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INTERNAL COMBUSTION ENGINE

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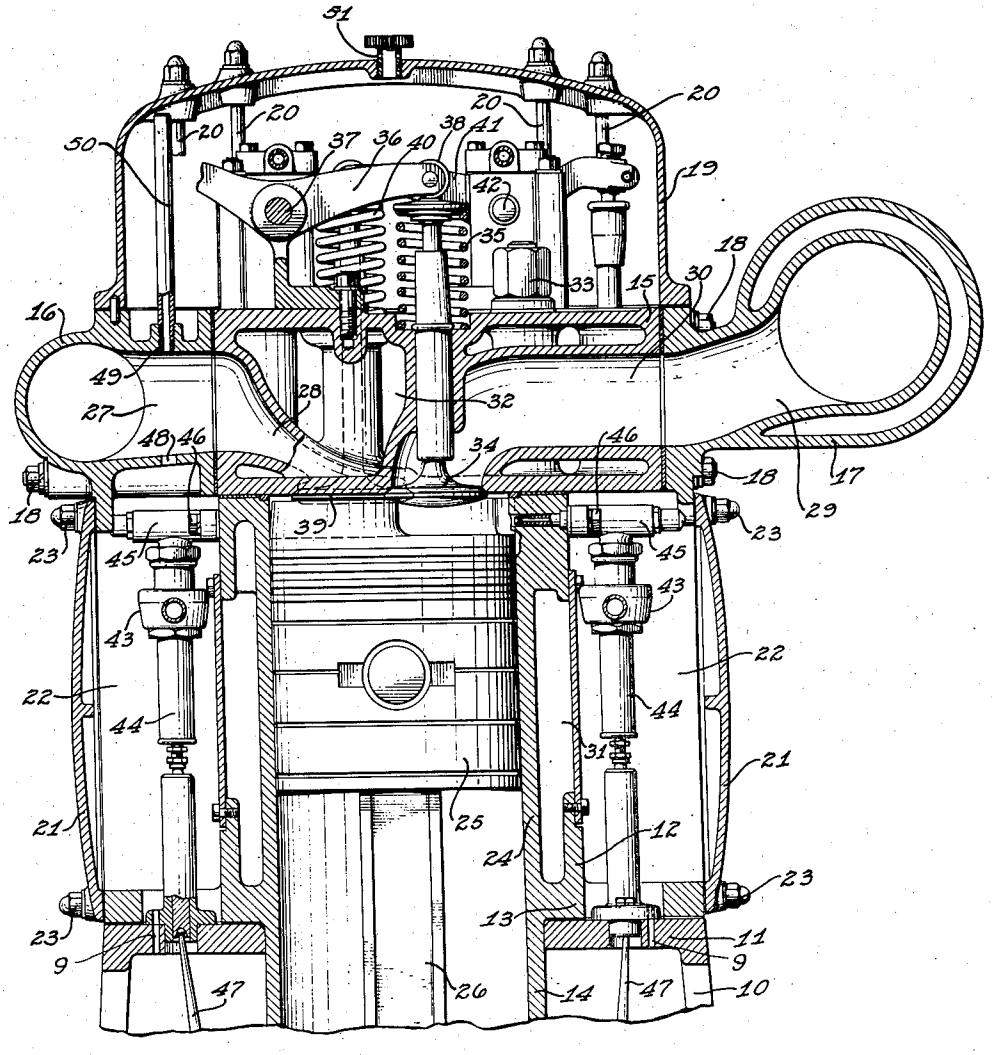

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INTERNAL COMBUSTION ENGINE

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This invention relates to internal combustion engines.

An object of the invention is to automatically ventilate spaces which are closed in around an internal combustion engine so that gas and vapor will be removed.

Another object of the invention is to provide an internal combustion engine in which closed-in spaces within the walls of the engine are arranged in communication with the fuel inlet manifold so that any accumulating gas or vapor will be removed by the suction.

Still another object of the invention is to provide suction means for removing gas and vapor from beneath the head cover plate of an internal combustion engine.

