Aug. 31, 1965 H. W WINKELMAN 3,203,408

LIQUID COOLING SYSTEM FOR INTERNAL COMBUSTION ENGINES

Filed Jan. 6, 1964 2 Sheets-Sheet 1

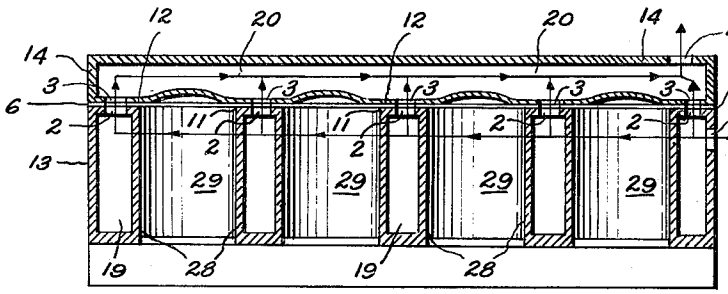

Fig. 1.

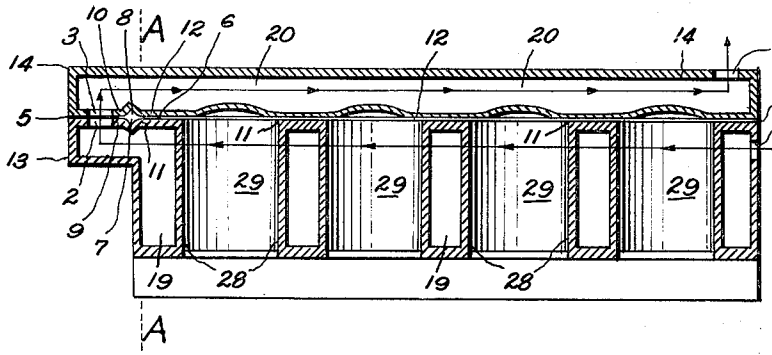

Fig. 2.

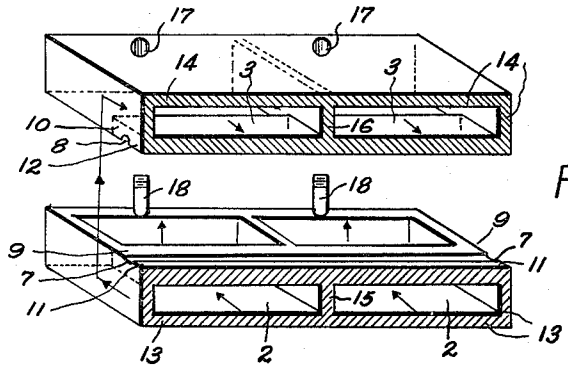

Fig. 3.

WITNESS.
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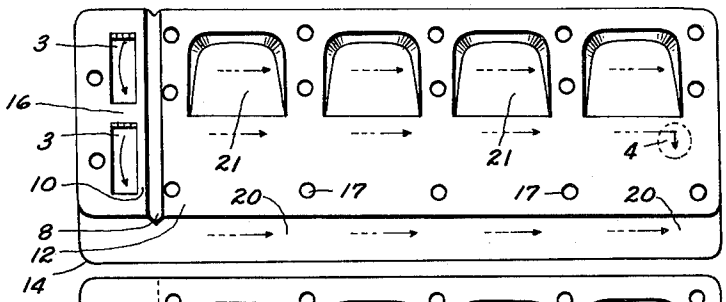

Fig. 4.

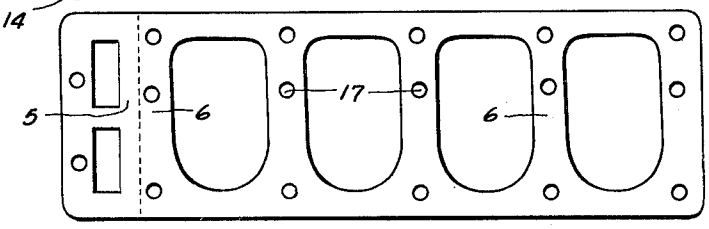

Fig. 5.

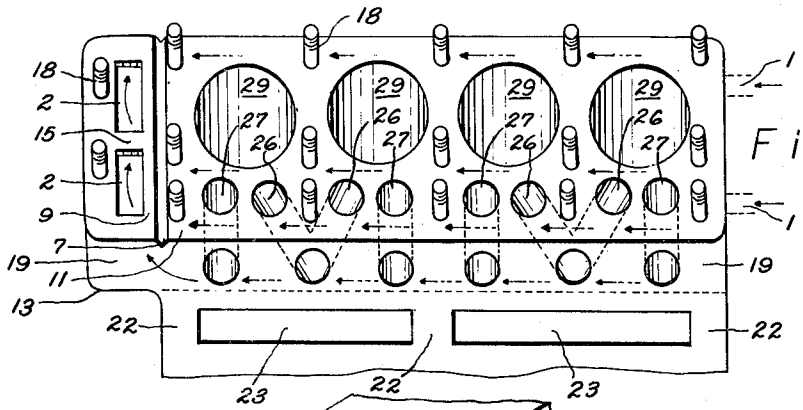

Fig. 6.

