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CYLINDER HEAD ASSEMBLY FOR AIR-COOLED INTERNAL COMBUSTION ENGINES

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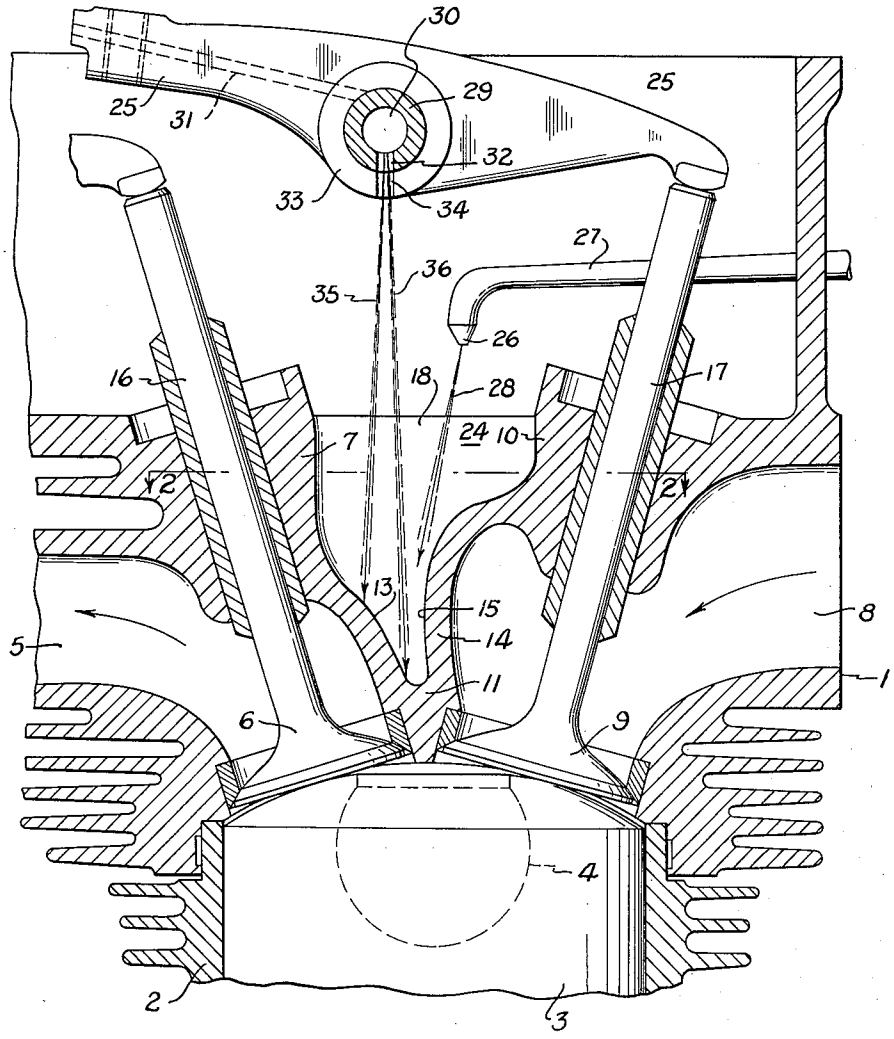


Fig. 1

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Fig. 2

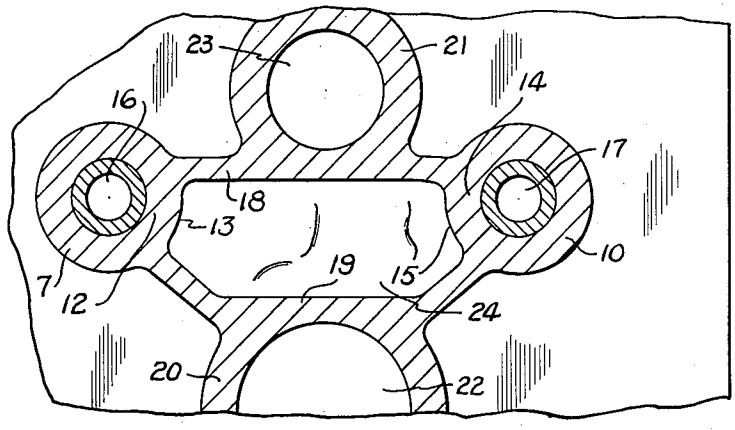
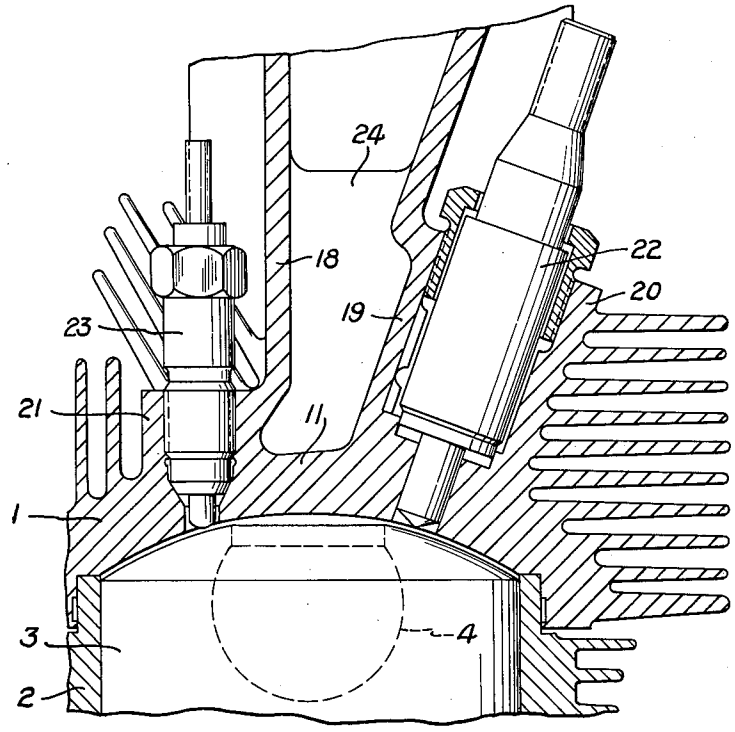


