

Clarke, Modet & Cº

COLOMBIA

P-4299

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO
DIVISION DE NUEVAS CREACIONES

E. S. D.

Ref.: Expediente No. 14-098.834

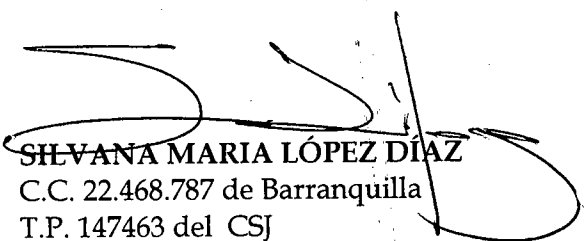
Solicitud de patente a nombre de NIROSOFT INDUSTRIES LTD

Yo, SILVANA MARIA LÓPEZ DÍAZ, identificada como aparece al pie de mi firma, domiciliada en la Carrera 11 No. 86-53, piso 6, obrando como apoderada de la sociedad NIROSOFT INDUSTRIES LTD, dado alcance a solicitud de diseño radicada el 8 de Mayo de 2014, me permito presentar como complemento:

1. Copia certificada de la prioridad No. 61/821,566 del 9 de mayo de 2013.

Espero con esto haber dado cabal cumplimiento a lo solicitado por ese despacho y de conformidad con lo indicado en los artículos 3º, inciso 3, 35 inciso 2 y 59 inciso 2 del CCA, al analizar este memorial, atentamente ruego se traten todas las cuestiones planteadas con motivo del mismo.

Señor Superintendente Delegado,


SILVANA MARIA LÓPEZ DÍAZ

C.C. 22.468.787 de Barranquilla
T.P. 147463 del CSJ
notificaciones@clarkemodet.com.co

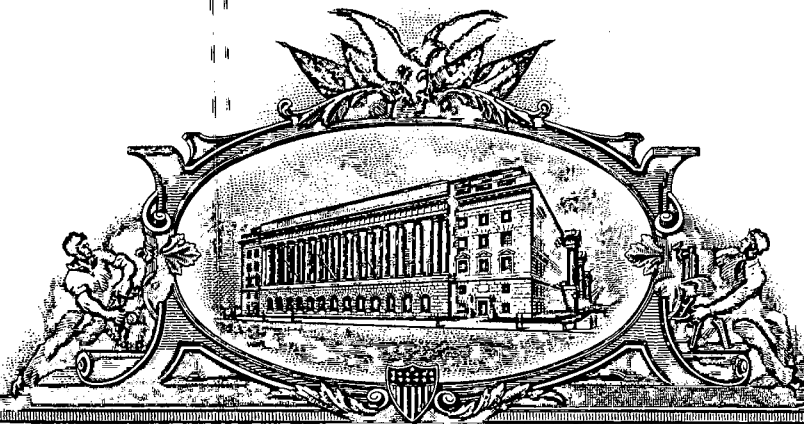
SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO



No. 14-098834- -00003-0000

Fecha: 2014-08-04 15:15:54 Dep. 2020 DIR.NUEVASCR
Tra. 2 PATENTES Eve: 1 REGDEPOSITO
Act. 329 CTOINFORMACION Folios: 17

1/17



THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

**UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office**

April 07, 2014

**THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM
THE RECORDS OF THE UNITED STATES PATENT AND TRADEMARK
OFFICE OF THOSE PAPERS OF THE BELOW IDENTIFIED PATENT
APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A
FILING DATE UNDER 35 USC 111.**

APPLICATION NUMBER: 61/821,566

FILING DATE: May 09, 2013

**THE COUNTRY CODE AND NUMBER OF YOUR PRIORITY
APPLICATION, TO BE USED FOR FILING ABROAD UNDER THE PARIS
CONVENTION, IS US61/821,566**

**By Authority of the
Under Secretary of Commerce for Intellectual Property
and Director of the United States Patent and Trademark Office**



