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METHOD OF PURIFYING HEAVY FUEL OIL FOR FUELING INTERNAL COMBUSTION ENGINES

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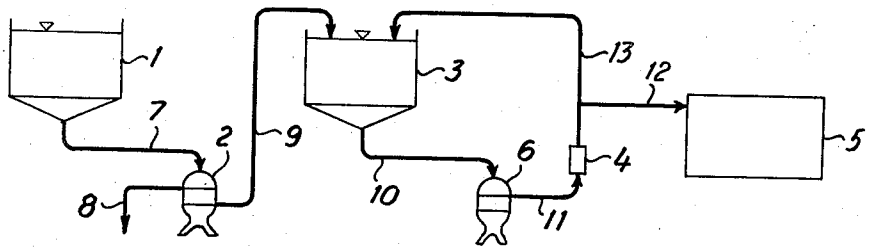


Fig. 1

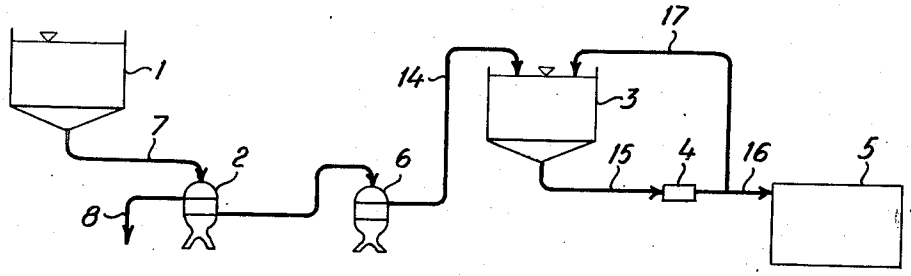


Fig. 2

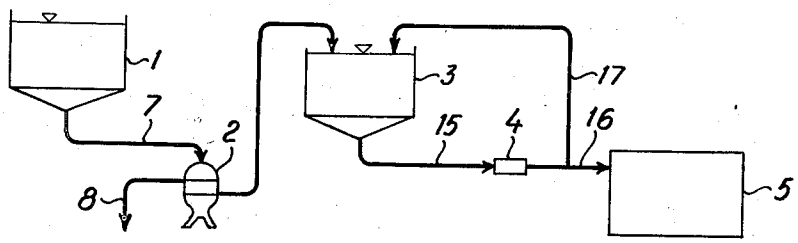


Fig. 3

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METHOD OF PURIFYING HEAVY FUEL OIL FOR FUELING INTERNAL COMBUSTION ENGINES

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6 Claims. (Cl. 208—187)

This invention relates to an improved method of purifying heavy fuel oil intended for use as a fuel in internal combustion engines.

Heavy fuel oils are now used as a fuel in internal combustion engines, especially diesel engines. To make this possible, these oils must be purified carefully before being fed into the engine, as the wear on the engine parts will otherwise be too great. As a rule, the purification of the fuel oil is carried out in centrifuges in two stages, the centrifuges being often connected in series. In the first centrifuging stage, water and coarse impurities are largely eliminated by means of a separator of the purifier type. In the second stage, the fine solid particles, which are more difficult to separate, are removed by a separator of the clarifier type. After separation, the oil is passed into a so-called day tank from which it is then fed into the engine, as required. According to circumstances, the oil will thus remain in the day tank for an indefinite time.

The centrifuging is generally carried out at an elevated temperature (for example, about 85° C.), which facilitates the centrifuging. This means, however, that the oil in the day tank also has this elevated temperature or at least approximately this temperature. Partly due to the increased temperature and partly due to the length of the storage period, heavy hydrocarbons (asphalt substances) are precipitated in the day tank to an extent which may vary from time to time, these substances forming lumps, or agglomerates. The distribution of these asphalt substances in the oil is generally uneven. This, in turn, affects the combustion in the engine, in that the engine at times will be supplied with oil having a considerably increased concentration of asphalt substances which are more difficult to burn than the rest of the oil. In this way, the engine will rapidly become dirty, a drawback which should, of course, be avoided if possible.

The present invention has for its principal object the provision of a method of purifying heavy fuel oil for use in fueling internal combustion engines, whereby the above-mentioned drawback is avoided.

In the practice of the invention the oil is purified by centrifugal separation in one or more stages, the oil being stored for a variable time in a day tank before being fed into the engine. According to the invention, the aforementioned drawback is eliminated by reason of the fact that the oil, after centrifuging, is subjected to homogenizing so that precipitates and agglomerates of heavy hydrocarbons (asphalt substances) which may be present in the oil are mechanically disintegrated and finely dispersed in the oil. The homogenizing can be carried out by means of a homogenizing device built into the centrifuge or, if several centrifuging stages are used, into the last-stage centrifuge; or it can be effected by a homogenizing device provided separately from the centrifuge.

The invention is described more in detail in the following, with reference to the attached drawing in which

Figures 1, 2 and 3 illustrate diagrammatically three different forms of a plant for carrying out the method.

