

Oct. 15, 1940.

F. W. MANNING
FILTER AND OIL RECHARGE

2,218,339

Filed Sept. 22, 1936

Fig. 1.

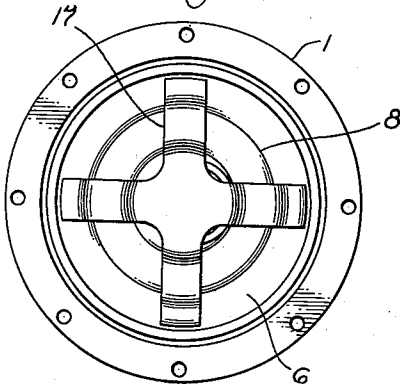


Fig. 4.

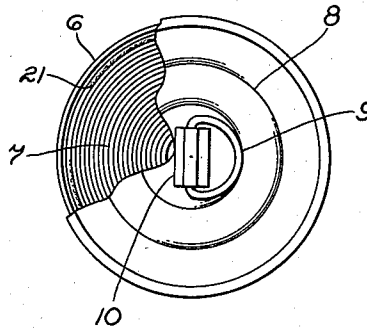


Fig. 2.

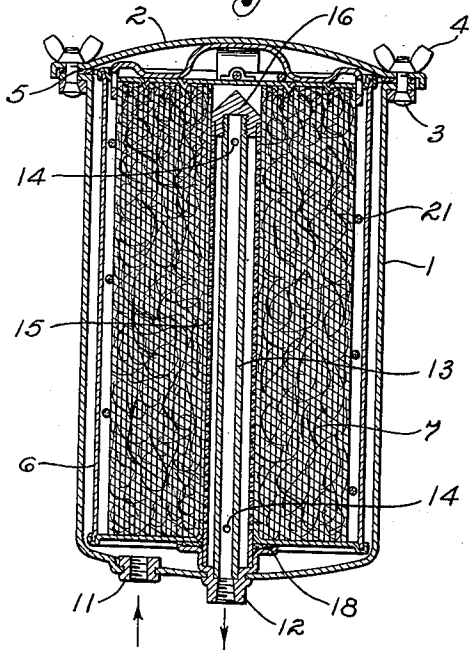


Fig. 5.

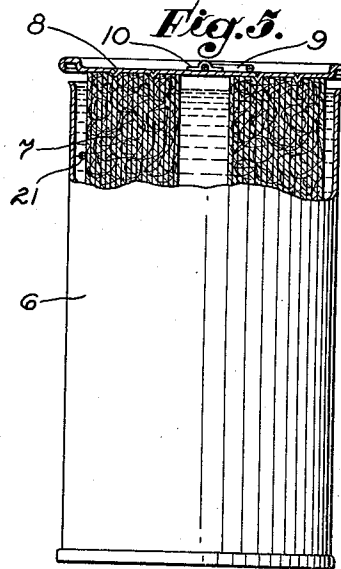


Fig. 6.

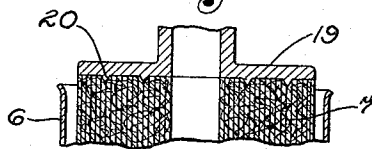
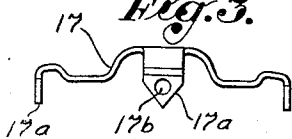


Fig. 3.



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UNITED STATES PATENT OFFICE

2,218,339

FILTER AND OIL RECHARGE

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Application September 22, 1936, Serial No. 101,947

10 Claims. (Cl. 210—112)

My invention relates to the art of removing solids from liquids, and is particularly directed to improved devices for removing solid contaminations from, and the adding of new oil to, the lubricating oils of internal combustion engines. My Patents Nos. 2,055,870; 2,093,090; and 2,128,589, describe a filter recharge in which discrete fibres are spaced uniformly throughout the recharge by means of a lubricating oil; the present application describes a recharge in which the fibres are distributed uniformly throughout the recharge before the oil comes in contact with the fibres.

It is common practice at present to market oil in sealed can containers for convenience in conveyance and to prevent contamination of new oil and for the motorist to pay for the introduction of sufficient new oil into his crankcase to fill his filter when the latter is replaced.