**T. LAWRENCE
Certifying Officer**

2

Electronic Acknowledgement Receipt

EFS ID:	15738811
Application Number:	61821566
International Application Number:	
Confirmation Number:	1588
Title of Invention:	MULTISTAGE FILTRATION PRE-TREATMENT FOR DESALINATION OF OILFIELDS PRODUCED WATER
First Named Inventor/Applicant Name:	Assaf HABERMAN
Customer Number:	49443
Filer:	Zeev Pearl/Laura Saporta
Filer Authorized By:	Zeev Pearl
Attorney Docket Number:	P-77079-USP
Receipt Date:	09-MAY-2013
Filing Date:	
Time Stamp:	18:08:08
Application Type:	Provisional

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	\$ 130
RAM confirmation Number	4945
Deposit Account	503355
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)	

3

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		P-77079-USP-APP.pdf	300698	yes	13
			757bb67780cc9aeb44d35494a8b49552e16b86e		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Provisional Cover Sheet (SB16)		1	1	
	Specification		2	10	
	Claims		11	11	
	Drawings-only black and white line drawings		12	13	

Warnings:

The page size in the PDF is too large. The pages should be 8.5 x 11 or A4. If this PDF is submitted, the pages will be resized upon entry into the Image File Wrapper and may affect subsequent processing

Information:

2	Fee Worksheet (SB06)	fee-info.pdf	29765	no	2
			b653409b1de8db7e648a2a289a9c0dddb07da1bf		

Warnings:**Information:**

Total Files Size (in bytes):			330463
------------------------------	--	--	--------

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PROVISIONAL APPLICATION FOR PATENT COVER SHEET – Page 1 of 1

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

Express Mail Label No. _____

INVENTOR(S)			
Given Name (first and middle [if any])	Family Name or Surname	Residence (City and either State or Foreign Country)	
Assaf Ravid	HABERMAN LEVY	Ramat Yishay, Israel Massad, Israel	
<i>Additional inventors are being named on the _____ separately numbered sheets attached hereto.</i>			
TITLE OF THE INVENTION (500 characters max):			
MULTISTAGE FILTRATION PRE-TREATMENT FOR DESALINATION OF OILFIELDS PRODUCED WATER			
Direct all correspondence to: CORRESPONDENCE ADDRESS			
☒ The address corresponding to Customer Number:		49443	
OR			
☒ Firm or Individual Name Pearl Cohen Zedek Latzer, LLP			
Address 1500 Broadway, 12th Floor			
City New York	State New York	Zip 10036	
Country USA	Telephone (646) 878-0800	Email USPTO@pczlaw.com	
ENCLOSED APPLICATION PARTS (check all that apply)			
☐ Application Data Sheet. See 37 CFR 1.76			
☐ CD(s), Number of CDs _____			
☒ Drawing(s) Number of Sheets 2			
☐ Other (specify) _____			
☒ Specification (e.g. description of the invention) Number of Pages 10			
Fees Due: Filing Fee of \$260 (\$130 for small entity). If the specification and drawings exceed 100 sheets of paper, an application size fee is also due, which is \$400 (\$200 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
METHOD OF PAYMENT OF THE FILING FEE AND APPLICATION SIZE FEE FOR THIS PROVISIONAL APPLICATION FOR PATENT			
☒ Applicant claims small entity status. See 37 CFR 1.27.			
☐ A check or money order made payable to the <i>Director of the United States Patent and Trademark Office</i>		130	
is enclosed to cover the filing fee and application size fee (if applicable).		TOTAL FEE AMOUNT (\$)	
☐ Payment by credit card. Form PTO-2038 is attached.			
☒ The Director is hereby authorized to charge the filing fee and application size fee (if applicable) or credit any overpayment to Deposit Account Number: 50-3355			
The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.			
☒ No.			
☐ Yes, the name of the U.S. Government agency and the Government contract number are: _____			

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

SIGNATURE



Date

09 May 2013

TYPED or PRINTED NAME

Zeev Pearl

REGISTRATION NO. (if appropriate)

60,234

TELEPHONE

646-878-0800

Docket Number:

P-77079-USP**USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT**

This collection of information is required by 37 CFR 1.51. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 8 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

