

OIL-WATER EVAPORATING AND SEPARATING FILTER

FIELD OF THE INVENTION

[0001] The present invention relates to the field of lubricant purification equipment in a machine or an engine, in particular to an oil-water evaporating and separating filter.

THE RELATED ART

[0002] In an engine, engine oil is constantly contaminated by engine wear particles and introduced impurities from outside, meanwhile, engine oil is thermo-oxidized and thus generates oil-soluble acid materials and insoluble colloidal precipitates. Hard particles in these impurities may increase engine wear and colloidal precipitates may cause cementation between parts, for example, between a piston and a piston ring, between a valve and a valve guide. A filter functions to filter out the above harmful impurities existed in engine oil, so as to ensure cleanness of lubricating oil, thus protecting the engine and elongating its service life. Therefore, the filter is of great importance.

[0003] In general, water content in lubricating oil should be less than 0.03%. When water content exceeds 0.1%, additives (e.g., antioxidant, detergent, etc.) in lubricating oil will become noneffective and thus oxidation of the lubricating oil is accelerated. Due to the high temperature inside the engine, chemical reaction occurs between lubricating oil and coolant and lubricating oil is emulsified as emulsive liquid, which greatly reduces lubricating effect. Organic acid generated from oxidation of lubricating oil reacts with water and in turn generates inorganic acid. These acid may cause erosion in engine components. With relative more water contained in lubricating oil, to a slight extent, this may result in an early metamorphism of lubricating oil and the rust of engine parts, while to a serious extent, this may result in serious mechanical accidents of the engine, such as engine seizure or scuffing. If lubricating oil is introduced into coolant, viscous mixture will be formed on the inner wall of cooling water channels of a radiator and the engine, which may seriously influence radiating effect of the engine and thus lead to overheat in the engine.

[0004] An existing filter generally functions to remove impurities, but can not filter out water

from engine oil. Therefore, there exists an urgent need to invent a filter that may filter out not only impurities from engine oil, but also water content from it. .

SUMMARY OF THE INVENTION

[0005] In view of the above described disadvantages, the technical problem to be solved by the present invention is to provide an oil-water evaporating and separating filter, which may filter out not only impurities from engine oil but also water content from engine oil, and thus can better protect the engine and elongate its service life.

[0006] To solve the above technical problem, an oil-water evaporating and separating filter provided in the present invention includes a filter element, a cartridge provided with an oil inlet and an oil outlet, and an evaporating and separating cover, the evaporating and separating cover comprises a sealing cover, an evaporating and separating portion and a heating device, the sealing cover is hermetically connected with the cartridge, the sealing cover is provided with a water vapor discharge hole and a recess, the heating device is disposed within the recess of the sealing cover, the evaporating and separating portion is hermetically connected with the filter element and includes a first folding plate provided with a plurality of outlets and having an angle of 91° - 120° with respect to a vertical direction.

[0007] Preferably, the first folding plate has an angle of 91° - 100° with respect to a vertical direction.

[0008] Preferably, the oil-water evaporating and separating filter further includes a second folding plate connected with the first folding plate and having an angle of 40° - 85° with respect to the vertical direction.

[0009] Preferably, the second folding plate has an angle of 60° - 70° with respect to the vertical direction.

[0010] Preferably, the oil-water evaporating and separating filter further includes a third folding plate connected with the second folding plate and having an angle of 91° - 120° with respect to the vertical direction.

[0011] Preferably, the third folding plate has an angle of 91° - 100° with respect to the vertical direction.

[0012] Preferably, a safety cap is mounted on the sealing cover, and the heating device is enclosed by the safety cap and the recess.

[0013] Preferably, a check valve for preventing backflow is provided at the oil inlet.

[0014] Preferably, a flow restricting nozzle for restricting flow rate is provided at the oil inlet.

[0015] Preferably, a pressure flow meter is provided at the oil outlet.

