary fibres may then be sold to a mill for use in recycled paper manufacture.

The resulting filtrate 12b' from station 70 is then fed by way of fluid pump (not shown) to the secondary washing/thickening station 80. Station 80 is used to extract smaller paper fibres from the filtrate 12b' which have a fibre length greater than 150 microns for use as boiler feed, or in manufacturing and/or recycling.

Final processing of the filtrate 12b" from the secondary washing/thickening station 80 occurs in the ash removal station 90. In station 90, ash is removed and cleaned for use as fertilizer. Any remaining contaminants in the station 90 are collected for disposal.

Figures 2 to 5 illustrate best the contaminant separation apparatus 20 used in the system 8 in accordance with a preferred embodiment of the invention. The apparatus 20 includes reservoir tank 24 having a generally cylindrical sidewall 26 and which is sealingly closed at its lowermost end by bottom panel 28 (Figure 3). The sidewall 26 extends radially about a central axis A_1-A_1 (Figure 4) to provide the tank 24 with a radial diameter D selected at between about 0.5 and 5 metres, preferably about 1 and 3 metres, and most preferably about 1.5 metres. The sidewall 26 extends in the axial direction from the bottom panel 28 to an uppermost lip 30, a vertical height of between about 0.5 to 5 metres, preferably 1 to 3 metres, and most preferably about 2 metres.

Figures 3 and 4 illustrate best the apparatus 20 as including a fluid infeed pipe 32 which extends through the sidewall 26 immediately adjacent the panel 28. The infeed pipe 32 provides fluid communication between the mixing tank 10 and interior of the reservoir tank 24. The infeed pipe 32 is sized to allow the waste stream slurry 12 to be fed into the apparatus 20 in a substantially continuous flow manner.

An air supply tube 34 (Figure 4) furthermore is provided through the sidewall 26 adjacent the bottom panel 28. As shown best in Figure 5, the air supply tube 34 provides gaseous communication between a pressurized air source 36 and a bubble diffuser 38 which is provided immediately adjacent the bottom panel 28 aligned with the reservoir

axis A-A₁. The pressurized air source 36 is selectively operable to supply pressure in air flow to the interior of the tank 24 via the bubble diffuser 38 at a gas flow rate selected at between about 0.2 and 5 cubic metres per minute, preferably about 0.3 to 1 cubic metres per minute, and most preferably about .75 metres per minute, depending upon the rate of inflow of the slurry 12 into the bottom of the reservoir tank 24.

Figures 3 and 4 furthermore show best the reservoir tank 24 as including a contaminate waste discharge port 40 formed through the sidewall 26 spaced immediately below the upper lip 30. The discharge port 40 is provided in fluid communication with a waste discharge pipe 42 (Figure 5) which is used to convey a waste fluid stream 12a containing plastics, adhesive residues and other contaminate material separated from the slurry 12 for disposal by landfill and/or incineration.

Figures 3 and 5 show best an annular flange member 44 as being disposed about the interior of the sidewall 26. The annular flange member 44 projects from the sidewall 26 radially inwardly towards the axis A-A₁, and downwardly at an angle selected at between about 30 and 60° and more preferably about 45° relative to the sidewall 26. The flange member 44 has a length selected at between about 4 and 40 cm, and more preferably about 15 to 20 cm.

As shown best in Figures 2 and 5, a series of fibre discharge passages 46a, 46b, 46c, 46d, 46e are provided at radially spaced locations about the sidewall 26. Each discharge passage 46 extends respectively from a passage inlet opening 48 vertically upwardly along the outside of the sidewall 26, opening into the bottom of a launder ring 50. The inlet openings 48 are formed through the sidewall 26 approximately one-half to two-thirds of the distance from the bottom panel 28 to the lip 30. Most preferably, the openings 48 are each located immediately adjacent to an underside of the flange member 44, with each discharge passage 46 extending generally vertically therefrom with a length of at least about 10 cm, and most preferably between about 30 and 100 cm.

