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(54) Oil separator with integrated element known as retex inverter oil separator formed by a tube with cuts or holes, metal wool, metal mesh

(57) An oil separator (10), having the function of separating oil from a gas in output from a compressor, comprising a filter (17) constituted by a tube (18) with cuts or holes (19), wrapped in a layer of metal wool (20) or the like, enclosed by a cartridge made of metal fabric (21) of at least two layers of metal fabric.

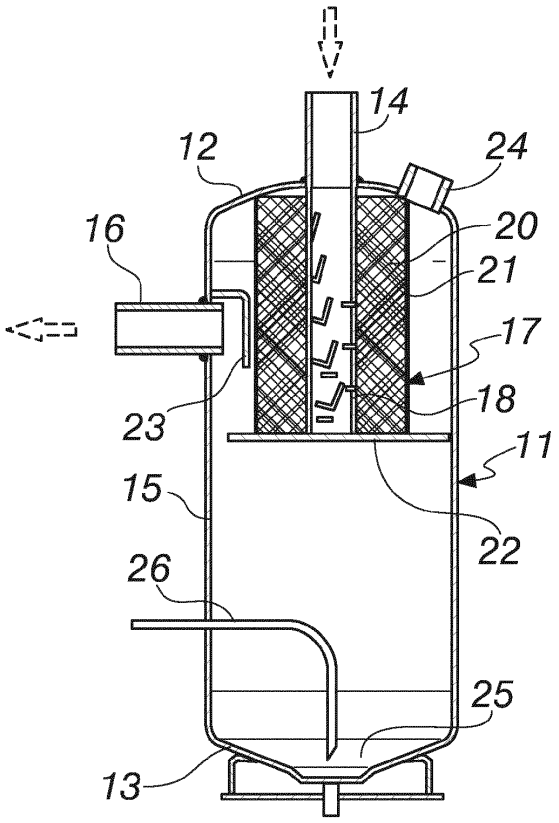

Fig. 2

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Description

[0001] The present invention relates to an oil separator with the function of separating oil from a gas in output from a compressor, particularly for industrial and civil refrigeration and conditioning systems.

[0002] In the circuits of the above-cited refrigeration and conditioning systems, during the operation of the system, and especially in particular conditions of operation and operating speed of the machines, the compressor introduces into the circuit large quantities of oil that must be stopped and separated from the gas before they enter the circuit and compromise its performance.

[0003] Currently, in order to separate the fumes, vapors and general residues of oil mixed with a cooling gas in output for example from a compressor of a refrigeration and conditioning system, elements known as separators are currently used which comprise glass wool fiber filters.

[0004] Existing glass wool fiber filters are subject to wear and to consequent fragmentation of the filtering element, which therefore is conveyed along the circuit, thus compromising its operation.

[0005] The aim of the present invention is to provide an oil separator that is capable of ensuring optimum oil separation without fragmentation of the filter contained therein.

[0006] Within this aim, an object of the invention is to provide an oil separator that ensures constant separation and cleaning of the gas in output over time.

[0007] Another object of the invention is to provide an oil separator that can be provided by means of known materials, such as for example carbon steel and/or stainless steel.

[0008] This aim and these and other objects that will become more apparent hereinafter are achieved by an oil separator, having the function of separating oil from a gas in output from a compressor, characterized in that it comprises a filter constituted by a tube with cuts or holes, wrapped in a layer of metal wool or the like, enclosed by a cartridge made of metal fabric of at least two layers of metal fabric.

[0009] Further characteristics and advantages of the invention will become more apparent from the description of a preferred but not exclusive embodiment of the oil separator according to the invention, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a perspective view of a separator according to the invention;
Figure 2 is a longitudinal sectional side view of a separator according to the invention;
Figure 3 is a top view of the separator according to the invention;
Figure 4 is a side view of a filter of a separator according to the invention;
Figure 5 is a top view of the filter of Figure 4;
Figure 6 is a view of a detail of Figure 4;
Figure 7 is a perspective view of the filter shown in Figures 4 to 6,
Figure 8 is a further top view of the filter of Figures 4 to 7, with a sectional plane IX-IX,
Figure 9 is a sectional view along the plane IX-IX of Figure 8;
Figure 9 is a flat extension of the contour of a cut or hole of the tube of the filter of the separator according to the invention;
Figure 10 is a view of the geometry of the cuts in the tube of the filter;
Figure 11 is a side view of a tube of a filter for a separator according to the invention;
Figure 12 is a perspective view of the tube of Figure 11;
Figure 13 is a plan view of the tube of Figures 11 and 12;
Figure 14 is another side view of the tube of Figures 11 to 13;
Figure 15 is a view of the geometric details of a cut of a tube of the filter for the separator according to the invention;
Figure 16 is a top view of a tube of a filter in a constructive variation thereof;
Figure 17 is a side view along the sectional plane XVII-XVII of Figure 16;
Figure 18 is a perspective view of the tube of Figure 17.