Fig. 3



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CYLINDER HEAD ASSEMBLY FOR AIR-COOLED INTERNAL COMBUSTION ENGINES

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4 Claims. (Cl. 123—41.57)

This invention relates to the cylinder head assembly for air-cooled Otto or diesel internal combustion engines having vertical or horizontally aligned cylinders.

In these types of engines, the cylinder head portions composed of the valve bridge and the adjoining walls forming portions of the air intake and gas exhaust ducts, and the wall portions forming the configurations for the openings for the fuel injection nozzle and spark plug were only insufficiently cooled by fresh air. These wall portions, and especially the valve bridge wall portion, are highly heated because they are adjacent the combustion chamber, and on the other hand, they are scarcely accessible to the cooling fresh air becuase they are surrounded by the cylinder head configurations for the fuel injection nozzle and spark plug. The provision of cooling fins in these wall portions is hardly feasible because of casting techniques, so that the disadvantage remains that cracks will occur in the valve bridge and adjacent wall portions of the cylinder head. Although there is an air-cooled internal combustion engine having cooling fin inserts, nevertheless, because of the narrow space between the inserts, the tendency is that the air flow is impeded so as to produce a lessened rather than an increased cooling effect.

Attempts have been made to provide special cooling agent passageways in the cylinder head so that the valve bridge wall portion can be liquid cooled. Furthermore, in such an engine, an increased cooling effect at the hotttest portions of the cylinder head is obtained by increasing the velocity of the cooling liquid so that the cooling liquid can be forced to flow through constrictions formed by special fins. In still another cooling system for cylinder blocks of multi-cylinder engines, the cooling liquid is conducted to the middle of the block and then divided into two streams by a baffle in order to direct the cooling agent to the critical areas such as the valve seats.

In air-cooled internal combustion engines, it is also known to use an axial air blower in order to force the cooling air through the cooling fins of the cylinder. In a multi-cylinder air-cooled high capacity engine, the blower is driven by the engine to cool the cylinder wall having fins. The use of blowers is expensive and requires additional power for forcing the cooling air to where it is needed. It is also known to provide an engine with a cooling system which is divided so that one stream of cooling fluid flows around the cylinder liner and the other stream around the valve openings. This is expensive to construct and requires special valve structures and additional engine power. Moreover, this construction does not provide for the cooling of the valve bridge and the adjoining walls of the cylinder head.

The object of this invention is to avoid the above-mentioned difficulties. According to this invention, the outside surfaces of the cylinder head wall portions for the gas exhaust and air inlet ducts which lie between the two valve openings and are connected by the valve bridge wall portion are cooled by means of one or more streams of cooling fluid. To this end, the cylinder head assembly includes an oil injection device having an outlet orifice located in the vicinity of and above the valve bridge wall portion and the outside wall portions of the gas exhaust and air inlet ducts so that these wall portions are heavily sprayed with the cooling fluid. In order to obtain an especially intensive cooling of the valve bridge wall portion, cross walls are provided between the cylinder head configurations for the exhaust and inlet valves so that a chamber is formed around the valve bridge wall portion, which chamber directs the cooling fluid against the hottest cylinder head portion, namely the valve bridge wall portion. The oil injection device is either in the form of a separate injection nozzle or a hollow valve rocker arm shaft having one or more orifices through which oil can be sprayed onto the cylinder head wall portions.

