May 1, 1945. J. A. PICKARD 2,374,953

FILTER

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Fig. 1.

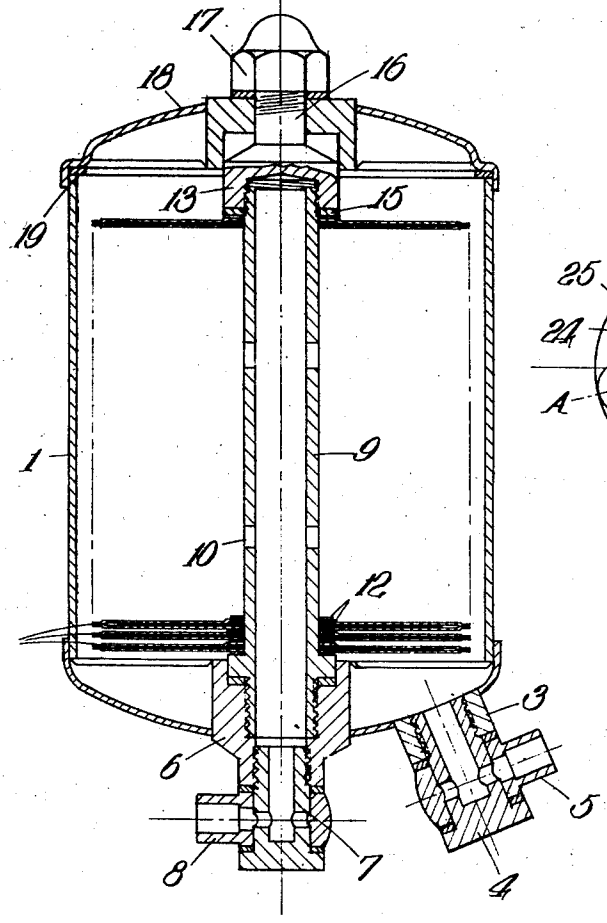


Fig. 2.

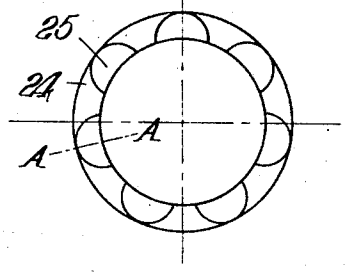
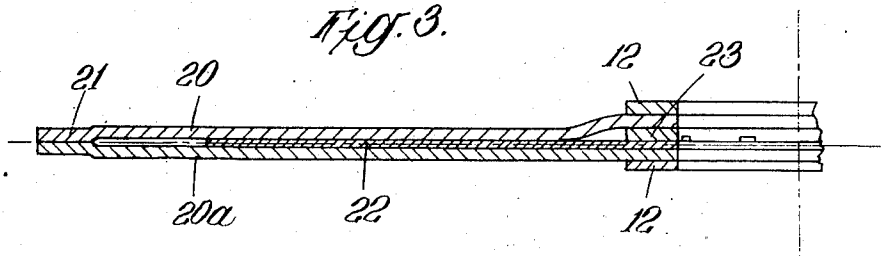


Fig. 3.



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Fig. 4.

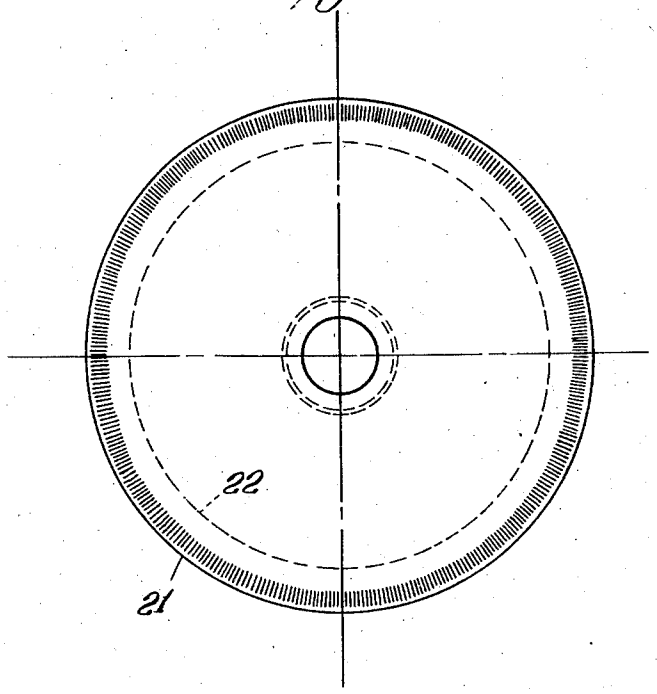
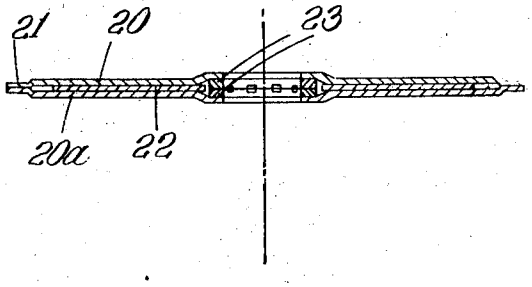


Fig. 5.



