

AS. 102.821

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO



No. 07-003857- -00003-0000

Fecha: 2009-02-06 16:43:41 Dep: 2020 NUEVA CREACION
Tra: 11 PATENTILYI Lve: 378 FASE NACIONAL
Act: 538 PLEICION Folios: 3

Señores

**SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO
DIVISION DE NUEVAS CREACIONES**

E. S. D.

REF.: Expediente No. 07 003.857 - Solicitud de Patente FASE NACIONAL

Corresp. a la Solicitud Internacional PCT/US2005/021442.

a nombre de: **THE BOC GROUP, INC.**

Titulada: DISPOSITIVO FILTRANTE PARA ADMINISTRACIÓN DE GASES
ALMACENADOS.

JUAN PABLO CADENA SARMIENTO, vecino de Bogotá, portador de la tarjeta profesional No. 57492 del Consejo Superior de la Judicatura, obrando como apoderado de la Sociedad **THE BOC GROUP, INC.**, según lo acredita el documento de poder presentado en esa División, de acuerdo con el Artículo 44 de la Decisión 486 de la Comisión de la Comunidad Andina, me permito solicitar que se examine si la invención contenida en la solicitud en referencia es patentable.

De acuerdo con lo anterior, me permito anexar los recibos oficiales de caja No. 08-96,495 y 09-1,199 por valor de \$452.000.

De la Señora Jefe atentamente,


JUAN PABLO CADENA SARMIENTO
C.C. No. 80.410.337 de Usaquén
T.P. No. 57492 del C.S.J.
Cra 7 No. 71-21 Torre B, Piso 4

Bogotá, 06 de febrero de 2009
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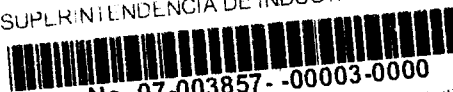
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SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO

NIT : 800176089-2

RECIBO OFICIAL DE CAJA : 08 - 96,495
FECHA : DICIEMBRE 12 DE 2008

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO



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***** CONSIGNACION *****

DEPOSITANTE	TIPO PAGO	BANCO	CUENTA	No. PAGO	FECHA PGO	Vr. PAGO
BRIGARD & CASTRO LTDA	CONSIGNACION	BANCO DE BOGOTA	062754387	3249923	12/12/2008	25,011,000.00

***** CONCEPTO *****

CANT.	RENTISTICO	CONCEPTO	TOTAL CONCEPTO
1	50005-01-01	SOLICITUDES	
		112 PTC CAP-I EXAMEN DE PATENTIBILIDA	420,000.00
		TOTAL :	\$ 420,000.00

SON: CUATROCIENTOS VEINTE MIL PESOS

RESPONSABLE :

RECIBO DE CAJA APLICADO AL EXPEDIENTE No. _____

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SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO

NIT : 800176089-2

RECIBO OFICIAL DE CAJA : 09 - 1,199
FECHA : ENERO 6 DE 2009

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***** CONSIGNACION *****

DEPOSITANTE	TIPO PAGO	BANCO	CUENTA	No. PAGO	FECHA PAGO	Vr. PAGO
BRILLO & CASTRO LTDA	RECIBO DE CAJA			1039	06/01/2009	5,012,000.00

***** CONCEPTO *****

CANT.	RENTISTICO	CONCEPTO	TOTAL CONCEPTO
1	50005-01-09	OTROS SERVICIOS DE PROPIEDAD I	998 VALOR COMPLEMENTO TARIFA A#0 ANTR
			TOTAL : \$ 32,000.00

SON: TREINTA Y DOS MIL PESOS

RECIBIBLE :

RECIBO DE CAJA APLICADO AL EXPEDIENTE No.

DIVISIÓN DE NUEVAS CREACIONES

RADICACIÓN EXPEDIENTE No. 07-03857

EL EXTRACTO DE LA PRESENTE SOLICITUD DE **PATENTE DE INVENCION**

FUE PUBLICADO EN LA GACETA DE PROPIEDAD INDUSTRIAL No **595** DE

FECHA **29 DE AGOSTO DE 2008** EL TÉRMINO HÁBIL SEÑALADO POR LA

LEY EXPIRA EL **26 DE NOVIEMBRE DE 2008**

NOTA: Dentro del plazo de los seis (6) meses siguientes a partir de la fecha de publicación en la gaceta de Propiedad Industrial, deberá solicitar y cancelar el examen de patentabilidad so pena de que la solicitud caiga en abandono, de acuerdo con lo establecido en el Artículo 44 de la Decisión 486/2000.

SE PRESENTARON OPOSICIONES POR PARTE DE TERCEROS.

