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LUBRICATING MATERIAL AND PROCESS OF PRODUCING THE SAME

Benjamin H. Rouse, Russell, Kans., assignor of one-third to Floyd B. Lee and Corder T. Brown, both of Hays, Kans., jointly, and one-third to Clair J. Wilson, M. C. Eddy, Hays, Kans., Floyd B. Lee, St. Louis, Mo., and Corder T. Brown, Kansas City, Mo.

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My invention relates to improvements in lubricating oils for lubricating the moving parts of machines including the cylinders of internal combustion engines, and to an improved process of producing such oils, the primary object of the invention being to provide means whereby the deleterious effects of high temperatures, friction, and corrosive agencies are substantially reduced and in some cases eliminated, and the efficiency and useful life of the machine, part, or engine substantially increased, by endowing the wearing surfaces with substantially permanent lubricating characteristics.

Another important object of the invention is to provide for forming a saturated solution of lubricating oil and microscopic exfoliated "vermiculite" wherein the "vermiculite" is permanently suspended and uniformly dispersed in the oil without any impairment of the lubricating properties and other desirable characteristics of the oil, whereby the oil is endowed with superior lubricating ability as well as insulation against heat and electricity.

A further object is to provide for bringing the properly prepared exfoliated "vermiculite" and the oil into a mechanical mixture so that it will embed itself into the metal or any bearing or wearing surface that the oil may come in contact with and thereby impart to the metal in which it is so embedded the natural inherent qualities of "vermiculite" of lubrication and insulation of heat due to friction and as a result keep the temperature of the metal parts and lubricating oil lower than that of such metal parts and lubricating oil under like or ordinary conditions, thereby prohibiting the production of ordinary amounts of carbon due to heating of the oil such as is formed in internal combustion engines, whether of the Diesel or spark-plug electrically fired type.

A further object is to provide for bringing the finely divided as well as the microscopically divided exfoliated "vermiculite" into a saturated mechanical mixture in the oil in such a way that the "vermiculite," being a non-conductor of electricity, will decrease the possibilities of "shorts" occurring at the spark plugs of internal combustion engines.

Other important objects and advantages of the invention will appear in the following description and the examples therein given for illustrative purposes.

The "vermiculite" concerned herein is a micaceous, laminated, non-metallic inert ore. There are many types and kinds of "vermiculite" all of which when processed as herein described in the pure state have in varying degrees, due to variations in chemical structure, properties of lubrication, insulation against heat especially that generated by friction of moving parts, electrical non-conductivity, and resistance to the action of ordinary solutions of acids and alkalies. The particular "vermiculite" whose treatment and incorporation in the lubricating oil is disclosed herein as constituting the preferred embodiment of the invention is that known as hard fine "grain" or grade as determined by the natural size of the flakes or particles of the untreated ore and by the high temperatures required to exfoliate the ore. Exfoliation in this instance is due to the separation of the laminae by the expansion of the water naturally resident between the laminae. This type of ore lends itself more readily to being ground to the desired microscopic flakes or laminae, about minus 300 mesh, and still retain its natural insulating and lubricating qualities.

The "vermiculite" requires a special mill, known as a hammer-type mill, to grind or reduce the exfoliated "vermiculite" to a minus 300 mesh and from that to a microscopically divided laminae of a few microns in size.

The "vermiculite" must be in as dry a state as possible in order that the hammer-type mill may reduce it to a proper size by dividing it along the natural lines of cleavage of the laminae. This is of specific importance for the larger laminae will, under the specific process of milling to be described later, absorb the oil in which it is suspended by the milling process, into the air cells or spaces between the laminae while the finer particles of the "vermiculite" probably become embedded between the particles or possibly the molecules of the oil. This condition spoken of is of specific importance, as it is probable that it accounts for the fact that these microscopic particles of "vermiculite" leave the oil and become embedded into whatever metal surface or bearings it comes in contact with without losing their lamina form and at the same time retain their properties of lubrication and insulation as shown later in these papers.

Preparation of the ore

After the "vermiculite" ore is separated from the matrix or vein matter of whatever nature or kind it may be found in, it is passed thru screens of from 60 to 100 minus mesh. It is then exfoliated in a special oven or kiln with a direct

flame of intense heat at a temperature of from 1500 degrees F. to about 2500 degrees F.

The resulting exfoliated "vermiculite" is again washed in water or in a 10 percent solution of hydrochloric acid, depending entirely upon whether there is lime or quartz or any calcareous substance present which is separated out by action of the acid. If such acid is used, a bath of alkali solution consisting of any alkali such as sodium hydroxide of sufficient strength to neutralize the acid is used. This is followed by a bath of clear water and the separated foreign matter is precipitated out. As "vermiculite" is not affected in any way by the acid or alkali, the only need for such baths or solutions is for the purpose of removing foreign substances and this varies as stated above with the matrix in which the "vermiculite" is originally found in the vein.

