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[54] DISPOSABLE OIL FILTER UNIT WITH TRIPLE FILTRATION 具有三重過濾的易處理油過濾器



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⑫ **EUROPEAN PATENT SPECIFICATION**

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⑤④ **Disposable oil filter unit with triple filtration.**

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 EP-A- 0 254 776
 FR-A- 1 407 307
 FR-A- 1 524 599
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 US-A- 4 655 914 | <ul style="list-style-type: none"> ⑦③ Proprietor: UNIVERSAL FILTER ITALIANA S.p.A.
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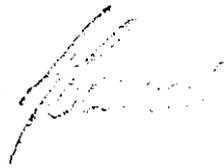
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Dated 12 JUN 1998

Description

This industrial invention patent relates to a disposable unit for filtering lubricating oil in internal combustion engines, in particular in diesel engines. *for* filtering the lubricating oil in such engines, disposable filter units are known consisting of a cup-shaped container containing one or more filter cartridges, which is arranged to be screwed directly onto the engine block to receive the oil to be filtered from the lubricating oil pump and feed it to the various lubrication points provided in the engine.

The most simple filters of this type are so-called full-flow filters, ie filters containing a single oil cartridge which is traversed by the whole throughput made available by the lubricating oil pump, and which feeds all the filtered oil to the lubricating points provided in the engine. These filters have operational limitations deriving from their intrinsic method of operation. In this respect, the filtering efficiency of said filters depends on the filter area and on the porosity of the filter material, whereas their life is inversely proportional to this porosity.

Thus to obtain a filter having an acceptable life, large-surface medium-porosity filter cartridges must be used but these have the defect of a low initial filtering efficiency which increases proportionally with time until they are completely clogged. On the other hand, reducing the filter material porosity leads to a shortening of the filter life and requires a too high lubricating oil pump power, whereas increasing the porosity on the one hand increases the filter life by delaying its complete clogging but on the other hand means a too low filtering efficiency during the initial operating period of the filter.

To obviate these drawbacks, which are obviously the result of a compromise between the requirement of engine protection on the one hand and economy and small overall size of the filter unit on the other hand, so-called double filtration units have been used. These latter filters, which are also known as mixed-circuit filters, provide a better filtration than that obtainable with the aforesaid full-flow filters. This type of filter is disclosed, e.g., by FR-A-1524599, and consist of a casing housing two filter cartridges arranged in parallel to receive the oil to be filtered from one and the same compartment, but feed the filtered oil to two different destinations. Specifically, the larger filter cartridge, which is also that of coarser porosity, feeds the filtered oil directly to the engine users, whereas the smaller filter cartridge of finer porosity, used for the so-called fine filtering, feeds the oil directly into the engine sump through separate ducts. Thus most of the oil passes through the coarser porosity filter

cartridge to be fed to the lubrication points provided in the engine, whereas a smaller fraction of the oil is recycled to the sump with all impurities completely removed.

Statistically, this continuous mixing in the engine sump of a small throughput of highly filtered oil with a larger throughput of normally filtered oil greatly increases the average degree of oil filtration.

This type of filter, known as a mixed-circuit filter, has however the serious drawback that it can be fitted only to engines designed for this purpose. In this respect, at the point where the filter unit is screwed on, there must be a duct provided for recirculation directly into the sump, a feed duct to the various lubrication points and a duct for oil feed to the filter. These filters cannot therefore be applied to engines which do not possess a circuit for recirculating part of the oil directly to engine sump. To obtain the same filtering efficiency without too much complication in engines not designed for mixed-circuit filters, an attempt has been made to fit into one and the same filter unit two cartridges of different porosity operating in parallel and feeding into the same lubrication circuit feed duct.

However, this attempt has proved ineffective because the filter cartridge of finer porosity is the first to clog and after a certain period of operation becomes completely inefficient, making the entire unit ineffective.

This drawback of a full-flow type filter having two cartridges of different porosity operating in parallel may be partially obviated by the apparatus disclosed by US-A-4655914, including low and high density filters, having inlets commonly connected to an inlet conduit, an orifice arranged in the outlet conduit of the low density filter, and a conduit connected between the outlet of the high density filter and the orifice.

Nevertheless, the apparatus of US-A-4655914 has not given the expected results.

The object of the present invention is to provide a filter unit which combines the efficiency of mixed-circuit filter unit with the simplicity of application of full-flow filter units, and which can be applied both to engines designed to receive full-flow filter units and to engines designed to receive mixed-circuit filter units.