A further object of the invention is to provide suction means for removing gas and vapor from a closed-in compartment along the side of an internal combustion engine cylinder block.

Other objects of the invention will appear from the following description taken in connection with the drawing, which forms a part of this specification.

The drawing shows a vertical sectional view of an internal combustion engine having my invention incorporated therewith.

The internal combustion engine illustrated is of the Diesel four-cycle type; however, the invention can be incorporated with other forms of internal combustion engines. The crank case 10 has a top wall 11 upon which a cylinder block 12 is supported by shouldered portions 13, the skirts 14 of the cylinders extending through openings in the top crank case wall. Upon the cylinder block there is mounted a head block 15, one side of which terminates in the same vertical plane with the adjacent side of the cylinder block and the other side of which overhangs the adjacent side of the cylinder block. An intake manifold 16 extends along the side of the head block which is flush with the cylinder block and an exhaust manifold 17 extends along the side of the head block which overhangs the cylinder block, such manifolds being secured to the head block by suitable means such as bolts 18. It will thus be seen that the manifolds overhang the flanged portion 13 of the cylinder block and extend laterally from the head block.

A cover 19 encloses a space beyond the end of the head block and overlies a portion of the inlet manifold, such cover being secured to the head block by suitable means such as bolts 20. The sides of the cover engage against the upper portion of the manifolds. Side cover plates 21 enclose the spaces 22 between the sides of the cylinder block and the overhanging manifolds, such cover plates being secured at their lower ends to the cylinder block and at their upper ends to the manifolds by suitable means such as bolts 23.

Within each of the cylinders 24 there is arranged a piston 25 which is connected with the crank shaft (not shown) by the usual rod 26. The air intake manifold includes ports 27, each of which communicates with a passage 28 leading through the head of the cylinder block into a cylinder, such passages 28 being in the form of a venturi and extending at an angle to the cylinder axis and tangential to the inner wall thereof. The exhaust manifold is formed with ports 29, each of which communicates with a port 30 leading through the cylinder head block into the cylinders. The cylinder block is provided with chambers 31 extending around the cylinders and the head block is provided with chambers 32 extending around the valves, and a water cooling system of the conventional type is connected with such chambers. The head block is secured to the cylinder block by means of bolts 33 which is the usual practice in securing such elements together in Diesel engines.

Each of the inner ends of the exhaust ports 30 is controlled by a valve 34 which extends through a guideway in the head block and is normally maintained in closed position by a coil spring 35. Each of such valves is opened through suitable mechanism driven from the crank shaft of the engine which includes individual rock levers 36 pivotally mounted, as indicated at 37, on top of the head block and each carrying a roller 38 which engages the end of the associated valve projecting beyond the end of the head block. The inner end of each of the ports 28 is controlled by a valve 39 which extends through a bearing in the head and projects therebeyond and is normally closed by a coil spring 40. These inlet valves 39 are opened through suitable mechanisms driven from the crank shaft, which includes rock levers 41 mounted on a shaft 42. The valves extend beyond the end of the head block and the springs and rock levers are arranged exteriorly of the head block and all of such mechanism is enclosed by the cover 19. It will be understood that the inlet valves are mechanically opened only during the intake strokes of the pistons and that the exhaust valves are opened only during the exhaust strokes of the pistons.

Arranged along each side of the cylinder block is a plurality of fuel injection devices, indicated

generally at 43, which are enclosed by the cover plates 21. These liquid fuel injection devices include a pump section contained within the housings 44 and a nozzle section contained within the housings 45, the nozzle portions being rigidly secured to the cylinder block by suitable means such as bolts 46. There is a nozzle on opposite sides of each cylinder which extends through openings in the cylinder wall so that atomized liquid fuel under high pressure can be injected directly into the cylinder. Suitable articulated push rod mechanism 47 is associated with each injection device and extends through the top wall of the crank case and actuates the pump portions, such push rods being operated through suitable cam means driven from the crank shaft in a conventional manner.