MULTISTAGE FILTRATION PRE-TREATMENT FOR DESALINATION OF OILFIELDS PRODUCED WATER

BACKGROUND OF THE INVENTION

[001] Onshore oil drilling usually involves the production of a byproduct in the form wastewater. Water is usually located above the oil layer in the ground. Water containing oil is often the first product of oil drilling. Water is also produced from crude oil during oil drilling and then has to be disposed. Treatment of such wastewater from onshore oil wells poses several challenges. Most commercial onshore processes, when ocean discharge is not available, include reducing the oil content in the water to approximately below 10 mg/liter, removing of the coarse particles and then injecting the received brackish water via deep aquifer injection. Further use of such water for domestic, industrial or agricultural usages is impossible due to excessive contamination and salt levels. In order for the brackish feed water to be used, a further reduction of pollutants and oil should be achieved and the water should be desalinated to meet stricter environmental regulations. After a first coarse filtering, the feed water still contains residual oils, hydrocarbons, solids, and other contaminants, all of which must be removed before any desalination process can be undertaken.

BRIEF DESCRIPTION OF THE DRAWINGS

[002] The subject matter regarded as the invention is particularly pointed out and distinctly claimed in the concluding portion of the specification. The invention, however, both as to organization and method of operation, together with objects, features, and advantages thereof, may best be understood by reference to the following detailed description when read with the accompanying drawings in which:

[003] Fig. 1 is a high level block diagram of an exemplary system for treating feed water according to some embodiments of the invention;

[004] Fig. 2A is a flowchart of a method for treating feed water according to some embodiments of the invention; and

[005] Fig. 2B is a flowchart of a method for treating feed water according to some embodiments of the invention.

[006] It will be appreciated that for simplicity and clarity of illustration, elements shown in the figures have not necessarily been drawn accurately or to scale. For example, the dimensions of some of the elements may be exaggerated relative to other elements for clarity, or several physical components may be included in one functional block or element. Further, where considered appropriate, reference numerals may be repeated among the figures to indicate corresponding or analogous elements.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

[007] In the following detailed description, numerous specific details are set forth in order to provide a thorough understanding of the invention. However, it will be understood by those skilled in the art that the present invention may be practiced without these specific details. In other instances, well-known methods, procedures, and components, modules, units and/or circuits have not been described in detail so as not to obscure the invention.

[008] Although embodiments of the invention are not limited in this regard, the terms “plurality” and “a plurality” as used herein may include, for example, “multiple” or “two or more”. The terms “plurality” or “a plurality” may be used throughout the specification to describe two or more components, devices, elements, units, parameters, or the like. Unless explicitly stated, the method embodiments described herein are not constrained to a particular order or sequence. Additionally, some of the described method embodiments or elements thereof can occur or be performed simultaneously, at the same point in time, or concurrently.

[009] When used herein, the term brackish feed water refers to any water that contains up to 15 mg/liter oil and grease contamination, salinity of less than 50 g/liter] total organic carbon (TOC) of less than 15 mg/liter], less than 30 mg/liter total suspended solids (TSS), and less than 25 Nephelometric Turbidity Units (NTU) suspended material measured as turbidity. In some embodiments, the brackish feed water is produced by a first stage coarse filtration of wastewater produced from crude oil during oil drilling. An

exemplary composition of brackish feed water that was measured prior to entry to a filtering system according to some embodiments of the invention is presented in Table 1.

[010]

Table 1

Parameter	Value
Temperature, °C	25-35
pH	8.5
Cl [mg/l]	150-180
SiO ₂ [mg/l]	30
Oil & grease [mg/l]	1.1
Hydrocarbons [mg/l]	
TSS [mg/l]	<5
Turbidity [NTU]	
TOC [mg/l]	<4
Conductivity [mS]	1.406

[011] Embodiments of the invention are directed to a system and method for treating brackish feed water. Fig. 1 is a high level block diagram of an exemplary water treatment system. Brackish feed water is collected in a feed tank 20, to be treated by a system 100. System 100 may include three filters, a first filter 30, also refers herein as a coarse filter, a second filter 40, also refers herein as a fine filter and a third filter 50, and also refers herein as an extra-fine filter. After exiting system 100, the treated water may be desalinated by a desalination system 70 to become product water. The wastewater from system 100 may be treated by a wastewater recycle unit 60.