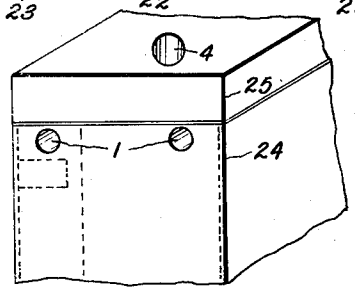

Fig. 7.

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3,203,408

LIQUID COOLING SYSTEM FOR INTERNAL COMBUSTION ENGINES

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Filed Jan. 6, 1964, Ser. No. 335,849
2 Claims. (Cl. 123—41.74)

My invention relates to liquid cooled, in line, internal combustion engines with removable cylinder head, and particularly to improvements in the circulating and cooling system.

An object of the invention is to provide the means to eliminate the numerous internal water passages and to separate the circulating and cooling system from power system to prevent leaks from each system to the other system at the numerous internal gasket seals, which leaks cause interference with the performance of the two systems and of the engine.

Another object is to eliminate the rear or closed ends in cylinder block and cylinder head water jackets and to provide water jackets with open rear ends and to connect the two open rear end water jackets and the two water chambers externally and directly, by-passing cylinder head gasket at rear end of engine, with a large unrestricted rectangular water passage the width of water chambers—which is the only water passage connecting cylinder block and cylinder head water chambers—whereby the volume of water circulated through cylinder block and cylinder head water chambers is uniform at front and rear ends of both water chambers, resulting in uniform cooling and uniform expansion.

A further object is to provide the means to obtain a single, larger and stronger, current, uniform in volume and uniform movement, in a straight line, parallel to major axis of engine, from inlet to outlet water passages of both cylinder block and cylinder head water chambers, surrounding all cylinders, valve guide housings and valve ports, and by its direction and flushing action will wash and cool two sides of the walls of all cylinders, valve guide housings and valve ports as well as the manifold wall and floor around valve guide housings and valve ports, causing uniform cooling and uniform expansion at front and rear ends of engine—a more efficient and trouble-free circulating and cooling system and a more trouble-free power system.

Other and further objects will be apparent from the drawings, specification and claims.

The invention resides in construction, location, arrangement and combination of means and elements in the circulating and cooling system and is adaptable to liquid cooled, in line, L-head and valve-in-head, internal combustion engines with removable cylinder head.

I do not limit my invention to the structure shown and described, as modifications, within the scope of the appended claims, may be made without departing from the spirit of my invention.

In present day liquid cooled, in line, L-head and valve-in-head, internal combustion engines with removable cylinder head, there are numerous restricted internal water passages in the cylinder block, head gasket and cylinder head as shown in FIG. 1 of a present-day liquid cooled, in line, internal combustion engine with removable cylinder head, and of the entire volume of water pumped into front end of cylinder block water chamber, only a small fraction of this volume of water is and can be circulated through the rear ends of cylinder block and cylinder head water chambers. Circulation, cooling, expansion, is not uniform at front and rear ends of engine. Leaks can and do occur at the numerous narrow internal gasket seals separating the two systems permitting high compression

and explosion gases to enter cooling system and water from cooling system to enter the cylinders on suction stroke of piston. These leaks cause interference with the performance of both systems and of the engine.

With my invention internal leaks from one system to the other system are impossible there being no internal water passages in cylinder block, cylinder head gasket and cylinder head and by-pass water passage gasket seal and rear cylinder gasket seal are isolated by vent grooves in cylinder block and cylinder head gasket faces at juncture of the two gaskets to prevent a leak in gasket seal of either system to enter the other system by diverting the leak into and to the ends of the groove at side of engine.

There are no dead ends in the water jackets and water chambers, no cross currents, as shown in FIGURES 2, 4 and 6. Circulation, volume, cooling, expansion, all are uniform at front and rear ends of engine. There is only one large unrestricted external water passage, which cannot become clogged by corrosion and foreign matter, connecting cylinder block and cylinder head water jackets as well as the water chambers, directly.

The following are some of the results of my invention:

It eliminates closed rear ends in cylinder block and cylinder head water jackets, cross currents, numerous internal water passages, internal leaks at gasket seals from each system to the other system which leaks cause interference with the performance of both systems and of the engine. Additional beneficial results will be apparent from the drawings, specification and claims.

