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INSTALLATION FOR PRODUCING A STARTING MIXTURE FOR
INJECTION-TYPE INTERNAL COMBUSTION ENGINES

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2 Sheets-Sheet 1

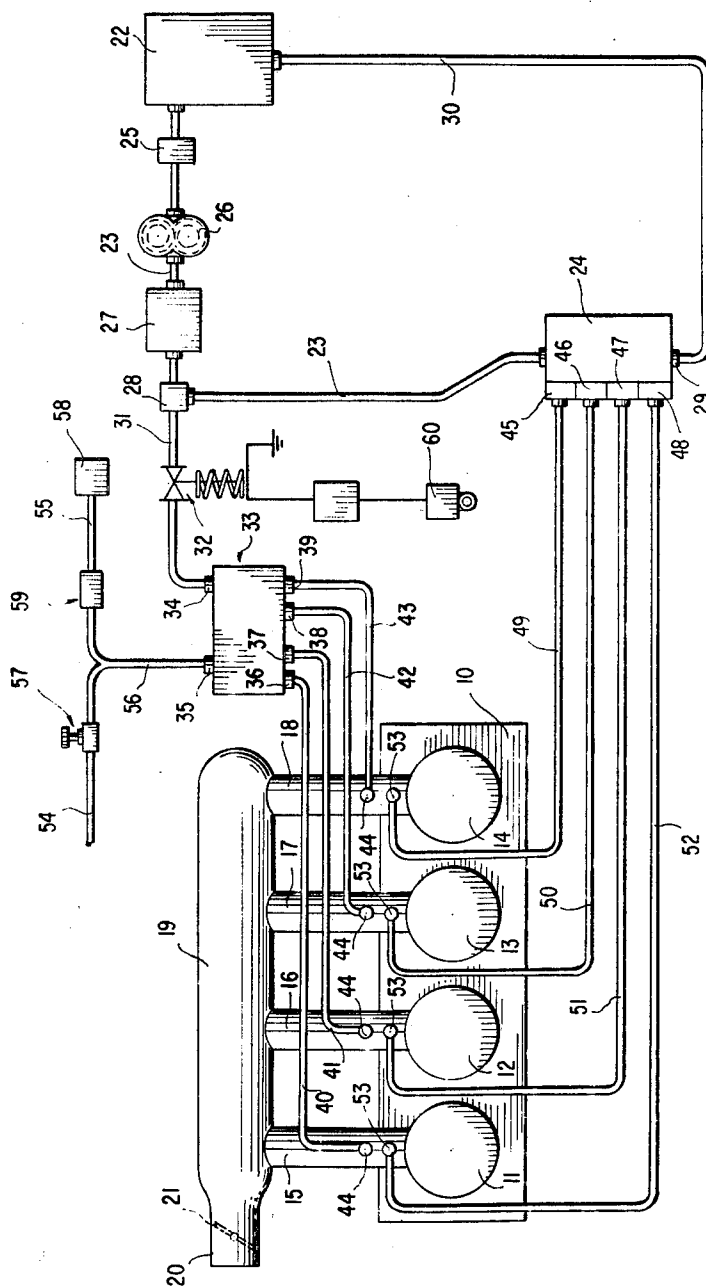


FIG. 1

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Fig. 1 is a cross-sectional view of a mechanical assembly. A central shaft (69) passes through a housing (62). The shaft has a threaded section (65) with a nut (64) on the left. A flange (63) is on the right. A horizontal component (67) is attached to the shaft, with a label 36a ÷ 39a pointing to its side. Other labels include 61, 68, 34a, 33a, and 35a.

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INSTALLATION FOR PRODUCING A STARTING MIXTURE FOR INJECTION-TYPE INTERNAL COMBUSTION ENGINES

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U.S. Cl. 123—119 12 Claims

ABSTRACT OF THE DISCLOSURE

An installation for producing a starting mixture for injection-type internal combustion engines in which individual suction-air pipes lead from a common suction-air manifold to the respective working cylinders, in which a throttle valve is provided upstream of the common manifold within a pipe connection, and in which there are supplied idling air and/or additional air in by-passing relationship to the throttle valve and additional fuel in by-passing relationship to the injection pump to a distributor device having a mixing chamber from which individual connections supply the fuel-air mixture from its mixing chamber to the individual suction pipes leading to the respective working cylinders.

