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(54) Calibrated injector assembly for feeding an internal-combustion engine, particularly for electric power generators

(57) A calibrated injector assembly (1) for feeding internal-combustion engines (2), particularly for electric power generators, comprising a box-like body (4, 5) that forms internally a cavity (6), a duct (13) for connecting said cavity (6) to a combustion chamber of said engine (2), at least one first nozzle (18) for feeding fuel into said box-like body (4, 5) proximate to an inlet to said duct, and a plurality of holes (11) formed in said box-like body (4, 5) for feeding combustion-supporting air into said cavity (6), said holes (11) being formed in order to ensure a given stoichiometric ratio with respect to said fuel.

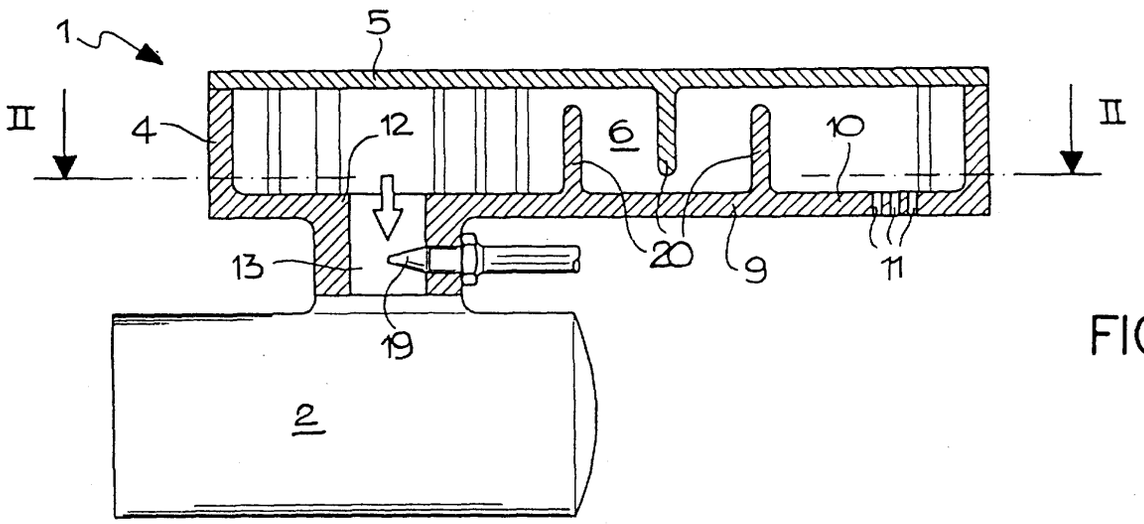

FIG 1

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Description

[0001] The present invention relates to a calibrated injector assembly for feeding internal-combustion engines, particularly for electric power generators, therefore for engines adapted to run at a constant speed.

[0002] Electric power generators are known which are powered by a single-cylinder internal-combustion engine and are typically used to recharge batteries of campers or the like.

[0003] The engines used in such electric power generators are characterized in that they have their maximum conversion efficiency by turning at a constant rotation rate, at which the efficiency of the entire electric power generator is optimized.

[0004] Therefore, since the rotation rate of electric power generators is affected by limited variations with respect to an optimum value, the parts of the carburetor that are designed to mix air and fuel in the intended quantities and proportions appear to be susceptible of constructive simplifications.

[0005] The aim of the present invention is therefore to provide a fuel injector assembly that has a considerably simplified structure with respect to conventional carburetors used in internal-combustion engines.

[0006] An object of the present invention is to reduce the intake noise caused by the shock wave that follows the combustion stroke of the engine.

[0007] Another object of the present invention is to provide an injector assembly that is particularly suitable for mixing gaseous fuel.

[0008] This aim and these and other objects are achieved by the present calibrated injector assembly for feeding internal-combustion engines, particularly for electric power generators, characterized in that it comprises a box-like body that forms internally a cavity, a duct for connecting said cavity to a combustion chamber of said engine, at least one nozzle for feeding fuel into said box-like body proximate to the inlet to said duct, and a plurality of holes formed in said box-like body for feeding combustion-supporting air into said cavity, said holes being formed in order to ensure a given stoichiometric ratio with respect to said fuel.

