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STUDY OF THE STAGES OF DEVELOPMENT OF A GAS-CYLINDER ENGINE SUPPLY SYSTEM

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Abstract
Gas engines are widely used in modern city vehicles. It uses compressed or liquefied natural, industrial and synthetic gases. Compressed and liquefied gases are stored in special cylinders, which is why vehicles are called gas cylinders.

Keywords: gas cylinder supply system, gas supply, fuel in an internal combustion engine, gas machine operation process.

Introduction

Gas engines are widely used in modern city vehicles. It uses compressed or liquefied natural, industrial, and synthetic gases. Compressed and liquefied gases are stored in special cylinders, which is why vehicles are called gas cylinders. Usually, it is created on the basis of gas-powered engines that run on liquid fuel in series (massively). When converting a mass-produced engine to work with gaseous fuel, its main parts and components remain unchanged [1-7]. The main difference between the gas-powered modifications is the fuel transfer system, ignition, and regulation of the combustible mixture.

The Main Part

Conversion of carburettor engines to gaseous fuel is carried out in two ways. The first method is to create a gas modification of a standard carburettor engine by equipping it with gas cylinder devices. In this case, the possibility of running the engine on both gasoline and gas remains. At the same time, the engine reaches full power on gasoline, and the power decreases slightly on gas [8-15]. In the second method, a special gas engine that achieves full power on gaseous fuel is created from a carburettor engine. Due to the fact that such engines have increased compression and the installation of a gas mixer, efficiency indicators are significantly improved.

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The second method (gas-diesel) provides for the simultaneous operation of the engine with diesel fuel and gas. The engine is equipped with a gas cylinder device for transferring gaseous fuel [16-24].

The gas is transferred to the inlet pipe through the mixer and mixed with air is sucked into the cylinders. At the end of the compression stroke, diesel fuel is injected into the cylinders, which acts as an ignition spark. Its amount is 20 per cent of the amount used in the normal diesel process. This method does not require fundamental changes to the engine design. The gas diesel method is widely used for car engines. Both methods are used for most stationary engines [25-34]. The duty cycle of a gas engine, duty cycle of a gas engine is almost no different from the duty cycle of a gasoline engine. A set of equipment (equipment) installed in a car to run its engine on gaseous fuel is called a gas cylinder device.

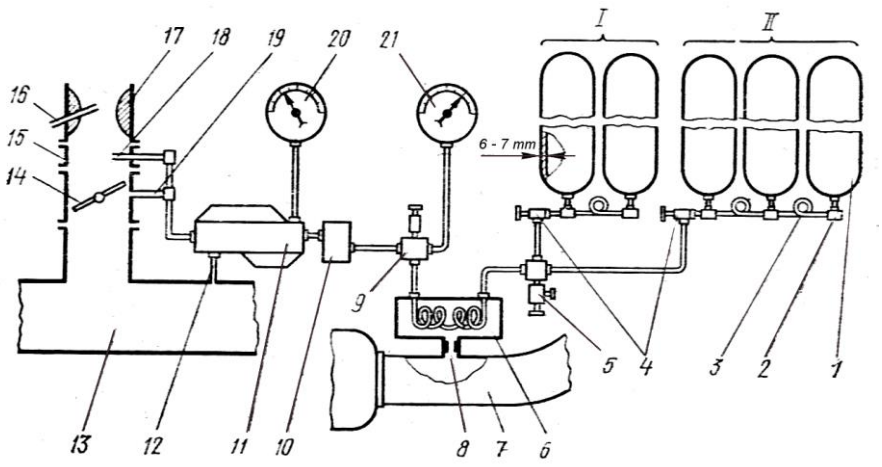

Figure 1. The principle (main) scheme of gas cylinder equipment

1-cylinders; 2-Connecting fittings; 3-steel tubes; 4-spending tap; 5-filling tap; 6-heater; 7-pipeline of used gas exhaust system; 8-dosing puck; 9-trunk tap; 10-filter; 11-reducer; 12-connecting tube with pipe; 13-input pipeline; 14-throttle valve; 15-base; 16-sprayer; 17-carburetor-mixer; 18-nozzle; 19-salting tube; 20-low pressure manometer; 21-high pressure manometer.

Gas cylinder devices are mainly divided into two types: compressed and liquefied gases. The peculiarity of the device with a gas cylinder is that the gas flows under high pressure in the cylinders in any case. Therefore, a reducer is introduced into the system, which makes it possible to reduce the gas pressure [35-41]. The principle (main) scheme of gas cylinder equipment working with compressed gas is shown in Figure 1 below, and its layout in passenger cars is shown in Figure 2.

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Compressed gas to a pressure of 20 MPa is stored in five steel cylinders 1, divided into two groups (I and II), each with a volume of 50 l, installed under the loading platform. The cylinders are connected to each other by means of interconnecting fittings 2 and tubes 3. As a result of the differentiation of the car frame, tube 3 is provided with compensators so that they do not break. Gas from the cylinders passes through the exhaust valve 1,4 heater 6 to the main valve 9, then it is cleaned in the filter 10 and passes to the reducer 11. In reducer 11, the gas pressure is reduced to atmospheric pressure.