It is therefore an object of this invention to make it possible for a motorist to obtain a combined filter recharge and oil container at a price slightly in advance of that paid for the same size container of new oil—a filter recharge that will quickly clean up a dirty oil, and a sufficient amount of properly refined oil to neutralize, as far as possible, the injurious effects, or to improve the quality, of an inferior oil that may be in his crankcase. The motorist is thereby encouraged to recharge his filter whenever replenishing the supply of oil in his crankcase, and this will tend to prolong the life of his engine.

In accordance with my invention a roll of air felted fibres is dropped into a container, such as a quart can, the container filled under suction, or by pressure, with a suitable lubricating oil, and the recharge then sealed by capping. For example, a roll 4" dia.×6" long of filter fabric, comprising fibres in the proportion of 66 to 75 per cent cotton to 33 to 25 per cent asbestos air-felted upon reinforcing threads and properly calendered to prevent further consolidation of the fibres during the filtering operation, will weigh about 9 ounces. If this roll is slipped into a 4" dia. can and submerged in 50 S. A. E. oil heated to 130° F., or 20 S. A. E. oil at normal room temperature, the roll will reach what is generally called saturation point in from 30 to 60 min., and the can will hold about 85 per cent of the oil that it would hold without the roll. If pressure is used for forcing the oil into the roll, the can may be filled in a fraction of a minute and will hold about 90 per cent of what it would hold without the roll. This increase in oil content is probably due to the oil replacing air in

the tubular structure of the fibres, and, of course, the hotter the oil the easier it is to force into the tubular openings and interstitial spaces of the fibres. The size of a quart can of oil, as marketed by the automobile service stations throughout this country, is about 4" dia.×5½" high. Therefore, a can 4" dia.×6" high will not only take a 6" filter roll but it will also hold approximately one quart of lubricating oil.

While I have mentioned above a preferred proportion of cellulose to asbestos fibres for removing carbon or other impurities from crankcase oil, it will be understood that this ratio may vary within wide limits. Incorporating treating agents, such as clay, decolorizing carbons, etc. in the fabric; changing the calendering pressures; and many other factors may make it desirable to vary the fibre ratios of my filter fabrics. The manufacture of an annular roll of uniformly distributed air felted fibres, may be accomplished in various ways. A preferred method is by depositing fibres, dispersed by air or other elastic fluid, on reinforcing threads or other retaining structure by the passage of the elastic fluid through the structure, followed by calendering and winding of the formed sheet into an annular roll. The individual fibres cannot be uniformly spaced one from the other as when each fibre is coated with a liquid film in a pressure-mobile filter element, but they can be uniformly distributed in the sense that in all units of area the fibres are felted and consolidated in contact with one another to the same extent so as to form a sheet of uniform porosity, and this uniform distribution of the fibres in the sheet will be maintained throughout the roll during the filtering operation. Such a uniform distribution of the fibres cannot be obtained in a water-laid web of fibres, as will at once be apparent from the blotchy appearance of a thin sample when held up to the light; and not only will this lack of uniformity in the distribution of water-laid fibres persist during the filtering operation but the cohesion of the fibres between contiguous webs of fibres in an annular roll will vary from the cohesion of the fibres in the webs. Such fabrics and their manufacture are described in my Patents 1,782,784; 1,782,785; 1,786,669; 2,152,901; also in my copending application, "Method and apparatus for making filter fabrics," Serial No. 99,633, filed September 5, 1936.

Before inserting the fabric roll in a container, its lower end may be sprayed, or otherwise coated, with an adhesive such as silicate of soda, shellac, amberoid, etc., and incorporated in the adhesive

may be suitable fibres, such as cellulose, asbestos, etc. Likewise, after the bottom of the roll has been cemented to the bottom of the container the cover may be cemented to the top of the roll in similar manner, and after the cement has sufficiently hardened, both container and roll submerged in a bath of lubricating oil and subjected to pressure until complete saturation of the filter roll has taken place, after which the cap may be closed into position. Circumferential crimps in the ends of the container with their ridges turned inward to press against the fabric roll, may also be used with or without adhesives for making the end joints. However, for all ordinary purposes, I have found that sealing of the end joints to prevent leakage thereby may be accomplished by simply cutting the fabric roll to a suitable length so that upon introduction of the roll into the container and capping of the latter, the container ends are caused to bear firmly against the roll; and to greatly expedite the filling of the containers the filling head of a volumetric filling machine may be used to make a joint with the end of filter roll and a predetermined quantity of oil forced into the center of the roll under pressure and in a heated condition, the strength of the fabric reinforcing threads being sufficient to withstand any ordinary pressure.