[0010] With reference to the figures, an oil separator is designated generally by the reference numeral 10.

[0011] Such oil separator 10 has the function of separating oil from a gas in output from a compressor, and can be used in particular in the field of industrial and civil refrigeration and in industrial and civil conditioning.

[0012] The oil separator is installed in the machines along the delivery line behind the compressor: it has the purpose of separating the oil in the vapor or gaseous state, present in the refrigerating gas or other gas, at the output of the compressor.

[0013] The oil separator 10 comprises a substantially cylindrical tank 11, which is closed in an upper region by a lid 12 and in a lower region by an oil collection pan 13.

[0014] An upper connecting sleeve 14 is fixed on the lid 12 for the inflow of the gas that exits from a compressor, the upper sleeve 14 being coaxial with the cylindrical tubular body 15 of the tank 11 and with a corresponding hole formed in the lid 12 for the passage of gas.

[0015] A lateral connecting sleeve 16, for the outflow of the gas separated from the oil, is fixed radially to the cylindrical tubular body 15 in the upper part thereof, at a complementarily shaped gas passage hole.

[0016] A filter 17 is present inside the tank 11.

[0017] The filter 17 is constituted by a tube 18 with cuts or holes 19, wrapped in a layer of metal wool 20, or the like, enclosed by a cartridge made of metal fabric 21 of at least two layers of metal fabric.

[0018] The filter 11 is carried by a supporting dia-

phragm disk 22, which closes the tube 18 in a downward region.

[0019] The metal fabric of the metal fabric cartridge 21 has a passage section smaller than 80 microns.

[0020] This makes it possible to bring the degree of filtration below 10 microns.

[0021] The through cuts 19 are substantially L-shaped, as shown in Figure 10, with an angular portion that is directed downward in the configuration for use.

[0022] In a constructive variation thereof, clearly visible in Figures 17 and 18, the tube 118 is provided with circular through holes 119.

[0023] In general, the cuts or holes 18 and 118 are to be understood as being providable also with other shapes and arranged inclined or vertically or horizontally with respect to a configuration for use, depending on the needs and the technical requirements.

[0024] The tube 18 or 118 of the filter 17 is fixed coaxially to the first sleeve 14, as shown in Figure 4; fixing is provided for example by welding.

[0025] The tube 18 and 118, with cuts (or holes) in the wall which are inclined, vertical or horizontal, ensures a slowing of the input gas stream, creating a uniform gas distribution in the entire region of the filter, regardless of the length, of the diameter, of the number of cuts, of the inclination of the cuts, of the cross-section of the cuts, of the placement of the holes, of the diameter of the holes.

[0026] The layer of metal wool 20 or the like, made for example of stainless steel, is useful in the first separation stage and allows separating the gas from the oil; the gas mixed with oil is filtered through the meshes of the metal wool (or the like), allowing the gas to exit in a clean state, and allows the vaporized oil to begin to condense, forming micro-droplets.

[0027] The metallic cartridge 21, made of metallic fabric with a passage smaller than 80 microns, has at least two turns, i.e., windings, so as to obtain a degree of filtration smaller than 10 microns; in this manner, in fact, the metal cartridge 21 makes it possible to retain any oil residues.

[0028] Such metal cartridge 21 is necessary for the second separation step, since it facilitates the growth of the drops that have condensed in the metal wool 20 (or the like).

[0029] The diaphragm disk 22 is necessary to ensure a calm region in the lower part of the separator 10.

[0030] The separator 10 also comprises, inside the cylindrical tubular body 15, at the lateral connecting sleeve 16 and interposed between the filter 17 and the inlet of said lateral sleeve 16, an internal partition 23, which is adapted to prevent any pressurized oil splashes from being introduced into the lateral sleeve 16, which is intended for the outflow of the gas separated from the oil.

