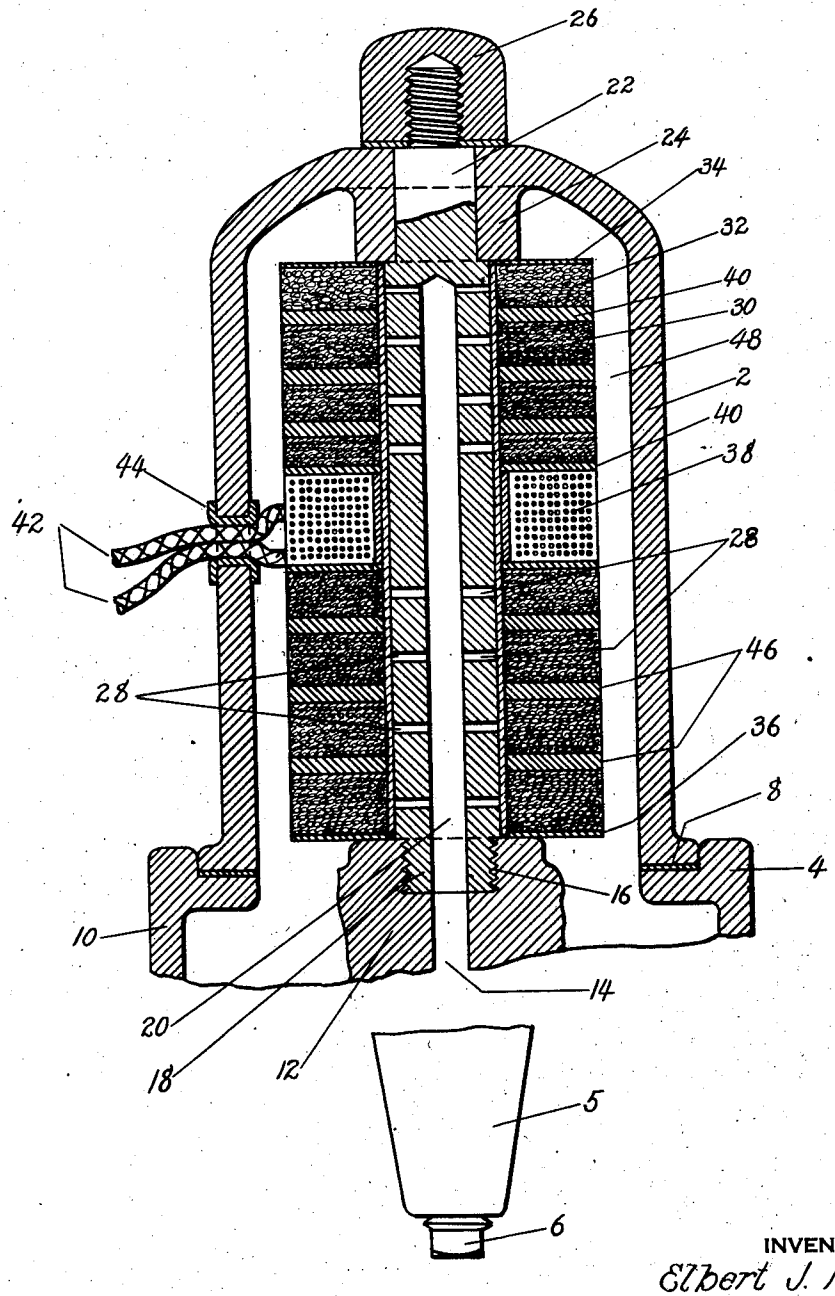
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METHOD OF AND MEANS FOR FILTERING FLUID LUBRICANTS

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METHOD OF AND MEANS FOR FILTERING FLUID LUBRICANTS

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This invention relates to filters for liquids and more particularly to a method of and means for separating carbon and metallic particles from oil used for lubricating the moving parts of internal combustion engines.

It is well known that it is highly desirable to prevent passage of carbon in lubricating oils to the working parts of an internal combustion engine. It is also well known that as the result of the operation of the moving parts of an internal combustion engine the lubricating oil contains metallic particles such as brass, babbitt, aluminum, etc. and that it is desirable to prevent these metallic particles from being carried to the working parts of the engine.