[012] The brackish feed water may be received at feed tank 20 after preliminary filtering treatment of water produced from crude oil drilling. Brackish feed water may contain salts, residual oils, hydrocarbons, solids, and other contaminants. The Feed water is collected in feed tank 20 prior to feeding into system 100. Feed tank 20 may be any tank configured to receive, collect and supply brackish feed water. Tank 20 may be made of or coated by a corrosive resistant material.

[013] . System 100 may be configured to reduce the contamination in the brackish feed water to levels suitable for a desalination process, for example, the water treated by system 100 may include less than 0.1 mg/liter residual oil and grease, less than 3 mg/liter

TOC, less than 1 mg/liter of other hydrocarbons, less than 2 mg/liter TSS and less than 0.5 NTU turbidity.

[014] Although system 100 is described herein as having three consecutive filters, it should be understood to a person skilled in the art, that embodiments of the invention are not limited in that respect and having two, four, five and more filters is within the scope of the invention. For example, according to some embodiments, the system may include two filters, for example, any combination of coarse filter 30 (the first filter), fine filter 40 (the second filter) and extra-fine filter 50 (the third filter). For example, according to other embodiments, the system may include four filters.

[015] Coarse filter 30 may be any filter that is configured to filter particles larger than 10 μm , for example, a filter configured to filter particles larger than, 15 μm , 20 μm , 25 μm , 35 μm or 40 μm . Coarse filter 30 may include a mesh or a screen for filtering coarse particles. Coarse filter 30 may further be configured to be automatically cleaned. During operation, coarse filter 30 may be at least partially blocked by a mixture of the coarse particles and residual oil. Most commercial industrial filtering units are not designed to filter a combination of relatively viscose oil sand and other hydrocarbon particles. In order to clean such a blockage, during the filtering operation, with minimal disturbance to the filtering process an automatic cleaning method may be desired. For example, when the pressure at the exit of coarse filter 30, drops below a predetermined threshold value (e.g., drop of 1 bar from the initial pressure) the meshes or screens may be automatically cleaned using water jets that remove the blockage layer from the surface of the filter. The system may include two pressure gauges, one at the entrance and one at the exit of filter 30, to measure the pressure drop in the filter.

[016] The system may clean coarse filter 30 by diversion of the feed pressure via suction nozzles. Alternatively or additionally, coarse filter 30 may be cleaned by a rotating brush assembly. The waste water from the cleaning procedure may be passed to waste stream recycle unit 60 that separates the feed water from solid residuals contained in the feed water. The feed water may be passed back to feed tank 20 (not shown) to be further processed by system 100. . Recycle unit 60 may include dissolved air flotation system (DAF) with chemical additives for separation of backwash solids and oils. DAF sludge may then be dewatered in a decanter centrifuge. The dewatered sludge (e.g.,

having approximately 30% dry solids) may be disposed as solid waste and water from both the DAF & decanter may be recycled to feed tank 20.

[017] From coarse filter 30, the water may pass to fine filter 40. Fine filter 40 may be any filter configured to filter particles larger than 2 μm . For example, filter 40 may be a threads filter. As known in the art, a thread filter includes textile fibers arranged in cassette-like element, for filtering the water. In some embodiments, fine filter 40 may include one or more filtering elements. Fine filter 40 may be configured to filter particles larger than 2 μm , 3 μm , 5 μm , 7 μm or 9 μm . Oil droplets and other particles may be accumulated on the surface of the fibers of fine filter 40, blocking the fibers.

[018] In some embodiments, fine filter 40 may be automatically cleaned when the pressure of the feed water measured at the exit of fine filter 40 drops below a threshold value, for example, when the difference between the pressure at the entrance to filter 40 and the pressure at the exit of filter 40 is above 0.5 bar, 1 bar, 2 bar, 4 bar or more. The system may include two pressure gauges one at the entrance and one at the exit of filter 40 to measure the pressure drop in the filter. For example, filter 40 may be cleaned using high pressure water jets to remove the accumulated particles and oil. Treated water may be taken via a second circulation pipe 45 or a dedicated tank using any water pumps and may further injected into filter 40 forming water jets at a pressure of at least 5 bar, 8 bar, 10 bar, 13 bar or more.

