

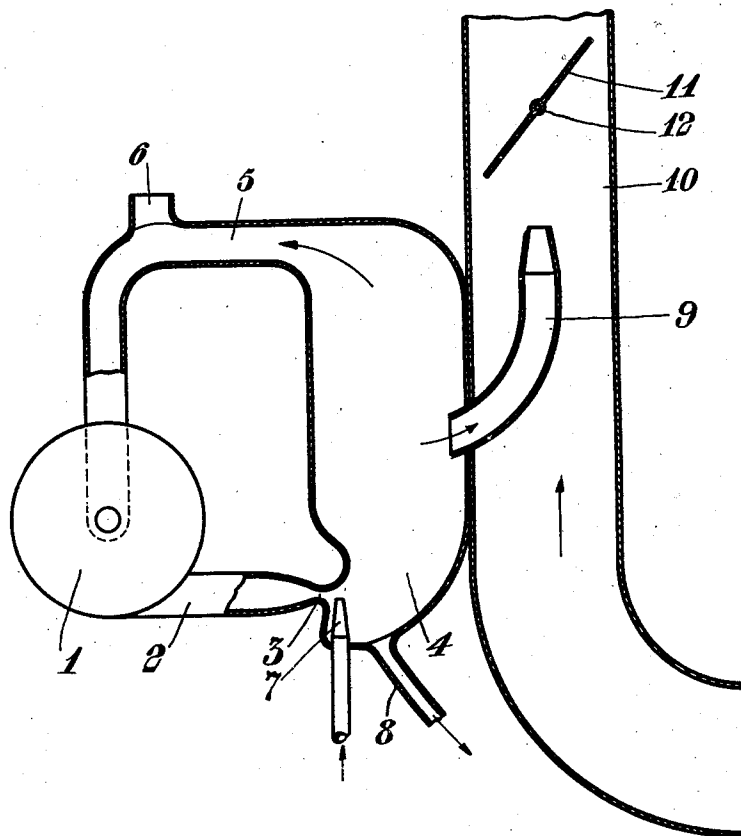
April 26, 1927

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1,625,997

METHOD OF AND APPARATUS FOR ATOMIZING LIQUID FUEL

Filed May 6, 1922



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METHOD OF AND APPARATUS FOR ATOMIZING LIQUID FUEL.

Application filed May 6, 1922, Serial No. 559,035, and in Germany May 7, 1921.

The present invention relates to a method of atomizing liquids, particularly liquid fuel for internal combustion engines, by means of a gas current which is led with a high velocity over the liquid to be atomized and thus carries with it and atomizes the liquid, and also to an apparatus for the carrying out of said method. Among such prior methods of atomizing fuel two fundamentally different procedures may be distinguished. According to a method adapted for high pressure engines the gas current, which is admitted under excess of pressure, atomizes each time the entire quantity of fuel which is in readiness. For measuring the quantity of fuel required at such time a fuel pump is thus necessary and for this reason this method is not very suitable for fast running engines. According to a method adapted for explosion engines the liquid fuel is in readiness in a practically unlimited quantity, and the measuring of the quantity of fuel required for a working cycle is effected in such manner that the total quantity of air required for a working cycle is led past the fuel nozzle and thus becomes charged with fuel. This method has the disadvantage, however, that the composition of the combustible mixture is dependent to a great extent on the number of revolutions of the engine, and becomes too rich in fuel at a high speed, but too poor in fuel at low speed. A further disadvantage of the said method consists in that for acceleration of the atomizing air current only the very small pressure difference between the atmospheric pressure and the vacuum in the engine is at disposal, so that in order to attain a sufficient high velocity of the air current the air conduit must be very much constricted in the vicinity of the fuel nozzle. The result will be that engines having such atomizing apparatus operate with an unfavourable volumetric efficiency also at full load and normal number of revolutions.

The present invention has for its object to avoid the said disadvantages. For this purpose the present method principally consists in causing the gas current utilized for the atomization wholly or partly to circulate. In the case of atomization of liquid fuel for internal combustion engines the said circulation can take place quite independently of the number of revolutions and

the output of the engine in a separate passage from which the quantity of fuel mist required at each time may be taken, and to which a corresponding new quantity of air or gas is automatically admitted. For this purpose a fan or the like may be connected in the path of circulation for generating and maintaining the gas current, and further there may be connected in the path of circulation a collecting chamber of greater volume which thus becomes filled with mist of the liquid, and from which said mist is taken, so that thus the required quantity of fuel mist is always at immediate disposal.