[0016] Compared with the prior art, in the oil-water evaporating and separating filter provided in the present invention, separating cover comprises a sealing cover, an evaporating and separating portion and a heating device, the sealing cover is hermetically connected with the cartridge, the sealing cover is provided with a water vapor discharge hole and a recess, the heating device is disposed within the recess of the sealing cover, the evaporating and separating portion is hermetically connected with the filter element and includes a first folding plate provided with a plurality of outlets and having an angle of 91° - 120° with respect to a vertical direction. The evaporating and separating portion is heated to a certain temperature by the heating device of the filter cover, while the engine oil filtered by the filter element flows along the first folding plate via an outlet. Due to the fact that the engine oil and water have different boiling points, the water content in the engine oil is heated and evaporated into water vapor which is then discharged through the water vapor discharging hole, and the engine oil flows along the first folding plate and flows out through the oil outlet, therefore, achieving the separation of water and engine oil. The water is removed.

[0017] In addition, to obtain better separating effect of water from the engine oil, the oil-water evaporating and separating filter provided in the present invention may further provide a second folding plate and a third folding plate to enlarge heated areas, and thus the engine oil and water may be separated more thoroughly from each other.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] Fig. 1 is a working principle diagram of an oil-water evaporating and separating filter of the present invention, in which the single-head arrow indicates a direction along which the engine oil flows and the double-head arrow indicates a direction along which the water vapor flows;

[0019] Fig. 2 is an exploded structural schematic view of the oil-water evaporating and separating filter of the present invention;

[0020] Fig. 3 is a structural schematic view of the evaporating and separating cover of the present invention;

[0021] Fig. 4 is a top view of the evaporating and separating cover of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0022] In order that those skilled in the art can understand the technical solution of the present invention better, descriptions will be given below with reference to particular embodiments.

[0023] Reference is made to Figs. 2-4. Fig. 2 is an exploded structural schematic view of the oil-water evaporating and separating filter of the present invention, Fig. 3 is a structural schematic view of the evaporating and separating cover of the present invention, and Fig. 4 is a top view of the evaporating and separating cover of the present invention.

[0024] An oil-water evaporating and separating filter provided by the present invention includes a filter element 12, a cartridge 13 provided with an oil inlet 27 and an oil outlet 28, as well as an evaporating and separating cover. The evaporating and separating cover includes a sealing cover 3, a evaporating and separating portion and a heating device 8. The sealing cover 3 is hermetically connected with the cartridge 13 through a bracket 26 and is provided with a water vapor discharge hole 2 and a recess 25. The heating device 8 is disposed within the recess 25 of the sealing cover. The evaporating and separating portion is hermetically connected with the filter element 12 and includes a first folding plate 9, a second folding plate 10 and a third folding plate 11. The first folding plate 9 is provided with a plurality of outlets 4 and has an angle a_1 of $91^\circ - 120^\circ$ with respect to a vertical direction. The second folding plate 10 is connected with the first folding plate 9 and has an angle a_2 of $40^\circ - 85^\circ$ with respect to the vertical direction. The third folding plate 11 is connected with the second folding plate 10 and has an angle a_3 of $91^\circ - 120^\circ$ with respect to the vertical direction.

[0025] Taking fluidity of the engine oil into consideration, preferably, the angle a_1 between the first folding plate 9 and the vertical direction is $91^\circ - 100^\circ$, the angle a_2 between the second folding plate 10 and the vertical direction is $60^\circ - 70^\circ$, and the angle a_3 between the third

folding plate 11 and the vertical direction is 91° - 100° .

[0026] Take fluidity of the engine oil into consideration, preferably, the angle a_1 between the first folding plate 9 and the vertical direction is 95° , the angle a_2 between the second folding plate 10 and the vertical direction is 65° , and the angle a_3 between the third folding plate 11 and the vertical direction is 95° .

[0027] The filter element 12 is mounted within the cartridge 13 with an element inlet at the bottom of the filter element 12 being hermetically connected with an oil inlet 27 at the bottom of the cartridge 13. The oil inlet 27 is provided with a check valve 14 for preventing backflow and a flow restricting nozzle 6 for restricting the flow rate. The flow restricting nozzle 6 is mounted on the oil inlet 27 through a bung hole 23. The oil outlet 28 is provided with a pressure flow meter 5. The evaporating and separating portion is hermetically connected with the filter element 12 through a washer 21 and an O-ring 22. The sealing cover 3 is provided thereon with the bracket 26 which is hermetically connected with the cartridge 13 through a stud 29. The stud 29 has one end thereof hinged to the cartridge 13 and has the other end thereof fixed on the bracket 26 of the sealing cover 3 through a nut 17, an elastic washer 18 and a flat washer 19. A safety cap 1 is mounted on the sealing cover 3 through a bolt 24. The heating device 8 is enclosed by the safety cap 1 and the recess 25. The heating device 8 is an electric heating device.