The filter and oil recharge may be suitably pierced as the recharge is introduced into its receptacle. Various ways of doing this are described in my patents mentioned above.

The invention is exemplified in the following description, and one design of the recharge with its receptacle is illustrated by way of example in the accompanying drawing, in which:

Fig. 1 is a plan view of the filter shown in Fig. 2 with the cover of the receptacle removed.

Fig. 2 is a vertical section of the filter showing the filter roll in its supported position about the thimble of the receptacle.

Fig. 3 is an elevation of the piercing plate shown in Figs. 1 and 2.

Fig. 4 is a part plan view and part cross-section of the container shown in Fig. 2.

Fig. 5 is a part elevation and part vertical section of the container shown in Fig. 2.

Fig. 6 is a fragmentary cross-section of the oil filling head in contact with the end of the filter roll.

Referring more specifically to the drawing by reference characters: The filter receptacle 1 is equipped with a cover 2, which is held in position by studs 3 and wing nuts 4, the gasket 5 making the joint between the receptacle and the cover. The container 6 encloses the filter roll 7, the circumferential crimps 8 in the ends of the container being embedded in the ends of the filter roll; and to the top of the container is attached a lifting ring 9 by means of a bracket 10. The oil to be filtered enters the receptacle through the threaded inlet fitting 11, and after being filtered leaves by the threaded outlet fitting 12, which supports the container sufficiently above the curved bottom of the receptacle to permit circulation of the oil to be filtered. Inner recessed portions of the outlet fitting also support and hold rigidly in place the filtrate thimble comprising; outlet pipe 13, in which are top and bottom drainage openings 14, the concentric foraminous retaining wall 15, and the thimble end piercing point 16, which is attached to the upper end of both. A pressure plate 17, positioned between the container top and the receptacle cover

and which may or may not be rigidly attached to the latter, is equipped with piercing points 17a having holes 17b therein; and it also exerts pressure against the container to hold the latter firmly seated against the gasket 18, which is recessed in the outlet fitting. Fig. 6 shows the end of the oil filling head 19 in contact with the end of the filter roll, the circumferential crimps 20 being embedded in the latter. A string or thread 21 wound around the roll, centralizes the latter and gives sufficient clearance between the container wall and the roll for circulation of the oil.

The operation of the apparatus thus constructed is in part indicated in connection with the foregoing description. A filter roll 7 is slipped into the container 6 and the lower ends of each cemented together, the roll when wrapped with a cord or wire for centralizing purposes, being of sufficient size to substantially fill the container. The filling head 19 of a volumetric filling machine is then brought into contact with the upper end of the roll, as shown in Fig. 6, and a predetermined charge of hot oil forced into the axial opening of the roll, the pressure being sufficient to cause the oil to permeate immediately the cells and interstitial spaces of the fibres that make up the filter roll. After capping of the container and removal of the cover of the receptacle, the container may be inserted in the receptacle so that the bottom of the container will rest upon the piercing point of the thimble. As the axial opening in the filter roll is substantially the same diameter as the thimble, which supports the roll during the filtering operation, the container can be thrust down by hand over the thimble until the bottom of the container makes contact with the gasket 18, the point easily piercing the bottom of the container and the displaced liquid passing into and out through the thimble. The pressure plate is then placed above the container and the points of the former, after being centralized within the beading of the upper end of the container, are forced through the top of the latter by pressure exerted against the plate, either before or after the cover is placed in position, until a portion of each piercing hole is positioned both below and above the container top. The division of the piercing plate into four arms, makes it sufficiently resilient to permit a reasonable variation in the depth of the gasket 18 recessed in the outlet fitting, without allowing the unfiltered oil to by-pass at this point. After clamping down the cover of the receptacle the oil to be filtered enters through the inlet fitting 11, circulates around the outside of the container, which it enters through the holes in the points of the pressure plate, and after passing through the filter roll 7, retaining wall 15, openings 14 into the outlet pipe 13, leaves the receptacle by outlet fitting 12, the new oil being pushed ahead of the incoming oil and both being mixed together by recirculation through the engine.

It will be obvious from the foregoing description that filter and oil recharges may be put up in various ways to suit the purposes for which they are intended. The fabric that is used to make up the rolls may be more heavily calendered for high pressure work; the fibre composition of the fabric may be of animal, vegetable, or mineral origin, and such fibres may be used separately, or in mixture with one another; the sizes of the recharges may be increased for trucks and tractors; the S. A. E. of the oil may vary to suit the climate; a filter roll may be enclosed within a

container without the addition of an oil, in which case the openings in the container may be made either before, or during, the introduction of the container into its receptacle; or the filter roll may be used without a container, and the ends of the roll may or may not be sealed against passage of a fluid.