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Patented May 1, 1945

2,374,953

UNITED STATES PATENT OFFICE

2,374,953

FILTER

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Application October 16, 1943, Serial No. 506,497
In Great Britain October 30, 1942

7 Claims. (Cl. 210—181)

This invention relates to filters of the kind in which a plurality of filter elements in the form of relatively thin cells is engaged with a drainage element extending through apertures provided in the opposite cell walls formed of filter paper or a textile fabric.

In certain filters of this kind no internal supporting means is provided within the cells and the space between the cell walls for permitting passage of liquid is secured by the inherent roughness of the material of which the walls are formed, or by inequalities produced in the surface of the walls by suitable treatment of the material of which they are constituted.

In certain cases it has been found desirable to provide a supporting means, for instance, where the filters are employed in filtering oil which may contain a proportion of water. The water causes the paper or fabric to soften or to expand with the result that the cells become distorted and the walls of adjacent cells may come into contact one with the other and the filtering surfaces of some of them may be thus in whole or in part covered over and blanked off rendering them useless for the purpose for which they are intended.

The invention is based upon the observation that the efficiency of such a filter is improved if within the cell, as supporting means, there is provided a thin relatively rigid plate extending over a substantial distance towards its outer periphery in association with a washer or washers adapted to encircle the drainage element. The capacity of such a filter is in some cases increased by 100%.

The invention comprises a filter of the kind specified, in which the individual filter elements in the form of relatively thin cells are engaged with a drainage element extending through apertures provided in the opposite walls of the cells, having as supporting means within each of the cells, a thin plate of relatively rigid material extending for a substantial distance towards its peripheral edge.

The precise distance which the relatively rigid material extends towards the peripheral edge of the cell may be varied, but generally it will be found that if it extends from 50–75% of the radial distance between the centre of the cell and its peripheral edge, adequate support is secured.

It has been found entirely unnecessary to employ perforated plates for the purpose, and it has been found unnecessary to provide reticulations, corrugations, or other form of roughening on the plates.

The supporting means may extend from the central aperture in the walls of the cell as it may be fashioned with a central perforation considerably greater than the diameter of the drainage element, and its outer periphery may lie well within the crimped outer edge of the filter element and the central perforation surround a washer so that the cell includes two washers embracing the drainage element of which one or both may be channelled to provide for the passage of the liquid to the drainage element. Neither of the two washers is continuous with the floating ring.

The plates may be formed of metal sheet or plate of the thickness of tin plate or of cardboard or of any material which remains stiff when damp.

The washers used in such cells are preferably channelled or otherwise provided with surface inequalities on the face in contact with the plate, to leave passages permitting the flow of the liquid to the drainage element.

The invention is illustrated by way of example in the accompanying drawings in which Fig. 1 is a view in sectional elevation of a filter adapted for instance to be located in the pressure lubricating system of an internal combustion engine. Fig. 2 is a plan view of one of the washers between the filter elements. Fig. 3 is a section to enlarged scale of one of the filter elements showing a washer as in Fig. 2 located between the filter elements of the cell and the spacing washers between adjacent cells. The washer is assumed to be in section on the line A—A of Fig. 2. Fig. 4 is a plain view of one cell. Fig. 5 is vertical section of a modified form of filter element incorporating two internal spacing washers, at least one of which having recesses to permit the flow of the liquid to the drainage element.

Referring to Figs. 1 to 3, the filter is shown as including a chamber comprising side walls 1 and a base 2 furnished with an internally threaded tubulure 3 in which is engaged the nipple 4 serving to connect with the tubulure the terminal portion 5 of one of the pipes from the pressure lubricating system and constituting the oil inlet to the filter and with a member 6 which is also internally screw-threaded and engaged by a screw 7 functioning to secure in position a second terminal portion 8 connected with the oil circulating system and forming the outlet for the filtered oil, and a pipe 9 secured in the member 6 and furnished with a plurality of holes 10. About this pipe there is located a plurality of filter elements, generally indicated by the reference 11 in Figure 1, between which are positioned washers 12. The number of filter elements engaged about the pipe 9 is such that by screwing down a member 13 which engages screw-threaded portion 14 of the pipe 9 against a washer 15, the several elements will be secured firmly in position. The member 13 is provided with an externally screw-threaded extension 16 adapted to be engaged by a nut 17 which serves to secure a cover plate 18 in position against a washer 19 provided on the upper edge of the wall 1 of the chamber.

Each filter element 11 consists of two annular pieces of soft filter paper or fabric 20 and 20a, Fig. 3, secured together adjacent their outer peripheral edge 21 as by crimping the paper material or by any other suitable means.