This is attained by a filter unit according to claim 1 using first and second cartridges of different porosity operating in parallel, of which the first, that of smaller filtering area and finer porosity, is arranged in series with and downstream of a third concentric filter cartridge of coarser porosity than that of the second cartridge, being the cartridges located within a cup-shaped container where the filtering occurs from the outside towards

the center of the cartridges.

The merits and constructional and operational characteristics of the invention will be more apparent from the detailed description given hereinafter with reference to the figures of the accompanying drawing which illustrate a preferred embodiment of the invention by way of non-limiting example.

Figure 1 shows a filter unit according to the invention in partial section; and

Figure 2 is a plan view thereof.

From said figures it can be seen that the filter unit consists of a cup 1 into which two filter cartridges 2 and 3 respectively are inserted one above the other. The cartridge 2 is supported by a lower plate 4 supported by the base of the cup by way of a spring 5, whereas the upper cartridge 3 is kept pressed downwards by an upper plate 6 provided with a central hole. A perforated tube 7 extends centrally downwards from the plate 6. The plate 6 is pressed downwards by an elastic gasket 66 placed between the plate 6 and an upper plate 9 with a central threaded hole 8. The upper plate 9 is kept in position by an upper shaped cover 10 which is clinched to the cup 1. In addition to the central threaded hole, the upper plate 9 and cover 10 comprises a series of circumferential holes 11 through which the oil arriving from the pump is fed into the filtering device. On entering through the holes 11 the oil flows into the interspace between the two filter cartridges 2 and 3 and the cup 1 and passes radially through said filter cartridges to flow into the central tube 7 and from here, through the threaded hole 8, to the engine lubrication duct. According to the invention, about the filter cartridge 3, which is formed of fine porosity material, there is disposed a further concentric filter cartridge 33 formed of coarser porosity material, the porosity of the filter cartridge 2 being intermediate between that of the filter cartridge 3 and that of the filter cartridge 33.

By way of example, the cartridge 2 is preferably formed of paper with a porosity of between 10 and 30 μm , and the cartridge 3 is of paper with a porosity of between 4 and 15 μm , whereas the cartridge 33 is of non-woven fabric with a porosity of between 40 and 80 μm . The filter materials can generally be chosen from the following: paper-felt non-woven fabric, cotton, synthetic fibres, or glass fibres, either single, paired, plaited, rolled up or punched.

A normal anti-emptying tube 99 extends from the centre of the plate 9, and a usual safety valve 44 is provided at the centre of the plate 4.

The operation of the filter is such that the oil fed through the holes 11 reaches the interspace about said filter cartridges where it splits between the two cartridges, with the larger fraction passing through the filter cartridge of lesser resistance, ie

the filter cartridge 2, until this latter is clogged to such an extent that the resistance to the passage of the oil to be filtered becomes comparable to that offered by the two cartridges 3 and 33 in series. At this point the oil begins to also traverse the pair of cartridges 3 and 33 to a substantial extent and thus undergo very fine filtration, which it is able to do until the filter is completely clogged.

It will be noted that with the described configuration, the mixing of a flow of oil undergoing medium filtration with a smaller flow of oil undergoing fine filtration is statistically obtained directly within the filter unit instead of within the engine sump as happens in the case of normal mixed circuit filters.

The presence of the coarse porosity filter cartridge 33 sufficiently delays complete clogging of the fine porosity filter 3 cartridge in the sense that it retains the larger size impurities and makes the filter life acceptable.

It will also be noted that above the shaped cover 10 there are located the seats of two annular gaskets 12 and 13 which ensure perfect sealing of the filter unit against the engine block and create between them an annular region into which the feed ducts open, whereas those ducts for recirculating the oil directly to the sump which are provided in engines designed to accept mixed-circuit filter units open into a sealed blind region within the gasket 12. These ducts are thus excluded from the oil circuit with the result that the filter unit heretofore described can be applied both to engine blocks designed for full-flow filter units and to engine blocks designed for mixed-circuit filter units.

The invention is not limited to the embodiments heretofore described and modifications and improvements can be made thereto.

