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ANTI-SEIZE COMPOSITION

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This invention relates to novel anti-seize compositions useful in the prevention of fusion between intimately engaged surfaces, particularly metal to metal surfaces. It is well known that friction and extreme pressure between two metal parts often causes them to seize or join to each other as if fused. This problem is particularly troublesome with metal screws threaded into metal surfaces. It is generally found that, when this phenomenon occurs, the torque required to release the screw is far in excess of that exerted in tightening the screw. Hence, if seizure occurs, screws set with a near maximum effort by ordinary tools cannot be easily removed.

Many compositions have been suggested and are available which are designed to prevent this type of metal-to-metal seizure. Their characteristics are generally those of heavy lubricants or solid lubricants such as graphite, mica, MoS₂, etc. which provide a high degree of adhesion to each metal surface. The composition of the present invention is a new composition offering a higher degree of anti-seize effectiveness by providing superior extreme pressure characteristics with further attendant advantages which will become apparent.

The composition of the present invention is a mixture of components containing as an essential ingredient 10-20% of one or more chlorinated naphthalenes. This material is a hard wax and must be dissolved in a more fluid carrier to render it suitable for application to metal parts. The carrier solvent of this invention is a mixture of a microcrystalline wax, a grease containing a calcium complex soap, and a petroleum oil. Using the proper constituents in the correct proportions a gel is obtained with a high degree of stability and a viscosity suitable for the intended use. These added constituents also serve to enhance the anti-seize action of the overall composition.

The wax in the carrier is a microcrystalline wax of a limited hardness serving as a diluent or filler and providing an occluding or retaining medium for the petroleum oil. The wax component in an amount of 30-50%, is characterized as follows: Melting point (using ASTM test method D-127) 160-175° F.; penetration (using ASTM test method D-1321) 20-35; flash point (using ASTM test method D-88) 550° to 600° F.; viscosity (using ASTM test method) 70-100 Saybolt Universal units at 210° F. All percentages appearing herein refer to percentage composition by weight.

The grease constituent, 10-30% of the overall composition, provides a stabilizing effect on the gel and prevents separation. The grease is characterized as containing from 10-30% of a calcium complex soap, remainder petroleum oil having a viscosity at 100° F. of 450-550 Saybolt Universal units. The grease may additionally contain oxidation inhibitors as are customarily employed in the art.

The petroleum oil used in the composition of this invention is a highly refined oil having a viscosity at 100° F. of from 500-600 Saybolt Universal units. This oil, in the amount of 15-35% of the overall composition, may additionally contain an oxidation inhibitor. A typical inhibitor is 2,6-di-tert-butyl-p-cresol.

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A preferred composition according to this invention is as follows:

EXAMPLE

	Percent
5 Chlorinated naphthalenes-----	15
Microcrystalline wax-----	40
Grease -----	20
Oil -----	25

More specifically, the chlorinated naphthalenes are predominantly trichloro- and tetrachloronaphthalenes, containing 50% chlorine. This composition is available from the Koppers Company, Inc., under the trade name Halowax 1001. Its specific gravity at 25° C. is 1.60, congealing point 91-94° C., acid number (mg. of KOH/gm.) less than 0.05, flash point: 141° C. and viscosity at 130° C. 30 Saybolt Univ. units.

The microcrystalline wax has a typical melting point of 168-170° C. (using ASTM test method D-127), a penetration value (using ASTM test method D-1321) of 22-32 (typically 29), a flash point (using ASTM test method D-92) 550° to 600° F. and a viscosity of 70-80 Saybolt Universal units at 210° F. (using ASTM test method D-88). A wax having these characteristics is Socony Mobil Wax 2305.

The specific grease of this example contains approximately 20% calcium complex soap and 80% of petroleum oil having a viscosity of 500 Saybolt Universal units at 100° F. Nebula #1 grease, a product of the Esso Standard Oil Company is appropriate.

The oil is a highly-refined turbine oil having a viscosity of 551 Saybolt Universal units at 100° F. The particular oil used in this example also contains 0.5% of an oxidation inhibitor namely, 2,6-di-tert-butyl-p-cresol. Such an oil is available from the Esso Standard Oil Company under the trade name Teresso 65 oil.

