May 16, 1967 R. C. LINDBERG 3,319,790

FILTERS EMPLOYING A FIBROUS PAPER ROLL

Filed Nov. 10, 1964

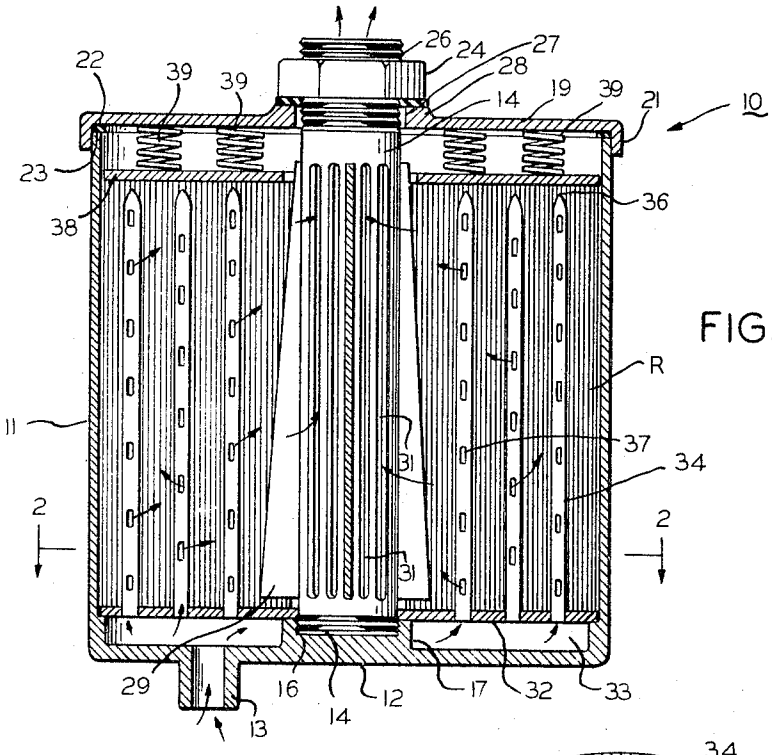


FIG. 1

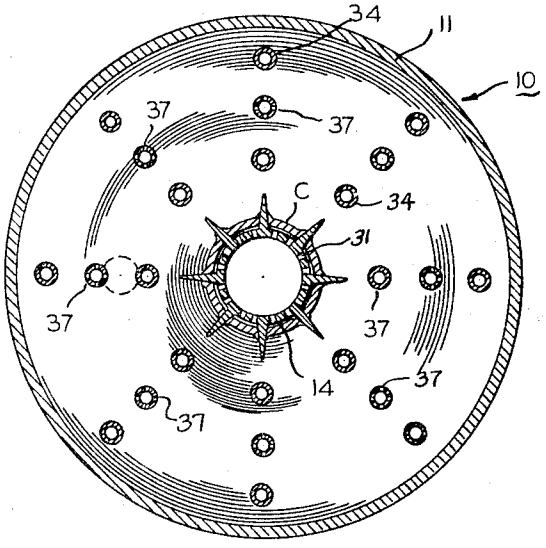


FIG. 2

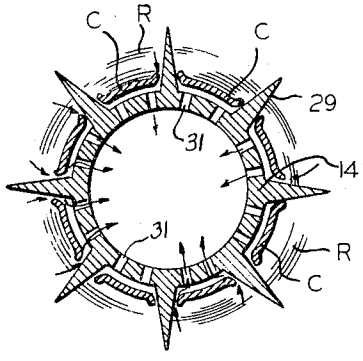


FIG. 3

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United States Patent Office 3,319,790 Patented May 16, 1967

3,319,790

FILTERS EMPLOYING A FIBROUS PAPER ROLL

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Filed Nov. 10, 1964, Ser. No. 410,188
7 Claims. (Cl. 210—232)

This invention relates generally to filters for lubricating oil of an internal combustion engine, and more particularly to an improved filter pack employing a roll of fibrous tissue wound upon a central cylinder such as an ordinary roll of toilet paper.

Heretofore it has been proposed to employ a roll of toilet paper as a filtering medium, but as far as is known, the filtering action takes place along the surfaces of the closely wound sheets of the absorbent paper, rather than transversely therethrough. In order to provide good filtering action, it is necessary to compress the wound roll in a direction laterally of the central hollow paper core or mandrel upon which the paper is wound. Since the filtering action occurs from end to end in the roll, the filtered particles tend to collect at one end of the roll rather than to be dispersed as they are separated throughout the length of the roll.

According to the present invention, structure is provided which introduces the liquid to be filtered throughout the entire roll, the filtering action taking place through the paper rather than by collection of the filtered material along the surface of the paper as the material to be filtered moves from one end to the other of the roll. The invention is also characterized by structure which serves to sever the hollow paper core supporting the roll throughout its length, such severing operation serving also to compact the paper and also to afford structure for either collecting the filtered liquid or to deliver the liquid to be filtered to the paper.

With the foregoing considerations in mind it is a principal object of the invention to provide a filter characterized by use of a conventional roll of toilet paper as a filtering medium, and to accomplish the filtering action by movement of the liquid through the roll in directions normal to the axis of the core upon which the paper is wound.

Another object is to provide a filter employing a roll of toilet paper as a filtering medium, and to introduce a number of probes between the layers of the wound roll of paper, these probes having apertures therein to serve either to supply liquid for filtering through the paper in directions normal to the axis of the hollow paper core, or to act as points where the filtered liquid is collected.

Another object is to provide in a filter of the general class, a central hollow arbor or mandrel over which the core of the roll of paper is forced, the arbor having a plurality of sharpened ribs extending therefrom to sever the paper core throughout its length, the hollow arbor or mandrel being provided with a plurality of longitudinal slits therein for the entrance of the liquid to be filtered or for the collection of liquid which has been filtered by the paper.