Claims

1. A disposable oil filter unit comprising a first filter cartridges (3) of finer porosity, and a second filter cartridge (2) of coarser porosity consisting of ring shaped filtering elements arranged one on the other along the longitudinal axis of a closed, cup-shaped container (1) having inlet means into which the lubrication oil to be filtered is supplied, and including a centrally disposed conduit means (7) which provides communication between the outlets of the high and low density filter cartridges and the outlet of said container, the high and low density filter cartridges being disposed in parallel with regard to the traversing oil flow, characterised by a third filter cartridge (33) concentric to the first filter cartridge (3) to be disposed upstream in series therewith, and having a coarser porosity than that of said

second cartridge (2).

A disposable oil filter unit as claimed in claim 1, characterised in that the first cartridge (3) is of paper and has a porosity of between 4 and 15 μm .

A disposable oil filter unit as claimed in claim 1, characterised in that the second cartridge (2) is of paper and has a porosity of between 10 and 30 μm .

4. A disposable oil filter unit as claimed in claim 1, characterised in that the third cartridge (33) is of unwoven fabric and has a porosity of between 40 and 80 μm .

5. A disposable oil filter unit as claimed in claim 1, characterised in that on the base of the cup container there are provided two concentric annular gaskets (12) and (13) which define a blind region between the more inner gasket (12) and the oil outlet hole (8) of the filter, and a region containing the filter feed holes (11) and defined between the two gaskets (12) and (13).

Patentansprüche

1. Einwegfiltereinheit, bestehend aus einem ersten Filtereinsatz (3) von feinerer Porosität und einem zweiten Filtereinsatz (2) von gröberer Porosität, bestehend aus ringförmigen Filterelementen, die entlang der Längsachse eines geschlossenen, becherförmigen Behälters (1) übereinander angeordnet sind, welcher Einlaßmittel besitzt, in die das zu filternde Schmieröl eingeleitet wird, und der ein zentrisch angeordnetes Leitungsmittel (7) beinhaltet, welches die Verbindung zwischen den Auslässen der Hoch- und Niederdichtefiltereinsätze und dem Auslaß des genannten Behälters herstellt, wobei die Hoch- und Niederdichtefiltereinsätze in Bezug auf den durchströmenden Ölfluß parallel angeordnet sind,

dadurch gekennzeichnet,

daß ein mit dem ersten Filtereinsatz (3) konzentrischer dritter Filtereinsatz (33) in Serie dem ersten Einsatz vorgeschaltet wird, dessen Porosität gröber ist als die des genannten zweiten Einsatzes (2).

2. Einwegfiltereinheit gemäß Anspruch 1, **dadurch gekennzeichnet,** daß der erste Filtereinsatz (3) aus Papier besteht und eine Porosität zwischen 4 und 15 μm hat.

3. Einwegfiltereinheit gemäß Anspruch 1, **dadurch gekennzeichnet,** daß der zweite Filtereinsatz (2) aus Papier besteht und eine Porosität zwischen 10 und 30 μm hat.

4. Einwegfiltereinheit gemäß Anspruch 1, **dadurch gekennzeichnet,** daß der dritte Filtereinsatz (33) aus Vliesstoff besteht und eine Porosität zwischen 40 und 80 μm hat.

5. Einwegfiltereinheit gemäß Anspruch 1, **dadurch gekennzeichnet,** daß am Boden des becherförmigen Behälters zwei konzentrische ringförmige Dichtungen (12) und (13) vorgesehen sind, die einen blinden Bereich zwischen der weiter innen liegenden Dichtung (12) und dem Ölauslaßloch (8) des Filters begrenzen, sowie einen Bereich, der die Filterzufuhrlöcher (11) enthält und zwischen den beiden Dichtungen (12) und (13) eingeschlossen ist.

Revendications

1. Unité de filtre à huile jetable comportant une première cartouche de filtre (3) de plus fine porosité et une seconde cartouche de filtre (2) de porosité plus grossière consistant en des éléments de filtrage de forme annulaire disposés l'un sur l'autre selon l'axe longitudinal d'un réservoir fermé en forme de coupelle (1) comportant des moyens d'entrée, dans lesquels l'huile de lubrification qu'il y a lieu de filtrer, est fournie et comportant un moyen formant conduit disposé en position centrale (7), qui assure une communication entre les sorties des cartouches de filtre à grande et faible densités et la sortie dudit réservoir, les cartouches de grande et faible densités étant disposées en parallèle par rapport au flux d'huile qui les traverse, caractérisée par une troisième cartouche de filtre (33) concentrique par rapport à la première cartouche de filtre (3), de façon à être disposée en amont et en série par rapport à celle-ci et ayant une porosité plus grossière que celle de ladite seconde cartouche (2).