FIGURE 1 is a side view of a portion of a present-day multiple cylinder internal combustion engine with removable cylinder head, with parts shown in section to show the numerous internal water passages in cylinder block, cylinder head gasket and cylinder head, with arrows showing circulation of the water from cylinder block water chamber through the internal water passages into cylinder head water chamber.

FIGURE 2 is a side view of a portion of a multiple cylinder internal combustion engine with removable cylinder head adapted at rear end of engine with my by-pass water passage invention which eliminates the internal water passages shown in FIGURE 1, with parts shown in section and arrows showing all water is circulated from cylinder block water chamber through this by-pass water passage to rear end of cylinder head water chamber.

FIGURE 3 is a detailed sectional view in perspective on the line A—A of FIGURE 2 showing the construction of my by-pass water passage invention with arrows showing the circulation of all of the water from rear end of cylinder block water chamber through this by-pass water passage, by-passing rear end of cylinder head gasket, into rear end of cylinder head water chamber.

FIGURE 4 is an under-side view of cylinder head without the usual internal water passages adapted at rear end with the by-pass water passage invention and showing a vent groove which prevents leaks in the gasket seals of either system to enter the other system by diverting the leaks into and to the ends of the vent groove at side of engine.

FIGURE 5 is a view of the cylinder head gasket showing water passage gasket 5 joined at dotted line to rear end of cylinder head gasket 6 which has no water passages.

FIGURE 6 is a top and side view of cylinder block without the usual internal water passages adapted at rear end with the by-pass water passage invention and showing the vent groove which prevents leaks in the gasket seals of either system to enter the other system by diverting the leaks into and to the ends of the groove at sides of engine.

FIGURE 7 is a view of the front end of cylinder block and top side of cylinder head showing the two inlet wa-

ter passages in front end of cylinder block water jacket and cylinder head outlet water passage located in and near front end of cylinder head water jacket.

Similar characters of reference designate similar parts in all views.

Referring to the drawings, the numeral **24** indicates a cylinder block as shown in FIGURE 7 and the cylinder block is also shown with various parts in FIGURE 6 and in FIGURE 2 with parts shown in section. The cylinder block has a plurality of cylinders **29** formed therein and in which cylinders the usual pistons (which are not shown) are operated. The cylinder block **24** is also provided with a plurality of inlet valve ports **26** and a plurality of exhaust valve ports **27** as shown in FIGURE 6, and the cylinders **29**, inlet valve ports **26** and exhaust valve ports **27** are cast integral with cylinder block. The inlet valve ports **26** and exhaust valve ports **27** are opened and closed by poppet valves (which are not shown) and with which the cylinder block is equipped. The inlet valve ports **26** in cylinder block serve to secure a supply of combustible mixture to the cylinders on the suction stroke of the piston (which is not shown) and the exhaust valve ports **27** provide for the outflow of the burnt gases from the cylinders on the exhaust stroke of the piston.

The cylinder block **24** is provided with an internal water space or chamber **19** which is inclosed by the water jacket **13** which surrounds the cylinders **29**, inlet valve ports **26** and exhaust valve ports **27**. Cooling water is supplied to the water chamber **19** by the water pump which forces the water through the inlet water passages **1**, of which there are two, and which water passages are formed in the water jacket **13** at front end of engine and the two inlet water passages **1** are placed in communication with the water pump (which is not shown) located at front end of engine. The outlet water passage **2** for cylinder block water chamber **19** is located in rear end of cylinder block water jacket **13** and this water passage by-passes rear end of cylinder head gasket and is placed in communication with the inlet water passage **3** of cylinder head water chamber **20** which is located in rear end of cylinder head water jacket **14** and by-passes rear end of cylinder head gasket as shown in FIGURES 2, 3, 4 and 6.

The open upper end of the cylinders **29** is closed by the cylinder head **25** which has an internal water space or chamber **20** which is inclosed by the water jacket **14** and rear end of the water chamber is provided with an inlet water passage **3** which is placed in communication with the cylinder block water chamber outlet water passage **2** so that the cooling water which is supplied to the cylinder block water chamber will rise and flow into cylinder head water chamber **20** and along the water chamber to and through its outlet water passage **4** located in and at front end of cylinder head water jacket **14**.

The cylinder head is also provided with a plurality of combustion chambers indicated by the numeral **21** which are disposed in the gasket face side of cylinder head and received the compressed fuel mixture.

The numeral **23** indicates the valve tappet chambers which are located just below the inlet and outlet valve ports at side of engine which are formed in cylinder block by the walls indicated by numeral **22** and are cast integral with cylinder block and the valve tappet chambers provide access for the adjusting of valve tappets for operating clearance and removal and installing of valve springs and their retainers.

