Jan. 31, 1956 G. N. HAGBERG 2,732,943

APPARATUS FOR REMOVING IMPURITIES FROM LIQUIDS

Filed June 19, 1953

FIG. 1

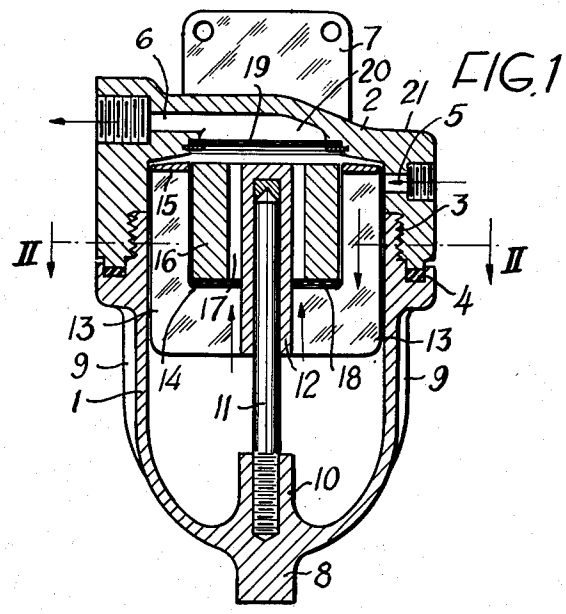


FIG. 2

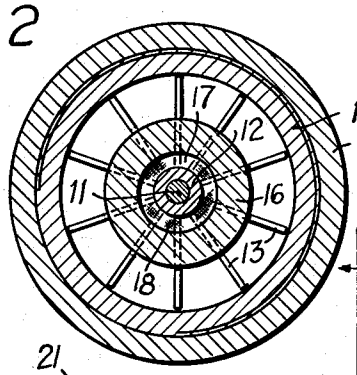


FIG. 3

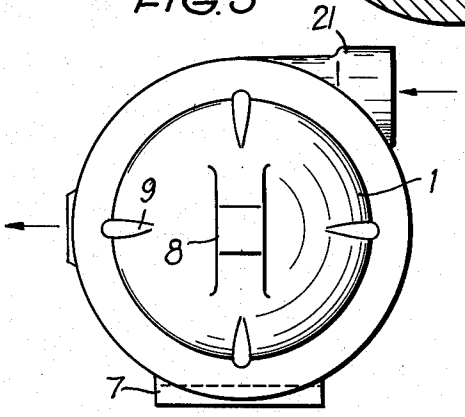
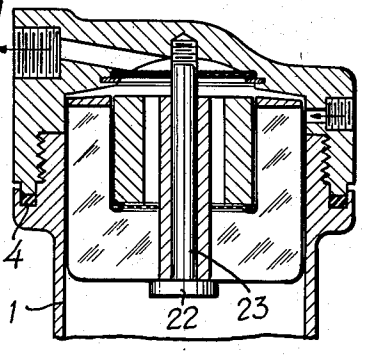


FIG. 4



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APPARATUS FOR REMOVING IMPURITIES FROM LIQUIDS

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4 Claims. (Cl. 210—1.5)

The present invention relates to a purifier for liquid fuel or the like which is partly based on the purification of the liquid by centrifuging and partly on the separation of metallic impurities by magnetic action. The purifier, which is primarily intended to be connected in the fuel pipe of an internal combusion engine in front of the latter's carburettor or fuel pump, may be employed for light and heavy fuels. The principal object of the invention is to provide an apparatus of the kind having high efficiency and very simple construction.

The invention is described below with reference to the form of construction shown by way of example in the accompanying drawing.

Fig. 1 illustrates the purifier in vertical section part of which is axial. Fig. 2 is a section along the line II—II in Fig. 1. Fig. 3 shows the purifier casing viewed from below. Fig. 4 shows the mounting of the vaned rotor in axial section and in a modified form of construction.

In the form of construction shown in the drawing the purifier casing consists of a bowl-shaped lower part **1** and a cover **2** which can be connected to the same by screw-threads **3**. The cover is tightened against a packing **4** arranged in the bowl **1**. Connecting passages **5** and **6** are arranged in the cover for an inflow and outflow pipe for the fuel. On the cover a fixing flange **7** having a screw-threaded hole is provided, by means of which the purifier can be attached to the engine or other fixed part. The bowl **1** can thus be unscrewed from the cover when it is desired to empty out impurities in the purifier or clean the same. A bottom projection **8** is shown on the bowl, which serves to engage a tool for screwing the apparatus apart. Ribs **9** for the same purpose are suitably arranged on the outside of the bowl to serve as a grip for the hand which in certain cases renders the use of a tool unnecessary.

In a knob **10** provided at the bottom of the lower part **1** a central spindle **11** with a pointed top is fixed on which the vaned rotor is rotatably mounted. The rotor hub is indicated at **12** while the vanes arranged on it are shown at **13**. The vanes are substantially vertical and have a recessed portion close to the hub so that they are in the shape of an L. The bottom of the recess is shown at **14**. At the upper side the vaned rotor is covered a the vertical L-limbs by an annular cover plate **15**. In the recess of the vane circle a ring-shaped cylindrical sleeve **16** which is permanently magnetic is detachably or permanently inserted. The magnet may advantageously consist of a highly magnetizable pulverulent material which is formed into a solid sleeve by a pressing operation. Between the hub **12** or spindle **11** and the sleeve **16** a vertical annular passage **17** is formed.