[0009] Further features and advantages will become better apparent from the detailed description of a preferred but not exclusive embodiment of a calibrated multiple injector assembly according to the invention, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

Figure 1 is a sectional view of the injector assembly of the invention, taken along a longitudinal plane;
Figure 2 is a sectional view, taken along the line II-II of Figure 1.

[0010] With reference to the figures, the reference numeral 1 generally designates a calibrated injector assembly for feeding two-stroke internal-combustion engines, particularly for electric power generators. Such assembly 1 feeds the two-stroke internal-combustion engine 2, to which it is rigidly fixed by means of a bracket 3. The internal-combustion engine is not shown in detail, since it is fully conventional.

[0011] The multiple injector assembly 1 is constituted by a metallic box-like body, which is substantially shaped like a prism with a rectangular base and is composed of a tray 4 which encloses a cavity 6 together with a lid 5. The tray 4 and the lid 5 are fixed one another by way of screws (not shown), which engage in threaded holes 8 of a peripheral wall 7 of the tray 4.

[0012] The tray 4 comprises a substantially rectangular bottom 9, in a portion 10 of which there are multiple calibrated holes 11 arranged along multiple rows. A duct 13, provided with the bracket 3 for fixing to the internal-combustion engine 2, extends from an opposite end 12 of the bottom 9.

[0013] The longitudinal walls of the tray 4 form, at the hole for entering the duct 13, two respective bends 14 and 15, which ideally divide the cavity 6 into two chambers 16 and 17, the first whereof is smaller than the second. A calibrated nozzle 18 is arranged on a lateral surface of the chamber 16 and is suitable to introduce the fuel. A second calibrated nozzle 19 is fixed to the duct 13, and oil for lubricating the combustion chamber of the internal-combustion engine 2 is introduced through the second nozzle. Three partitions 20 are provided inside the cavity 6 and are arranged transversely to the length of the box-like body; two of such partitions extend from one side wall 7 of the tray 4 to the other and are fixed to the tray 4, while the remaining partition, which also has the same dimensions, is fixed to the lid 5.

[0014] Operation of the invention is as follows: air is aspirated through the calibrated holes 11 into the cavity 6, at the end of the chamber 17; the calibration is such that the holes 11 allow the inflow of an amount of air that is equal to the amount required in order to provide the correct stoichiometric ratio with the fuel, particularly gaseous fuel, introduced with a constant flow-rate by the calibrated nozzle 18.

[0015] The path is such that every fluid thread of the air stream is subjected to an alternated sequence of positive and negative accelerations and of direction changes owing to the presence of the partitions 20; the motion of said fluid thread is of the turbulent type.

[0016] The air, after entering the chamber 17 of the cavity 6, mixes with the fuel introduced through the nozzle 18 into the chamber 16. It should be noted that the larger quantity of air that arrives from the chamber 17 gathers, due to the suction of the engine, directly in the duct 13, facilitating correct mixing.

[0017] The resulting mix of air and fuel is aspirated into the intake duct 13, where the nozzle 19 introduces the lubricating oil at a constant flow-rate. The mix of air and fuel in which the lubricating oil is suspended advances along the intake duct until it is introduced in the cylinder of the two-stroke internal-combustion engine 2.

[0018] It has thus been shown that the invention allows to provide a carburetor that has no moving parts (comparable to the throttle valve of conventional internal-combustion engines) and is therefore constructively extremely simple and highly effective in obtaining an explosive air-gas mix.

[0019] The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims.

[0020] For example, if it is necessary to provide a plurality of stable operating states of the engine, each characterized by a different rotation rate of the engine, it is necessary to provide a number of different flow-rates of the explosive mix, provided by the assembly according to the invention, that is equal to the number of said operating states.

[0021] Such a condition is achieved by providing a larger number of calibrated holes in the lower surface of the tray 4, in the portion 10. Those holes can be partially closed, according to a number of variations equal to the number of said operating states of the engine, by means of a partition that is actuated in a gate-like fashion: said partition can, for example, be able to slide within a guide and can be locked along said guide in the positions that correspond to each one of the partial closures of the holes that provide the air supply that is required in each instance.

[0022] The number of the calibrated nozzles for introducing fuel is equal to the number of said operating states of the engine that one wishes to provide: only one of said nozzles might operate in order to provide the minimum-speed condition (which corresponds to the minimum opening of the calibrated holes on the part of the movable partition), or two or more of said nozzles, taken in pairs, can operate simultaneously for the other operating states, which are characterized by higher engine speeds (which correspond to larger openings of the calibrated holes on the part of the movable partition).

