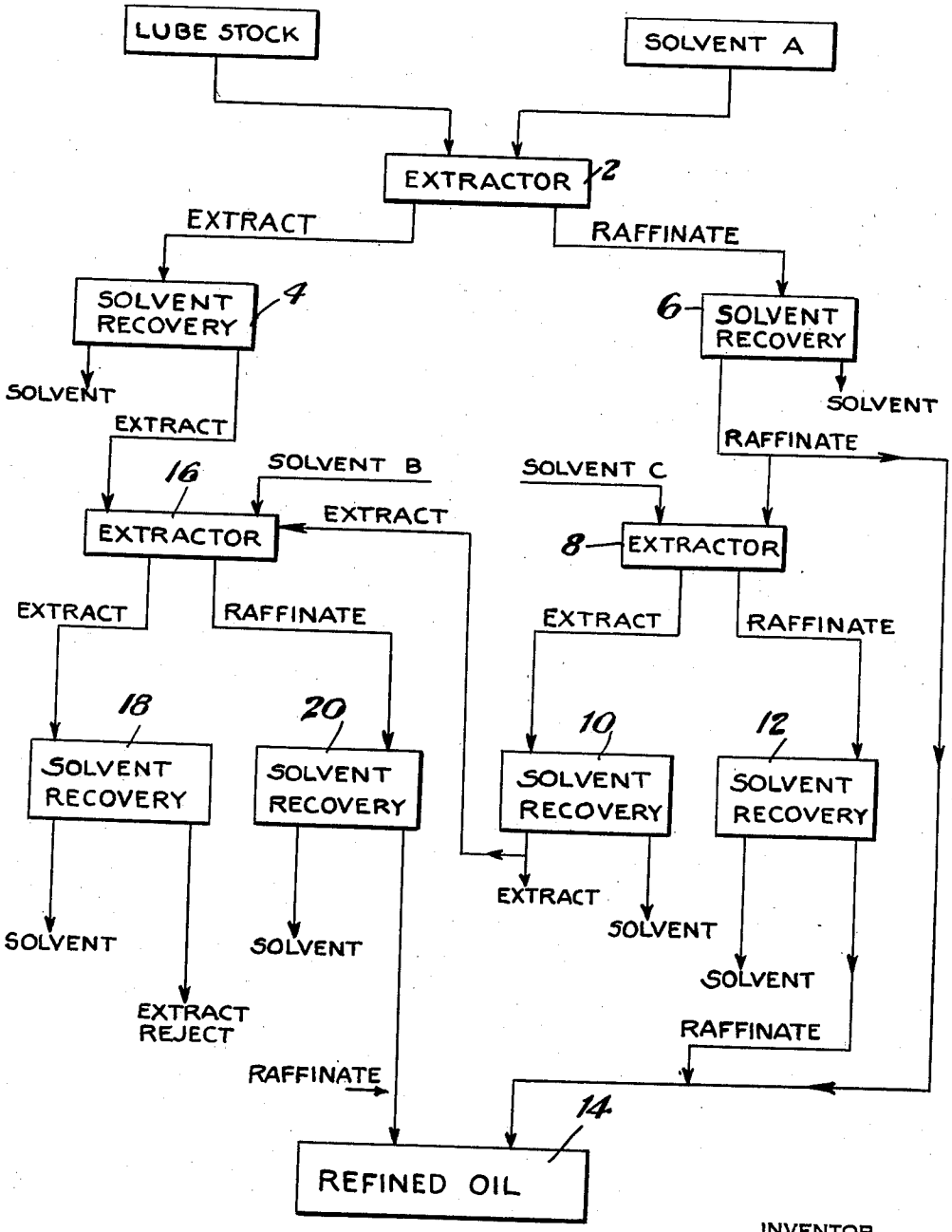
Oct. 29, 1940. H. N. LYONS 2,220,016

PROCESS FOR REFINING LUBRICATING OIL STOCKS

Filed Jan. 21, 1937




INVENTOR
HENRY N. LYONS
BY Edmund F. Baden
ATTORNEY

Patented Oct. 29, 1940 2,220,016

# UNITED STATES PATENT OFFICE

2,220,016

## PROCESS FOR REFINING LUBRICATING OIL STOCKS

Henry N. Lyons, Maplewood, N. J., assignor to Power Patents Company, Hillside, N. J., a corporation of Maine

Application January 21, 1937, Serial No. 121,411

2 Claims. (Cl. 196—13)

This invention relates to a process for refining lubricating oil stocks and more particularly to a solvent extraction process for eliminating undesirable constituents from such stocks.