Between the bottom **14** of the recesses in the vanes **13** and the lower part of the magnet **16** a ring-shaped filter wire cloth **18** is inserted. Between the latter and the magnet an elastic packing ring may be placed at the outer edge. In the cover **2** immediately in front of the passage **17** a filter wire cloth **19** is also arranged which

is placed in a turned-out portion **20** in the cover and held in position by a detachable holder comprising an expansion locking ring or the like. The outlet passage **6** is connected to the turned-out portion **20**.

The cover plate **15** at least, and preferably the vanes **13** also, should lie close to the wall of the casing, but without direct contact occurring at that point as far as the vanes are concerned.

The inflow passage **5** is arranged in a tangential socket **21** relatively to the centre of the cover, and the passage **5** opens into the casing in a tangential direction at the upper part of the vane circle **13**, so that the vaned rotor when in operation continues to rotate, while at the same time the fuel, under turbulence, is conveyed downwards in the container. Heavy impurities, drops of water and the like are conveyed downwards with a certain amount of centrifuging and are collected for the greater part in the bottom of the bowl. The fuel next passes through the fine-mesh filter cloth, preferably a metal filter **18**, which also holds back very fine impurities, and is then conveyed upwards through the passage **17**. Here, the finest magnetic metal particles are attracted by the inner surface of the magnetized sleeve **16**. Finally, the fuel passes through the similarly fine-meshed filter **19**.

From the section **1** in Fig. 2 it will be seen that the outer surface of the magnetic sleeve **16** constitutes the bottom in the pockets formed between the vanes **13** and the wall of the casing. In this space also the magnet exercises a certain effect.

The hub **12** may, if desired, be provided with a permanent magnetic covering. This can replace the permanent magnet **16** or function together with the latter. In the former case the sleeve **16** may be cast or die-cast in one piece with the vanes from a non-magnetic material. The passage **17** may be divided into a number of passages by arranging permanently magnetic inserts or walls, shields or the like in the same.

In the example shown in Fig. 4 the spindle **11** projecting upward from the bottom of the bowl **1** is replaced by a spindle **23** screwed into the cover **2**, on the flange-shaped lower part **22** of which the vaned rotor rests. In order to reduce the friction a ball bearing may be provided between the flange and the rotor hub, particularly where large purifiers are in question. The spindle can easily be unscrewed for cleaning the purifier. If desired, the flange may be screwed fast at the spindle, and the latter may be fixed in the cover in a more permanent manner.

What I claim is:

1. Apparatus for removing impurities from liquids comprising a vaned rotor, a casing for the rotor having an inlet and an outlet for the liquid, said rotor being rotatably mounted on a central vertical shaft in the casing, said inlet opening into the casing in a tangential direction at the upper part of the vane circle, a sleeve arranged at a distance around the hub of the rotor thereby to establish an annular channel between the hub wall and the confronting inner wall of said sleeve, the outer wall of said sleeve being located adjacent the radially inner edges of the vanes on said rotor, said outlet being arranged above the sleeve, and a cover plate arranged at the top of the vane circle outwardly in the radial direction of the sleeve so that the liquid entering the casing between the outer part of the vanes will be conveyed downwards in the casing under rotation, being subsequently conveyed upwards in the rising channel between the hub of the rotor and the sleeve to the outlet, a fine-meshed filter at the inlet to the channel, one of said walls forming said channel being magnetized for the purpose of attracting magnetic impurities passing through the filter.

2. Apparatus for removing impurities from liquids comprising a vaned rotor, a casing for the rotor having an

inlet and an outlet for the liquid, said rotor being rotatably mounted on a central vertical shaft in the casing, said inlet opening into the casing in a tangential direction at the upper part of the vane circle, a sleeve arranged at a distance around the hub of the rotor thereby to establish an annular channel between the hub wall and the confronting inner wall of said sleeve, the outer wall of said sleeve being located adjacent the radially inner edges of the vanes on said rotor, said outlet being arranged above the sleeve, and a cover plate arranged at the top of the vane circle outwardly in the radial direction of the sleeve so that the liquid entering the casing between the outer part of the vanes will be conveyed downwards in the casing under rotation, being subsequently conveyed upwards in the rising channel between the hub of the rotor and the sleeve to the outlet, and a fine-meshed filter at the inlet to the channel, said sleeve being constituted by a permanent magnet for the purpose of attracting magnetic impurities passing through the filter.

3. Apparatus for removing impurities from liquids comprising a vaned rotor, a casing for the rotor having an inlet and an outlet for the liquid, said rotor being rotatably mounted on a central vertical shaft in the casing, said inlet opening into the casing in a tangential direction at the upper part of the vane circle, a sleeve arranged at a distance around the hub of the rotor thereby to establish an annular channel between the hub wall and the confronting inner wall of said sleeve, the outer

wall of said sleeve being located adjacent the radially inner edges of the vanes on said rotor, said outlet being arranged above the sleeve, and a cover plate arranged at the top of the vane circle outwardly in the radial direction of the sleeve so that the liquid entering the casing between the outer part of the vanes will be conveyed downwards in the casing under rotation, being subsequently conveyed upwards in the rising channel between the hub of the rotor and the sleeve to the outlet, and a fine-meshed filter at the inlet to the channel, said sleeve being a permanent magnet for the purpose of attracting magnetic impurities passing through the filter, the rotor vanes being constructed of a non-magnetic material.

4. Apparatus for removing impurities from liquids comprising a vaned rotor, a casing for the rotor having an inlet and an outlet for the liquid, said rotor being rotatably mounted on a central vertical shaft in the casing, said inlet opening into the casing in a tangential direction at the upper part of the vane circle, and a sleeve forming a permanent magnet inserted in an axial recess in the part of the rotor vanes located nearest to the rotor hub and at a distance around the hub of the rotor.

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