[0023] All the details may further be replaced with other technically equivalent ones.

[0024] In practice, the materials used, as well as the shapes and the dimensions, may be any according to requirements without thereby abandoning the scope of protection of the appended claims.

The disclosures in Italian Patent Application No. BO2002A000251 from which this application claims priority are incorporated herein by reference.

[0025] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the scope of each element identified by way of example by such reference signs.

Claims

1. A calibrated injector assembly (1) for feeding internal-combustion engines (2), particularly for electric power generators, **characterized in that** it comprises a box-like body (4, 5) that forms internally a cavity (6), a duct (13) for connecting said cavity (6) to a combustion chamber of said engine (2), at least one first nozzle (18) for feeding fuel into said box-like body (4, 5) proximate to an inlet to said duct, and a plurality of holes (11) formed in said box-like body (4, 5) for feeding combustion-supporting air into said cavity (6), said holes (11) being formed in order to ensure a given stoichiometric ratio with respect to said fuel.

2. The assembly according to claim 1, **characterized in that** it comprises at least one second nozzle (19), which is installed in said connecting duct (13) and is adapted to introduce lubricating oil.

3. The assembly according to claim 1, **characterized in that** said first nozzle (18) is adapted to feed gaseous fuel.

4. The assembly according to claim 1, **characterized in that** said calibrated holes (11) are formed in a surface of the box-like body (4, 5) and can be controlled partially by means of a partition that can be actuated in a gate-like fashion in order to control the quantity of aspirated air.

5. The assembly according to one of claims 1 to 3, **characterized in that** said box-like body (4, 5) is substantially shaped like a prism with a rectangular base and is composed of a tray-like element (4) and of a lid (5) which encloses said cavity (6) together with said element, said cavity (6) comprising two chambers between which said duct (13) is arranged, one of said chambers being connected to the outside by means of said plurality of holes (11), said fuel supply nozzle (18) leading into the other chamber.

6. The assembly according to claim 5, **characterized in that** it comprises at least two calibrated nozzles (18) that can be selected in order to feed fuel according to the intended quantity, said holes (11) being controlled by said partition so as to achieve the stoichiometric ratio with respect to said quantity of fuel.

7. The assembly according to one of the preceding claims, **characterized in that** partitions protrude into said cavity, are interposed between said plurality of holes and said duct, and form a labyrinth-like intake path.