During the suction strokes of the pistons, air is drawn through the manifold and the ports 27 and the passages 28 into the cylinders, the valves 39 being opened during such periods. After the air intake strokes of the pistons, there are compression strokes and near the end of the compression strokes fuel injection devices project atomized liquid fuel into the air rotating in the cylinders, forming a combustible mixture which ignites and causes working strokes of the pistons. After the working strokes, the exhaust valves open and the pistons operate in their exhaust strokes. The fuel mixtures which are formed within the cylinders ignite through heat developed by compression.

I have found that water and oil vapor and gas collect in the chambers 22 in which the fuel injection devices are housed, as well as in the space enclosed by the cover 19, due to the heat developed and to the presence of moisture and oil which has leaked therein. The presence of such gas and vapor, if retained in such spaces, causes a chemical reaction on the enclosed mechanism which is very undesirable because of rusting and other changes caused in the physical properties thereof, and this invention is directed to a means for ventilating such spaces so that the gas and vapor will be withdrawn therefrom as they form. To this end, I provide openings 48 through a wall of the intake manifold which will establish communication between the ports 27 and the space 22 therebelow. I also provide similar openings 49 in the upper wall of the intake manifold which establishes communication with the space enclosed by the cover 19. During the suction strokes of the pistons, gas and vapor will be drawn through the openings 48 and 49 into the ports 27 and will be moved by suction with the air charges through the passages 28 into the cylinders, and in this manner gas and vapor will be removed from the enclosed spaces during operation of the engine. Passages 9 are provided to establish communication between the crank case and the separated spaces 22 on each side of the cylinder structure so that any gas or vapor in the space below the exhaust manifold would first be drawn into the crank case through one of the passages 9 and from there through the other space 22 into the air intake manifold.

Associated with each of the openings 49 is a tube 50 which is screwed therein to establish communication between the top of the space enclosed by the cover 19 and the ports 27. This tubular extension is designed to withdraw vapor and gas from the space within the cover 19 at the point where the temperature is the highest. If desired, the cover may be provided with an air inlet port, one form of which is shown at 51, so that the air can be drawn from the outside of the casing and moved through the tubular extensions 50 along with the gas and vapor through the ports 27 and the passages 28 into the cylinders during the suction strokes of the pistons. Through the use of an air inlet device associated with the cover 19, the space bounded thereby is better ventilated; however, such air inlet is not requisite to the removal of air and gas from the space enclosed by the cover.

While I have herein described in some detail a specific embodiment of my invention, which I deem to be new and advantageous and may specifically claim, I do not desire it to be understood that my invention is limited to the exact details of the construction, as it will be apparent that changes may be made therein without departing from the spirit or scope of my invention.

What I claim is:

1. In an internal combustion engine, a cylinder block, a head block, an intake manifold secured to one side of the head block, a cover enclosing a space beyond the head block and a portion of the manifold, and a passage through the manifold wall establishing open communication with the space enclosed thereabove by the cover.

2. In an internal combustion engine, a cylinder block, a head block, an intake manifold secured to one side of the head block, a cover enclosing a space beyond the head block and a portion of the manifold, said manifold wall beneath the cover having an opening therein establishing communication between the enclosed space and the interior thereof, and a tube in said opening leading to a point in the enclosed space remote from the head block.

3. In an internal combustion engine, a cylinder block, a head block secured on the cylinder block, an intake manifold fixed on one side of the head block and overhanging the cylinder block, and a cover fixed to the manifold and the cylinder block enclosing a space to house engine mechanism, said manifold having an opening through its wall establishing communication with said space.

4. In an internal combustion engine, a cylinder block having separate compartments along each side thereof, a head on one end of the cylinder block having air passages therein leading to the interior of the cylinders, a crank case on the other end of the cylinder block, and vent means between the compartments and the crank case and between one of the compartments and the air passages in the head.

5. In an internal combustion engine, a plurality of sections forming cylinders, enclosed chambers adjacent the cylinders and air inlet passages leading into the cylinders; and means wholly within the confines of the outer walls of the sections establishing direct communication between the chambers and the air intake passages.

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