[019] Filter 40 may include textile microfibers having, for example, 10 micron diameter that may be wound over a rigid grooved base plate (a cassette). Feed water may flow through the thread layers into the grooves and may further be channeled to specially designed outlets. The filter cassettes may be mounted on at least one hollow pipe. The exemplary filter may be automatically cleaned using high-pressure water jets spray through the thread layers that may hit the grooved base plate and may further be rejected back through the layers again. The contaminants may be carried off from the cassettes by the reject stream. Therefore, no dirt passes through the filter during back-flush. The filtration mechanics may include a combination of surface and depth filtration

[020] In some embodiments, fine filter 40 may be periodically cleaned using a detergent. Filter 40 may be immersed in a water solution comprising water (e.g., from pipe 45) and a detergent for cleaning oil, for example, detergent comprising terpenes.

Following the immersion, filter 30 may be washed (e.g., twice) by treated water from pipe 45 to clean the detergent from the filter, e.g., to clean the detergent from the textile fibers. Filter 30 may be chemically cleaned once a day, once a week, once a month or at any other timing. The waste water from the two cleaning procedure (water jets and detergents) may be passed to a waste stream recycle tank 50 to be separated to feed water that may be passed to feed tank 20 and solid residuals 55.

[021] System 100 may further include a third extra-fine filter 50. Extra-fine filter 50 may be any filter configured to filter particles larger than 0.5 μm , 1 μm , 1.5 μm or more. Extra-fine filter 60 may include a cartridge filter or any other filter configured to separate such extra-fine particles from water. An exemplary data presenting the amount of additives that was measured in the treated water at the end of the filtering process conducted using an exemplary system similar to system 100, is presented in Table 2.

[022]

Table 2

Parameter	Value
pH	6-8.5
Na [mg/l]	NA
Cl [mg/l]	NA
TSS [mg/l]	<1
Turbidity [NTU]	0.5
TOC [mg/l]	3
Oil & grease [mg/l]	0.8
Hydrocarbons [mg/l]	<1
Conductivity [mS]	NA

[023] After being treated in system 100, the treated water may further undergo any desired desalination process, for example to for producing water suitable for agricultural, domestic and/or industrial usages. The treated water may pass through desalination system 70. Desalination system 70 may be any desalination system utilizing for example, reverse osmosis or thermal desalination. The desalinated water may further be supplied to the end user.

[024] Reference is now made to Fig. 2A that illustrates a method for treating brackish feed water according to some embodiments of the invention. Method 200 may be preformed using system 100 or any other suitable system. In operation 210, the method

may include passing feed water comprising less than 15 mg/liter oil and grease through a coarse filter. For example, coarse filter 30 configured to filter particles larger than 10 μm . The feed water may include residual oil and additional contaminations, such as sand particles, salts and other hydrocarbons. The feed water may be received from initial filtering of oil field water.

[025] In operation 220, the method may include automatically cleaning the coarser filter. The automatic cleaning may be initiated when a pressure drop in the filter is raised above a first threshold or when the pressure at the exit of the coarse filter is dropping below a second threshold. Treated water, for example, from pipe 35 may be used for washing the coarse filter, alternatively or additionally the coarse filter may be cleaned by a rotating brush assembly.. The contaminated layer may include oil and coarse particles from the feed water.

[026] In operation 230, the method may include passing the feed water through a fine filter configured to filter particles larger than 2 μm , for example, fine filter 40. The fine filter may include textile fibers (e.g., microfibers) arranged in at least one cassette or filtering elements for trapping particles larger than 2 μm . In operation 240, the method may include automatically cleaning the feed water when pressure measured at the exit of the fine filter drops below a threshold value, using one or more water jets having pressure larger than 5 bar. Treated water, for example from pipe 45, may be pumped to increase the pressure of the water, using any suitable water pump, to be further injected into the fine filter using water jets. The water jets may mechanically remove a contaminated layer comprising oil and particles from the filter, e.g., from the textile fibers. In operation 250, the method may further include passing the water through an extra-fine filter configured to filter particles larger than 0.5 μm . The filter may be any cartridge filter.