BACKGROUND OF THE INVENTION

The present invention relates to an installation for producing a starting mixture for injection-type internal combustion engines with several individual suction-air pipes for the working cylinders fed from a common suction-air manifold, in which idling-air and/or additional-air is adapted to be supplied to the individual suction air pipes in by-passing relationship to the throttle member in the pipe connection for the throttle valve and additional fuel is adapted to be supplied in by-passing relationship to the injection pump in dependence on a control valve.

SUMMARY OF THE INVENTION

The present invention aims at improving such an installation. To this end it is proposed according to the present invention that the additional air or idling air and the additional fuel are supplied to the mixing chamber of a distributor device which is in communication on the outlet side thereof with the individual suction-air pipes. Considerable advantages are achieved by the present invention. The preparation of the starting mixture can be accurately metered and therewith improved. The fuel-mixture is evenly distributed to all working cylinders. A decrease of the fuel quantity necessary for starting is realized thereby and the starting behavior of the internal combustion engine is improved thereby. The starting magnet, necessary heretofore with the prior art injection-type internal combustion engines, for influencing the control rack of the injection pump during the starting operation can be dispensed with by the arrangement of the present invention.

It had been proposed heretofore in the prior art for an installation of the aforementioned type that inlet apertures in the individual suction-air pipes for the idling air terminate in a common idling-air manifold having a common air inlet. With an installation for producing the starting mixture having the characteristics of the present invention, the function of the common idling-air manifold is carried out by the distributor device and the connection thereof to the individual suction-air pipes.

In an advantageous construction of the installation according to the present invention, the mixing chamber may be provided with a common chamber connection at the inlet side thereof for the idling air and the additional air.

The lines for the idling air and additional air are thereby combined upstream of the distributor device into a common line which is connected to the mixing chamber. The distributor device is adapted to be equipped with one distributor connection each for the separate connection with the individual suction-air pipes and may be connected thereby by way of one line each to the individual suction-air pipes. A partial preparation of the starting mixture takes place already in the relatively narrow supply lines. A nozzle may be installed into the individual suction-air pipes which is fed from a supply line for the starting mixture. The nozzle further improves the preparation of this mixture.

A nozzle for the admission of the additional fuel may project into the mixing chamber whereby the fuel is injected under the influence of the fuel supply pump by way of a respective nozzle aperture into the distributor connections.

With a particularly advantageous construction, from a structural point of view, according to the present invention, the distributor device is provided with a cylindrical housing within which the nozzle for the additional fuel is arranged coaxially. Radially extending nozzle bores which are arranged in a star-shaped manner with respect to each other, are accommodated in the also cylindrical nozzle body. The cylindrical housing of the distributor device is then provided with one housing bore each for the distributor connections coaxial to the respective nozzle bore in the cylindrical nozzle body. The connections of the distributor device at the inlet sides may be arranged advantageously at the end faces of the cylindrical housing. One of the two end-faced housing parts may be constructed as nozzle body in a particularly advantageous constructional realization of the present invention. The other end-faced housing part of the distributor device is provided as connecting flange for the air inlet of the mixing chamber.

Accordingly, it is an object of the present invention to provide an installation for the production of a starting mixture for injection-type internal combustion engines which avoids the aforementioned shortcomings encountered with the prior art constructions and additionally improves such installations to a considerable extent.

Another object of the present invention resides in an installation for producing a starting mixture for injection-type internal combustion engines which permits an accurate metering of the starting mixture and therewith an improvement in the preparation thereof.

Still a further object of the present invention resides in an installation for producing a starting mixture in internal combustion engines of the injection type which assures even distribution of the fuel mixture to all working cylinders.

Another object of the present invention resides in an installation for producing a starting mixture for injection-type internal combustion engines in which the fuel quantity necessary for starting is decreased, and the starting behavior of the engine is considerably improved.