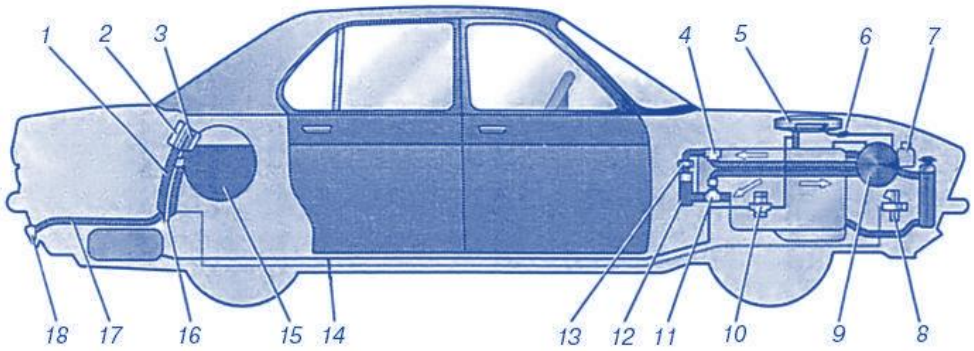

Figure 2. Scheme of the arrangement of gas equipment in the car

1-ventilation pipe; 2-sealed box; 3-reinforcement; 4, 11-tees; 5 blender; 6-dispenser; 7-control unit; 8-electromagnetic gas valve with filter; 9-reducer superheater; 10-electromagnetic gasoline valve; 12-cabin heater; 13-heater tap; 14-pipe high pressure; 15- duralumin balloon; 16 ejectors; 17-transition pipe; 18-casting device

Due to the sudden decrease (expansion) of the gas pressure, if it contains moisture, it can freeze and cause a violation of the normal operation of the system. Therefore, the gas is transferred through the heater 6. The heat of the gases used for heating the gas is used 7.8.

When the engine is not running, the reducer closes the gas line. In the working engine, due to the resulting rarefaction, the gas passes through the nozzle 18 to the carburettor-mixer 17 and mixes with air to form a gas-air mixture. In salt mode, the gas is directly injected into the lower part of the throttle through tube 19 [42-49]. The gas pressure in the cylinders and the amount proportional to it are controlled by means of the high-pressure manometer 21. The operation of the reducer is controlled using the low-pressure manometer 20.

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Both manometers are installed on the instrument panel in the car cabin [47-54]. Cylinders are filled with gas through the valve (faucet) 5. The device shown in the picture is universal, and thanks to the reserve gasoline fuel system, it provides the possibility of normal operation even on gasoline.

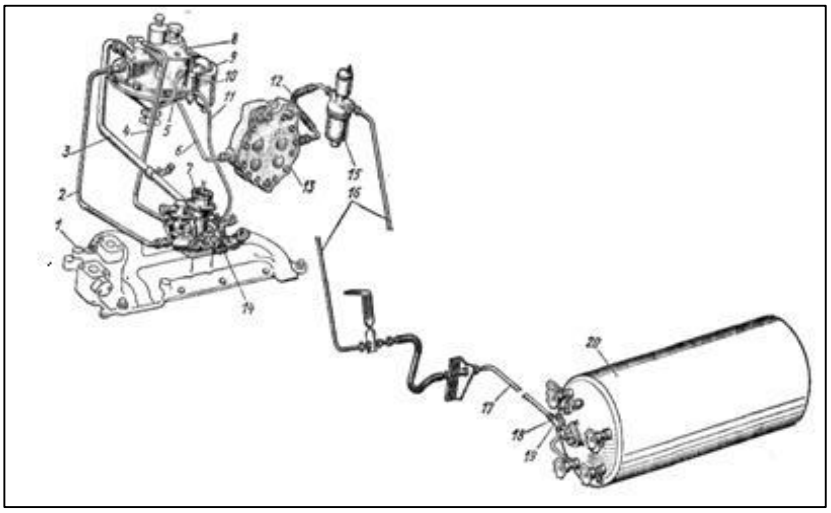

Figure 3. Scheme of the liquefied gas supply system of the car
1 – ventilation pipe; 2 – hermetic box; 3 – armature; 4, 11 – tees; 5 – mixer; 6 – dispenser; 7 – control unit; 8 – electromagnetic gas valve with a filter; 9 – reducer evaporator; 10 – electromagnetic gasoline valve; 12 - cabin heater; 13 – heater coil; 14– high pressure pipe; 15 – duralumin cylinder; 16 – ejectors; 17 – passage pipe; 18 - pouring device.

In devices working with liquefied gas, the transition of gas to a vapour state takes place in a special heat exchanger, i.e. in an evaporator. The peculiarity of the liquefied gas device is that its working pressure does not depend on the amount of gas in the cylinder, but depends on the component composition of the gas mixture and the ambient temperature to determine the amount of liquefied gas in the cylinder, unlike the compressed gas device. A special level indicator should be installed in the liquefied gas device.
Liquefied gas is stored in a 225-litre cylinder 20, which is installed under the platform and is attached to the left side spar of the frame. Exhaust valves are installed on the front wall of the cylinder, through which the gas passes from the triple (troy) of cylinder 19 to the speed valve 18. The gas is taken from the gas from the tee 19 and passes through tubes 16, and 17 to the electromagnetic valve 15.

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When the ignition is connected, the gas is transferred through a high-pressure hose 12 to the vaporizer 13 installed in the intake manifold 1 of the engine. Gas from evaporator 13 enters the two-stage reducer 8 and reduces its pressure. A filter 9 is installed before the first stage of the reducer. From the cavity of the second stage of the reducer, the gas goes to the dosing-economizer device, and from it, the required amount of gas is sent to mixer 7 following the engine's operating mode. The engine start system includes an electromagnetic start valve 10 with metering nozzles, tubes and valve shut-offs. When starting a cold engine, after the start valve is connected, the gas passes from the first stage of the reducer under pressure through tube 2 to the mixing system.

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