[0031] The separator 10 also comprises an additional sleeve 24 for the insertion of a safety valve; the sleeve 24 is arranged for example on the lid 12 of the tank 11, in a position that is not affected by the filter 17.

[0032] Operation of the oil separator 10 according to the invention is as follows.

[0033] The gas enters the inside of the tube 18 or 118 provided with cuts that are inclined, vertical or horizontal (or holes 119) and distribute it uniformly within the metal wool 20 (or the like), creating a flow slowdown.

[0034] The gas mixed with the vaporized oil passes through the metal wool 20 (or the like), creating the first separation stage; the vaporized oil is condensed by forming micro-drops.

[0035] Once the metal wool 20 has been traversed, the second separation stage is entered, in which the gas passes through the metal fabric cartridge 21 (a minimum of two turns around the metal wool and a weft section smaller than 80 microns) so as to bring the degree of filtration below 10 microns: the weight of the micro-drops is thus increased and they are forced by gravity to precipitate into the lower part of the tank 11 in the oil collection region 25, where the residual oil vapors are retained.

[0036] Thanks to a capillary tube 26 made of copper, the condensed oil can be reintroduced into the lubrication circuit of the compressors.

[0037] In the lower part of the filter 17 the diaphragm disk 22 is located, which ensures a calm region in the part where the separated oil is settled, allowing the oil to be free from foam at the outlet through the capillary tube.

[0038] The resulting 99.8% oil separation thus achieved is independent of the size of the pipe, of the geometry of the cuts (or holes), of the consistency of the metal wool and of the degree of filtration of the metal fabric.

[0039] In practice it has been found that the invention achieves the intended aim and objects.

[0040] In particular, the invention provides an oil separator that is capable of ensuring an optimum oil separation without fragmentation of the filter contained therein.

[0041] Moreover, the invention provides an oil separator that ensures a separation and cleaning of the gas in output that are constant over time and a 99.8% degree of filtration of the oil from the gas.

[0042] Moreover, the invention provides an oil separator the filter of which can be made of known materials, such as for example carbon steel and/or stainless steel.

[0043] The oil separator 10 according to the invention is to be intended for all industrial and civil refrigeration and conditioning systems and can be provided according to the power requirements of the refrigeration machine with which it is associated.

[0044] The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims; all the details may further be replaced with other technically equivalent elements.

[0045] In practice, the materials used, so long as they are compatible with the specific use, as well as the contingent shapes and dimensions, may be any according to the requirements and the state of the art.

[0046] The disclosures in Italian Patent Application No.

PD2013A000091 from which this application claims priority are incorporated herein by reference.

[0047] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. An oil separator (10), having the function of separating oil from a gas in output from a compressor, **characterized in that** it comprises a filter (17) constituted by a tube (18) with cuts or holes (19; 119), wrapped in a layer of metal wool (20) or the like, enclosed by a cartridge made of metal fabric (21) of at least two layers of metal fabric.

2. The oil separator according to claim 1, **characterized in that** said metal fabric of said cartridge made of metal fabric (21) has a passage section smaller than 80 microns.

3. The oil separator according to claim 1, **characterized in that** said cuts (19) are through cuts substantially L-shaped, with the angular portion directed downward in the configuration for use.