The present invention contemplates a method for positively preventing the passage of carbon and these metallic particles to the working parts of an internal combustion engine.

In one form of the present invention advantage is taken of the well known fact that a magnetic field serves to attract and hold metal such as metal particles which invariably occur in lubricating oils and the present invention contemplates the establishing of a magnetic field within a filter housing whereby the metal particles in the fluid lubricant passing therethrough are attracted and held and thus prevented from passing to the parts of an engine to be lubricated.

Other objects and advantages of this invention will be apparent from the following description and the particular features of novelty will be pointed out in the appended claims.

The figure is a broken, sectional view through a filter embodying the present invention.

To accomplish the above mentioned objects I use an oil filter which is more or less conventional and which comprises an outer shell, usually of metal, with an inner relatively concentric filter element or strainer. In use, oil either passes between the outer shell and the filter element, thence through the filter element to the working parts of an engine or the oil passes first through the filter element to the space between the same and the outer shell and then to the parts to be lubricated. The filter element or strainer of a filter of more or less conventional type usually includes a center piece of metal, usually tubular, and provided with a plurality of openings through which the fluid lubricant passes; this center piece being surrounded by a metal gauze or strainer which latter is surrounded by filter elements formed of suitable fabric; the entire assembly just mentioned being assembled concentrically within an outer shell formed of metal.

In carrying out the present invention I preferably embed within the fabric filter elements a solenoid which surrounds the center piece and which is connected to the standard automobile generator circuit so as to be energized thereby during operation of the generator, the center piece functioning in the assembly as a magnetic core. In cooperation with the solenoid and core I preferably embed within the fabric filter elements a plurality of soft iron washers which surround the metal gauze and it is obvious that with such an assembly when the generator is in operation magnetic fields are established within the outer shell of the filter which, when the lubricant is being pumped through the filter, will cause metallic particles therein to be attracted and restrained from passing through the filter into the parts of an engine which are to be lubricated.

No special design of filter is essential to a proper operation of this improved method of separating metallic substances or other impurities from the fluid lubricant and almost any oil filter may be used. The drawing discloses a sectional view through a filter in which the present invention is embodied and the filter comprises a main filter casing 2 which is removably attached in any suitable manner to a base 4 which is provided with a sump 5, the lower end of which latter is normally closed by a plug 6. For sealing the joint between the filter casing and base a suitable gasket 8 is employed.

The filter base 4 comprises a casting having an outer portion 10 and a substantially centrally arranged portion 12 provided with an opening 14, the central portion 12 having an internally threaded recess 16 which receives the lower end portion of a stud bolt 18, centrally and longitudinally cored as at 20 to provide an oil passage, as will be more clearly described hereinafter.

The upper end portion of the stud bolt is squared as at 22 to fit within an internal boss 24, and the upper end portion of said bolt projects beyond the filter casing 2 and is threaded for the engagement of a securing nut 26. In the construction just described it is obvious that the filter casing 2 and base 4 are held in assembled relation by means of the nut 26 and the stud bolt 18.

The stud bolt 18 provides the filter center piece and the same is provided with a plurality of oil passages 28 which communicate with the central passage 20 and this center piece is surrounded by metallic gauze or screening 30. Arranged around the center piece 18 and the gauze 30 are

a plurality of discs 32 formed of felt or other suitable fabric and they are retained by top and bottom plates 34 and 36, respectively; plate 34 bearing against the boss 24 while the plate 36 rests upon and is supported by the portion 12 of the base casting 4.

Also surrounding the center piece 18 is a solenoid 38 which is mounted on a fibre bobbin 40 and has connection with electric conductors 42 which are connected in the generator circuit of the vehicle. As clearly shown in the drawing, these conductors 42 extend through an insulator 44 arranged in a suitable opening in the filter casing 2.

Separating the fabric discs 32 is a plurality of spaced metallic washers 46 which are formed of suitable magnetic material such as soft iron or the like and they are arranged to surround the center piece 18 and the gauze or strainer 30.