The launder ring 50 is preferably provided as a U-shaped channel which extends radially about the uppermost lip 30 of the sidewall 26. The lower extent of the launder

ring 50 is provided vertically adjacent to the waste discharge port 42. The laundering 50 opens along a side of the reservoir 24 to a discharge outlet 52 for the paper fibre stream 12b. The fibre discharge outlet 52 is most preferably radially opposed to contaminate discharge port 40. Although not essential, the reservoir tank 24 may be mounted on leg supports 54 so that the tank axis A-A₁ is inclined an angle between about 2 and 7.5° relative to the vertical towards the discharge outlet 52, with the result that the lower extent of the discharge outlet 52 locates between about .2 and 10 cm, preferably .2 cm and .4 cm below the lower extent of the waste discharge port 40. Piping 56 (Figure 5) provides fluid communication between the discharge outlet 52 and the primary washing/thickening station 70 to convey the fluid stream 12b containing paper fibres separated from the slurry 12 for further processing.

Optionally, a cleanout drain 60 may be provided in the bottom panel 28. The cleanout drain 60 allows the reservoir tank 24 to be drained for periodic cleaning and/or maintenance.

In use of the apparatus 20, the homogenized waste slurry 12 having a water content of between 95 and 98%, and most preferably about 97% is pumped or more preferably fed under gravity from the mixing tank 10 to the reservoir tank 24. The slurry 12 is fed into the reservoir tank 24 through the infeed pipe 32 at a preferred continuous flow rate of about 2 cubic metres per minute. Simultaneously, as the waste slurry 12 is fed into the reservoir tank 24, the pressurized air source 36 is operated. The air source 36 provides a continuous stream of air into the bottom of the reservoir 24 via bubble diffuser 38 with a flow volume of between about 0.1 and 1 cubic metres per minute. The introduced air bubbles (shown as 100 in Figure 5) rise vertically through the slurry 12 generally along the axis A₁-A₁ in the direction of arrow 110. As the gas bubbles 100 rise in the reservoir tank 24, contaminant material in the slurry 12, such as plastics, waxes and other glues and adhesive residues, are entrained with the rising bubbles 100. As a result, the contaminate material travels in an upward axially centered flow path, so as to move upwardly past the flange member 44. Concurrently, heavier paper fibres tend not to rise with the bubbles 100, moving towards the lower edges of the sidewall 26. The continuous flow of additional waste slurry 12 into the bottom of the reservoir tank 24,

results in the contaminate material moving upwardly and then flowing as part of a waste flow stream 12a, outwardly from the apparatus 20 via the waste discharge port 40 and pipe 42.

Simultaneously, paper fibres are left behind as they tend not to be entrained with air bubbles 100. The result is that the paper fibres are concentrated and collect along the periphery of the sidewall 26. The continued inward movement of waste slurry 12 into the bottom portion of the reservoir tank 24 causes the flow of paper fibres to move upwardly against the underside of the flange member 44. Continued fluid flow results in a fluid stream 12b containing paper fibres with reglued concentrations of contaminant materials to move into the inlet openings 48 of the fibre discharge passages 46a, 46b, 46c, 46d, 46e and upwardly therealong into the launder ring 50. The fluid flow 12b containing paper fibres thus travels along the discharge passage 46 into the launder ring 50, flowing outwardly therefrom into the piping 56 via the discharge outlet 52.

The applicant has appreciated that the present apparatus 20 permits the removal of plastics, adhesives and other contaminants from recycled paper waste without requiring expensive filtration, or the use of mechanical screening and/or pumps. Accordingly, the apparatus 20 may be economically operated and is ideally suited for large scale paper processing and recycling operations.

Although Figures 2 to 5 illustrate the reservoir tank 24 as having an annular flange member 44, the invention is not so limited. It is to be appreciated that suitable baffle members could also be provided, or baffles omitted in their entirety. Similarly, it is envisioned that fibre discharge passages 46 having differing shapes and/or configurations alone, or in combination with flange members of different profiles could also be used, without departing from the spirit and scope of the invention.

Although the preferred embodiment describes and illustrates the reservoir 24 as having a generally cylindrical sidewall construction, the invention is not so limited. It is to be appreciated that the present apparatus could equally be provided with a number of

different sidewall 26 configurations including, without restriction, sidewalls having a generally square, oval or spherical cross-sectional profile.