SI _____

NO X



US006716274B2

(12) **United States Patent**
Gogins et al.

(10) **Patent No.:** **US 6,716,274 B2**
(45) **Date of Patent:** **Apr. 6, 2004**

(54) **AIR FILTER ASSEMBLY FOR FILTERING
AN AIR STREAM TO REMOVE
PARTICULATE MATTER ENTRAINED IN
THE STREAM**

(75) **Inventors:** **Mark A. Gogins**, Roseville, MN (US);
Thomas M. Weik, Deephaven, MN
(US)

(73) **Assignee:** **Donaldson Company, Inc.**,
Minneapolis, MN (US)

(*) **Notice:** Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.

(21) **Appl. No.:** **09/871,575**

(22) **Filed:** **May 31, 2001**

(65) **Prior Publication Data**

US 2002/0059868 A1 May 23, 2002

Related U.S. Application Data

(60) Provisional application No. 60/230,138, filed on Sep. 5,
2000.

(51) **Int. Cl.⁷** **B01D 46/02; B01D 46/04**

(52) **U.S. Cl.** **95/273; 95/278; 95/280;**
55/302; 55/484; 55/486; 55/487; 55/495;
55/498; 55/510; 55/527; 55/528

(58) **Field of Search** **55/482, 486, 487,**
55/382, 527, 528, 291, 293, 300, 304, 305,
302, 484, 495, 498, 510, 521; 95/273, 278,
280, 282; 442/36

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Primary Examiner—Duane Smith

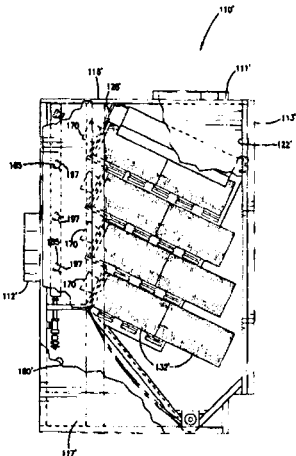
Assistant Examiner—Jason M. Greene

(74) **Attorney, Agent, or Firm**—Merchant & Gould P.C.

(57) **ABSTRACT**

Filter arrangements for industrial air cleaners include a
barrier media, usually pleated, treated with a deposit of fine
fiber. The media is particularly advantageous in high tem-
perature (greater than 140° F.) operating environments.

53 Claims, 24 Drawing Sheets



US 6,716,274 B2

1

AIR FILTER ASSEMBLY FOR FILTERING AN AIR STREAM TO REMOVE PARTICULATE MATTER ENTRAINED IN THE STREAM

RELATED APPLICATION

This application claims priority under 35 U.S.C. §119(e) to U.S. provisional application Ser. No. 60/230,138, filed on Sep. 5, 2000, incorporated by reference herein.

FIELD OF THE INVENTION

The present invention relates to a filter arrangement and filtration method. More specifically, it concerns an arrangement for filtering particulate material from a gas flow stream, for example, an air stream. The invention also concerns a method for achieving the desirable removal of particulate material from such a gas flow stream.

The present invention is an on-going development of Donaldson Company Inc., of Minneapolis, Minn., the assignee of the present invention. The disclosure concerns continuing technology development related, in part, to the subjects characterized in U.S. Pat. Nos. B2 4,720,292; Des 416,308; 5,613,992; 4,020,783; and 5,112,372. Each of the patents identified in the previous sentence is also owned by Donaldson, Inc., of Minneapolis, Minn.; and, the complete disclosure of each is incorporated herein by reference.

The invention also relates to polymer materials can be manufactured with improved environmental stability to heat, humidity, reactive materials and mechanical stress. Such materials can be used in the formation of fine fiber such as microfibers and nanofiber materials with improved stability and strength. As the size of fiber is reduced the survivability of the materials is increasingly more of a problem. Such fine fiber are useful in a variety of applications. In one application, filter structures can be prepared using this fine fiber technology. The invention relates to polymers, polymeric composition, fiber, filters, filter constructions, and methods of filtering. Applications of the invention particularly concern filtering of particles from fluid streams, for example from air streams and liquid (e.g. non-aqueous and aqueous) streams. The techniques described concern structures having one or more layers of fine fiber in the filter media. The compositions and fiber sizes are selected for a combination of properties and survivability.