The numeral **18** indicates the stud bolts which are disposed in the cylinder block head gasket face and which stud bolts secure the cylinder head to the cylinder block.

The numeral **17** designates stud bolt holes which are disposed in cylinder head **25** and which stud bolt holes

receive the stud bolts which are disposed in head gasket face of cylinder block.

Numeral **11** indicates the cylinder head gasket face of cylinder block for cylinder head gasket. Numeral **12** indicates the cylinder head gasket face of cylinder head for cylinder head gasket.

In FIGURE 2 numeral **28** indicates the walls of the cylinders **29** in which the usual pistons operate.

Referring to FIGURE 3, the numeral **7** indicates a vent groove located in rear end of cylinder block head gasket face and the vent groove is at right angle to major axis of engine at juncture of water passage and cylinder head gaskets which vent groove will prevent leaks in the gasket seals of either cooling system or power system from entering the other system by diverting the leaks into and to the ends of the vent groove at side of engine. The numeral **8** also indicates a vent groove located in rear end of cylinder head gasket face and is at right angle to major axis of engine at juncture of water passage and cylinder head gaskets to prevent leaks in the gasket seals of either cooling system or power system to enter the other system by diverting the leak into and to the ends of the vent groove at side of engine.

The numeral **15** designates a partition or reinforcing wall centrally located in cylinder block outlet water passage **2** at rear end of engine and provides rigidity for the structure.

The numeral **16** designates a similar partition or reinforcing wall centrally located in cylinder head inlet water passage **3** at rear end of engine and provides rigidity for the structure.

The numeral **9** indicates a part of the water passage gasket face in cylinder block which is formed by extending the rear end of cylinder block gasket face beyond the rear end of cylinder head gasket and the remainder of the water passage gasket face is formed by the extended cylinder block water jacket which is extended beyond the rear end of cylinder block head gasket face.

Numeral **10** indicates a part of water passage gasket face in cylinder head which is formed by extending the rear end of cylinder head head gasket face beyond the rear end of cylinder head gasket and the remainder of water passage gasket face is formed by the extended cylinder head water jacket which is extended beyond the rear end of cylinder head head gasket face.

Referring to FIGURE 5 which shows the combined water passage and cylinder head gasket in which the water passage gasket **5** is joined at dotted line to the rear end of cylinder head gasket **6** which has no water passages, and the gaskets form the seals for the cooling system and power system.

In L-head engines the operation of the circulating and cooling system is as follows: The water pump (which is not shown) forces the water into and through the two inlet water passages **1** located at front end of cylinder block water chamber **19** and in cylinder block water jacket **13** and the two inlet water passages are placed to direct the water to flow along the two sides of the water chamber **19** and the by-pass water passage being located in the rear ends of cylinder block and cylinder head water jackets the water current is directed to surround, wash and cool two sides of all inlet valve ports, all exhaust valve ports and all cylinders as well as the manifold wall, then the water pump will force all of the water supplied to cylinder block water chamber **19** out of the water chamber through its outlet water passage **2** and cylinder head water chamber inlet water passage **3** into rear end of cylinder head water chamber **20** and along the water chamber to and through its outlet water passage **4** located in and at front end of cylinder head water jacket **14**.

In valve-in-head engines with the valve guide housings valve ports and manifold wall located in cylinder head this circulating and cooling system functions the same as in L-head engines.

I am aware that prior to my invention, liquid cooled, in line, internal combustion engines with removable cylinder head and with internal water passages, have been made with a tube in the cylinder block water chamber which tube has water passages to direct the water laterally to the valve ports. I therefore do not claim such combination.

What I claim as new and useful and desire to secure by Letters Patent is:

1. In a cooling system for an internal combustion engine having cylinders in line, a cylinder block having at least one cooling water inlet at one end of said block and at least one outlet solely at the other end whereby serial flow of water over said cylinders is obtained, a cylinder head having at least one inlet at one end and at least one outlet at the other end, said cylinder head inlet being connected to said block outlet.

2. In a cooling system for an internal combustion engine having cylinders in line, a cylinder block having at least one cooling water inlet at one end of said block and at least one outlet solely at the other end, a cylinder head having at least one inlet at one end and at least one outlet at the other end said cylinder head inlet being connected to said block outlet; a vent groove in and across cylinder head gasket face of said cylinder block, a vent groove in and across head gasket face of said cylinder head at right angle to major axis of engine at juncture of cooling system and power system gaskets to isolate cooling system and power system gasket seals from each other and direct a leak in either gasket seal into and through the groove into the space without whereby safeguard for the cooling system and power system from invisible internal communicating leaks is obtained.

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KARL J. ALBRECHT, *Primary Examiner.*