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DEVICE FOR CHARGING LUBRICANTS

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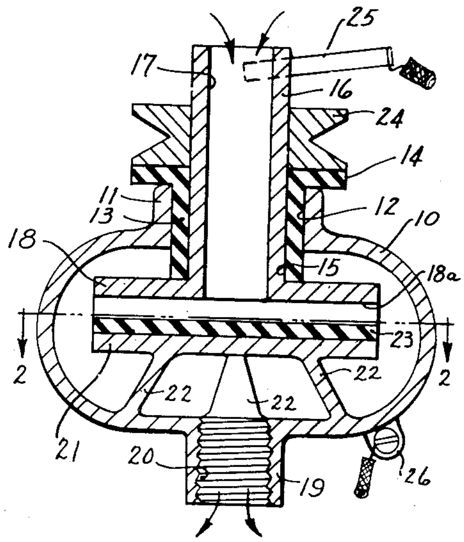


FIG. 1

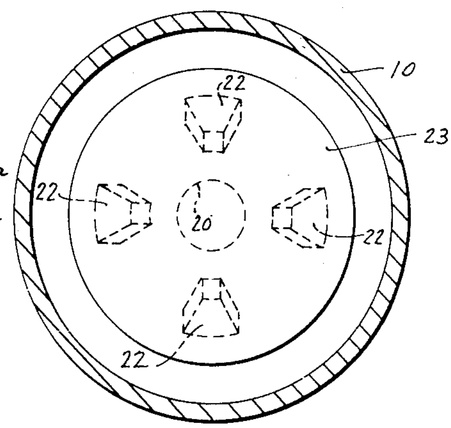


FIG. 2

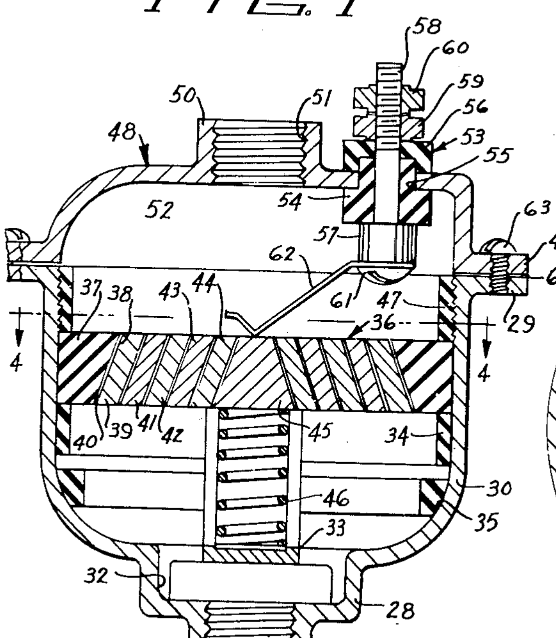
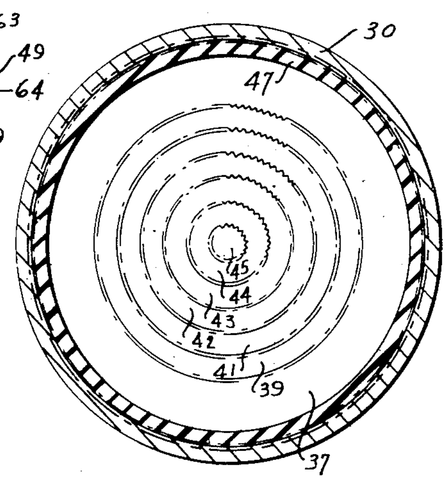


FIG. 3

FIG. 4



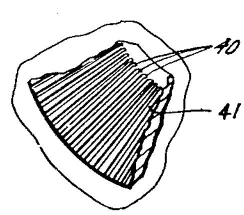


FIG. 5

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DEVICE FOR CHARGING LUBRICANTS

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5 Claims. (Cl. 259—7)

This invention relates to improvements in apparatus for charging fluid lubricants and this application is a division of application Serial Number 253,915, filed October 30, 1951.

The main object of the invention is the provision of apparatus for initially charging lubricating oils by imparting to the molecules of the oil, charges of the same polarity so that they tend to repel each other and produce a lubricating effect similar to the lubricating effect of uncharged oil, however the friction in bearings and between moving parts is substantially less with the charged oil.

