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LUBRICANT

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This invention relates to a grease suitable for use in lubricating the packings and bearings of pumps, compressors, and valves operating on mixtures of light petroleum hydrocarbons and halogen acids. A specific, non-restrictive example occurs in catalytic isomerization plants where it is necessary to pump a mixture of butane and hydrogen chloride. Straight petroleum oils are unsuitable because of solubility in the hydrocarbon. The usual type of greases containing soaps are likewise unsuitable because of reactivity with hydrogen chloride. Many oils of mineral and vegetable origin are also unsuitable for either or both of the above reasons.

It is an object of this invention to provide a lubricant which is nonreactive with, and resistant to solution in, petroleum hydrocarbons containing halogen acids.

It is a further object of this invention to provide a superior lubricant for mechanical systems operating in the presence of petroleum hydrocarbons and hydrogen halides.

Other objects and purposes will be made apparent in the following disclosure.

In the isomerization of normal paraffins to isomeric forms, anhydrous hydrogen chloride is used as a catalytic promoter. Subsequently to the catalytic reaction the hydrogen chloride is generally condensed at a low temperature, usually at about 40° F., with the hydrocarbon reaction products obtained from the process. The mixture of hydrocarbon and HCl is then pumped to a stripping column where HCl is stripped from the hydrocarbon portion and recycled to the reactors.

The lubrication of the pumps used in charging the stripping column and elsewhere in the process, is a considerable source of trouble, not only from the point of view of selecting a proper packing, but from the lubricant side as well. Commercially available greases containing soaps of various kinds are unsuitable because the soaps and hydrogen chloride combine to form metallic chloride and free organic acid. The oil contained in the original grease may then be either blown out of the packing causing immediate failure of the packing or else it may partially dissolve in the hydrocarbon, and eventually cause failure of the packing by loss of lubricant therefrom. In either case, experience has shown a life of from a few hours to a day or two for the packing when lubricating with ordinary grease. Such frequent overhauls would be ruinous to an otherwise continuous process.

Many vegetable oils, and their combinations with vegetable waxes were also found unsatisfactory. It appears that the basic trouble in many of these combinations is the relatively unsaturated nature of many of these oils as exemplified by relatively high iodine numbers.

Various lubricating compositions with low iodine absorption numbers, either with or without fillers, have given some satisfaction, but their period of useful operation is still short. Examples of such lubricants are petroleum, saturated fats, and saturated fatty acids, to which may be added mica, graphite, asbestos, or other filler. The life of such compositions is generally only two or three times that of the ordinary cup grease.

According to the present invention lanolin is used as a lubricating base to which is added about 10% of flake or powdered graphite. Pump packings regularly lubricated with this composition have given consistently six weeks or more of satisfactory service on pumps continuously operated on mixtures of light hydrocarbons and hydrochloric acid. Like packings in the same service lubricated frequently with cup grease gave only one or two days' service before it was necessary to replace the packings.

For this type of service the lanolin itself has excellent lubricating properties. It is entirely non-reactive with hydrogen halides under conditions of normal temperature and at all pressures we have investigated (up to 350 lbs. per square inch). It is but sparingly soluble in aliphatic hydrocarbons. However, lanolin, when used by itself, readily works out of the packing gland during operation of the pump shaft and, consequently, requires frequent servicing. The addition of the graphite gives a structure to the mixture which substantially retards this tendency to work out of the gland.

A combination of lanolin containing about 10% by weight of graphite has a "light greasy" consistency particularly adapted for application by means of the usual grease guns and pressure fittings. According to the mode of application used and the service requirements of the lubricant a somewhat harder compound may be prepared, if desired, by adding small amounts of beeswax. In preparing a lubricant for the packing glands of pumps, compressors, and similar equipment in continuous operation not more than about 15% of beeswax should be added. Higher proportions may impair the flow of the grease in the packing during operation. Such larger proportions may be added, if desired, in other applications where flow of the lubricant under operating conditions

is not essential. An example of an application where larger proportions of beeswax may be advantageous is in the lubrication of valves and valve stems which are only occasionally subjected to motion. Another example is the lubrication of sleeve, ball, or roller bearings which are exposed to HCl-hydrocarbon mixtures.

The lanolin used for the preparation of the lubricant should be substantially anhydrous, or any water present in the lanolin should be removed during the compounding of the finished lubricant.

Any suitable method for compounding the lanolin and graphite will be satisfactory. An advantageous procedure comprises melting the lanolin and adding the graphite while stirring the mixture. Maintaining the temperature at about 240° F. for from one-half to three hours while agitating will aid in final dehydration. However, it is generally preferable to start with anhydrous lanolin. If graphite of sufficiently fine particles is used, no appreciable settling of graphite will occur on cooling. Consequently, powdered graphite is preferred in the manufacture of the lubricant.

The amount of graphite used may vary from about 1% to about 20%, depending on service requirements, but about 10% is preferred. Its function is largely to act as carrier for the lanolin on the packing. The graphite particles are generally firmly held in the interstices of the packing and serve to maintain a supply of lubricant. Accordingly, the following formula is suggested:

	Per cent
Anhydrous lanolin	99–65
Graphite	1–20
Beeswax	0–15

An alternative method of application comprises making a graphite-lanolin concentrate and applying this to the packing prior to installation. Such concentrate may contain as much as 50% by weight of graphite. In this case, straight lanolin (anhydrous) may be injected into the packing from time to time during operation.

Some care should be used in the selection of packings. Generally an asbestos fibre packing is best. Suitable asbestos packings are marketed by most manufacturers. Cotton duck packings are definitely inferior and their use is not recommended for HCl-hydrocarbon systems. In the presence of butane and HCl, for example, cotton duck packings are altered to hard inelastic slate-like masses. Asbestos packings are not so affected. Certain rubber bonded and metallic packings have been found to be satisfactory.

Commercial packing materials listed above as suitable or their equivalents may be either hot-dipped or otherwise impregnated with this composition prior to use. Such procedure would simplify for the consumer the installation of the packings for HCl-hydrocarbon service.

I claim:

1. A lubricating composition adapted for use in the lubrication of surfaces exposed to mixtures of hydrogen halides and hydrocarbons which comprises a major portion of substantially anhydrous lanolin and a minor portion of graphite.

2. A composition according to claim 1 in which the amount of graphite present is from 1% to 20%.

3. A composition according to claim 1 in which the amount of graphite present is about 10%.

4. A composition according to claim 1 in which the amount of graphite present is from 20% to 50%.

5. A lubricating composition adapted for use in the lubrication of equipment exposed to mixtures of hydrogen halides and hydrocarbons which has the following approximate formula: substantially anhydrous lanolin 99% to 65%; graphite 1% to 20%; and beeswax 0% to 15%.

6. An asbestos packing material for packing glands impregnated with a mixture of substantially anhydrous lanolin and graphite, the percentage of graphite in said mixture being between 1% and about 50% and the major component of said mixture being lanolin.

7. The method of lengthening the life of an asbestos fibre packing in a gland exposed to hydrocarbons mixed with hydrogen halides, which consists in first impregnating the packing with a concentrate of anhydrous lanolin 50% to 80% by weight and finely divided graphite 50% to 20%, and thereafter, from time to time, injecting further anhydrous lanolin into the packing under pressure while in place in the gland, the graphite serving as a carrier for the lanolin and retarding its flow out of the gland.

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