[0028] Reference is made to Fig. 1, which is a working principle diagram of the oil-water evaporating and separating filter of the present invention, in which the single-head arrow indicates a direction along which the engine oil flows and the double-head arrow indicates a direction along which the water vapor flows.

[0029] The working principle of the oil-water evaporating and separating filter provided by the present invention is as follows:

[0030] The oil inlet 27 and the oil outlet 28 of the present oil-water evaporating and separating filter are respectively connected with the engine 16 via a compression resistant hose 15 and a compression resistant hose 7. When flowing from the compression resistant hose 15 into this oil-water evaporating and separating filter via the oil inlet 27, engine oil is firstly filtered by the filter element 12 and impurities are removed therefrom. The filtered engine oil flows into the chamber defined by the filter element 12 and the evaporating and separating cover via the outlet of the filter element, flows to the surface of the first folding plate 9 via the outlet of the first

folding surface 9, then flows along the surface of the second folding plate 10 and finally flows along the surface of the third folding plate 11. At the same time, the first folding plate 9, the second folding plate 10 and the third folding plate 11 of the evaporating and separating portion are heated by the electric heating device 8. As the engine oil flows along the surfaces, water content in the engine oil is evaporated due to the heating and is discharged to the outside via the water vapor discharging hole 2, therefore, achieving the separation of the engine oil and water. The engine oil eventually flows out via the oil outlet 28 and flows back to the engine through the compression resistant hose 7. The above operation is cycled repeatedly.

[0031] Compared with the prior art, the present oil-water evaporating and separating filter may filter out both impurities and water from the engine oil, thus better protect the engine and elongate its service life.

[0032] Certainly, the above description is given only as preferred embodiments of the present invention. It is noted some variation and modifications can further be made by those skilled in the art without departing from the principle of the invention. Those variation and modifications should also be considered within the scope of protection of the present invention.

What is claimed is:

1. An oil-water evaporating and separating filter, comprising a filter element, a cartridge provided with an oil inlet and an oil outlet, and an evaporating and separating cover, characterized in that, the evaporating and separating cover comprises a sealing cover, an evaporating and separating portion and a heating device, the sealing cover is hermetically connected with the cartridge, the sealing cover is provided with a water vapor discharge hole and a recess, the heating device is disposed within the recess of the sealing cover, the evaporating and separating portion is hermetically connected with the filter element and includes a first folding plate provided with a plurality of outlets and having an angle of 91° - 120° with respect to a vertical direction.
2. The oil-water evaporating and separating filter according to claim 1, characterized in that, the first folding plate has an angle of 91° - 100° with respect to the vertical direction.
3. The oil-water evaporating and separating filter according to claim 1, characterized in that, further comprising a second folding plate connected with the first folding plate and having an angle of 40° - 85° with respect to the vertical direction.
4. The oil-water evaporating and separating filter according to claim 3, characterized in that, the second folding plate has an angle of 60° - 70° with respect to the vertical direction.
5. The oil-water evaporating and separating filter according to claim 3, characterized in that, further comprising a third folding plate connected with the second folding plate and having an angle of 91° - 120° with respect to the vertical direction.
6. The oil-water evaporating and separating filter according to claim 5, characterized in that, the third folding plate has an angle of 91° - 100° with respect to the vertical direction.
7. The oil-water evaporating and separating filter according to claim 1, characterized in that, a safety cap is mounted on the sealing cover, and the heating device is enclosed by the safety cap and the recess.

8. The oil-water evaporating and separating filter according to claim 1, characterized in that, a check valve for preventing backflow is provided at the oil inlet.
9. The oil-water evaporating and separating filter according to claim 1, characterized in that, a flow restricting nozzle for restricting flow rate is provided at the oil inlet.
10. The oil-water evaporating and separating filter according to claim 1, characterized in that, a pressure flow meter is provided at the oil outlet.