It will be understood throughout the appended claims that the words "cellular structure" are used to include the interstitial spaces between the fibres and other solids that may make up the filter rolls, as well as the openings within such solids; and that the "filling of the cellular structure" refers to the amount of liquid that may be taken up by, or retained in, the cellular structure, which amount may vary slightly under different conditions, as indicated above.

I claim as my invention:

1. A filter recharge comprising: a container; an annular roll of contiguous layers of fibrous material within the container; and adhesive means for cementing the ends of the said roll to the ends of the said container.

2. A filter recharge comprising: a liquid-tight container; an annular roll of contiguous layers of fibrous material within the container; adhesive means for cementing the ends of the said roll to the ends of the said container; and a liquid surrounding the said roll within the container and filling the cellular structure of the said fibrous material.

3. A recharge for a filter in the lubricating system of an internal combustion engine, comprising: a liquid-tight container; an annular roll of contiguous layers of fibrous material within the container, the ends of the said roll being cemented to the ends of the said container; and a suitable oil for lubricating purposes surrounding the said roll within the container and filling the cellular structure of the said fibrous material.

4. A recharge for a filter in the lubricating system of an internal combustion engine, comprising: a liquid-tight container; an annular filter roll of contiguous layers of uniformly distributed air-felted fibres within the container, the ends of the said roll being cemented to the ends of the said container; and a suitable oil for lubricating purposes surrounding the said roll within the container and filling the cellular structure of the fibrous material.

5. A method of making a filter and oil recharge for the lubricating system of an internal combustion engine, comprising: substantially filling a container with an annular roll of contiguous layers of fibrous material; cementing the ends of the said roll to the ends of the container; submerging the roll in a suitable oil for lubricating purposes to fill the cellular structure of the fibrous material; and capping the filled container.

6. A method of packing a filter and oil recharge for the lubricating system of an internal combustion engine, comprising: substantially filling a container with an annular roll of contiguous layers of fibrous material; forcing a suitable oil

for lubricating purposes under pressure into the axial opening of the said roll until the cellular structure of the roll is filled with the said oil; and capping the said container.

7. A method of packing a filter and oil recharge for the lubricating system of an internal combustion engine, comprising: substantially filling a container with an annular roll of contiguous layers of fibrous material; forcing a suitable oil for lubricating purposes under pressure in a heated condition into the axial opening of the said roll until the cellular structure of the roll is filled with the said oil; and capping the said container.

8. In a filter, the combination of: a container enclosing an annular roll of contiguous layers of fibrous material, the ends of the said roll being cemented to the ends of the said container; and a receptacle for the container, the receptacle having fluid inlet and outlet openings and means for piercing the container for ingress of the unfiltered fluid and egress of the filtered fluid, whereby the introduction of the container into the receptacle causes the said piercing of the container, the inlet openings of the receptacle and container to be connected, and the outlet openings of the container and receptacle to be connected, for passage through the fibrous material of the fluid to be filtered.

9. In a filter, the combination of: a liquid-tight container enclosing an annular roll of layers of fibrous material; a liquid surrounding the said roll within the container and filling the cellular structure of the said fibrous material; and a receptacle for the container, the receptacle having fluid inlet and outlet openings and means for piercing the container for ingress of the unfiltered fluid and egress of the filtered fluid, whereby the introduction of the container into the receptacle causes the said piercing of the container, the inlet openings of the receptacle and container to be connected, the outlet openings of the container and receptacle to be connected, for passage through the fibrous material of the fluid to be filtered.

10. A filter and oil supply for the lubricating system of an internal combustion engine, comprising: a liquid-tight container enclosing an annular roll of layers of fibrous material; a suitable oil for lubricating purposes surrounding the said roll within the container and filling the cellular structure of the said fibrous material; and a receptacle for the container, the receptacle having fluid inlet and outlet openings and means for piercing the container for ingress of the unfiltered oil and egress of the filtered oil, whereby the introduction of the container into the receptacle causes the said piercing of the container, the inlet openings of the receptacle and container to be connected, the outlet openings of the container and receptacle to be connected, and the oil within the container to be added to the oil of the said lubricating system.

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