The solvent extraction processes now being used for the refining of lubricating oil stocks have been found in many cases to reject oil constituents of very unusual lubricating value. This loss of valuable constituents from the oil stock has been due in many cases to the idea that the solvent selected for extraction purposes removed only the undesirable constituents.

The primary object of the present invention is therefore to avoid the defects of prior practice and provide a process for extraction of lubricating oil stocks to remove undesirable low viscosity index constituents, but to provide a process which avoids the loss of certain desirable hydrocarbon constituents which have high viscosity indices.

Another object of the invention is to provide a process of recovering and utilizing certain valuable lubricants normally discarded in solvent extraction processes.

Accordingly the improved process of the present invention comprises the steps of extracting the lubricating oil stock to be refined with a selective solvent such for example as liquid sulfur dioxide to form an extract and a raffinate, removing the solvent from the extract and raffinate, reextracting each with different solvents so that additional undesired constituents are removed from the raffinate and desirable constituents are left in the raffinate of the extract, and blending the raffinates resulting from the reextractions to produce the desired refined oil (after removal of the solvents therefrom). This operation may be modified by eliminating the reextraction of the raffinate, but where both the extract and the raffinate are subjected to the second extraction the same solvent may be used provided the extractions are made under different conditions such as at different temperatures and with different proportions of the solvent.

Other features and advantages of the process of the present invention will be apparent to those skilled in the art from the following more detailed description thereof taken in connection with the accompanying drawing in which the figure is a flow diagram showing the various operations to which the lubricating oil stock is subjected in accordance with the features of the present invention.

Referring to the drawing the oil stock to be treated which may be diluted with naphtha, petroleum ether, liquid butane, propane or a similar hydrocarbon diluent is introduced into an extractor 2 and extracted with a solvent A which may be liquid sulfur dioxide, nitrobenzol, dichloroethyl ether, acetone or furfural, at a selected temperature. The extractor 2 may comprise any suitable pieces of apparatus, commonly known in the art for effecting the desired extraction. The extract is discharged into a solvent recovery system 4, and the raffinate into a separate solvent recovery system 6. The raffinate removed from the solvent recovery system 6 may be conducted directly to a final blending tank or subjected to a reextraction operation at the same or a different temperature, for example in an extractor 8.

The extraction operation carried out in the extractor 2 usually serves to remove most of the undesired constituents contained in the oil, such for example as the naphthenic hydrocarbons, nitrogen bases and undesired aromatic hydrocarbons. The raffinate may still contain some of the undesirable low viscosity index constituents and therefore a solvent C which may be one of those mentioned above but different from the solvent used in the extractor 2, is introduced into the extractor 8 where the raffinate is subjected to a reextraction under conditions adapted to remove any undesirable constituents which may not have been taken up by the solvent previously used. The extract is discharged from the extractor 8 into a solvent recovery 10 from which the solvent is recovered and the oil extract rejected.

The raffinate obtained from the extractor 8 is conducted into a solvent recovery 12 and the solvent free raffinate then conducted into a blending tank 14.

The extract recovered from the solvent recovery 4 has been found to contain a very substantial proportion of desirable constituents (regardless of the solvent employed) such as certain cyclic hydrocarbons, apparently long paraffinic side chain derivatives, which have very desirable characteristics as lubricants. This extract is passed into an extractor 16 and extracted with a solvent B which is preferably different from the solvent used in the extractors 2 and 8. Dichloroethyl ether is a very good solvent for this extraction, particularly where liquid sulfur dioxide is used in the extractor 2. The extract obtained from the extractor 16 is conducted to a solvent recovery system 18 from which the solvent is recovered and the extract rejected.

The raffinate from the extractor 16 is conducted to a solvent recovery system 20 and the resulting solvent free raffinate of the original ex-

tract is conducted into the tank 14 and blended with the raffinate therein to produce the desired refined oil in accordance with the process of the present invention.