4. The oil separator according to claim 1, **characterized in that** said holes (119) are circular through holes.

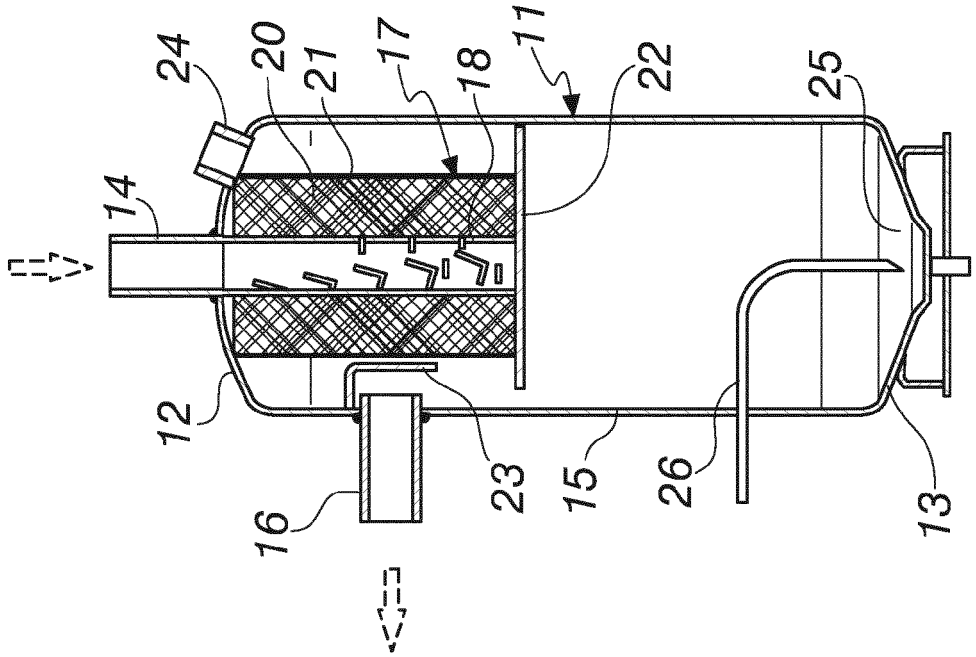
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Fig. 2

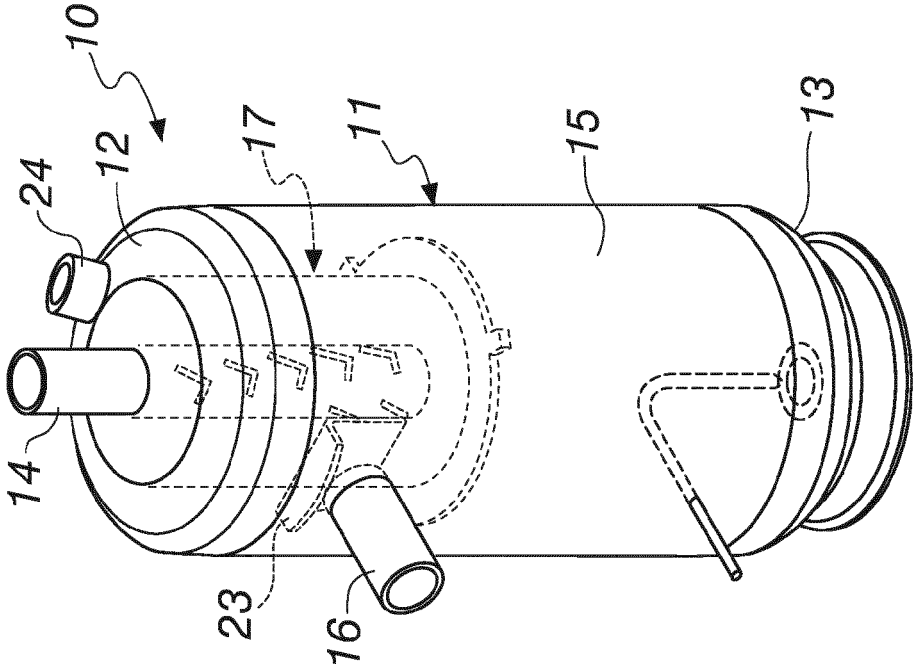
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Fig. 1