[027] In some embodiments, method 200 may include additional operations for improving the filtering performance of any one of the coarse filter, the fine filter and/or the extra-fine filter. In operation 260, the method may include adding additives to the feed water that improves the ability of the filters to catch and trap the residual oil and the particles from the feed water. For example, the method may include adding a coagulant material to the water. A coagulant material may be any material configured to cause

coagulation of fine particles into larger particles, which are trapped more easily by the filters. For example, the coagulant material may include ferrous salts or any other organic or inorganic coagulant materials. The coagulant material may be added at one or more stages of the filtering process, for example, prior to passing through the coarse filter, prior to passing through the fine filter or prior to passing through the extra-fine filter. In some embodiments, the method may include adding demulsifiers, also known as, emulsion breakers to separate the oil-water emulsion thus allow better separation of the oil from the water. The demulsifiers may be added at one or more stages of the filtering process, for example, prior to passing through the coarse filter, prior to passing through the fine filter or prior to passing through the extra-fine filter. The demulsifier may include at least one of acid catalyzed phenol-formaldehyde resins, base catalyzed phenol-formaldehyde resins, epoxy resins, polyethylene imines, polyamines, di-epoxides and polyols.

[028] In operation 270, the method may include periodically cleaning the fine filter using a detergent for removing oil. The cleaning may be preformed using any cleaning method. For example, a cleaning in place (CIP) method may be used to clean the filter on site without disassembling the filter. The cleaning may be preformed using any detergent for cleaning oil, for example a detergent comprising terpenes. An exemplary cleaning procedure may include the following operations: treated water, for example from pipe 45, may be used for washing (e.g., twice) the fine filter. The fine filter may be isolated by blocking the entrance and exit of the feed water. The fine filter may be further be immersed in a solution containing treated water and the detergent, by letting the solution to flow in close circle, for example, for one hour. The detergent solution may be extracted and the filter may be washed (e.g., twice). This operation may be carried out periodically, for example, once a day, once a week, once a month or more.

[029] An exemplary system comprising three filtering stages was examined. The system included a first coarse filter for filtering particles larger than 25 μ m and a third extra-fine cartridge filter for filtering particles larger than 1 μ m, as disclosed above with respect to coarse filter 30 and extra-fine filter 50. The coarse filter was ABS screen filter with 25 micron screen and suction cleaning of Amiad Filtration Systems Ltd. The system further included a second fine filter for filtering particles up to 7 μ m, comprising textile

microfibers having an automatic cleaning abilities (e.g., filter 40) according to some embodiments of the invention. The fine filter was AMF with 7 micron cassettes and high pressure cleaning of Amiad Filtration Systems Ltd. Results showing the pressure drop of the fine filter as a function of time are given in Table 3. Table 3 summaries measurements of water pressure drop ΔP in bars on the fine filter as function of operation time [days].

[030]

