Nov. 17, 1942. J. W. JOHNSON 2,302,552

METHOD AND APPARATUS FOR TREATING LUBRICATING OILS

Filed April 7, 1938

Fig. 1

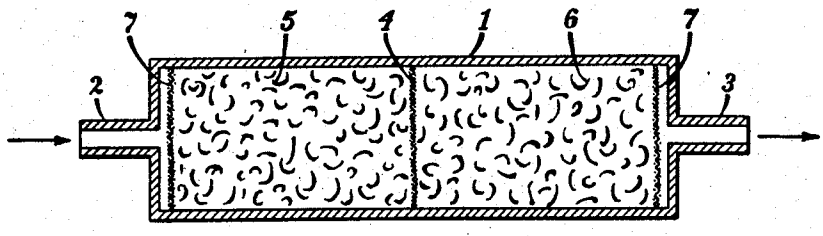


Fig. 2

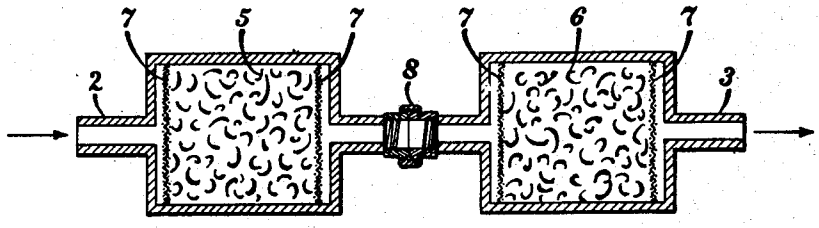
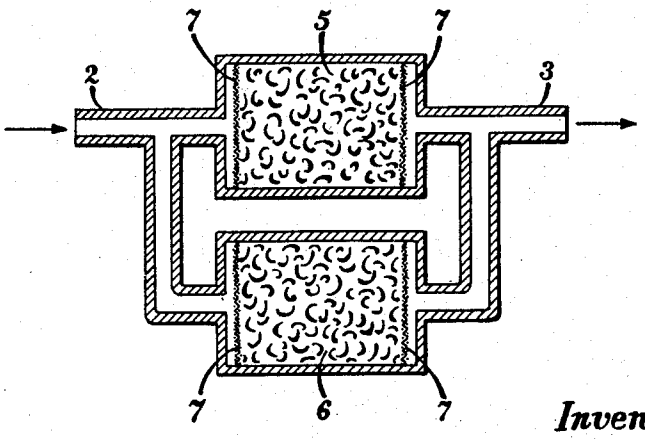


Fig. 3



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METHOD AND APPARATUS FOR TREATING LUBRICATING OILS

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3 Claims. (Cl. 252—10)

The present invention relates to a method and device for treating lubricating oil during its use in the lubrication systems such as may be associated with internal combustion engines, steam turbines, compressors and the like, and relates more particularly to the maintenance of effective concentrations of organic addition agents in said oil during use in such lubricating systems.

A principal object of this injection is the maintenance of effective concentrations of various organic addition agents, such as oxidation inhibitors, sludge inhibitors, film strength agents, and "oiliness" agents in lubricating oil during its use in internal combustion engines.

A further object of this invention is the removal from engine lubricating oil of impurities such as carbon, metal particles, abrasive solids and sludge, prior to its treatment for the maintenance of effective concentrations of organic addition agents.

Heretofore it has been customary to add to lubricating oils, prior to their use, a suitable proportion of one or more agents for inhibiting oxidation, sludging, bearing corrosion and the like, or for the purpose of increasing film strength and "oiliness." Since many of these agents are relatively slightly soluble in lubricating oil, only small quantities thereof could be incorporated in the oil and still retain a satisfactory and marketable appearance. Moreover, upon extended use of these compounded oils, particularly in crankcase service of internal combustion engines, the effectiveness of the added agents progressively decreased, and in many cases such agents failed completely, due to consumption and/or chemical reaction associated with their inhibiting effect.

I have found that such difficulties may be overcome by replenishing the addition agent in the lubricating oil as it is consumed during use. This may be accomplished, in accordance with my invention, by passing oil, for example, from the engine crankcase through a chamber provided with a porous absorbent medium impregnated with an organic addition agent which is soluble in the oil in relatively low concentrations. The oil, in passing through the impregnated absorbent medium, dissolves therefrom sufficient of the addition agent to continuously maintain an effective concentration of the agent in solution therein. Preferably, the oil from the crankcase is first passed through a porous filtering medium, in order to remove carbon, abrasive solids, sludge or the like which would otherwise tend to accumulate on the impregnated absorbent medium and prevent solution of the addition agent in the oil. It is to be understood, however, that the filtering medium may be dispensed with in lubricating systems in which the oil does not become contaminated with foreign solids, sludge, and the like. The organic addition agents which I prefer to employ are those which are soluble in the oil to the extent of, for example, from about 0.02% to about 0.5% at temperatures normally encountered in engine operation, and may be illustrated by the following examples. The percentages given indicate the maximum solubility in engine lubricating oil at ordinary temperatures, the increase of solubility with increase in temperature being very slight. Either a single addition agent, or a mixture of two or more of such agents, may be employed in accordance with my invention.