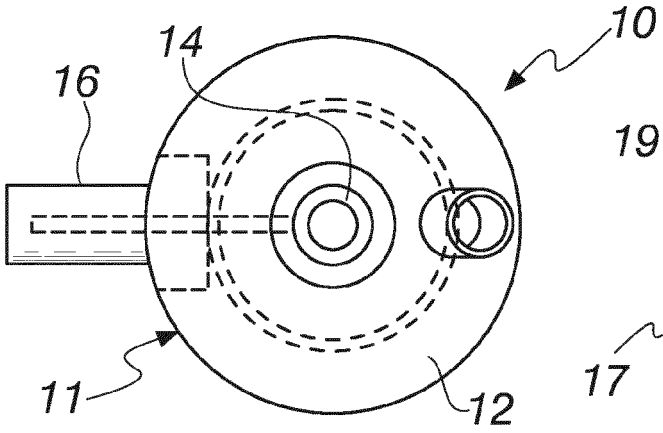

Fig. 3

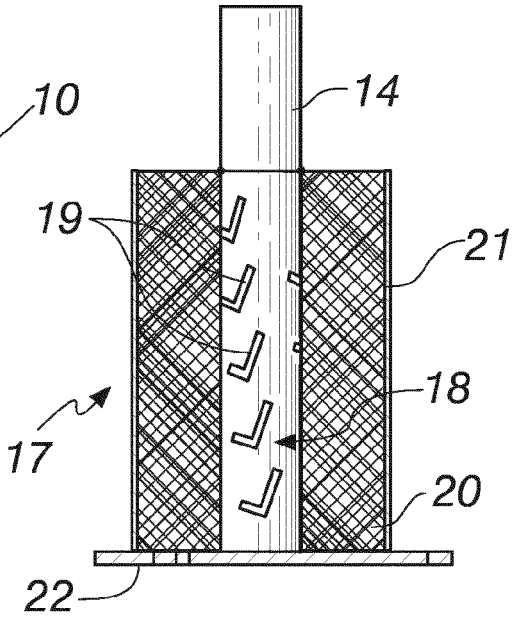

Fig. 4

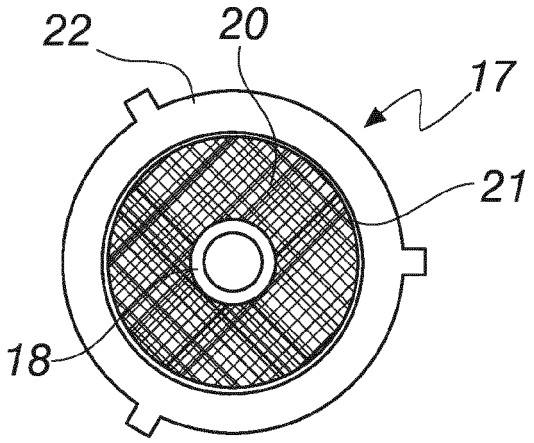

Fig. 5

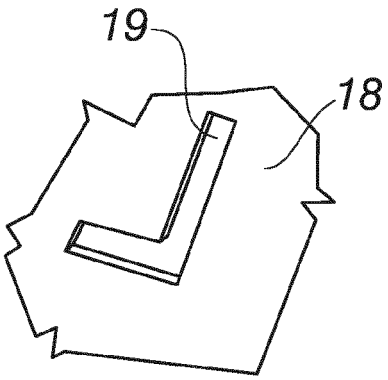

Fig. 6

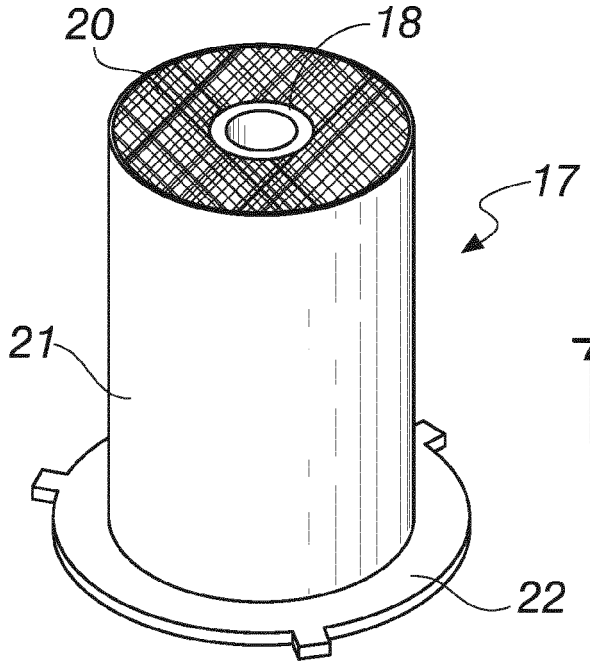

Fig. 7

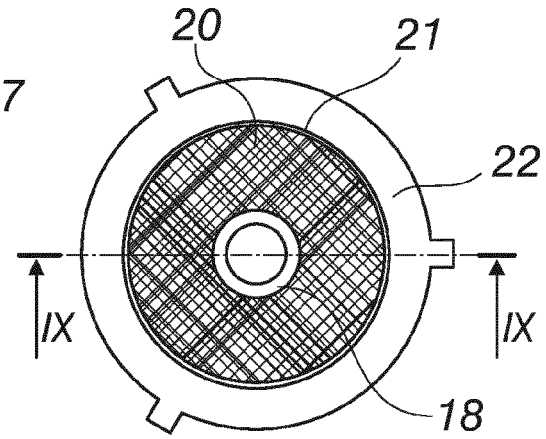

Fig. 8

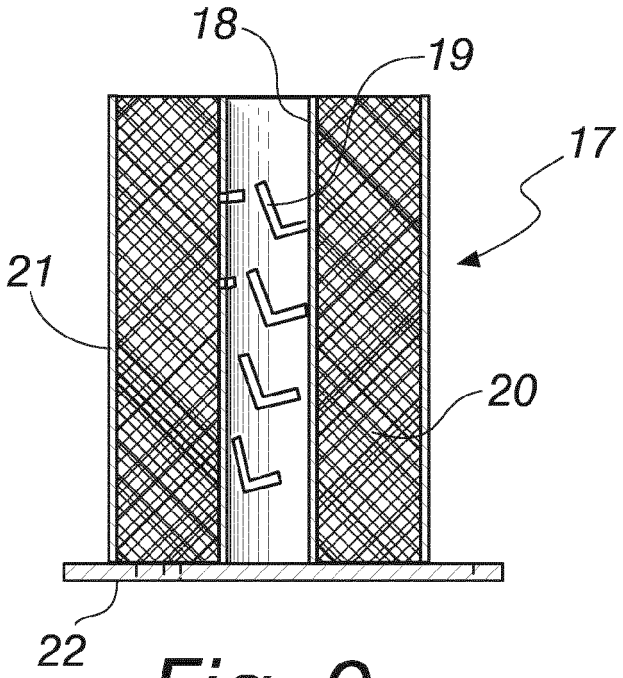

Fig. 9

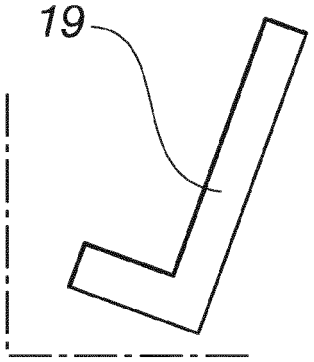

Fig. 10

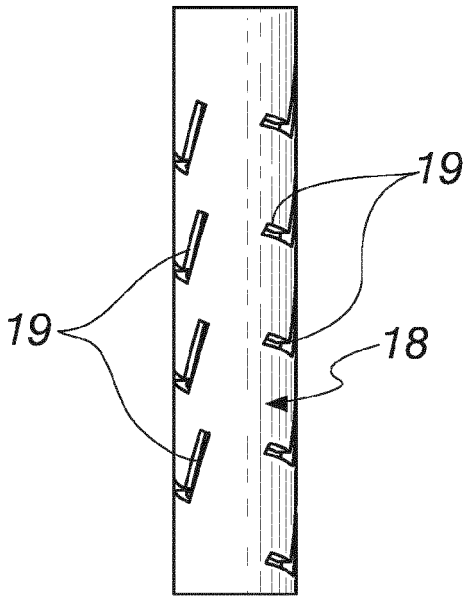

Fig. 11

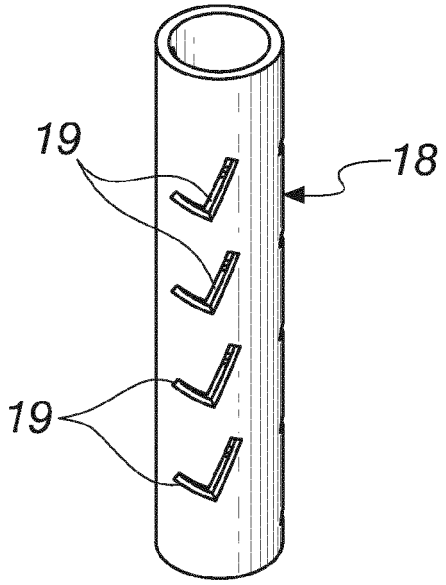

Fig. 12

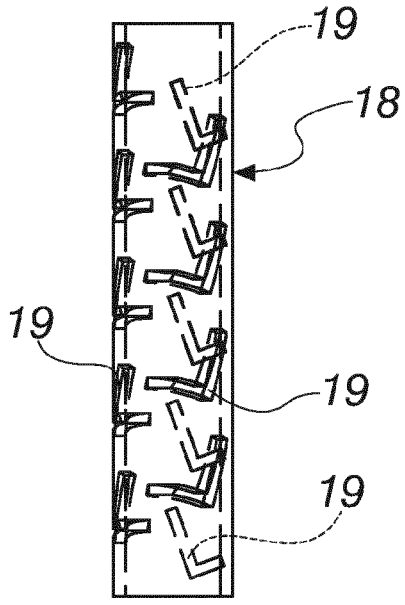

