EUROPEAN PATENT SPECIFICATION

(54) A FILTER ELEMENT FOR A FLUID FILTER
FILTERELEMENT FÜR EINEN FLÜSSIGKEITSFILTER
ELEMENT DE FILTRE POUR FILTRE A FLUIDE

Designated Contracting States:
AT BE CH DE DK ES FI FR GB IT LI NL PT SE

Priority: 11.12.1995 NL 1001867

Date of publication: 18.08.1999 Bulletin 1999/33

Inventor:
BARTELS, Antonius Josephus
NL-6816 PS Arnhem (NL)

Representative:
Boelsma, Gerben Harm, Jr.
vvan Exter Polak & Charlouis B.V.,
P.O. Box 3241
2280 GE Rijswijk (NL)

References cited:
EP-A- 0 580 491
DE-U- 9 204 169
BE-A- 668 812

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).
Description

[0001] The invention relates to a filter element as defined in the first part of claim 1.


[0003] With this well-known filter element both the rigid bottom end cap and the rigid annular end cap are fixedly bonded to the radial ends of the cylindrical filter body, thereby ensuring that the filter element is completely fluidtight at the ends, so that no fluid (including contaminants!) can flow from the space within the cylindrical filter body between the radial ends of the filter body and the rigid bottom end cap or annular end cap towards the exterior of the filter body and vice versa. The cylindrical filter body and the two end caps form a sub-assembly that is adapted to be removably placed into the perforate support tube. The latter is closed by a separate bottom end cap at one end and is provided with an outwardly extending flange at the opposite end, said flange being adapted to sealingly engage an annular lip that extends radially outwardly from the rigid annular end cap, and to be sealingly clamped, together with said lip, onto a support within the housing of the fluid filter.

[0004] When, in use, a certain degree of blockage of the filter element has been reached, the element has to be removed from the filter housing or filter chamber for replacement.

[0005] From a viewpoint of damage to the environment it is advantageous to the well-known filter element that only the sub-assembly needs to be replaced and is considered as waste and treated accordingly, whereas the perforate support tube can be reused after having placed therein a new sub-assembly.

[0006] The invention aims at providing a further improved filter element of the type above referred to, involving reduced damage to the environment by a blocked filter body, without making concessions as to the quality of the filter element in the unblocked state.

[0007] A further object of the invention is to provide a filter element of a simpler construction.

[0008] According to the invention this aim is achieved by the features defined in the second part of claim 1.

[0009] The filter element according to the invention can be easily disassembled into parts, said parts being the blocked filter body with the sealing rings connected thereto on one hand and the rigid bottom cap, the rigid supporting tube and the rigid end cap on the other hand. As compared with the well-known filter element above referred to, the rigid bottom end cap and the rigid annular end cap have become reusable as well, while the construction of the filter element according to the invention has become simpler due to the absence of a second bottom end cap and the absence of a sealing flange at the opposite end of the perforate support tube.

[0010] Moreover and in contrast to the well-known construction, the filter element construction according to the invention is applicable in a simple manner also in case of a perforate support tube that is placed within the cylindrical filter body.

[0011] The embedding of the terminal edges of the cylindrical filter body in the sealing rings on one hand and the fluidtight contact between the sealing rings and the metallic bottom cap and metallic end cap respectively (for which a slight axial clamping force will be required only) guarantee a fluidtight connection of high quality.

[0012] Furthermore the invention enables to simply realise a filter element, of which the filter body can be composed of a number of sections to be placed one on top of the other.

[0013] In this way, for example filter elements may be realised which have a relatively great length, i.e. a length which is greater than the width of the available filtering fabric from which the filter body is to be formed.

[0014] A similar construction is of use when making a filter element of which the filter body, as seen in the axial direction, comprises areas within which the μ-values and/or the type of filtering fabric are different. In those cases a number of filter bodies having each an integrated sealing ring on both ends and may have different μ-values and/or formed of different types of filtering fabric, placed on top of one another around a common supporting tube.

[0015] It is to be remarked that it has already been proposed as a solution for the above problem to apply separate sealing rings of rubber or similar elastomeric material between the metallic bottom cap and metallic end cap respectively and the respective terminal ends of the cylindrical filter body. However, a fluidtight connection between the circumferentially zig-zag extending terminal edges of the filter body and the separate sealing rings within the metallic bottom cap and end cap appeared not to be realisable.

[0016] The invention will be hereinafter further explained by way of example with reference to the drawing, in which:

Fig. 1 shows a perspective view of the filter element according to the invention in a disassembled state, wherein portions of the composing parts are cut away for clarity and

fig. 2 shows a filter element according to the invention in the assembled state and mounted in the housing of an oil filter.