Although the detailed description describes the contaminant separation apparatus 20 as used in a paper recycling process for the separation of waxes, glues plastics and adhesive residues, and the like from paper fibres, the invention is not so limited. It is to be appreciated that the apparatus 20 may be used in the separation of contaminants or other undesired materials in a variety of manufacturing, waste treatment and/or classification processes. By way of non-limiting example, such applications could include the treatment of pulp waste, other chemical industries or purification systems, food-manufacturing applications, as well as other liquid waste treatment processes.

Although the detailed description describes and illustrates various preferred aspects, the invention is not so limited. Many modifications and variations will now occur to persons skilled in the art. For a definition of the invention, reference may be had to the appended claims.

I claim:

1. An apparatus for separating contaminant material from paper or cellulose fibres in a waste stream slurry, the apparatus including,

a reservoir for receiving a volume of said slurry therein, said reservoir including a sidewall extending from a lower edge portion to an upper edge portion,

a slurry infeed opening providing fluid communication between a slurry supply and a lower region of said reservoir,

a contaminate waste outlet spaced toward said upper edge portion and in fluid communication with said reservoir,

at least one baffle member disposed in said reservoir and positioned intermediate said infeed opening and said waste outlet,

at least one fibre discharge passage providing fluid communication between an inlet opening proximate to an underside of a portion of a selected said baffle member and a discharge outlet spaced vertically above said inlet opening, and

a gas nozzle selectively operable to supply a gas flow to said lower region of said reservoir.

2. The apparatus as claimed in claim 1 wherein said discharge outlet is spaced vertically between about 0.5 and 5 cm below said waste outlet.

3. The apparatus as claimed in claim 1 wherein said lower region comprises a central bottom region.

4. The apparatus as claimed in claim 1 wherein said fibre discharge passage comprises a generally vertically extending passage having a length selected greater than about 10 cm.

5. The apparatus as claimed in claim 1 wherein said sidewall comprises a generally vertically extending cylindrical sidewall, and said at least one baffle member including an

annular baffle extending radially and downwardly inwardly from an upper edge portion proximate said sidewall, to a lower distal edge remote therefrom.

6. The apparatus as claimed in claim 5 wherein said annular baffle extends downwardly at an angle of between about 30 to 60° relative to vertical.

7. The apparatus as claimed in claim 1, further including a pumping assembly for supplying said slurry to said reservoir as a substantially continuous flow.

8. The apparatus as claimed in claim 7 wherein said substantially continuous flow is selected at between about 0.5 and 5 cubic metres per minute.

9. The apparatus as claimed in claim 8 further including a pressurized gas source for supplying said gas flow at a flow rate selected at between about 0.1 and 1.0 cubic metres per minute.

10. The apparatus as claimed in claim 9 wherein said sidewall is a generally cylindrical sidewall having a diameter between about 0.5 and 5 metres, and an axial length selected at between about 1 and 3 metres.

11. The apparatus as claimed in claim 10 wherein said gas comprises air and said nozzle includes a diffuser spaced towards an axial centre of said cylindrical sidewall.

12. Use of a separation apparatus for separating contaminants from cellulose fibres in a slurry, the apparatus comprising

a reservoir for receiving a volume of said slurry therein, said reservoir including a sidewall extending from a lower edge portion to an upper edge portion,

a slurry infeed opening providing fluid communication between a slurry supply and a lower region of said reservoir,

a waste outlet spaced toward said upper edge portion and in fluid communication with said reservoir,

at least one baffle member disposed in said reservoir and positioned intermediate said infeed opening and said waste outlet,

at least one fibre discharge passage providing fluid communication between a passage inlet opening proximate to an underside of a portion of a selected said baffle member and a discharge outlet spaced vertically above said inlet opening, and

a gas nozzle selectively operable to supply a gas flow to said lower region of said reservoir,

and wherein said waste stream slurry comprises at least about 90% water and is fed into said reservoir through said infeed opening at a rate selected at between about 0.2 and 5 cubic metres per minute.