Fig. 14

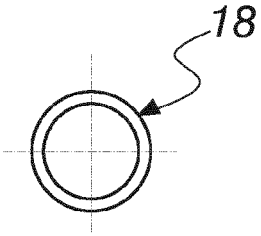

Fig. 13

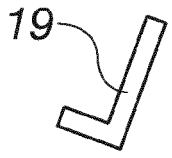

Fig. 15

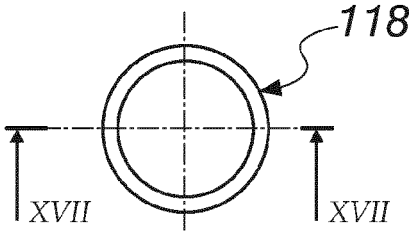

Fig. 16

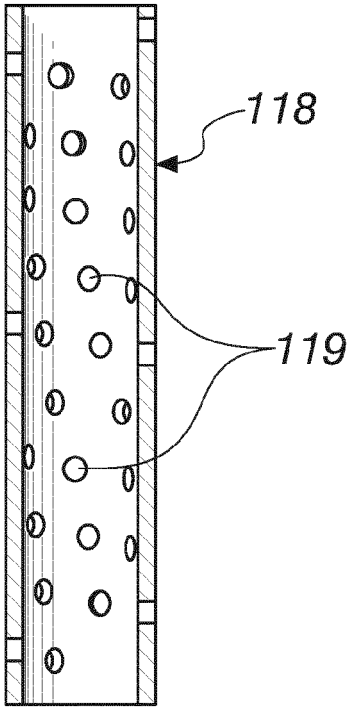

Fig. 17

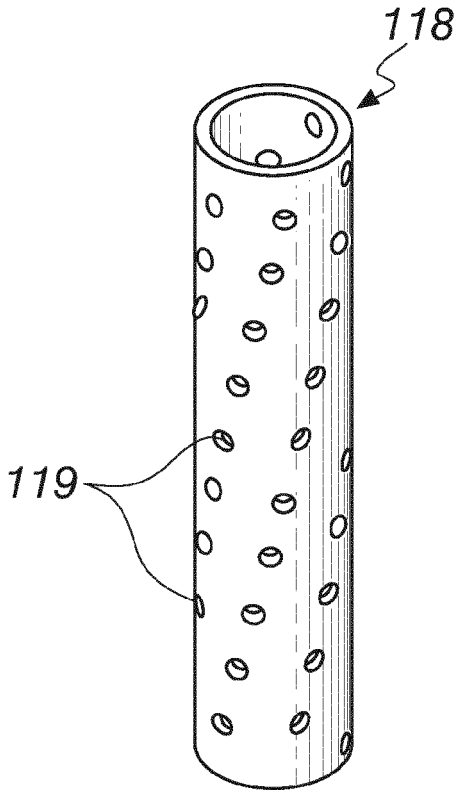

Fig. 18

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EUROPEAN SEARCH REPORT

Application Number
EP 14 16 3826

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2007/028571 A1 (BARRATT THOMAS R [US]) 8 February 2007 (2007-02-08) * paragraphs [0033], [0034]; figures 2,3 *	1-4	INV. F25B43/02 F25B43/00
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A	GB 2 261 830 A (PROCESS SCIENT INNOVATIONS [GB]) 2 June 1993 (1993-06-02) * the whole document *	1-4	
A	GB 2 007 992 A (MANN & HUMMEL FILTER) 31 May 1979 (1979-05-31) * the whole document *	1-4	
			TECHNICAL FIELDS SEARCHED (IPC)
			F25B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	26 May 2014	Ritter, Christoph

CATEGORY OF CITED DOCUMENTS

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26-05-2014

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