In the instance shown in the drawing the filter casing 2 and the base 4 are preferably made of non-magnetic material and it will be apparent that with the generator in operation the solenoid will be energized and the center piece 18 functions as a core therefor and that magnetic fields will be established between the solenoid 38 and the several magnetic washers 46 thereby establishing within the filter casing 2 a plurality of magnetic fields which will serve to attract and hold metallic particles and carbon in the oil as it passes through the filter. In the instance shown the oil passes into the filter casing 2 between the filter element formed on the center piece 18 and comprising the fabric discs 32 and the casing 2, the oil passage being designated for purposes of convenience as 48. The oil will pass through the discs 32 and through the strainer 30 into the openings 28 and then into the passage 20 in the center piece 18 and is then led to the working parts of the vehicle engine. It will be obvious that during this passage of the oil the foreign matter such as metallic particles and carbon are magnetically attracted to the washers 46 and prevented from passing with the oil to the parts to be lubricated. When the generator circuit is broken it will be apparent that following the loss of residual magnetism in the washers 46 the magnetically-held metallic particles will drop by gravity in the space 48 into the sump 5 and may be removed from the filter upon removal of the plug 6.

This invention also may be modified in such a manner as to provide a magnetic coil which externally surrounds the filter housing and merely by way of example, a doughnut coil in circuit with the generator may encircle the outer shell of the filter and when energized cause magnetic lines of force to be formed which are adapted to hold the metallic substances and other impurities in the oil to prevent their passage into the engine. A coil of any preferred or desired type may be made to accomplish this purpose and the doughnut coil is mentioned merely by way of example; it being a part of this invention to provide a coil located either externally or internally of the shell of the filter which will establish, when energized, magnetic lines of force through the fluid lubricant in its passage through the filter. The magnetic field established by the coil will cause an accumulation of the floating metallic substances and other impurities in the oil at a point dependent upon the direction of the lines of magnetic force. In one instance the magnetic field established by the coil may cause an accumulation of the impurities in the vicinity of the outer shell while in another instance the magnetic lines of force may be of such a character as to force the impurities away from the coil as will be obvious; the direction of the lines of force being determined in accordance with the passage of the fluid lubricant through the filter, it being the object of the invention to prevent the passage of these impurities to the parts to be lubricated. In all events, regardless of the direction of the magnetic lines of force the coil is adapted to be energized by the generator for the purpose of influencing travel of the impurities in the lubricant so as to prevent their passage to parts to be lubricated.

After breaking of the circuit and loss of residual magnetism, the accumulated particles and other impurities may fall by gravity to the bottom of the filter and may be removed in any desired manner.

In the construction described above it is to be understood, of course, that suitable insulation will be provided in order to properly establish the magnetic fields. As an example of a construction with which an internal coil is associated with the center piece, the outer shell of the filter will preferably be made of non-magnetic material. In the use of an external coil portions of the outer shell of the filter may be made of non-magnetic material such as brass, for example, and the portions adapted for cooperation with the coil will be made of suitable magnetic material.

Obviously the invention disclosed herein is susceptible of many modifications and it is not to be understood that the invention is limited to the specific structure described and the methods recited, as various changes may be made within the scope of the appended claims without departing from the spirit of the invention.

What is claimed is:

1. In a filter for separating metallic substances and other impurities from fluid lubricant, said filter including an outer non-magnetic shell and an interiorly arranged filter element having portions thereof formed of magnetic material and other portions formed of fabric or the like, the combination of a solenoid imbedded in said fabric and connected to a source of electric current and a plurality of magnetic elements imbedded in said fabric in spaced relation with respect to said solenoid whereby upon energization of the solenoid magnetic fields are established within the filter adapted to influence the travel of metallic substances and other impurities in the fluid lubricant passing through said filter.

2. A combined filter and magnetic separator comprising a casing, a sump at the lower end of said casing, an upstanding hollow core mounted in said casing above said sump, a solenoid surrounding said core, a plurality of spaced disks of magnetic material surrounding said core, disks of filtering material mounted in the spaces between said magnetic disks, means for intermittently energizing said solenoid whereby metallic particles caught by said disks will be precipitated to said sump when the solenoid is de-energized.

3. In a device of the class described, a casing, a sump in the lower part of said casing, a core of magnetic material mounted in the upper part of said casing, said core having longitudinal and radial passages therein, a strainer gauze surrounding said core, a solenoid surrounding said core, and filtering material surrounding said strainer gauze.

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