2. Unité de filtrage d'huile jetable telle que revendiquée à la revendication 1, caractérisée en ce que la première cartouche (3) est réalisée en papier et a une porosité comprise entre 4 et 15 μm .

3. Unité de filtrage d'huile jetable telle que revendiquée à la revendication 1, caractérisée en ce

ue la seconde cartouche (2) est réalisée en papier et a une porosité comprise entre 10 et 30 mm.

4. Unité de filtrage d'huile jetable telle que revendiquée à la revendication 1, caractérisée en ce que la troisième cartouche (33) est réalisée en un tissu lâche et a une porosité comprise entre 40 et 80 mm. 5
- 10
5. Unité de filtrage d'huile jetable telle que revendiquée à la revendication 1, caractérisée en ce que, sur la base du récipient en forme de coupelle, sont prévus deux joints annulaires concentriques (12 et 13), qui définissent une région fermée entre le joint le plus interne (12) et le trou de sortie d'huile (8) du filtre et une région contenant les orifices d'alimentation du filtre (11) et qui est définie entre eux les deux joints (12 et 13). 15
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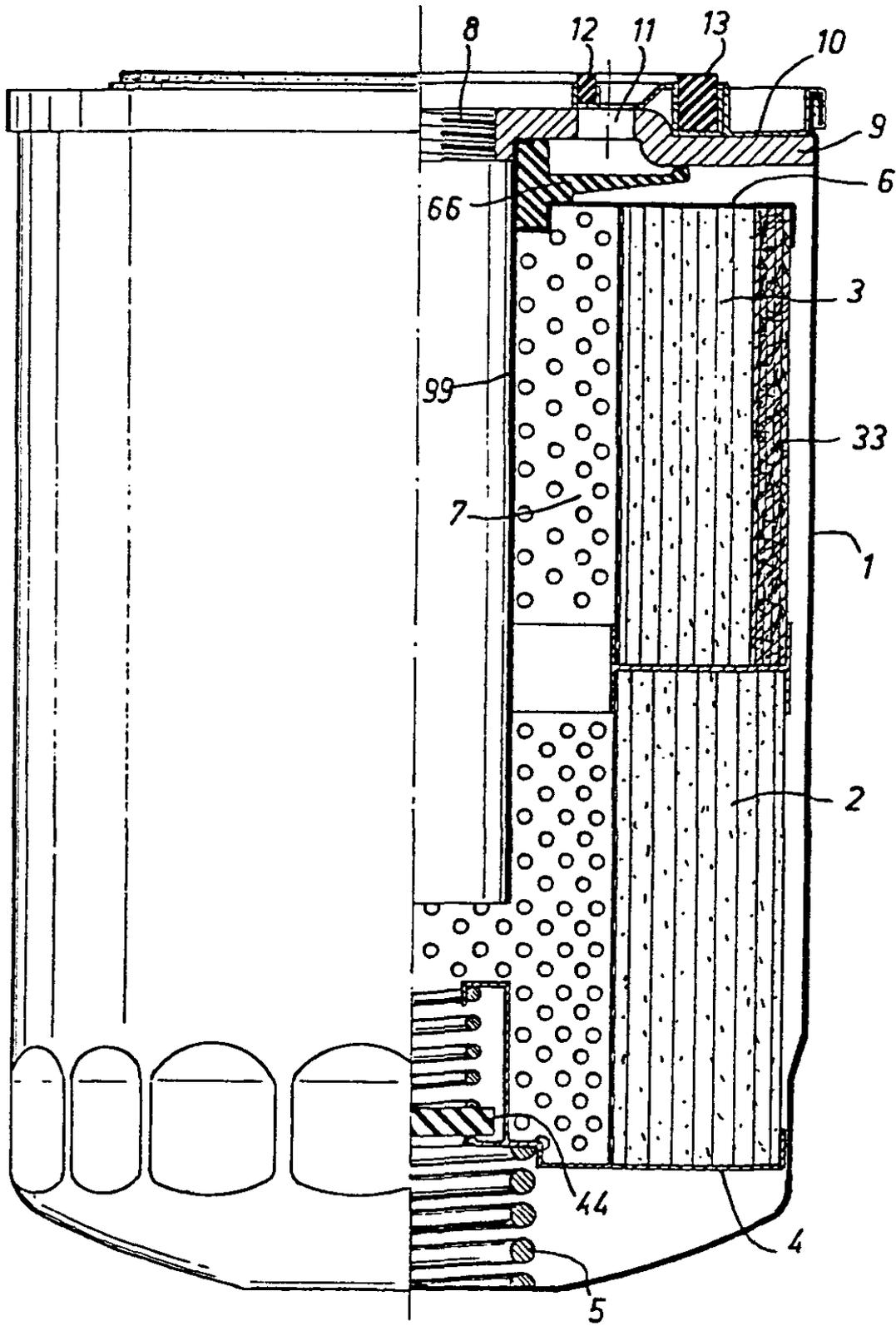