In order to illustrate the effective anti-seize characteristics of the above-specified composition, tests were carried out on a MacMillan wear testing machine comparing the seize propensities of various commercial anti-seize compositions in military and industrial use. The nature of this test is well known in the art and the indicia of effectiveness is essentially the amount of weight a bearing member which is coated with the anti-seize composition being tested will carry until seizure or fusion in the bearing occurs. The following table shows the composition, the number of weights and the time in minutes required to initiate seizure. The composition of the above example is designated A-6 for convenience. All compositions were diluted 2 to 1 with mineral spirits to simulate the most desired conditions for actual use whereby a thin film of the compound is applied to the individual parts. The testing procedure for this machine involves the addition of equal weights loaded at intervals of approximately one minute.

TABLE I

Composition	No. of equal weights required for seizure	Time required for seizure in minutes after addition of last weight
A-6-----	17	5
KS-14614-----	5	½
Royco 8 (Lubricant)-----	1	1
Royco 44 (Mil. Spec. T-5544A-Thread Comp'd. containing Graphite Petroleum)-----	7	¾
Royco 81 (Anti-Seize Comp'd. with Mica Base, Mil. Spec. 13881)-----	7	¾

From this table it is apparent that the anti-seize characteristics of the compound of this invention are far superior to those of the known commercial compositions tested. Other distinct advantages in the A-6 composition are its non-toxicity and its consistency and cleanliness which allow for convenient handling by individuals for separate manual treatment of small parts. It is a stable gel composition which will not separate except under very severe conditions. This product additionally provides extreme stability against galvanic corrosion. It is particularly useful for the prevention of seizure between metal screws threaded into aluminum parts, although it is effective in preventing seizure between other materials.

Although specific ranges have been set forth for each essential ingredient of the composition, a general ratio for the three carrier components is 2 parts microcrystalline wax, 1 part grease and 1 part oil. The amount of chlorinated naphthalene should in all cases be from 10-20% and preferably from 13.5% to 16.5% of the overall composition.

The chlorinated naphthalenes useful as the major active constituent of this composition may be any single compound or mixture of compounds containing at least 40% chlorine up to a theoretical maximum of 67% chlorine.

It may become apparent to those skilled in the art that minor deviations from the ranges and ingredients given may be tolerated while still retaining good anti-seize characteristics. All such modifications which still employ the basic character of this composition which are appropriately considered within the skill of the art are also considered to be within the scope of this invention as defined in the appended claims.

What is claimed is:

1. An anti-seize composition comprising (a) 10-20% chlorinated naphthalene containing 40-67% of chlorine,

(b) 30-50% of a microcrystalline wax having a melting point, using ASTM test method D-127, of 160-175° F., a penetration value, using ASTM test method D-1321, of 25-35 and a viscosity, using ASTM test method D-88, at 210° F. of 70-140, (c) 10-30% of grease containing approximately 10-30% of a calcium complex soap and the remainder a petroleum oil having an ASTM viscosity at 100° F. of 450-550, and (d) 15-35% of a petroleum oil having an ASTM viscosity at 100° F. of 500-600.

2. The composition of claim 1 wherein ingredient (a) is present in an amount of 13.5 to 16.5% and ingredients (b), (c) and (d) comprise the remainder of the composition in the ratio b to c to d of 2:1:1.

3. The composition of claim 1 wherein the ingredient (a) contains approximately 50% chlorine.

4. An anti-seize composition comprising (a) 15% chlorinated naphthalene containing approximately 50% chlorine, (b) 40% of microcrystalline wax having a melting point, using ASTM test method D-127, of 160-175° F., a penetration value, using ASTM test method D-1321, of 22-32 and a viscosity, using ASTM test method D-88, at 210° F. of 70-80, (c) 20% of grease containing approximately 20% calcium complex soap remainder essentially consisting of petroleum oil having an ASTM viscosity at 100° C. of 500, and (d) 25% of a petroleum oil having an ASTM viscosity at 100° F. of approximately 551.

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