[0017] With reference to fig. 1 the filter element shown therein is composed of a filter body 1, a metallic annular cap 2, a metallic bottom cap 3 and a metallic perforate supporting tube 4.

[0018] The cylindrical filter body is formed in a well-known manner of a pleated filtering fabric which is often produced as a laminate; the filter body is embedded with its zig-zag extending terminal edges 5 in rings 6 which are formed e.g. of a visco-elastic polyurethane or
a similar suitable elastomeric material.

[0019] The step of embedding the terminal edges 5 may be carried out while the rings 6 are still in a soft state in a mould. Preformed rings 6, provided with an annular groove for receiving the terminal edges 5 to be embedded, may also be used. In that case, after the respective terminal edges 5 being received in such grooves, the grooves are filled up with a suitable filling material.

[0020] The metallic end cap 2 has a U-shaped cross-section, as seen in the axial direction and thus confines an annular space for receiving a ring 6 that makes part of the filter body 1. The outer and inner circumferential walls of the annular receiving space are indicated at 7 and 8 respectively. At a few circumferentially spaced locations of the outer peripheral wall 7 a slot 9 is provided, which makes part of a bayonet catch to be described below. This slot has a portion 9a that extends, from the free terminal edge 7a, at first in the axial direction and then turns to a circumferentially sloping slot portion 9b which in turn ends up into a holding seat 9c.

[0021] Similarly the metallic bottom cap 3 has an annular space confined by an outer circumferential wall 10 and an inner circumferential wall 11 for receiving a ring 3 making part of the filter body 1.

[0022] In the example shown in the drawing the supporting tube 4 has its lower edge portion welded or riveted to the outer circumferential wall 11 of the bottom cap 3.

[0023] A plurality of pin-shaped projections 12 is provided adjacent the upper terminal edge of the supporting tube 4, each of these projections being adapted to cooperate with a slot 9 in the metallic end cap 2 in the manner of a bayonet catch.

[0024] When assembling the filter element from the parts shown in the drawing, the filter body 1 is inserted into the supporting tube 4, so that the filter body will be supported with its lower sealing ring 3 onto the bottom surface of the annular deepened receiving space of the bottom cap 3. In this stage the upper sealing ring 6 projects with its upper end face slightly beyond the upper edge of the supporting tube 4. The end cap 2 is then placed over the upper sealing ring 6 and the upper edge of the supporting tube 4 in a position which will allow the pin-shaped projections 12 to enter into the axial slot portions 9a. The pin-shaped projections 12 having thus entered into engagement with the slots 9, the end cap 2 is turned in the arrow direction shown in the drawing, to cause the pin-shaped projections 12 to move into the sloping slot portions 9b and thereby pull the end cap 2 in the axial direction. In this way an axially directed clamping force will be exerted, due to which the two sealing rings 6 will become with their end faces in sealing contact with the bottom faces of the annular receiving spaces in the end cap 2 and the bottom cap 3 respectively.

[0025] The finished filter element may then be placed in a well-known manner into a filter housing 21 as shown in fig. 2. The filter housing 21 has an oil inlet 22 and an oil outlet 23. In the connecting area between the inlet and outlet a pressure ring 24 is sealingly pressed onto a seat within the housing, due to the spring pressure exerted by a cover 25. The pressure ring 24 is provided with a gasket 26 for sealing engagement with the end gap 24 of the filter element. The filter element is sealingly pressed against the gasket 26 by means of a coil spring 27 provided around the free end of a rod 28 that is carried by the pressure ring 24 and sealingly extends through a central opening to be made in the bottom cap 3.

[0026] In the example shown in the drawing, in which the supporting tube 4 is provided on the outer side of the filter body, the fluid to be filtered will enter through the central opening of the end cap 2 and flow outwardly through the filter body. The supporting tube, however, could also be placed within the filter body in which case the fluid to be filtered would flow in the opposite direction, while the inlet and outlet of the filter housing would change.

Claims

1. A filter element for a fluid filter of the type allowing the fluid to be filtered to pass radially outwardly through the filter element, said filter element comprising a web of pleated filtering material that is formed into a circumferentially closed cylindrical filter body, which is coaxially supported by a perforate rigid tube surrounding said body and the axial ends of which are sealingly inserted into corresponding annular receiving cavities provided in a rigid bottom end cap at one end and in a rigid annular end cap at the opposite end of the filter body, characterized in that the cylindrical filter body has its axial ends embedded in separate sealing rings of a flexible type of rubber or similar elastomeric material and that said filter body is sealingly and removably clamped with said sealing rings, and together with the said supporting tube, between said rigid bottom end cap and said annular end cap.