Table 3

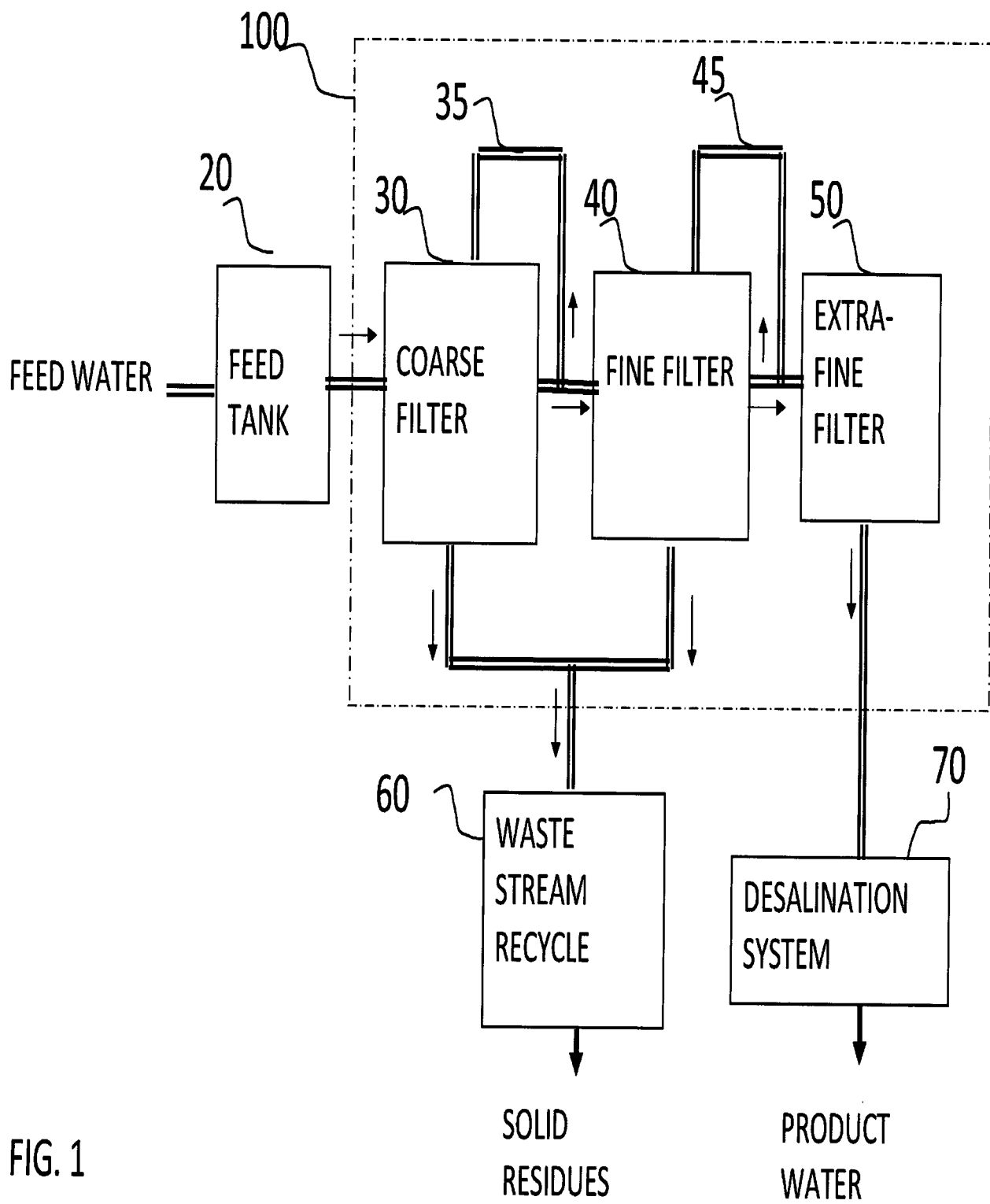
Day	ΔP [bar]
2	2
4	2
6	2
8	2
10	3
12	3
14	3
16	3
18	4
20	4.5

[031] The examined system having automatic cleaning abilities, showed an excellent performance with only small increase in the pressure drop. After approximately 20-30 days, the fine filter was further cleaned using a detergent to restore the filtering abilities of a completely new filter.

[032] The foregoing description of the embodiments of the invention has been presented for the purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise form disclosed. It should be appreciated by persons skilled in the art that many modifications, variations, substitutions, changes, and equivalents are possible in light of the above teaching. It is, therefore, to be understood that the appended claims are intended to cover all such modifications and changes as fall within the true spirit of the invention.

What is claimed is:

1. A method for treating contaminated water comprising:
 - passing feed water comprising less than 15 mg/liter oil and grease and less than 30 mg/liter through a coarse filter configured to filter particles larger than 10 μm ;
 - passing the feed water through a fine filter configured to filter particles larger than 7 μm , wherein the fine filters is configured to be automatically cleaned when the feed water pressure after the fine filters drops below a threshold value using water jets having pressure larger than 3 bar; and
 - passing the water through an extra fine filter configured to filter particles larger than 0.5 μm .