13. Use of the apparatus as claimed in claim 12 wherein said slurry comprises a recycled paper slurry and said contaminants comprise plastics and adhesive residues.

14. Use of the apparatus as claimed in claim 13 wherein said nozzle further includes a diffuser, and wherein gas is introduced into said reservoir through said diffuser at a gas flow rate selected at between about 0.1 and 1.0 cubic metres per minute.

15. Use of the apparatus as claimed in claim 14 wherein said sidewall comprises a generally vertically extending cylindrical sidewall, and said at least one baffle member including an annular baffle extending radially and downwardly inwardly from an upper edge portion proximate said sidewall, to a lower distal edge remote therefrom.

16. Use of the apparatus as claimed in claim 15 wherein said annular baffle extends downwardly at an angle of between about 30 to 60° relative to vertical.

17. Use of the apparatus as claimed in claim 16 wherein said sidewall is a generally cylindrical sidewall having a diameter between about 0.5 and 5 metres.

18. Use of the apparatus as claimed in claim 17 wherein said slurry comprises a substantially homogeneous mixture.

19. An apparatus for separating plastic and adhesive materials from paper fibres in a recycled paper waste slurry, the apparatus including,

a reservoir for receiving said slurry therein, said reservoir including a generally cylindrical sidewall extending along an axis from a lower edge portion to an upper edge portion,

an infeed opening through said sidewall and providing fluid communication between a slurry supply and a lower region of said reservoir,

a contaminant waste outlet spaced toward said upper edge portion and providing fluid communication between said reservoir and a waste discharge,

a baffle member disposed in said reservoir and projecting radially about said sidewall part way towards said axis, said baffle member being positioned intermediate said infeed opening and said waste outlet,

a plurality of fibre discharge passages, said discharge passages being radially spaced about said axis and providing fluid communication between a respective passage inlet opening proximate to an underside of said baffle member and a discharge channel spaced vertically a distance above the passage inlet opening,

a gas nozzle selectively operable to supply a gas flow to said lower region of said reservoir.

20. The apparatus as claimed in claim 19 wherein said baffle member extends angularly downward at an angle of 30 to 60° relative to said axis a distance selected at between about 3 and 30 cm.

21. The apparatus as claimed in claim 19 wherein said fibre discharge passages extend in a generally vertical orientation, and

said discharge channel includes a generally horizontally extending flow channel fluidically coupled to an upper end portion of said fibre discharge passages, and a discharge outlet for permitting the discharge of fluid entrained paper fibres therethrough.

22. The apparatus as claimed in claim 19 wherein said discharge outlet is spaced vertically between about 0.25 and 5 cm below said waste outlet.

23. The apparatus as claimed in claim 21 wherein said discharge outlet is spaced vertically between about 0.5 and 3 cm below said waste outlet.
24. The apparatus as claimed in claim 23, further including a pumping assembly for supplying said slurry to said reservoir as a substantially continuous flow.
25. The apparatus as claimed in claim 24 wherein said substantially continuous flow is selected at between about 0.5 and 5 cubic metres per minute.
26. The apparatus as claimed in claim 23 further including a pressurized gas source for supplying said gas flow at a flow rate selected at between about 0.1 and 1.0 cubic metres per minute.
27. The apparatus as claimed in claim 26 wherein said sidewall is a generally cylindrical sidewall having a diameter between about 0.5 and 5 metres.