Sludge inhibitors and bearing corrosion inhibitors:

	Weight, per cent
Thiourea	0.02
o-Tolyl thiourea	0.03
Phenyl thiourea	0.02
Diphenyl thiourea	0.03
S-di-p-tolyl thiourea	0.20
Di-o-tolyl thiourea	0.06
Di-β-naphthylamine	0.05
Catechol	0.50
Tetramethylthiuram disulfide	0.15
Dipentamethylene thiuram monosulfide	0.15
Thiodiphenylamine	0.30
Furfuramide	0.30
p-Hydroxyphenylmorpholine	0.05
2-amino, 4-nitrophenol	0.02
m-Dinitrobenzene	0.30
Sym-trinitrobenzene	0.30
Hexamethylene tetramine	0.20
Pyrogallol	0.05
Resorcinol	0.03
2, 4 diamino diphenylamine	0.30
p-Hydroxy diphenyl	0.15
Di-α-naphthol	0.30
β-hydroxy anthraquinone	0.30
p-Aminophenol	0.30
β-dithio diglycol	0.10
m-Diamino benzene	0.30

Film strength agents:

Tri-phenyl methyl phosphonium iodide	0.10
Tri-butyl methyl phosphonium iodide	0.10
Tri-Phenyl phosphine	0.50
Tri-phenyl phosphoric acid amide	0.50
Diphenyl phosphimate	0.50
Di-o-cresyl phosphimate	0.50
Tri-trichloro phenyl phosphate	0.50

Oiliness agents:

Ethylene glycol distearate	0.50
Stearic acid	0.05
Cerotic acid	0.02
Cetyl alcohol	0.20

My invention may be further illustrated with reference to the accompanying drawing in which Figures 1, 2, and 3 are sectional views of three

modifications of my device for treating engine lubricating oil. In these figures, corresponding elements are similarly numbered.

Referring to Fig. 1, a chamber 1 is provided with an oil inlet 2 and an outlet 3, and may be further provided with a permeable partition 4, such as a metal screen, which divides the chamber into two sections 5 and 6. Section 5 is provided with a loosely packed, porous filtering medium such as clay, hair felt or other fibrous material, and serves to filter foreign solids such as carbon, abrasive particles and sludge from the engine oil. Section 6 is provided with a porous absorbent material, such as cotton waste, impregnated with an organic addition agent which is soluble in lubricating oil in relatively low concentrations. The porous absorbent material may be impregnated with the organic addition agent, if solid, by dissolving the agent in a suitable solvent, saturating the absorbent material with the solution so formed, and removing the solvent by vaporization. The oil, in passing from the filtering section 5 through the impregnated absorbent medium in section 6, dissolves therefrom a small quantity of the organic addition agent, thus compensating for the loss of agent in the oil during use. In order to maintain the filtering medium and the impregnated absorbent medium in position within chamber 1, screens 7 may be provided adjacent the ends of the chamber.

Fig. 2 represents a modified construction of the device illustrated in Fig. 1, the individual sections 5 and 6 being joined by a coupling or union 8. This modification permits renewal of either section 5 or 6 as necessity demands.

Fig. 3 shows a further modification of the device, wherein sections 5 and 6 are connected in parallel, as distinguished from the preferred construction of Figures 1 and 2 in which the sections are disposed in series.

The devices illustrated in Figures 1, 2 and 3 may be installed in the conventional oil circulation system associated with the crankcase of an internal combustion engine, the used oil from the crankcase being introduced into the device by means of oil inlet line 2 and the treated oil withdrawn therefrom through outlet line 3. Each of the devices illustrated may be further provided with a conventional oil by-pass line (not shown) which insures a continuous flow of oil to the engine parts to be lubricated, in the event that the treating device becomes clogged or otherwise disabled.

While I have described my invention primarily with respect to the treatment of oils during use in the lubrication of internal combustion engines, my invention is also applicable to the treatment of lubricating oils employed in oil circulating systems of steam turbines, air or gas compressors, and the like.

What I claim is:

1. A device for purifying lubricating oil and for maintaining therein an effective concentration of an organic addition agent, which comprises, in series, a porous filtering medium and a porous absorbent medium impregnated with an organic addition agent soluble in lubricating oil in relatively low concentrations, means for introducing used oil to the porous filtering medium and means for withdrawing treated oil from the porous absorbent medium impregnated with said organic addition agent.

2. A device for purifying lubricating oil and for maintaining therein an effective concentration of an organic addition agent, which comprises a chamber, a permeable partition disposed within said chamber and dividing said chamber into two sections, a porous filtering medium disposed in one section of said chamber, a porous absorbent medium impregnated with an organic addition agent soluble in lubricating oil in relatively low concentrations disposed in the second section of said chamber, means for introducing used oil into the first mentioned section and means for withdrawing treated oil from the second section of said chamber.

3. A device for purifying lubricating oil and for maintaining therein an effective concentration of an organic addition agent, which comprises a chamber, a porous filtering medium disposed in one section of said chamber, a porous absorbent medium impregnated with an organic addition agent soluble in lubricating oil in relatively low concentrations disposed in a second section of said chamber, means for introducing used oil into the first mentioned section, and means for withdrawing treated oil from the second section of said chamber.

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