16

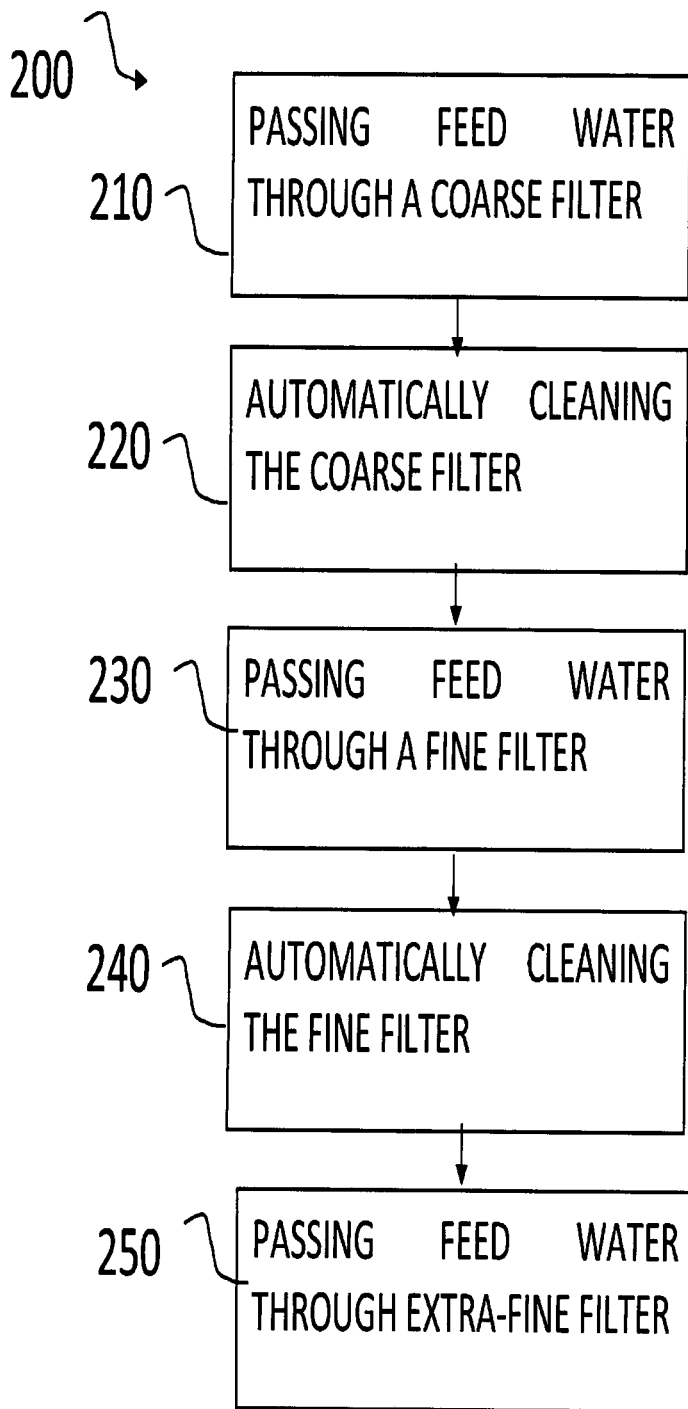


FIG. 2A

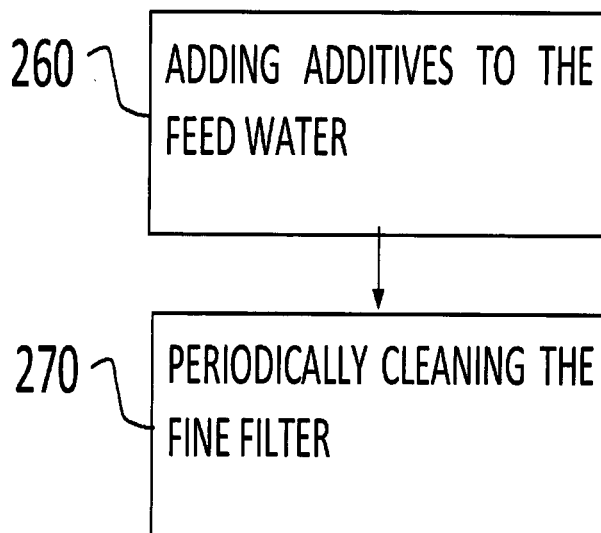


FIG. 2B

12