1/3

FIG. 1

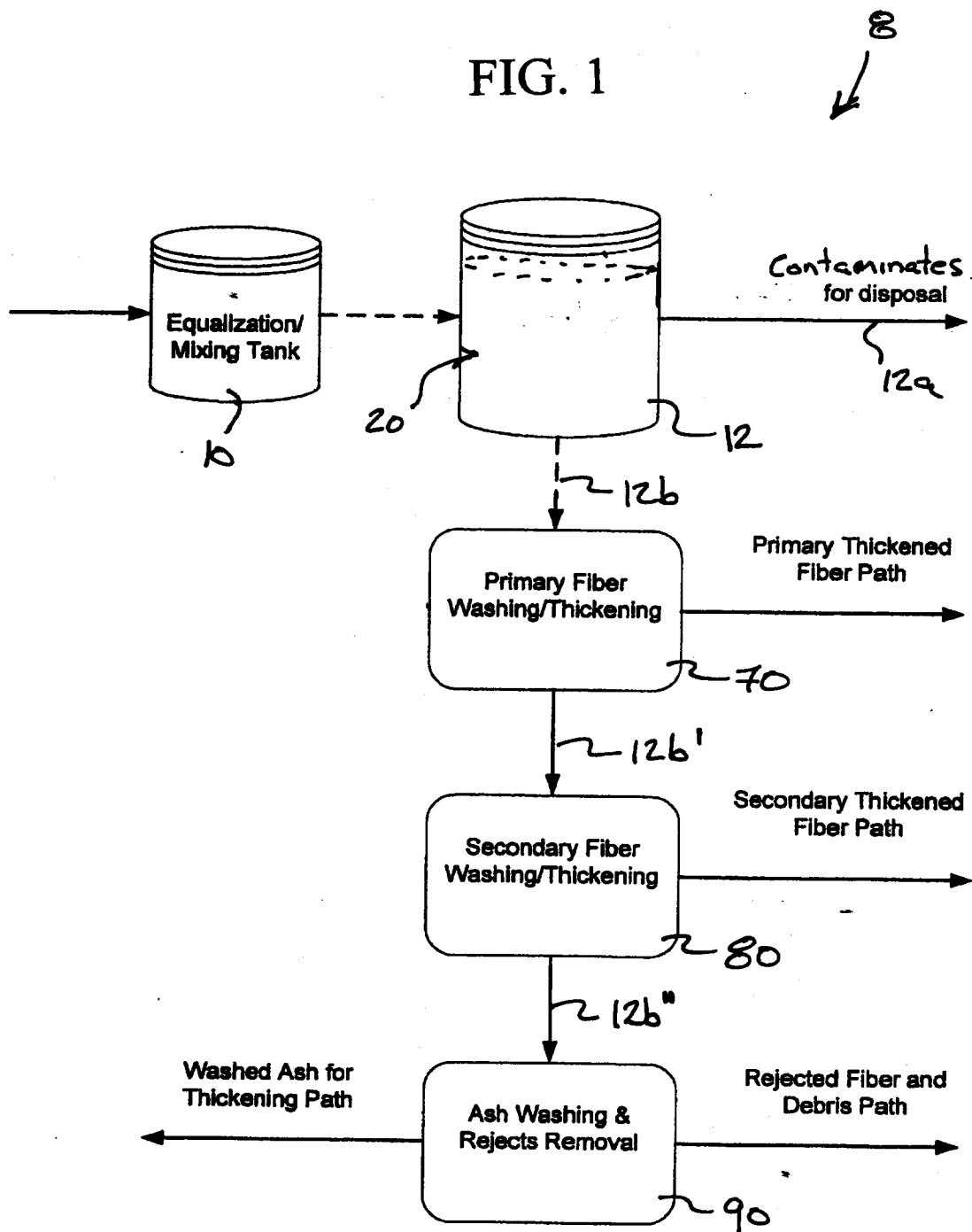


FIG. 2