The "vermiculite" is then thoroughly dried by whatever method found convenient, so as to remove as much of the water content as possible. The method of drying is non-essential, but the condition or state of dryness of the "vermiculite" is of vital importance.

The dried "vermiculite" is then ground in a dry state by means of a hammer-type mill. This particular type of grinding is of specific importance, in that it has the effect of splitting the exfoliated "vermiculite" along the natural lines of cleavage of the laminae into sizes of minus 300 mesh and less, the majority of the particles being a few microns in size, this specific grinding being also of specific importance because in the following processes there must not be any foreign material or substance, such as water, in the "vermiculite" to interfere with the mixture of "vermiculite" and oil.

The ground "vermiculite" is then ground again with the oil, the mill used for this purpose being a flapper type mill, such as is disclosed on the Cross Patent No. 2,044,757 granted June 16, 1936, and is so designed as to grind materials as fine as is necessary to put them into a colloidal or semi-colloidal mixture or solution with the oil.

The mill consists of a cylindrical drum, with an axle running thru the length of the cylinder. On this axle are projecting arms or fins, the ends of which are of flexible material and which are pressed against the sides of the cylinder as the axle is rotated.

The oil to be processed, and the "vermiculite" prepared as described above are placed in the flapper type mill in the proportion of one and one-half (1½) drams by volume to one (1) quartz of oil, and the mill run at the desired speed until the mixture has reached a stage of saturation of the "vermiculite" in the oil. The time of milling varies with the speed of rotation of the mill. Thus the faster the rotation the less time it takes. This varies from about thirty minutes to one hour. The essential point is that the oil must reach a saturation point with the "vermiculite."

When the proper state of mixture has been reached, the entire mixture is emptied and the mill refilled or a continuous inflow and outflow of the oil and "vermiculite" can be so arranged that there is a continuous process. This is immaterial as long as the oil and "vermiculite" remain in the mill for the required time and become properly mixed into a saturated solution or mixture.

After the mixture is properly processed as stated above it is passed thru filters of suitable material which are just coarse enough to allow the mixture to pass thru under gravity pressure. This is an essential step as all particles of "vermiculite" which have not been ground fine enough to remain in suspension which is probably colloidal or semi-colloidal, are removed, together with any other substance that might prove harmful.

If the oil and "vermiculite" mixture is to be used in a machine or engine where there is no oil filter where the lubricating oil is circulated, the above process of filtration is non-essential, as the larger particles of 'vermiculite" that might possibly not have been ground by the process of dry grinding and the milling in the oil, will in no wise cause any deleterious effects.

The suspended "vermiculite" remaining in the oil after or before filtration will not gum, crystallize, cake or corrode in any manner or form, in the bearings or moving parts or other metal surfaces.

This mechanical mixture of any oil of whatever kind or condition used for lubrication and finely ground or microscopically ground exfoliated "vermiculite" when properly milled to a saturation mixture or solution in the oil is capable of imparting its inherent properties of lubrication and lower temperatures of oil and working parts of bearings or wearing surfaces to a demonstrable degree, even when it is mixed with other lubricating oils which do not contain the "vermiculite" processed oil in the proportions of one (1) part of the "vermiculite" by volume processed oil to as much as four (4) parts of ordinary lubricating oil.

It is established by experiments and practical tests that the described mixture of oil and properly prepared exfoliated "vermiculite," is capable of being used as a lubricating oil longer than the same oil before being so treated or processed, and has definite and distinctive advantages thereover in that the temperature of the processed oil is lower and the lubricated parts or bearings or surfaces exhibit less friction and remain cooler, thus increasing the efficiency of the moving parts, such as bearings and cylinder walls.

It is further demonstrated by tests and experiments that the "vermiculite" so prepared and processed in any and all lubricating oils will not act as a conductor of electricity, so that its use diminishes the possibility of carbon or other substance collecting on the spark plugs of an internal combustion engine and causing a "short" in the current supplied to the engine, thereby promoting better firing of an internal combustion engine.

Used in a Diesel type of engine, the engine runs cooler and at a more even temperature because of reduced friction and because of the insulating qualities inherent in the suspended "vermiculite," thus making for higher efficiency in such type of engines.

It is further demonstrated, that the processed "vermiculite" enters into and becomes embedded in metal surfaces wherever the oil carrying the "vermiculite" comes in contact with the metal, whether it be the bearings or cylinder walls or other wearing surfaces.