The extractors 2, 8 and 16 may include any apparatus elements found necessary in the particular instances, and the various operations may be carried on continuously or intermittently. It is apparent that a single extractor apparatus may be used by storing the original extract and raffinate and subsequently processing them one after the other.

It is apparent from the foregoing description of the process that the extraction of the original extract with a different solvent separates out certain desirable constituents which would normally be discarded in the operation. These desirable constituents are recovered as a raffinate of the original extract and blended directly, either with the original raffinate or with a raffinate recovered in an extraction of the original raffinate.

In carrying out the process the solvent used in the extractor 2 should have properties of removing practically all of the undesirable constituents particularly which tend to adversely affect the high viscosity index of the desired lubricating oil. The solvent used in the extraction operation carried out in extractor 16 should be one which will not take up certain desirable cyclic hydrocarbons to any substantial extent but which would remove any nitrogen bases and naphthenic constituents which would tend to adversely affect the viscosity index of the lubricating oil. This solvent should not take up such constituents as long paraffinic side chain cyclic compounds. The extraction in the extractor 8 may or may not be used, depending on the thoroughness of the treatment in the extractor 2 or whether or not the raffinate from the extractor 2 contains undesirable constituents.

The extractions carried out in the extractors 8 and 16 may be effected with the oils diluted with naphtha, petroleum ether, butane or propane. But the extraction in 16 has been found to be more satisfactory when carried out in the presence of a diluent such as benzene which is a better solvent for high molecular weight cyclic compounds of the type referred to.

The extract recovered from the solvent recovery system 10 may be introduced into the extractor 16 for the recovery of desirable constituents which may have been removed in extractor 8, although it is desirable to employ a solvent in the extractor 8 which will be extremely selective on the very small proportion of undesirable constituents left in the raffinate from the extractor 2. Various other modifications may be made in the operation without departing from the spirit of the present invention since the composition of petroleum oils varies considerably in accordance with their origin, and therefore require somewhat different treatment. The selection of the solvent for any particular part of the operation should be based not only upon the character of the oil to be extracted, but upon the conditions under which the extraction is to be carried out such as the temperature, pressure and proportion of solvent. The oil stock to be treated should be substantially free of asphalt and preferably wax free, although stocks relatively low in wax may be dewaxed after the refined blend is formed in the tank 14.

Having thus described the invention in its preferred form, what is claimed as new is:

1. In the process of refining lubricating oil stocks containing relatively high and relatively low viscosity index constituents by extracting the oil stock with a selective solvent for the low viscosity index constituents and thereby forming a raffinate phase containing the relatively high viscosity index constituents and an extract phase containing the relatively low viscosity index constituents, the improvement which comprises separating the phases and removing the solvent from the extract and raffinate phases, extracting the said extract with a different selective solvent adapted to leave a raffinate phase containing relatively high viscosity index constituents, extracting said first mentioned raffinate with a selective solvent to more completely dissolve the relatively low viscosity index constituents contained therein to thereby produce an extract and leave a raffinate phase comprising relatively high viscosity index constituents, mixing said last-mentioned extract with said first-mentioned extract prior to the extraction, and blending said last mentioned raffinate with the raffinate obtained by the said extracting of said extract to produce a refined lubricating oil stock.

2. In the process of refining lubricating oil stocks containing relatively high and relatively low viscosity index constituents by extracting the oil stock with a selective solvent for the low viscosity index constituents and thereby forming a raffinate phase containing the relatively high viscosity index constituents and an extract phase containing primarily the relatively low viscosity index constituents, the improvement which comprises separately extracting the extract and raffinate phases, the extraction of the raffinate phase being effected to remove the relatively low viscosity index constituents contained therein, mixing the resulting extract obtained from the raffinate phase with said extract phase, extracting the resulting mixture with a solvent adapted to leave a raffinate phase containing relatively high viscosity index constituents, and blending the resulting raffinate obtained from the mixture of extracts with the raffinate obtained from the extraction of the original raffinate phase to produce a lubricating oil stock of relatively high viscosity index.

HENRY N. LYONS.