2. A filter element according to claim 1, characterized in that at least one end of the supporting tube is fastened to a circumferential wall portion of the respective cap by means of a release connection of the type that attracts said tube towards the respective cap.

3. A filter element according to claim 2, characterized in that the opposite end of the supporting tube is fixedly connected to a corresponding circumferential wall portion of the other cap.

4. A filter element according to claims 2-3, characterized in that said release connection is a connection of the bayonet catch type, comprising a circumfer-
5. A filter element according to claims 1-4, characterized by a plurality of filter bodies, which are axially stacked together, with adjoining sealing rings contacting one another, and placed within a common supporting tube.

Patentansprüche

1. Filterelement für ein Flüssigkeitsfilter vom Typ wobei die zu filtrierende Flüssigkeit radial auswärts durch das Filterelement hindurchtreten kann, welches Filterelement aus einem ringschem geschlossenen zylindrischen Filterkörper aus gefaltetem Filtertuch besteht, welcher Filterkörper koaxial von einer ihn umgebenden gelochten und steifen Buchse gestützt wird und deren Stirnenden abdichtend in entsprechenden ringförmigen Aufnahmeräumen stecken, welche in einer steifen Boden-Kappe am Ende bezw. in einer steifem ringförmigen Kappe am entgegengesetzten Ende des Filterkörpers vorgesehen sind, dadurch gekennzeichnet, dass der zylindrische Filterkörper mit seinen Stirnenden in gesonderten Dichtungsringen aus biegsem Gummi oder ähnlichem Elastomer-Werkstoff eingebettet sind und dass der Filterkörper mit diesen Dichtungsringen dichtend und ausnehmbar in Kombination mit der Stütz- buchse zwischen der steifen Bodenkappe und der ringförmigen Endkappe eingeklemmt sitzt.

2. Filterelement nach Anspruch 1, dadurch gekennzeichnet, dass mindestens ein Ende der Stütz- buchse an einem Umfangswandteil der betreffenden Kappe mittels einer lösbaren Verbin- dung der Art wobei die Buchse gegen die jeweilige Kappe gezogen wird, befestigt ist.


Revendications

1. Elément formant filtre pour un filtre de fluide du genre permettant au fluide destiné à être filtré de passer radialement vers l'extérieur à travers l'élé- ment formant filtre, l'élément formant filtre compor- tant une nappe de matière filtrante plissée qui est con- formée en un corps cylindrique de filtre fermé circonférentiellement, qui est supportée de manière coaxiale par un tube rigide perforé entourant le corps et dont les extrémités axiales sont insérées de manière étanche dans des cavités de réception annulaires correspondantes ménagées dans un couvercle d’extrémité de fond rigide à une extrémité et dans un couvercle d’extrémité annulaire rigide à l’extrémité opposée du corps de filtre, caractérisé en ce que le corps de filtre cylindrique a ses extrémités axiales noyées dans des bagues d’étanchéité distinctes d’un type souples de caoutchouc ou maté- riau élastomère similaire et en ce que le corps de filtre est serré de manière étanche et amovible aux bagues d’étanchéité, et avec le tube de support, entre le couvercle d’extrémité de fond rigide et le couvercle d’extrémité annulaire.

2. Elément formant [être suivant la revendication 1, caractérisé en ce qu’au moins une extrémité du tube de support est fixée à une partie de paroi circonférentielle du couvercle respectif au moyen d’une liaison à déclenchement du genre qui attire le tube vers le couvercle respectif.

3. Elément formant filtre suivant la revendication 2, caractérisé en ce que l’extrémité opposée du tube de support est reliée de manière fixe à une partie de paroi circonférentielle correspondante de l’autre couvercle.

4. Elément formant filtre suivant les revendications 2 à 3, caractérisé en ce que la liaison à déclenchement est une liaison du genre à joint de baionnette, com- portant une fente en pente circonférentiellement dans une extrémité du tube de support ou dans la partie de paroi circonférentielle, la fente coopérant avec une salle en forme de broche, s’étendant radialement à partir de la partie de paroi circonfé- rentielle ou de ladite une extrémité du tube de sup- port respectivement.

5. Elément formant filtre suivant la revendication 1 à 4, caractérisé par une pluralité de corps de filtre, qui
sont empilés axialement ensemble, avec des
bagues d’étanchéité adjacentes se contactant les
unes les autres, et placés à l’intérieur d’un tube de
support commun.