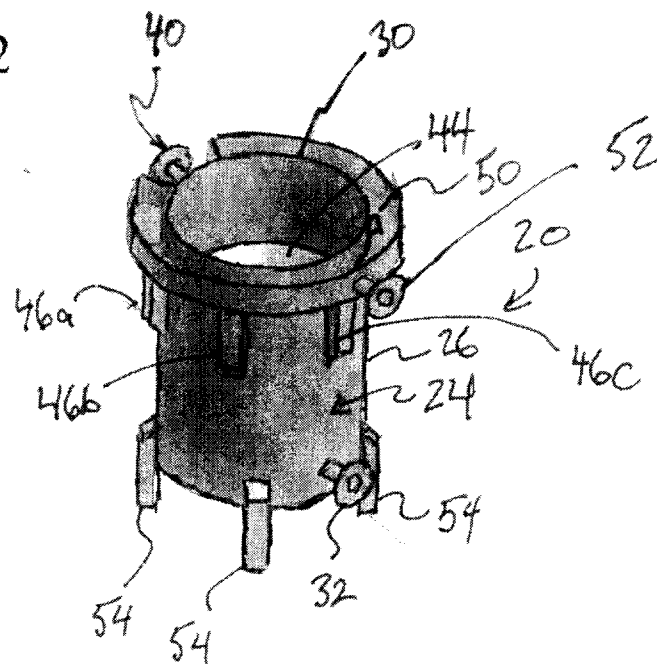
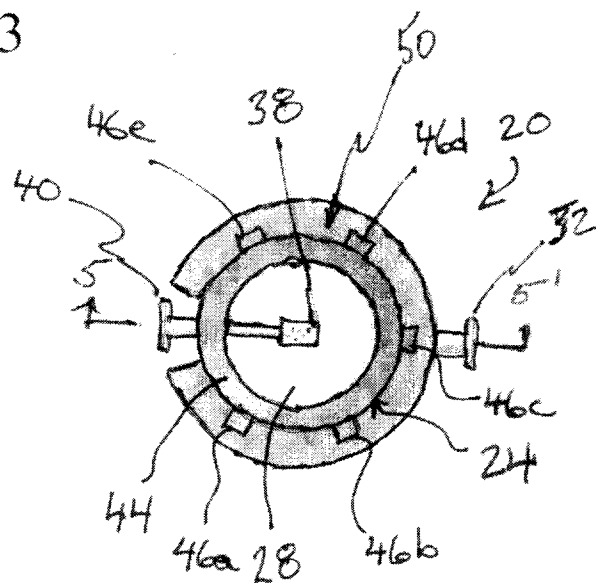