FIG 1

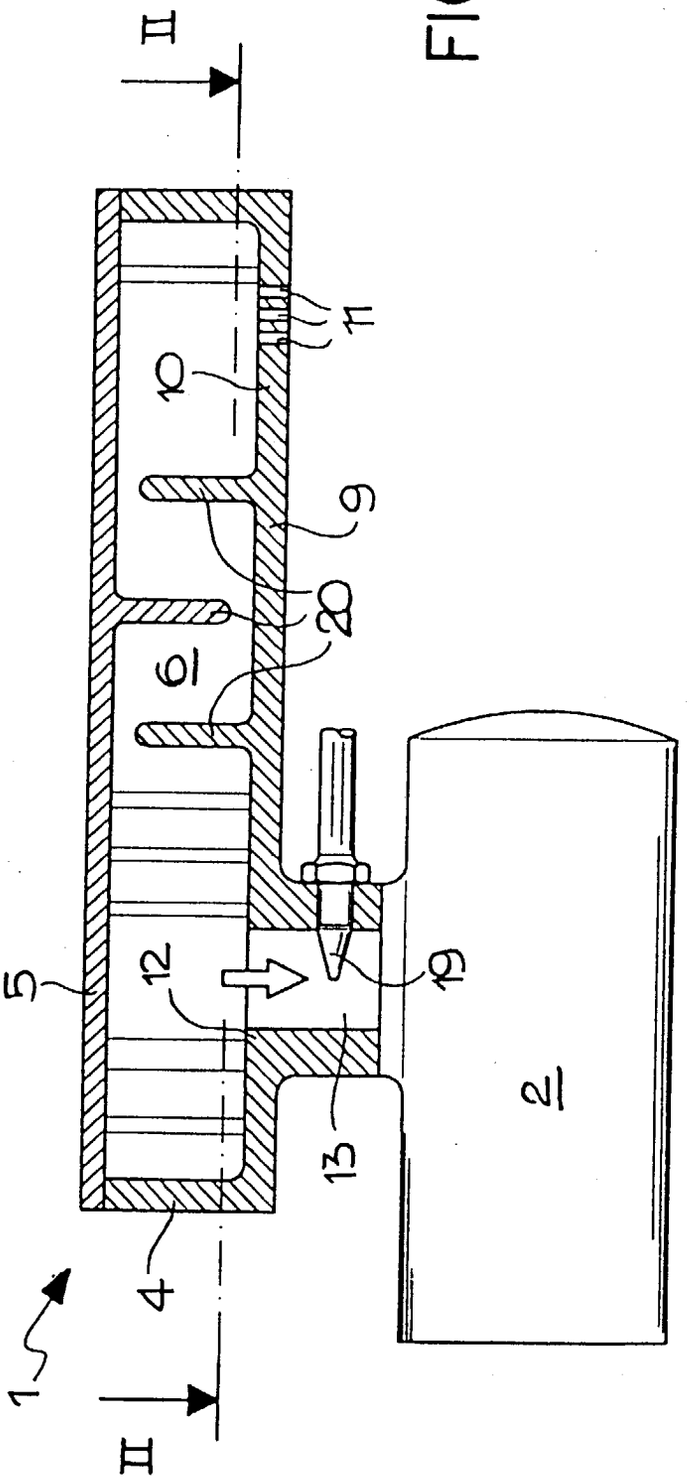
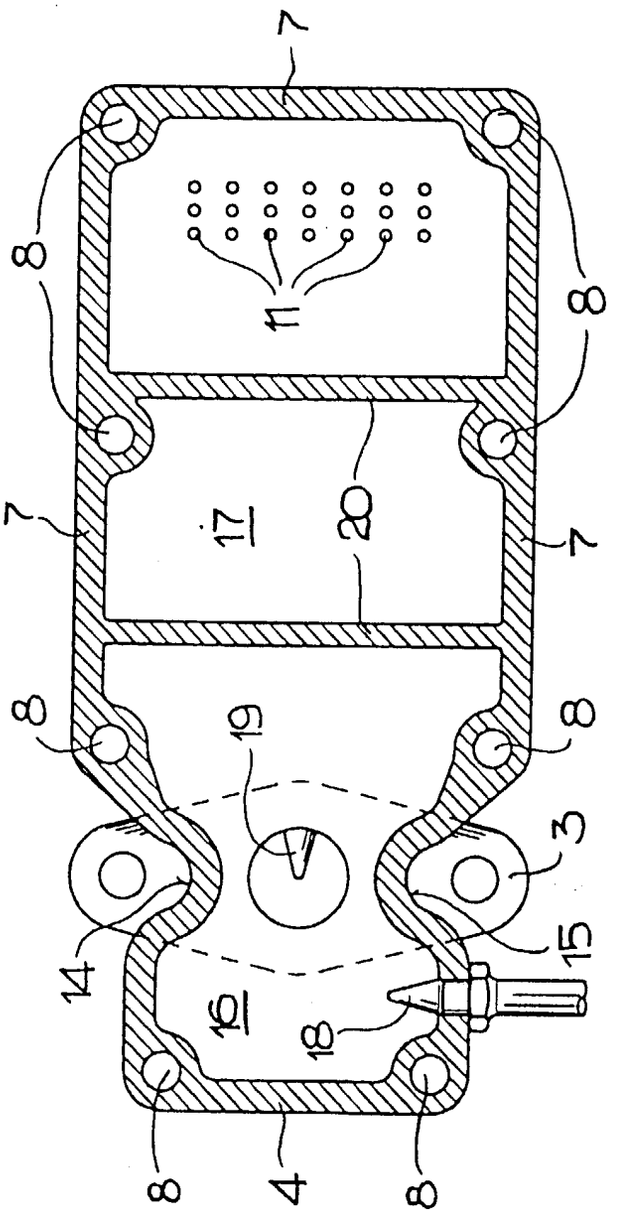


FIG 2



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EUROPEAN SEARCH REPORT

Application Number
EP 03 00 8777

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	23 June 2003	Blanc, S

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