Another object of the invention is the provision of apparatus through which oil is passed to charge it initially, said device employing homogenization and a high electrical potential.

Yet another object of the invention is the provision of apparatus through which charged oil in use is passed repetitively for the purpose of maintaining or increasing the charge. For example, by the use of this apparatus installed on an internal combustion engine and connected to a source of high potential electricity, and inter-connected with the crank case of the engine, the oil in the crank case would be continuously and repetitively circulated through the device with the result that the oil would become charged and would continue to remain charged.

Referring to the drawings which are given by way of example to illustrate apparatus for treating oils:

Figure 1 is a cross-sectional elevation of one form of apparatus for electrically charging lubricating oils;

Figure 2 is a view taken along the line 2—2 of Figure 1;

Figure 3 is an elevation, in section, of an oil charger which employs homogenization in addition to a high electrical potential;

Figure 4 is a view taken along the line 4—4 of Figure 3; and

Figure 5 is a fragmentary view showing details of the minute passages through which the oil is forced.

In internal combustion engines the great frictional load appears to be constrained in the lubricating oil and should not occur anywhere else. If there were metal to metal contact scoring would be experienced and the engine would be damaged in a short period of time. This being the case the friction in the oil is caused by the work involved in separating oil layers on the cylinder wall from those on the piston. Hence the work involved is shear work within the oil.

As the oil serves the purpose of covering the metal parts for rubbing against one another it must have the characteristic of forming a practically unbreakable layer over the metal. This layer should not break down under any of the pressures and frictional stresses involved making it necessary to use an oil of a given minimum viscosity. The oil should also have the property of thoroughly wetting the metal so that an unbroken even layer of oil is present over the entire metallic surface.

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It is quite evident that the higher the viscosity of the oil the greater will be the internal friction.

The requirements for a substantially frictionless engine would boil down to the specifications for an ideal lubricating oil, for which a set of requirements would be set up. First of all there is the demand that the oil should form an unbreakable film over all metal parts which may conversibly give rise to friction. Secondly, the oil should have the lowest possible internal friction. These two demands are in apparent contradiction because with the usual oils, covering power is a function of viscosity. The higher the viscosity the tougher the film of oil coating the metal parts, but also the higher the internal friction. Attempts have heretofore been made to impart to oils the characteristic of closely clinging to the metal surfaces with little success and, as far as applicant is aware, no attempt has heretofore been made to create a lubricating oil which has been given the desired characteristics electrically. It appears to applicant that here is the one and only logical way of producing a frictionless lubricant.

Since oil is an insulator it will retain an electrical charge almost indefinitely. In that respect a body of oil so charged would behave as if it were a sort of electrophor as used in the old static experiments of the physics classroom where an electrophor is rubbed with a cat skin. The oil in constant motion or flow may be charged electrically, for example if I flow oil through a metallic sponge, such for example as formed by powder metallurgical processes, said metallic sponge being installed in an insulating ring and held at high potential by means of a source of high tension D. C. electricity, the oil molecules touching the metal would acquire a charge according to the polarity impressed upon the sponge. As soon as such a charge has been acquired, the oil molecule will be violently repelled by the imposed equal charge to be replaced by new neutral molecules which in turn would be so charged. As the oil is practically a perfect insulator the entire body of oil after a given number of recirculations would be completely ionized since all of the molecules will have acquired an electrical charge.

Where such a body of charged oil is used as a lubricant the ionized oil particles having a definite electrical charge would cling to any metallic surface with the greatest of tenacity especially if the metallic surface were capable of loosing any induced charges and hence were self-neutralizing. Under these circumstances it would be practically impossible to free the metal of an atomic or molecular layer of oil since no amount of rubbing pressure could displace the oil layer clinging to it. Hence we have acquired an oil which satisfies the first demand stipulated above for the ideal frictionless lubricant.

Furthermore, such an oil has negligible internal friction due to the fact that the electrical charges on the oil molecules being all of the same polarity had the tendency to offset the normally cohesive characteristics which the uncharged molecules have in ordinary oil and any shear work would be made easier or negligible by the mutual repulsion of the charged particles of oil.

Such an oil in an engine would then be almost ideal because the metal parts are protected against frictional contact and the oil surfaces separating the metal parts are mutually repulsive and consequently offer negligible shear resistance. Such oil then installed in an internal combustion engine would result in a well nigh frictionless engine.