Other objects and important features of the invention will be apparent from a study of the following specification taken with the drawing, which together describe and illustrate a preferred embodiment of the invention, and what is now considered to be the best mode of practising the principles thereof. Other embodiments may be suggested to those having the benefit of the teachings herein, and such other embodiments are intended to be reserved especially as they fall within the scope of the subjoined claims.

In the drawing:

FIG. 1 is a longitudinal cross sectional view through a filter embodying the principles according to the present invention, certain parts thereof being shown in elevation.

FIG. 2 is a transverse sectional view taken along the line 2—2 of FIG. 1 looking in the direction of the arrows; and

FIG. 3 is an enlarged cross sectional view of the central arbor or mandrel upon which the roll of paper is mounted.

Referring now to the drawing, the improved filter according to the present invention is referred to by reference numeral **10**, and includes a hollow cylindrical casing **11** having an end wall **12** provided with a hollow boss **13** for the entrance to the filter **10** of liquid to be filtered or the removal of filtered liquid therefrom. A hollow arbor **14** extends along the longitudinal axis of casing **11**, and is threaded at **16** to a central boss **17** extending inward of the end wall **12**, and the other end of the hollow arbor **14** receives a closure **19** having a sliding fit thereon, closure **19** having a rim flange **21**.

An annular gasket **22** is interposed between the end closure **19** and the rim **23** of the casing **11**. A fastening nut **24** is secured to threads **26** at the opposite end of the hollow arbor **14**, and a sealing washer **27** is interposed between the fastening nut **24** and a central hollow boss **28** on the closure **19**.

A roll of fibrous tissue sheets such as a conventional roll of toilet paper R is adapted to be supported within the casing **11**, and is employed as a filtering element. The roll R has a central paper core C upon which the paper is wound, and core C is adapted to be pushed with roll R over the hollow arbor **14**, it being severed by a plurality of sharp edge ribs **29** extending from the hollow mandrel **14**, see FIG. 3 particularly. The hollow arbor **14** also has a plurality of longitudinal extending apertures **31**, which serve to supply liquid to be filtered to the roll R, or to collect the filtered liquid.

The roll R is adapted to be forced down over the arbor **14**, and in so doing the central core C is slit longitudinally as seen in FIG. 3. The roll R is forced down into contact with a bulkhead **32** resting on boss **17** and spaced from the end wall **12** define a chamber **33**. The bulkhead **32** has a plurality of hollow concentrically arranged probes **34** which enter between adjacent layers of the paper constituting the roll R, each of the probes **34** having the end thereof brought to a rather fine point **36**. Each of the probes has a plurality of apertures **37** therein adapted to supply liquid to be filtered to the roll R, or to receive the filtered liquid.

The roll R is held between the lower bulkhead **32** and an upper bulkhead **38** surrounding the central hollow arbor **14**, and the upper bulkhead **38** is held tightly in position against the roll R by means of a plurality of springs **39** constrained between the upper bulkhead **38** and the closure **19**.

The filter **10** may be connected in a pressure lubricating system of an internal combustion engine either in such a fashion so that the interior of the hollow mandrel **14** is connected to a supply of oil to be filtered, with the hollow boss **13** connected to the filtered oil, or vice versa. Irrespective of the manner in which the filter is connected in the system, the hollow probes **34** have the openings **37** therein arranged in a plurality of directions, so that the maximum amount of filtering efficiency can be obtained from the paper constituting the roll. In the case where the probes are used for the collection of the filtered liquid, the so filtered liquid is collected from many different directions.

From the description foregoing, it is believed evident that there has been provided some new and useful improvements in the art of lubricant filters of the type where the conventional roll of toilet paper is used as a filtering medium. By the structure according to the

present invention, the filtering is done always in the directions normal to the axis of the core upon which the paper is wound, rather than in directions between adjacent layers of the paper and from one end of the roll to the other.

Having thus described this invention is such full, clear, concise and exact terms as to enable any person skilled in the art to which it pertains to make and use the same, and having set forth the best mode contemplated of carrying out this invention, the subject matter regarded as being patentable is particularly pointed out and distinctly claimed in what is claimed, it being understood that equivalents or modifications of, or substitutions for, parts of the above specifically described embodiment may be made without departing from the scope of the invention as set forth in what is claimed.

I claim:

1. In a filter of the type adapted to employ a roll of fibrous tissue having a central opening as a filtering medium, a cylindrical casing having an internal diameter substantially conforming to the external diameter of said roll, a closure for said casing, a bulkhead spaced from one end of said casing to define a chamber, a hollow central arbor adapted to receive said roll at the central opening thereof for placement thereon against said bulkhead, a plurality of knife means extending from said arbor for splitting said roll at said central opening, a plurality of openings in said hollow arbor between said knife means, a plurality of hollow probes supported by said bulkhead and having the interior thereof in communication with said chamber, each of said probes

having at least one opening therein whereby the filtering action takes place in directions normal to the longitudinal axis of said roll.

2. The invention of claim 1 wherein means are provided for maintaining longitudinal pressure on said roll.

3. The invention of claim 2 wherein said means comprises a bulkhead spaced from said closure and spring means are provided between said closure and said bulkhead.

4. The invention as defined in claim 1 wherein said chamber and the interior of said hollow arbor are interchangeably connected to the filtrate.

5. The invention according to claim 1 wherein the openings in said hollow arbor extend longitudinally for substantially the length of said arbor.

6. The invention of claim 1 wherein said probes have openings therein spaced along the length thereof.

7. The invention of claim 1 wherein said probes are arranged concentrically about said arbor.

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