Patented Aug. 29, 1944 2,357,184

UNITED STATES PATENT OFFICE

2,357,184

FUEL FOR MOTOR VEHICLES

Jean Leon Maurice Frejacques, Paris, France; vested in the Alien Property Custodian

No Drawing. Application April 7, 1942, Serial No. 438,045. In France October 21, 1940

2 Claims. (Cl. 44—52)

Liquid ammonia has already been proposed as a replacement fuel for motor vehicles. It presents a number of advantages making it worth while to consider its use. It is already being produced on a very large scale, and eventually it may be made solely from air and water, with the use of hydraulically produced electric energy, i. e. from raw materials which are present practically unexhausted in nature. Compared to hydrogen and other compressed gases, ammonia has the advantage of requiring for storage only comparatively low pressures, so that the dead weight to be transported is considerably reduced. In case of accidents, the dangers of explosion are further considerably reduced, while the tank leakages cannot be ignited, thus reducing the dangers of fire.

The calorific value per litre of the ammonia fuel mixture is, however, less than that of gasoline mixture, and its use in an engine therefore brings about a corresponding decrease in the power output.

It is also known that ammonia, used alone, will burn badly in an ordinary engine, and that, for obtaining an absolutely correct operation, it is necessary to add to it a small proportion, of about 5 to 15% of a combustible gas, such as hydrogen, CO or town gas. This necessity, however, sets up, in use, a serious complication, the above gases having to be stored in separate, high pressure containers.

For overcoming this difficulty, it has already been proposed to break up part of the ammonia into nitrogen and hydrogen by causing it to pass over a suitable catalyser, but this necessitates the installation, on board the vehicle, of rather complicated devices and makes the starting laborious.

The present invention concerns another means for overcoming the said difficulty. This means is based upon the fact that acetylene is comparatively very soluble in liquid ammonia and that the applicant has found that it is possible to obtain easily mixtures containing up to 20% of acetylene by weight without unduly increasing the vapour pressure of the liquid ammonia. It has further been found by the applicant that the mixtures containing at least 3% of acetylene by weight will burn quite correctly in an ordinary engine and that the presence of acetylene, while increasing the calorific value of the cylinder charge, will advantageously compensate for the small loss of power resulting from the use of liquid ammonia alone. From the latter point of view, it may be interesting to employ mixtures very rich in acetylene, the contents of the latter amounting up to about 20%, while the corresponding pressures are quite reasonable and the dangers of explosion are very low. In practice however, an acetylene contents ranging from 10 to 12% by weight is very adequate. At 25° C., mixtures of this sort have vapour pressures of the order of 9 to 10 kg./sq. cm. for pure liquid ammonia, and the partial pressure of the acetylene in the gas, in equilibrium with the liquid, is only 3 to 4 kg./sq. cm. The mixtures may be stored without difficulty in ordinary containers for liquid ammonia.

For use, it is advantageous to arrange for the ammonia tank to be operated as a siphon, and to cause the drawn liquid to pass into a small evaporator heated by the exhaust gases. The evaporator may, besides, consist simply of a pipe of reduced cross-section, wound around the exhaust pipe and covered with asbestos.

The distribution of fuel to the engine may be effected by means of one of the many existing types of pressure reducing and metering devices for compressed gases existing on the market, some of which are very easy to install, without eliminating the possibility of operation with liquid fuels. The alteration to be made to the vehicle is therefore comparatively simple and cheap. Lastly, the starting of the vehicle is easy and does not require the use of liquid fuels, the mass of the apparatus being sufficient for supplying the heat required for evaporating the ammonia up to the moment when the exhaust pipe reaches its working temperature.

Having now particularly described and ascertained the nature of my invention and the manner in which it is to be performed, I declare that what I claim is:

1. A fuel for internal combustion engines consisting of liquid ammonia with a partial vapor pressure of approximately ten kilograms per square centimeter at 25° C. and containing from three to twenty per cent by weight of dissolved acetylene.

2. A fuel for internal combustion engines consisting of liquid ammonia with a partial vapor pressure of approximately ten kilograms per square centimeter at 25° C. and containing from ten to twelve per cent by weight of dissolved acetylene.

JEAN LEON MAURICE FREJACQUES.