The means by which the objects of the invention are obtained are described more fully with reference to the accompanying diagrammatic drawings, in which:

FIGURE 1 is a cross-sectional view through the cylinder head of a diesel engine;

FIGURE 2 is a partial cross-sectional view taken generally on the line 2—2 of FIGURE 1; and

FIGURE 3 is a cross-sectional view through the cylinder head taken at a right angle to FIGURE 1.

The cylinder head **1** covers the engine cylinder **2** which contains a piston **3** having a combustion chamber **4**, the piston being shown in its upper dead center position. The exhaust gas duct **5** contains an exhaust valve **6** which is supported in the valve guide **7**. In a similar manner, the air intake duct **8** contains a valve **9** which is supported in the valve guide **10**. The valve bridge wall portion **11** extends between the two valve seats. The cylinder head exhaust duct wall portion **12** has an outside surface **13** which merges in with the valve guide **7**, and likewise the air intake duct wall portion has an outside surface **15** which merges with the valve guide **10**. Exhaust valve **6** has a valve stem **16** and intake valve **9** has a valve stem **17**. The wall portions **12** and **14** are joined by cross walls **18** and **19**, note FIGURES 2 and 3 with the latter being formed in part by the cylinder head configuration **20** for the fuel injection nozzle and the configuration **21** for the glow or spark plug **23** which, respectively, contain the injection nozzle **22** and the plug **23**. Wall portions **12**, **14**, **18** and **19** form the side walls of the cooling chamber **24** of this invention, the bottom of which is the valve bridge **11**.

In the vicinity of chamber **24**, such as above it in the direction of the valve rocker arm **25** is the outlet orifice **26** for the pipe **27** forming a cooling oil injection device. Orifice **26** directs a stream of oil **28** particularly upon the valve bridge wall portion **11** in order to spray the hottest portion of the cylinder head with a cooling agent. A plurality of oil streams **28** can be used in order to cool the valve bridge portion **11** and the adjacent wall portions **13** and **15** for the chamber **24**.

In addition to the oil injection device formed by pipe **27** with orifice **26**, a further feature of this invention for increasing the cooling effect comprises providing the shaft **29** for rocker arm **25** with a cylindrical bore so that this bore can be connected to the lubricating system of the engine by means of line **31**. Accordingly, hollow shaft **29** is further provided with a bore **32** and the bearing **33** for arm **25** has an aligned opening **34**, these two openings being directed towards valve bridge **11** and the adjacent wall portions so that the surfaces **13** and **15** are sprayed by the oil jets **35** and **36**. A wide area spraying of the valve bridge wall portion **11** and the wall surfaces **13** and **15** is obtained when a plurality of openings are used instead of a single opening **34**. In so doing, the cooling agent is discharged in the form of a fan and thus covers a greater area of the wall surfaces. This manner of cooling is especially advantageous in engines having horizontal cylinders.

In engines with vertical cylinders, chamber **24** will be filled with the cooling agent and the oil jets **28**, **35** and **36** which have a pressure of about 3 atmospheres absolute will reach the valve bridge wall portion **11** and the adjacent surfaces **13** and **15** and, at the same time, will whirl the cooling agent around in chamber **24** so that the cooling agent will reach the wall portions for the injection nozzle **22** and the plug **23**. In so doing, the oil jets **35** and **36** will swing through an arc of about 5° as produced by the movement of the rocker arm **25** so that the swirling of the cooling agent in chamber **24** is ensured.

Having now described the means by which the objects of the invention are obtained,

We claim:

1. In a cylinder head assembly for an air-cooled internal combustion engine, said head having an intake air duct wall portion, a gas exhaust duct wall portion, and a valve bridge wall portion joining the air duct wall portion to the exhaust duct wall portion, the improvement comprising a pair of cross walls extending between the air duct wall portion and the exhaust duct wall portion for forming a chamber around said valve bridge wall portion, and oil jet means mounted above said chamber for directing

at least one jet of a liquid cooling agent against the exterior surface of each wall portion.

2. In a cylinder head assembly as in claim 1, said oil jet means comprising an oil injector having at least one outlet orifice positioned adjacent said valve bridge wall portion for providing said jet of a liquid cooling agent.

3. In a cylinder head assembly as in claim 2, said cross walls including openings in the cylinder head for a fuel injection nozzle and a glow plug, respectively.

4. In a cylinder head assembly as in claim 2, said oil injector comprising a hollow rocker arm shaft mounted above said chamber, a rocker arm on said shaft, and aligned openings in said shaft and rocker arm directed toward the wall portions of the chamber for applying the jet of cooling agent against the wall portions.

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