A further object of the present invention resides in an installation for producing a starting mixture for injection-type internal combustion engines which is considerably simpler than the installations utilized heretofore and results in eliminating the starting magnet customarily required heretofore.

Still another object of the present invention resides in an installation for producing a starting mixture for in-

jection-type internal combustion engines in which the fuel preparation is significantly improved.

These and further objects, features, and advantages of the present invention will become more obvious from the following description when taken in connection with the accompanying drawing which shows, for purposes of illustration only, one embodiment in accordance with the present invention, and wherein:

FIGURE 1 is a schematic exploded view of the installation in accordance with the present invention;

FIGURE 2 is a cross-sectional view, taken along line II—II of FIGURE 3 and illustrating the details of a distributor device in accordance with the present invention; and

FIGURE 3 is a transverse cross-sectional view through the distributor device of FIGURE 2.

Referring now to the drawing wherein like reference numerals are used throughout the various views to designate like parts, and more particularly to FIGURE 1, reference numeral 10 designates therein the injection-type internal combustion engine which may be of any conventional construction. The inlet valves of the working cylinders 11–14 are each in communication with a respective individual suction-air pipe 15–18. The individual suction-air pipes 15–18 are supplied from a common suction-air manifold 19 which is provided at the inlet side with a valve-connecting piece 20 in which is arranged the throttle valve 21.

A low-pressure supply line 23 for the fuel leads from the fuel tank 22 to the injection pump 24. A fuel air-filter 25, an electric fuel supply pump 26, a fuel main filter 27 as well as a line-connecting piece 28 are arranged between the fuel tank 22 and the injection pump 24.

The suction space of the injection pump 24 is provided with an overflow valve schematically indicated at 29 to which is connected a fuel return line 30 leading back to the fuel tank 22.

An auxiliary fuel line 31 branches off at the connecting piece 28 from the low-pressure supply line 23. A control valve generally designated by reference numeral 32 is arranged in the auxiliary fuel line 31 which leads to a distributor device generally designated by reference numeral 33.

The distributor device 33 is provided at the inlet side with the connecting piece 34 for the auxiliary fuel line 31 and in addition thereto is provided with a further common connection 35 at the inlet side for the idling air and additional air. The distributor device 33 is provided furthermore on the outlet side thereof with four distributor connections 36–39 for a respective supply line 40–43 each. Each of these supply lines 40–43 terminates in an individual suction-air pipe 15–18 by way of a conventional nozzle schematically indicated by reference numeral 44.

The pump elements 45–48 of the injection pump 24 supply the fuel by way of a respective high-pressure injection line 49–54 to the injection valves 53 for the working cylinders 11–14.

An idling air line 54 and an additional air line 55 are combined into a common air line 56 which is connected to the distributor device 33 by way of the air connection 35.

The idling air line 54 can be connected upstream of the throttle valve 21—in relation to the direction of flow of the suction air—at the valve-connecting piece 20 and may be provided with a throttle member of its own generally designated by reference numeral 57 which changes the cross section of the idling air line 54.

The additional air line 55 terminates by way of an air filter 58 in the atmosphere. The cross section of the additional air line 55 is adapted to be changed by a control valve generally designated by reference numeral 59 which control part is adapted to be influenced, for example, by operating valves of the internal combustion engines

and/or in dependence on time and/or from the ignition switch 60.

FIGURES 2 and 3 illustrate in detail an example of how the distributor device 33 may be constructed. A cylinder nozzle body 61 for a nozzle generally designated by reference numeral 62 for the additional fuel is inserted coaxially into a cylindrical distributor housing 33a. The nozzle body 61 is constructed in one-piece with the end face housing cover 63 which closes off in a pressure-tight manner the housing 33a on one end face thereof and is secured thereat by cover bolts 64. The housing cover 63 is provided with a threaded bore 69 coaxial to the nozzle body 61 into which is threaded a pipe-connecting piece 34a for the auxiliary fuel line in a pressure-tight manner.