BACKGROUND OF THE INVENTION

Particulate matter suspended in a gas is encountered in many industries. In some industries, such particulate matter is a valuable product, for example, starch, that is to be recovered. For others, such as the metal working industry, the particulate matter may be simply dust to be removed from the air. Systems for cleaning an air or gas stream laden with particulate matter include air filter assemblies that have filter elements disposed in a housing. The filter element may be a bag or sock of a suitable fabric or pleated paper. Cleaning is accomplished by periodically pulsing a brief jet of pressurized air into the interior of the filter element to reverse the air flow through the filter element. Such air filter assemblies are disclosed in, for example, U.S. Pat. No. 4,218,227 and U.S. Pat. No. 4,395,269, which patents are incorporated by reference herein.

Venturi elements are sometimes used to direct the jet of pressurized air into the filter element and to recover pressure energy as air exits the filter element. Often, the inlet end of the Venturi element is either outside the filtering chamber or

2

extends into the interior of the filter element. For example, U.S. Pat. No. 4,218,227 discloses mounting a Venturi with the inlet of the Venturi element resting on the side of the partition of the filter chamber opposite the filter element. U.S. Pat. No. 3,942,962 discloses a Venturi element with the Venturi inlet portion extending into the interior of the filter element.

The invention relates to polymeric compositions with improved properties that can be used in a variety of applications including the formation of fibers, microfibers, nanofibers, fiber webs, fibrous mats, permeable structures such as membranes, coatings or films. The polymeric materials of the invention are compositions that have physical properties that permit the polymeric material, in a variety of physical shapes or forms, to have resistance to the degradative effects of humidity, heat, air flow, chemicals and mechanical stress or impact.

In making non-woven fine fiber filter media, a variety of materials have been used including fiberglass, metal, ceramics and a wide range of polymeric compositions. A variety of techniques have been used for the manufacture of small diameter micro- and nanofibers. One method involves passing the material through a fine capillary or opening either as a melted material or in a solution that is subsequently evaporated. Fibers can also be formed by using "spinnerets" typical for the manufacture of synthetic fiber such as nylon. Electrostatic spinning is also known. Such techniques involve the use of a hypodermic needle, nozzle, capillary or movable emitter. These structures provide liquid solutions of the polymer that are then attracted to a collection zone by a high voltage electrostatic field. As the materials are pulled from the emitter and accelerate through the electrostatic zone, the fiber becomes very thin and can be formed in a fiber structure by solvent evaporation. As more demanding applications are envisioned for filtration media, significantly improved materials are required to withstand the rigors of high temperature 100° F. to 250° F. and up to 300° F., high humidity 10% to 90% up to 100% RH, high flow rates of both gas and liquid, and filtering micron and submicron particulates (ranging from about 0.01 to over 10 microns) and removing both abrasive and non-abrasive and reactive and non-reactive particulate from the fluid stream.

Accordingly, a substantial need exists for polymeric materials, micro- and nanofiber materials and filter structures that provide improved properties for filtering streams with higher temperatures, higher humidities, high flow rates and said micron and submicron particulate materials. A variety of air filter or gas filter arrangements have been developed for particulate removal. However, in general, continued improvements are sought.

SUMMARY OF THE INVENTION

Herein, general techniques for the design and application of air filter arrangements are provided. The techniques include preferred filter media. In general, the preferred media concern utilization, within an air filter, of barrier media, typically pleated media, and fine fiber, to advantage. The filter media includes at least a micro- or nanofiber web layer in combination with a substrate material in a mechanically stable filter structure. These layers together provide excellent filtering, high particle capture, efficiency at minimum flow restriction when a fluid such as a gas or liquid passes through the filter media. The substrate can be positioned in the fluid stream upstream, downstream or in an internal layer. A variety of industries have directed substantial attention in recent years to the use of filtration media for

US 6,716,274 B2

37

Pass/Fail Criteria: >50% efficiency retention

In most industrial pulse cleaning filter applications the filter would perform adequately if at least 50% of the fine fiber efficiency is retained.

THC Bench (Temperature, Humidity
Description:

The purpose of this bench is to evaluate fine fiber media resistance to the affects of elevated temperature and high humidity under dynamic flow conditions. The test is intended to simulate extreme operating conditions of either an industrial filtration application, gas turbine inlet application, or heavy duty engine air intake environments. Samples are taken out, dried and LEFS tested at intervals. This system is mostly used to simulate hot humid conditions but can also be used to simulate hot/cold dry situations.

Temperature -31 to 390° F.

Humidity 0 to 100% RH (Max temp for 100% RH is 160° F. and max continuous duration at this condition is 16 hours)

Flow Rate 1 to 35 FPM

Procedure:

A 4" diameter sample is cut from the media. Particle capture efficiency of the test specimen is calculated using 0.8 μ m latex spheres as a test challenge contaminant in the LEFS bench operating at 20 FPM.

The sample is then inserted into the THC media chuck.

Test times can be from minutes to days depending on testing conditions.

