# FILTER ELEMENT AND 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. Impurity removing function of an existing filter is primarily implemented by a filter element. Since the filter element uses filter paper, which is disposed between an oil inlet and oil outlet, to block impurities in the engine oil, the filtering precision is as low as about 30 μm-80 μm. This results in early abrasive wear, meanwhile, the filter paper is easy to get clogged and filter cake effect occurs. Therefore, the service life of the filter element is reduced.

## SUMMARY OF THE INVENTION

**[0003]** In view of the above described disadvantages, the technical problem to be solved by the present invention is to provide a filter element and a filter with high filtering precision, which will not lead to early abrasive wear and filter paper clogging and thus elongate the service life of the filter element.

**[0004]** To solve the above technical problem, the present invention provides a filter element, comprising a housing provided with an oil inlet and an oil outlet, inside the housing, a cotton felt layer, an integral raw cotton layer and a special membrane filter layer are sequentially stacked along a direction from the oil inlet to the oil outlet.

**[0005]** Preferably, the cotton felt layer has a core diameter of 0.5 μm-1.5 μm.

**[0006]** Preferably, the special membrane filter layer has a pore diameter of 0.5 μm-5 μm.

**[0007]** Preferably, the cotton felt layer has a thickness of 1mm-10mm.

**[0008]** Preferably, the filter element further includes a second cotton felt layer stacked on the special membrane filter layer.

**[0009]** Preferably, the second cotton felt layer has a pore diameter of 0.5 μm-1.5 μm.

**[0010]** Preferably, the second cotton felt layer has a thickness of 1mm-10mm.

**[0011]** In addition, the present invention also provides a filter comprising a filter element, the filter element comprises a housing provided with an oil inlet and an oil outlet, inside the housing, a cotton felt layer, an integral raw cotton layer and a special membrane layer are sequentially stacked along a direction from the oil inlet to the oil outlet.

**[0012]** Compared with the prior art, the filter element provided in the present invention comprises a housing provided with an oil inlet and an oil outlet, inside the housing, a cotton felt layer, an integral raw cotton layer and a special membrane filter layer are sequentially stacked along a direction from the oil inlet to the oil outlet. In using, the filter element of the present invention perfectly enables impurities in the engine oil to be filtered three times through the cotton felt layer, the integral raw cotton layer and the special membrane filter layer, respectively. It has advantages of large filtering area and high filtering precision, etc., and will not lead to early abrasive wear and filter clogging to form a filter cake, therefore, elongating the service life of the filter element.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0013]** Figure 1 is a structural schematic view of a filter element in the present invention, in which the direction of arrow indicates a direction along which the engine oil flows.

**[0014]** Figure 2 is a cross-sectional view of the housing of the filter element showing the outer (6) and inner lid cover (7).

## DETAILED DESCRIPTION OF THE INVENTION

**[0015]** 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.

**[0016]** Reference is made to Fig. 1, which is a structural schematic view of a filter element provided in the present invention, in which the direction of arrow indicates a direction along which the engine oil flows.

**[0017]** A filter element provided in the present invention includes a housing 5 provided with an oil inlet and an oil outlet. Inside the housing 5, a cotton felt layer 1, an integral raw cotton layer 2, a special membrane filter layer 3 and a second cotton felt layer 4 are sequentially stacked along a direction from the oil inlet to the oil outlet. The cotton felt layer 1 has a pore diameter of 0.5 μm-1.5 μm, the special membrane filter layer 3 has a pore diameter of 0.5 μm-5.0 μm, the second cotton felt layer 4 has a pore diameter of 0.5 μm-1.5 μm. The cotton felt layer 1 has a thickness of 1mm-10mm, the special membrane filter layer 3 has a thickness of 5mm-15mm, and the second cotton felt layer 4 has a thickness of 1mm-10mm.

**[0018]** Preferably, the cotton felt layer 1 has a pore diameter of 1 μm, the special membrane filter layer 3 has a pore diameter of 1 μm, and the second cotton felt layer 4 has a pore diameter of 1 μm.

~~**[0019]** The special membrane filter consists of purified cellulose, natural inorganic material filter aids, polyamidoamine. Free of plastic fibers, formaldehyde, GMO and common allergens.~~

**[0019]** The special membrane filter is made of polyamidoamine material which have wet and dry strength properties.

**[0020]** In addition, the present invention also provides a filter including a filter element, the filter element includes a housing 5 provided with an oil inlet and an oil outlet. Inside the housing 5, a cotton felt layer 1, an integral raw cotton layer 2, a special membrane filter layer 3 and a second cotton felt layer 4 are sequentially stacked along a direction from the oil inlet to the oil outlet.

**[0021]** Reference is made to Fig 2, which is a cross-sectional view of the filter element housing. The outer and inner lid prevents and locked the stacked special membrane and cotton felt layer during filtration thus increasing the efficiency of filtration.

Compared with the prior art, when being used, the filter element of the present invention perfectly enables impurities in the engine oil to be filtered three times through the cotton felt layer, the integral raw cotton layer and the special membrane filter layer, respectively. It has advantages of large filtering area and high filtering precision, etc., and will not lead to early abrasive wear and

filter paper clogging to form a filter cake, therefore, elongating the service life of the filter element.

**[0022]** Certainly, the above description is only given 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. A filter element, comprising a housing provided with an oil inlet and an oil outlet, characterized in that, inside the housing, a cotton felt layer, an integral raw cotton layer and a special membrane filter layer are sequentially stacked along a direction from the oil inlet to the oil outlet.

2. The filter element according to claim 1, characterized in that, the cotton felt layer has a pore diameter of 0.5 μ m-1.5 μ m.

3. The filter element according to claim 1, characterized in that, the special membrane filter layer has a pore diameter of 0.5 μ m-5.0 μ m.

4. The filter element according to claim 1, characterized in that, the cotton felt layer has a thickness of 1mm-10mm.

5. The filter element according to claim 1, characterized in that, the special membrane filter layer has a thickness of 5mm-15mm.

6. The special membrane filter consists of purified cellulose, natural inorganic material filter aids, polyamidoamine. Free of plastic fibers, formaldehyde, GMO and common allergens.

6. The special membrane filter is made of polyamidoamine material which has wet and dry strength properties.

7. The filter element according to claim 1, characterized in that, further comprising a second cotton felt layer stacked on the special membrane filter layer.

8. The filter element according to claim 6, characterized in that, the second cotton felt layer has a pore diameter of 0.5 μ m-1.5 μ m.

9. The filter element according to claim 6, characterized in that, the second cotton felt layer has a thickness of 1mm-10mm.

10. The filter element according to claim 1, characterized in that, the housing consist of outer and inner lid that prevents and locked the stacked special membrane and cotton felt layer during filtration thus increasing the efficiency of filtration and prevent any side seepage of unfiltered oil.

11. A filter comprising a filter element, characterized in that, the filter element comprises a housing provided with an oil inlet and an oil outlet, inside the housing, a cotton felt layer, an integral raw cotton layer and a special membrane filter layer are sequentially stacked along a direction from the oil inlet to the oil outlet.