According to Figs. 1 and 2, the centrifuging is carried out in two stages, while in Fig. 3 it is carried out in only one stage. As shown in each of the figures, the plant comprises a storage tank **1** for the fuel oil to be purified, a centrifuge **2**, a day tank or storing zone **3**, a homogenizing apparatus **4** and an internal combustion engine **5**. In the plant according to Fig. 1, the centrifuge in the second stage is indicated at **6**, and here the day tank **3** is placed between the centrifuges **2** and **6**. The homogenizing apparatus **4** is located immediately after the centrifuge **6** in the second stage. From the storage tank **1** the fuel oil to be purified is supplied to the centrifuge **2** through a pipe line **7**. From the centrifuge **2**, which may be of the purifier type, a component containing mainly water and coarse solid impurities is discharged through an outlet **8**. The oil component from this separator is led through a pipe line **9** to the day tank **3** and from the latter through a pipe line **10** to the centrifuge **6** in the second stage. To the outlet **11** of this centrifuge, which may be a clarifier, the homogenizing apparatus **4** is connected. From the homogenizer **4** the oil is led partly via a pipe line **12** to the engine **5** and partly through a pipe line **13** back to the day tank **3**. In this plant, oil is thus kept in constant circulation through the circulation circuit formed by the day tank **3**, the pipe line **10**, the centrifuge **6**, the pipe line **11**, the homogenizing apparatus **4**, and the pipe line **13**, whereby any formation of lumps or agglomeration of the asphalt substances is effectively prevented and these substances are more evenly dispersed in the oil.

The homogenizing apparatus **4** can be of any conventional form. Also, while it is shown as an apparatus independent of the centrifuge, it can be built into the centrifuge proper as is well known in the art. In the latter case, the centrifuge is preferably a paring disc centrifuge, in which the paring disc has such a shape that the desired fine dispersion or homogenization of the asphalt substances in the oil is obtained in it.

In case of varying load on the engine, the day tank **3** serves as a buffer between the engine on one hand and the centrifuge **6** and the homogenizing apparatus **4** on the other hand. It is possible that the engine **5**, the homogenizing apparatus **4** and the centrifuge **6** can be synchronized in such a way that all the oil passing from the homogenizing apparatus **4** is consumed directly in the engine **5**. In this case, the pipe line **13** is, of course, of no use and can therefore be eliminated.

In the plant shown in Fig. 2, the centrifuges **2** and **6** are coupled in series, one directly beyond the other, and the oil is conveyed from the second centrifuge **6** to the day tank **3** and from this to the homogenizing apparatus **4**, from which the oil is led directly into the engine. The homogenizing apparatus **4** must, of course, in this case be separate from the centrifuge **6**. The oil is passed from this centrifuge through a pipe line **14** to the day tank **3**, from the latter through a pipe line **15** to the homogenizing apparatus **4**, and from the latter through a pipe line **16** to the engine **5**. Part of the homogenized oil may be returned via a pipe line **17** to the day tank **3**, so that in this case too a circulation is maintained through the day tank **3**.

The plant shown in Fig. 3 differs from that in Fig. 2 only in that the centrifuging takes place in a single stage by means of the centrifuge **2**. The day tank **3** and the homogenizing apparatus **4** are thus arranged between the centrifuge **2** and the engine **5**, forming with the pipe lines **15** and **17** a circulation circuit for homog-

enized oil which is not supplied to the engine **5** via the pipe line **16**.

The engine **5** may be a diesel engine, or it may be an internal combustion engine of another kind, such as an internal combustion turbine.

I claim:

1. In the purification of heavy fuel oil for use in fueling internal combustion engines, wherein the oil is subjected to centrifugal separation, the oil being stored in a storing zone, the improvement which comprises homogenizing the oil after the centrifugal separation, whereby precipitates and agglomerates of heavy hydrocarbons which are present in the oil are mechanically disintegrated and finely dispersed in the oil.

2. The method according to claim 1, in which the centrifugal separation is effected in at least two stages, the oil from the next to the last stage of separation being fed to the storing zone and thence to the last stage of separation and the homogenizing operation, the method comprising also the steps of feeding part of the oil from the homogenizing operation to the engine and returning the remainder of the oil to the storing zone.

3. The method according to claim 1, in which the centrifugal separation is effected in at least two stages, the oil from the last stage of separation being fed to the storing zone and thence through the homogenizing operation to the engine.

4. The method according to claim 1, in which the centrifugal separation is effected in at least two stages, the oil from the last stage of separation being fed to the storing zone and thence to the homogenizing operation, the method comprising also the steps of feeding part of the oil from the homogenizing operation to the engine and returning the remainder of the oil to the storing zone.

5. The method according to claim 1, in which the centrifugal separation is effected in at least two stages, the oil from the storing zone being fed to the last stage of separation and thence through the homogenizing operation to the engine.

6. The method according to claim 1, comprising also the steps of feeding part of the oil from the homogenizing operation to the engine and returning the remainder of the oil to the storing zone.

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