The annular space 65 between the nozzle body 61 and the distributor housing 33a forms a mixing chamber into which terminate, on the one hand, radially extending nozzle bores 66 of the nozzle 62, mutually arranged in a star-shaped manner and, on the other, housing bores 67 for the distributor connections indicated at 36a–39a. Each distributor connection 36a–39a is in communication with a line indicated, for example, at 68 which is connected with a respective one of the individual suction-air pipes of the working cylinders.

A further pipe-connecting piece 35a is threaded into the distributor housing 33a in a pressure-tight manner on the end face opposite the housing cover part 63. The pipe-connecting piece 35a serves for the connection of the common line for the idling air and additional air.

While we have shown and described one embodiment in accordance with the present invention, it is understood that the same is not limited thereto but is susceptible of numerous changes and modifications as known to a person skilled in the art, and we therefore do not wish to be limited to the details shown and described herein but intend to cover all such changes and modifications.

We claim:

1. An installation for producing a starting mixture for injection type internal combustion engines having several individual suction-air pipes for the working cylinders which are fed from a common suction-air manifold and a throttle valve upstream of the common manifold, and in which, on the one hand, idling air or additional air is adapted to be fed to the individual pipes in by-passing relationship to the throttle valve and, on the other, additional fuel is adapted to be supplied to the individual pipes in by-passing relationship to the injection pump in dependence on a control valve, wherein the improvement comprises distributor means provided with mixing chamber means, the additional or the idling air and the additional fuel being supplied to said mixing chamber, and means operatively connecting the distributor means on the outlet side thereof with the individual pipes for the suction air, said mixing chamber means being provided with a common chamber connection at its inlet side for the idling air and the additional air, wherein said distributor means is provided with one connection each for the separate connections with the individual suction-air pipes, said control valve being responsive to engine speed, thus serving to render the installation operative throughout the entire operating range of the engine.

2. An installation according to claim 1, further comprising nozzle means projecting into the mixing chamber means for the admission of the additional fuel.

3. An installation according to claim 2, wherein said nozzle means is provided with one nozzle aperture each for a respective one of the distributor connections.

4. An installation according to claim 3, wherein said distributor means includes a substantially cylindrical housing within which the nozzle means for the additional fuel is arranged coaxially.

5. An installation according to claim 4, wherein radially extending nozzle bores mutually arranged in a star-shaped manner are accommodated in the substantially cylindrical nozzle body of the nozzle means.

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6. An installation according to claim 5, wherein the substantially cylindrical housing of the distributor means is provided with one housing bore for a corresponding one of the distributor connections, the housing bores being arranged coaxially to the respective nozzle bores in the cylindrical nozzle body of the nozzle means.

7. An installation according to claim 6, wherein the connections of the distributor means at the inlet side are arranged at the end faces of its cylindrical housing.

8. An installation according to claim 7, wherein a housing part at the end face of the cylindrical distributor means is constructed as nozzle body.

9. An installation according to claim 8, wherein a housing part at the end face of the cylindrical distributor means is constructed as connecting flange for the air inlet of the mixing chamber means.

10. An installation for producing a starting mixture for injection-type internal combustion engines having several individual suction-air pipes for the working cylinders which are fed from a common suction-air manifold and a throttle valve upstream of the common manifold, and in which, on the one hand, idling air or additional air is adapted to be fed to the individual pipes in by-passing relationship to the throttle valve and, on the other, additional fuel is adapted to be supplied to the individual pipes in by-passing relationship to the injection pump in dependence on a control valve, wherein the improvement comprises distributor means provided with mixing chamber means, the additional or the idling air and the additional fuel being supplied to said mixing chamber, and means operatively connecting the distributor means on

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the outlet side thereof with the individual pipes for the suction air, wherein the connections of the distributor means at the inlet side are arranged at the end faces of its cylindrical housing, said control valve being responsive to engine speed, thus serving to render the installation operative throughout the entire operating range of the engine.

11. An installation according to claim 10, wherein a housing part at the end face of the cylindrical distributor means is constructed as nozzle body.

12. An installation according to claim 11, wherein a housing part at the end face of the cylindrical distributor means is constructed as connecting flange for the air inlet of the mixing chamber means.

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