This would be true because the oil would minimize any friction between pistons and cylinder walls and also in the various bearings which would all be "electro-oil plated." Hence such an engine would very closely approach the long sought ideal. Such an engine in operation would not have to generate the 23 H. P.-hour per hour required for overcoming the engine friction losses.

Referring now to Figures 1 and 2, a casing **10** has a boss **11** on its upper end with a passage **12** therethrough into which is pressed an insulating bushing **13** having a flange **14** formed integral therewith. This bushing has an interior bore **15** into which a hollow shaft **16** is journalled. The shaft **16** has an interior passage **17** via which oil flows downwardly. Preferably formed integral with the shaft **16** is a flange **18**.

The casing **10** also has a boss **19** which is preferably in alignment with the boss **11**. This boss has a passage **20** therethrough. A disc **21** is supported by webs **22** in spaced relation to the face **18**a of the flange **18** and the upper surface of the disc **21** carries a disc of insulation **23**. The shaft **16** may carry a grooved pulley **24**, which may be belted to a suitable prime mover, whenever it is desired to rotate the shaft **16** and the flange **18**, however the device will operate either with the shaft **16** stationary or rotating. The thickness of the insulating layer **23** should be approximately one-half of the distance between the flange **18** and the disc **21** and the insulating layer functions to spread the layer of oil out thinly, so that an area of thin oil approximately equal to the area of the disc **18** is subjected to the charge on the disc **18** before it flows over the edges of the insulating disc **23** and falls into the bottom of the chamber and passes out through the passage **20**. It will be understood that this action is repetitive. In addition to this, the rotation of the disk **18** tends to pull the oil comprised in the thin layer on the surface of **23** rotatorially and at the same time, the rotation of **18** causes some of the oil to fly off due to centrifugal force and this oil is replaced by additional oil by the passage **17** so this action is also repetitive. The shaft **16** is connected to a source of D. C. potential of the order of 50,000 volts, one polarity being impressed on the shaft **16** via a brush **25** and the other being impressed on the body **10** by a connection to the lug **26**.

As pointed out above, this device may be connected in series with the oil line, preferably after the oil has passed through the filter and if the engine is supplied with charged oil, this device will maintain it in a charged condition due to the repetitive circulation of the oil through it. If the engine is supplied with non-charged oil, this device will gradually charge the oil and thereafter maintain it charged.

Referring now to Figures 3, 4 and 5, I show a device which employs both a high potential and homogenization. A casing **30** has a flange **29** on one end thereof and is provided with a stepped boss **27, 28** on the other end thereof. The boss **27** has an interior bore **31** through which the charged oil discharges. The boss portion **28** has a counterbore **32** therein to accommodate a spider **33** which is engaged by the lower end of a ceramic spring which will presently be described. Supported by the curved interior wall **35** of the body **30** is an annulus **34** formed of insulation. Supported on the annulus **34** is an outer ring **37** of my new and improved homogenizer **36**. Nested in the ring **37** are several other rings **39, 41, 42, 43** and **44** and the central plug **45**. The ring **39** has a plurality of minute grooves formed on the outer surface thereof and these grooves form with the surface **38**, isolated passages through the homogenizer **36**. The rings **41, 42, 43** and **44** as well as the plug member **45** also have minute grooves like the grooves **40** formed on the outer surfaces thereof which also form minute isolated passages through the homogenizer **36**. The plug member **45** is in effect a keystone and it is pressed upwardly by a ceramic spring **46** which is strong enough to hold the plug member on a level with the other ring members against the pressure of the oil as will presently be described. The inner wall of the body **30** in the vicinity of the flange **29** has internal threads formed therein and these threads are engaged by a threaded ring **47**, which is formed of insulation and the upper end of this ring is shown as flush with the upper surface of the flange **29**.