This embedding of "vermiculite" into the metal is of a varying depth and of such a nature that the surface of the metal must be mechanically removed by a lathe or other abrasive in order to remove the "vermiculite." This is essentially of vital importance as it has been demonstrated that the embedding of the "vermiculite" into the metal gives the results of better wearing surfaces due

to the affinity of "vermiculite" for metal and the natural inherent qualities of lubrication and insulation of "vermiculite."

It has been demonstrated that wearing surfaces, such as cylinder walls and bearings will retain the ability to function better for a long period of time after being so treated with lubricating oil having a saturated solution of "vermiculite" as described above, even tho the oil subsequently used for lubrication does not contain the processed "vermiculite."

It has been demonstrated that the results stated above are obtained when ordinary lubricating oil is treated with the "vermiculite"-processed oil in proportions as low as one (1) part of "vermiculite"-processed oil to four (4) parts of ordinary lubricating oils not so treated with "vermiculite."

In the processing of any and all oils used for lubrication, of any condition or kind, it has been found that in the cases of the lighter grades of oil, more "vermiculite" may be suspended therein if the oil is first prepared by the addition thereto of a one percent solution of aluminum stearate in the following manner:

Aluminum stearate powder is dissolved in any suitable solvent such as benzol and added to the oil in such proportions as one percent by volume, while the oil is cold. The oil is then heated to 100 degrees C. or higher, to drive off the solvent after which the oil is cooled and the regular process as described herein is proceeded with.

This process so described is not an essential part of the process for making a saturated solution of "vermiculite" in oil, but may be used to make a heavier suspension of the "vermiculite" in any lubricating oil.

Although I have set forth and described hercin preferred embodiments of the invention, it is to be definitely understood that I do not wish to limit the application of the invention thereto, except as may be required by the scope of the subjoined claims.

What is claimed as new is:

1. A process of producing a lubricant of the character described, said process comprising screening the "vermiculite" through a 60–100 mesh, then exfoliating the screened "vermiculite" by direct flame heating, then washing the resultant to remove foreign matter therefrom, then drying said resultant, then grinding the dried resultant in a hammer mill so as to separate the "vermiculite" into microscopic laminae or flakes along the natural lines of cleavage thereof, then grinding the resultant in company with lubricating oil alone so as to further reduce the "vermiculite" to substantially colloidal form and produce a substantially saturated suspension of the "vermiculite" in the oil.

2. A process of producing a lubricant of the character described, said process comprising screening the "vermiculite" through a 60–100 mesh, then exfoliating the screened "vermiculite" by direct flame heating, then washing the resultant to remove foreign matter therefrom; then drying said resultant, then grinding the dried resultant in a hammer mill so as to separate the "vermiculite" into microscopic laminae or flakes along the natural lines of cleavage thereof, then grinding the resultant in company with lubricating oil containing a relatively small amount of aluminum stearate so as to further reduce the "vermiculite" to substantially colloidal form and produce a substantially saturated non-aqueous suspension of the "vermiculite" in the oil.

3. A process of producing a lubricant of the character described, said process comprising screening the "vermiculite" through a 60–100 mesh, then exfoliating the screened "vermiculite" by direct flame heating at a temperature between 1500° and 2500° F., then washing the resultant to remove foreign matter therefrom, then drying said resultant, then grinding the dried resultant in a hammer mill so as to separate the "vermiculite" into microscopic laminae or flakes along the natural lines of cleavage thereof, then grinding the resultant in company with lubricating oil so as to further reduce the "vermiculite" to substantially colloidal form and produce a substantially saturated non-aqueous suspension of the "vermiculite" in the oil, then mixing the resultant with untreated lubricating oil in the approximate proportion of one (1) part by volume of said resultant to as much as four (4) parts of untreated lubricating oil.

4. A process of producing a lubricant of the character described, said process comprising screening the "vermiculite" through a 60–100 mesh, then exfoliating the screened "vermiculite" by direct flame heating at a temperature between 1500° and 2500° F., then washing the resultant to remove foreign matter therefrom, then drying said resultant, then grinding the dried resultant in a hammer mill so as to separate the "vermiculite" into microscopic laminae or flakes along the natural lines of cleavage thereof, then grinding the resultant in company with lubricating oil so as to further reduce the "vermiculite" to substantially colloidal form and produce a substantially saturated non-aqueous suspension of the "vermiculite" in the oil, the lubricating oil and the dried ground "vermiculite" being ground together in the approximate proportions of one (1) dram of "vermiculite" to one (1) quart of the oil.

5. The process of producing vermiculited oil which includes exfoliating the vermiculite, grinding ore containing vermiculite, mixing the ground ore with oil, while simultaneously reducing and mixing the vermiculite to a degree such that the vermiculite will remain in suspension in the oil, and filtering out the impurities and unground ore.

BENJAMIN H. ROUSE.