FIG. 3



3/3

FIG. 4

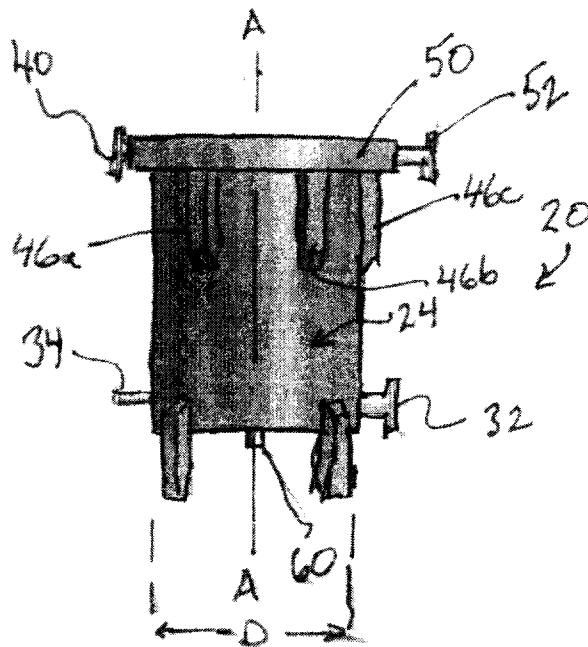
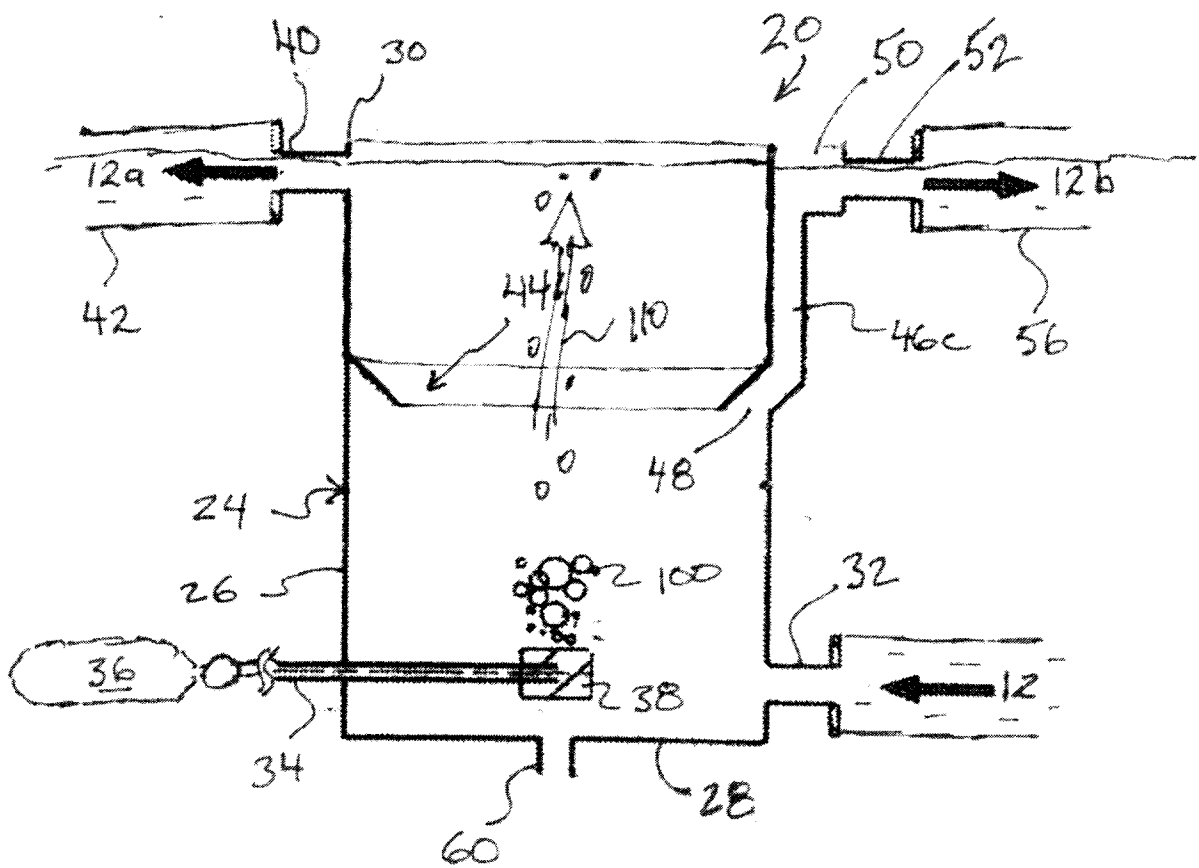


FIG. 5



INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA2007/001306

A. CLASSIFICATION OF SUBJECT MATTER
IPC: **D21C 5/02** (2006.01) , **D21C 9/00** (2006.01) , **D21C 9/08** (2006.01)
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC: (2006.01) D21C 5/02, D21C 9/00, D21C 9/08

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
IPC: (2006.01) D21B 1/32, B03D 1/14

Electronic database(s) consulted during the international search (name of database(s) and, where practicable, search terms used)
Scopus, Delphion, Canadian Patent Database, Espacenet
Keywords: Flotation, aeration, paper, cellulose, fibre, recycle, recover, waste

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6,227,374 (BRITZ et al.) 08 May 2001 (08-05-2001) Columns 5 , 6; Figures 6, 7	1-27

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier application or patent but published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

25 March 2008 (25-03-2008)

Date of mailing of the international search report

21 April 2008 (21-04-2008)

Name and mailing address of the ISA/CA
Canadian Intellectual Property Office
Place du Portage I, C114 - 1st Floor, Box PCT
50 Victoria Street
Gatineau, Quebec K1A 0C9
Facsimile No.: 001-819-953-2476

Authorized officer

Chris Bowen 819- 994-3555

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CA2007/001306

Patent Document Cited in Search Report	Publication Date	Patent Family Member(s)	Publication Date
US6227374	08-05-2001	AU4302893 A	30-12-1993
		CA2097222 A1	02-12-1993
		DE19730464 A1	21-01-1999
		EP0894892 A1	03-02-1999
		MX9303282 A1	31-05-1994
		US5367838 A	29-11-1994
		US2001010294 A1	02-08-2001
		WO9324275 A1	09-12-1993