FIG. 1

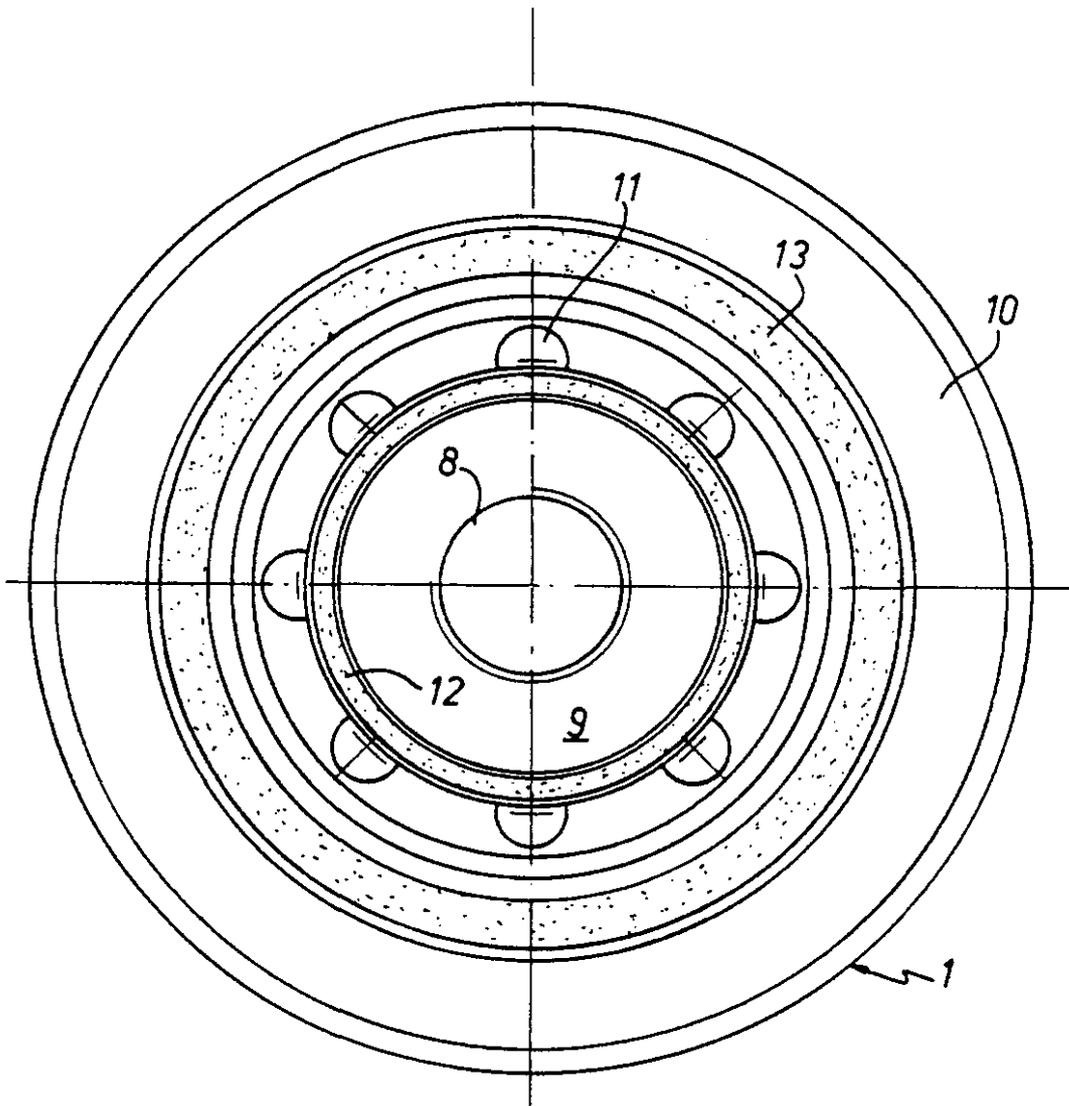


FIG. 2

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