The sample is then placed on a drying rack and dried at room temperature (typically overnight). Once it is dry the sample is then retested for efficiency on the LEFS bench using the same conditions for the initial calculation.

The previous steps are repeated for the fine fiber supporting substrate without fine fiber. From the above information one can calculate the efficiency component due only to the fine fiber and the resulting loss in efficiency due to alcohol damage.

Once the loss in efficiency due to the fine fiber is determined one can calculate the amount of efficiency retained.

Pass/Fail Criteria: >50% efficiency retention

In most industrial pulse cleaning filter applications the filter would perform adequately if at least 50% of the fine fiber efficiency is retained.

Alcohol (Ethanol) Soak Test

Description:

The test uses the LEFS test bench to measure filter media performance changes upon immersion in room temperature ethanol.

Procedure:

A 4" diameter sample is cut from the media. Particle capture efficiency of the test specimen is calculated using 0.8 μ m latex spheres as a test challenge contaminant in the LEFS bench operating at 20 FPM. The sample is then submerged in alcohol for 1 minute.

The sample is then placed on a drying rack and dried at room temperature (typically overnight). Once it is dry the sample is then retested for efficiency on the LEFS bench using the same conditions for the initial calculation. The previous steps are repeated for the fine fiber supporting substrate without fine fiber. From the above information one can calculate the efficiency component due only to the fine fiber and the resulting loss in efficiency due to alcohol damage. Once the loss in efficiency due to the fine fiber is determined one can calculate the amount of efficiency retained.

Pass/Fail Criteria: >50% efficiency retention.

The above specification, examples and data provide an explanation of the invention. However, many variations and

38

embodiments can be made to the disclosed invention. The invention is embodied in the claims herein after appended. What is claimed is:

1. An air filter assembly comprising:

(a) a housing including an air inlet, an air outlet, a spacer wall separating said housing into a filtering chamber and a clean air chamber; said spacer wall including a first air flow aperture therein;

(b) a first filter construction positioned in air flow communication with said first air flow aperture in said spacer wall; said first filter construction including an extension of a pleated filter media composite defining a filter construction inner clean air chamber;

(i) said first filter construction being oriented with said filter inner clean air chamber in air flow communication with said spacer wall first air flow aperture;

(ii) said pleated filter media composite including a substrate, the substrate having an efficiency greater than 11% when measured according to ASTM-1215-89, with 0.78 μ monodisperse polystyrene spherical particles, at 20 fpm (6.1 meters/min), a permeability of about 2 to 900 meters-min⁻¹, a basis weight not greater than 200 grams-m⁻² and a thickness of 25 to 800 microns, the substrate at least partially covered by a layer of fine fiber having a thickness of about 1-8 times the fine fiber diameter;

(A) said fiber comprising a diameter of about 0.01 to 0.5 microns that after exposure for a test period of 16 hours to test conditions of 140° F. air and a relative humidity of 100% retains greater than 30% of the fiber unchanged for filtration purposes

(c) a pulse-jet cleaning system oriented to direct a pulse of air into said filter construction inner clean air chamber.

2. An air filter assembly according to claim 1 wherein the fine fiber comprises a polymer.

3. An air filter assembly according to claim 2 wherein the polymer comprises a condensation polymer.

4. An air filter assembly according to claim 2 wherein the polymer comprises an addition polymer.

5. An air filter assembly according to claim 4 wherein the addition polymer comprises a polyvinyl halide polymer.

6. An air filter assembly according to claim 4 wherein the addition polymer comprises a polyvinylidene halide polymer.

7. The air filter assembly of claim 6 wherein the polyvinylidene halide comprises polyvinylidene chloride.

8. The air filter assembly of claim 6 wherein the polyvinylidene halide comprises polyvinylidene fluoride.

9. The air filter assembly of claim 4 wherein the polymer comprises a polyvinylalcohol.

10. The air filter assembly of claim 9 wherein the polyvinylalcohol is crosslinked with about 1 to 40 wt. % of a crosslinking agent.

11. The air filter assembly of claim 10 wherein the crosslinked polyvinylalcohol is crosslinked using a polyacrylic acid having a molecular weight of about 1000 to 3000.

12. The air filter assembly of claim 10 wherein the crosslinked polyvinylalcohol is crosslinked using a melamine-formaldehyde resin having a molecular weight of about 1000 to 3000.

13. The air filter assembly of claim 3 comprising a condensation polymer, other than a copolymer formed from a cyclic lactam and a C₆₋₁₀ diamine monomer or a C₆₋₁₀ diacid monomer, and a resinous additive comprising an oligomer having a molecular weight of about 500 to 3000