A cover member **48** has a flange **49** which matches the flange **29**. The cover member also has a boss **50** with a threaded interior bore **51** therein through which oil under pressure is delivered to the interior **52** thereof. The cover member also has a terminal **53** thereon which is comprised of a bushing **54** having a shank extending through a hole **55** and into a counterbore insulating washer **56** on the exterior thereof. A boss **57** has a threaded shank **58** which is engaged by a nut **59** to secure it in the bushings **54** and **56**, and a nut **60** is provided for securing a conductor thereto. The head **57** is tapped to accommodate a screw **61** which secures a contact spring **62** thereto. The contact spring bears on the conical member **45** to supply the homogenizer with potential. The cover member has a plurality of aligned holes therein which are clearance holes for screws **63** which engage corresponding threaded holes in the flange **29**. A suitable gasket **64** is provided between the flanges to render the device fluid tight. Oil under a pressure sufficient to force it through the minute passages **40** between the tapered rings is supplied via the passage **51**, and with one terminal from a source of high potential D. C. is supplied to the terminal **53**. The body **30** is connected to the other terminal of the source so that as the oil passes through the device and out via the passage **30**, it becomes molecularly charged.

The homogenizer **36** is in a sense a metallic sponge, because it is formed of metal and has many minute passages **40** therethrough through which the oil is forced while the homogenizer **36** is charged to a potential of between 50,000 and 125,000 volts. The several rings forming the homogenizer may be formed by powder metallurgy, or they may be formed as a single mass in such a manner that a myriad of minute passages for the oil extend therethrough.

I propose to process the oil initially by means of the device shown in Figures 3, 4 and 5 and supply a smaller similar device or a device on the order of that shown in Figures 1 and 2 to be placed on the vehicle preferably in the oil line returning from the filter.

Although I have herein disclosed a method of reducing the friction between wearing surfaces in mechanisms by means of charged oil, the charging reducing the friction between the different strata of oil between said wearing surfaces, and have shown apparatus by means of which the oil may be initially charged and maintained in a charged condition, I do not wish to be limited to the exact details shown, as many changes may be made in the method and the apparatus within the scope of the following claims.

What is claimed is:

1. In a device for charging the molecules of a lubricant, a casing, a hollow shaft rotatably carried in said casing and insulated therefrom, said shaft having a flange on the lower end thereof, a disc within said casing fixed in a predetermined spaced relation with respect to said flange, an insulating disc positioned on said first-mentioned disc, means to impress a high direct current potential across said shaft and said casing, and means to pass said lubricant through said hollow shaft, between said flange and said insulating disc and then out from said casing.

2. In a device for molecularly charging lubricating oil, a vessel, a stationary metallic plate within said vessel, an insulating coating on said plate, a second metallic plate rotatably carried in said vessel, means to impress a high direct current potential across said metallic plates, and means to move lubricating oil in a layer between said insulation and said second plate.

3. In a device for molecularly charging lubricating oil, a vessel, a stationary metallic plate within said vessel, an insulating coating on said plate, a second metallic plate rotatably carried within said vessel, means to impress a high direct current potential across said metallic plates, means extending from said vessel to be connected

to a prime mover for rotating said second plate, and means to pass a layer of oil between said rotating plate and said insulation whereby the rotary motion of said last plate rolls the molecular structure of the oil under the influence of said potential.

4. In a device for electrically charging the molecules of a lubricating oil, a casing, a non-metallic bushing supported in said casing, a hollow shaft journaled in said bushing and carrying a flange on the lower end thereof, a metallic disc supported within the casing in spaced relation to said flange, an insulating disc on said plate, means to impress a high direct current potential across said shaft and said casing, and means to pass said lubricating oil through said hollow shaft and between the then charged flange and said insulating disc and thence out from said casing.

5. In a device for electrically charging the molecules of a lubricating oil, a casing having a vertical hole formed therein, a non-metallic bushing supported in said hole, a hollow shaft journaled in said bushing and carrying a flange on the lower end thereof, a metallic disc within said casing and coextensive with said flange, said disc and

said flange being spaced apart from one another a predetermined distance, a dielectric disc supported on said first disc and of such thickness as to provide between it and said flange sufficient space to accommodate a stream of lubricating oil delivered into the casing via said hollow shaft, and means to subject said oil to a high direct current potential, said means including connections between a source of high potential direct current, said shaft, and said casing.

References Cited in the file of this patent

UNITED STATES PATENTS

1,360,654	Littlefield	Nov. 30, 1920
2,049,940	Barthel	Aug. 4, 1936
2,132,854	Knott	Oct. 11, 1938
2,203,673	Cornell	June 11, 1940
2,577,247	Irwin	Dec. 4, 1951
2,595,227	Cotton	May 6, 1952
2,620,172	Jenett et al.	Dec. 2, 1952

FOREIGN PATENTS

306,673	Italy	Mar. 29, 1933