As shown and in accordance with the invention there is provided within the cells a thin relatively rigid annular plate 22 extending over a substantial distance towards the outer periphery of the cell and acting as a supporting means for the cell. In association with the plate is provided a washer 23 adapted to encircle or closely embrace the drainage element 9. The washer 23, illustrated separately in Fig. 2, is in the form of a ring provided on one face with channels 24 converging towards the inner diameter and presenting a superficial area substantially less than the superficial area of the elevated portions 25 on the face of the washer located on the sides of these channels. The plate may be formed of metal sheet or plate of the thickness of tin plate or of any material which remains stiff when damp. In the form shown in Figs. 1 and 3 this thin relatively rigid plate 22 is of substantially the same internal diameter as that of the washer 23 the elevated portions 25 of which bear on the plate around its central aperture.

In the modification illustrated in Figs. 4 and 5 the inner peripheral edge of the thin plate or annulus 22 is spaced from the drainage tube 9 and constitutes a floating annulus extending as in the above case a substantial distance towards the outer periphery of the cell but not to the crimped outer edge 21 of the cell, while a pair of washers 23 is interposed in the cell between the inner edge of the stiffening plate and the drainage element. As shown the external diameter of the washers is slightly less than the internal diameter of the plate. One or both of the facing surfaces of the two washers 23 is formed with channels for example of the form shown in Fig. 2 or provided with surface inequalities to leave passages permitting the free flow of liquid between the washers to the drainage element.

I claim:

1. In a filtering apparatus comprising a chamber having an inlet for the supply to the chamber of liquid to be filtered, a drainage element disposed axially in the chamber, an outlet for filtered liquid in communication with the drainage element and a plurality of individual filter elements in the form of relatively thin cells of filter paper closely embracing the drainage element, a supporting means within the cells, said supporting means comprising a thin smooth annular imperforate plate of rigid material extending a substantial distance towards the peripheral edge of the cells and forming an imperforate partition within the cells.

2. In a filtering apparatus comprising a chamber having an inlet for the supply to the chamber of liquid to be filtered, a drainage element disposed axially in the chamber, an outlet for filtered liquid in communication with the drainage element and a plurality of individual filter elements in the form of relatively thin cells of filter paper closely embracing the drainage element, a supporting means within the cells, said supporting means comprising a thin annular plate of rigid material presenting an imperforate smooth surface and extending a substantial distance towards the peripheral edge of the cells, and an annulus interposed in the cells and closely embracing the drainage element, said annulus abutting against the face of the supporting means and presenting in conjunction with the supporting means passages leading to the drainage element.

3. In a filtering apparatus comprising a chamber having an inlet for the supply to the chamber of liquid to be filtered, a drainage element disposed axially in the chamber, an outlet for filtered liquid in communication with the drainage element and a plurality of individual filter elements in the form of relatively thin cells closely embracing the drainage element, a thin smooth annular imperforate plate of rigid material disposed within each cell and extending a substantial distance towards the peripheral edge of the cell, and a pair of washers interposed in each cell and embracing the drainage element and presenting between them passages leading to the drainage element, the plate having an internal diameter greater than that of the washers and the outer diameter considerably less than the filter elements and forming with the washer a discontinuous support for the cell.

4. A filter element for a filter of the kind specified comprising a relatively thin cell of soft filtering material closely embracing a drainage element and having a supporting means within the cell said supporting means comprising a thin rigid annular smooth imperforate plate constituting also a partition within the cells and extending over a substantial distance towards its outer periphery in conjunction with a single washer adapted to encircle the drainage element.

5. In a filtering apparatus of the kind specified a filter element comprising a drainage element and a relatively thin cell of soft filtering material with a freely floating ring of thin smooth imperforate rigid material interposed in the cell and extending a substantial distance towards its outer periphery and a pair of washers disposed centrally within the cell of a diameter less than the internal diameter of the plate and having an internal diameter adapted to closely embrace the drainage element, at least one of the washers being formed with passages for the passage of liquid from the cell.

6. A filter element for a filter of the kind specified comprising a drainage element and a relatively thin cell of soft filtering material closely embracing with the drainage element and having a supporting means within the cell consisting of a thin relatively rigid smooth imperforate plate constituting also a partition and extending over a substantial distance towards its outer periphery in conjunction with a single washer adapted to closely embrace the drainage element, the supporting means consisting of sheet metal of tinplate thickness.

7. A filter element for a filter of the kind specified comprising a relatively thin cell of soft filtering material closely embracing with a drainage element and having a supporting means within the cell consisting of a thin stiff smooth imperforate plate constituting also a partition and extending over a substantial distance towards its outer periphery in conjunction with a single washer adapted to closely embrace the drainage element, the supporting means consisting of material which remains stiff when damp.

JOSEPH ALLEN PICKARD.

CERTIFICATE OF CORRECTION.

Patent No. 2,374,953. May 1, 1945.

JOSEPH ALLEN PICKARD.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, first column, line 35, after "washers 23" insert --one of which has a plane surface--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 31st day of July, A. D. 1945.

Leslie Frazer

(Seal)

Acting Commissioner of Patents.