In the accompanying drawing, an apparatus for atomizing liquid fuel for an internal combustion engine is illustrated by way of example.

Referring to the drawing, 1 denotes a fan driven in any suitable manner, 2 is the pressure conduit from the fan which is constricted at 3 to form a nozzle and is afterwards enlarged to form a collecting chamber 4, and 5 denotes the suction conduit which communicates with the atmosphere, or with a gas conduit, through a pipe connection 6. The suction conduit 5 communicates with the chamber 4, so that the parts 1, 2, 4, and 5 form a continuous passage or circuit in which the circulation of the gas current may take place. The fuel nozzle 7 which communicates with a float chamber, not illustrated in the drawing, opens into the said passage immediately beyond the constriction 3. A pipe 8 leads from the bottom of the chamber 4 to the fuel tank, so that the excess fuel may flow back into the tank. The chamber 4 also communicates through a pipe 9 with the air suction pipe 10 of the engine, which pipe leads to the cylinders of the engine and may be closed more or less by means of the throttle valve 11 which turns on the shaft 12.

The apparatus described operates in the following manner:

When the fan 1 is driven with the necessary speed there is produced in the circuit or passage 2, 4, 5 a circulating gas current. The current will of course obtain its highest velocity in the constriction 3, and the gas current will therefore atomize very finely the fuel admitted through the nozzle 7, so that the collecting chamber 4 will always be

filled with a fuel mist of approximately atmospheric pressure. If now the engine draws air through the pipe 10, a certain quantity of such fuel mist will be drawn
 5 from the chamber 4 by the air current flowing past the opening of the pipe 9 and will be mixed with the air. The air drawn in and the fuel mist practically following the same laws of flow, there will always be obtained a properly proportioned mixture of
 10 fuel mist and air, notwithstanding a varying number of revolutions of the engine, that is to say, notwithstanding a varying velocity of the air in the pipe 10. The throttle valve 11 serves for regulating the engine for different loads, said valve closing the suction conduit more or less and thus controlling the filling of the engine cylinders. It would of course also be possible to
 20 provide a throttle member in the pipe 9 and thus to influence the composition of the mixture. Finally, by utilizing two throttle members it would also be possible to operate with control of the mixture as well as of the filling. Air or gas flowing in through the pipe connection 6 in the same proportion as fuel mist is taken from the collecting chamber 4, the gas current serving for atomizing the liquid fuel is of course in no
 30 manner influenced by the control and the running of the engine.

In practice the fan 1 is of course preferably driven by the engine for the driving of which the atomizing apparatus serves. It
 35 is suitable to connect between the engine and the fan an intermediate gear which makes it possible to drive the fan with a constant number of revolutions independent of the speed of the engine. In order to avoid
 40 ignition in the atomizing apparatus, for instance in the chamber 4, it may in certain cases be suitable to use instead of the air a neutral gas free from oxygen, and it may also be advantageous to introduce in the
 45 atomizing circuit a hot gas, for instance hot

exhaust gas, for preheating and vaporization of the fuel.

I claim:

1. The method of atomizing liquid fuel for an internal combustion engine, which
 50 consists in passing a current of gas past such liquid fuel so as to atomize and mix said fuel with said gas, maintaining at least a substantial portion of said current of gas and atomized fuel mixed therewith in circulation in a circuit past such liquid fuel,
 55 delivering a portion of such mixed gas and atomized fuel to the intake of the engine, and admitting a corresponding quantity of fresh gas to said circulating current.

2. An apparatus for atomizing liquid fuel, comprising in combination a circulation passage, means for admitting liquid fuel into said passage, means for generating and maintaining a current of gas in circulation through said passage past said liquid
 65 admitting means, an outlet from said circulation passage for discharging a mixture of gas and atomized fuel, and an inlet for fresh gas to said circulation passage.

3. An apparatus for atomizing liquid fuel, comprising in combination a circulation passage, means for admitting liquid fuel into said passage, means for generating and maintaining a current of gas in circulation through said passage, means for discharging a mixture of gas and atomized fuel from said circulation passage, means for admitting fresh gas into said circulation
 75 passage, and means for draining excess liquid fuel from said passage.

4. The combination with an internal combustion engine, of a circulation passage for atomized fuel, a conduit for conveying fuel from said passage to the combustion chamber of said engine, and means for maintaining a quantity of atomized fuel in circulation in said passage during the operation of said engine.

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