Nov. 29, 1955 E. FLATZ ET AL 2,725,045

AIR COOLED CYLINDER HEAD FOR DIESEL ENGINES

Filed Oct. 2, 1951

FIG. 1

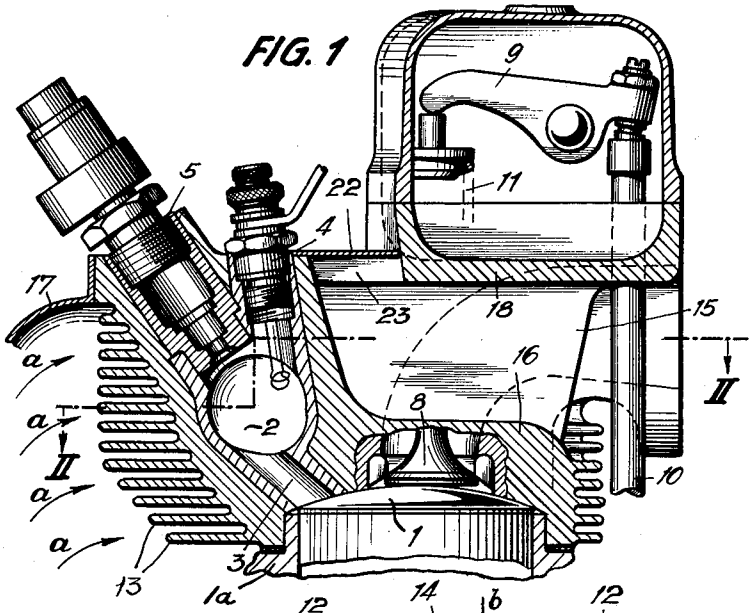


FIG. 2

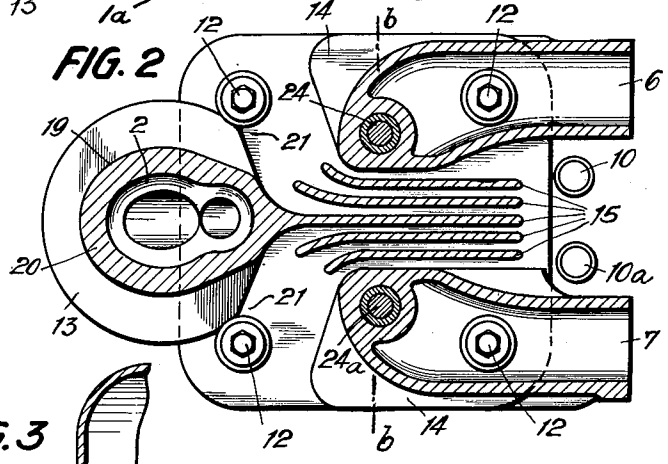


FIG. 3

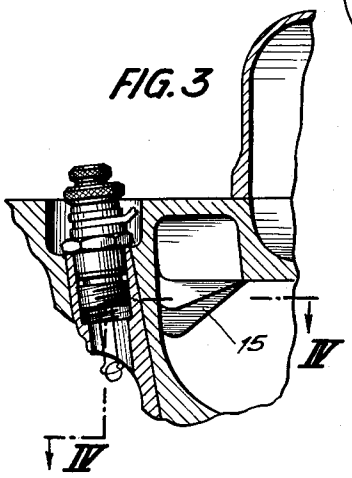
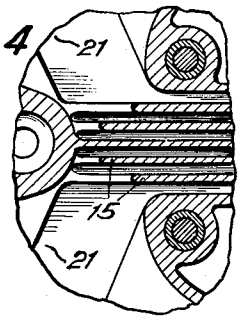


FIG. 4



INVENTORS
Emil Flatz
Josef Hövel

BY
Walter Bulow
Patent Agent.

United States Patent Office 2,725,045 Patented Nov. 29, 1955

2,725,045

AIR COOLED CYLINDER HEAD FOR DIESEL ENGINES

Emil Flatz, Bergisch-Gladbach, and Josef Hövel, Köln-Bruck, Germany, assignors to Klockner-Humboldt-Deutz Aktiengesellschaft, Köln, Germany

Application October 2, 1951, Serial No. 249,241

Claims priority, application Germany December 6, 1950

8 Claims. (Cl. 123—41.69)

The present invention relates to cylinder heads for internal combustion engines and, more particularly, to air cooled cylinder heads for diesel engines which include a combustion chamber separate from the cylinder and furthermore include a fuel injection nozzle and a glow plug both extending into said combustion chamber.

With air cooled cylinder heads of this type, heretofore, the glow plug was arranged in front of the combustion chamber when looking in the direction of flow of the cooling air. In order to get to the glow plug, it was, therefore, necessary first to remove the sheet metal guide member which guides the cooling air to the cylinder head, or, as an alternative, an aperture had to be provided in the said guide member through which the glow plug could be reached from the outside. While in the first instance the replacement of the glow plug was relatively complicated and time consuming, the said alternative arrangement requires an additional manufacturing step and a special tool. Furthermore, both arrangements had the drawback that the guide member for the cooling air had to be provided with interruptions which interfere with the flow of the cooling air and thus harmfully affect the cooling of the cylinder head.

It is, therefore, an object of this invention, to provide an air cooled cylinder head for diesel engines which will overcome the above mentioned drawbacks.

It is another object of this invention to provide an air cooled cylinder head for diesel engines which will permit a more efficient arrangement of the guide member for the cooling air while simultaneously materially simplifying the assembly and exchange of the injection nozzle and the glow plug.

It is also an object of this invention to provide a cylinder head of the type set forth in the preceding paragraph, which will make it possible to improve the guiding of the cooling air and thus will bring about a material improvement in the air cooling of the cylinder head.

These and other objects and advantages of the present invention will appear more clearly from the following specification in connection with the accompanying drawings in which:

Fig. 1 is a vertical section through a cylinder head according to the present invention.

Fig. 2 is a section along the line II—II of Fig. 1.

Fig. 3 shows in a section similar to that of Fig. 1 a detail somewhat modified over a corresponding part in Fig. 1.

Fig. 4 represents a section along the line IV—IV of Fig. 3.

General arrangement

According to the present invention and in contrast to the heretofore known arrangements mentioned above, the glow plug, when looking in the direction of flow of the cooling air, is arranged on the rear side of the combustion chamber into which the glow plug extends. The injection nozzle is advantageously, in a manner known per se, arranged on that side of the said combustion chamber which

is remote from the cylinder pertaining to the cylinder head.

When the cylinder head is provided with two passages for the inlet and/or outlet of a gaseous medium controlled by suspended valves, the arrangement according to the present invention is such that the said valves and the combustion chamber form the corners or apices of a triangle, while the glow plug is provided on that side of the combustion chamber which is adjacent said valves.

The arrangement mentioned above enables not only an easy assembly and exchange of the glow plug and injection nozzle but also makes it possible to connect the sheet metal guide member directly to the plate which is customarily arranged above and in spaced relationship to the base body of the head and is connected thereto by cooling fins as well as by the wall of the passages controlled by the valves, and also by the wall of the above mentioned combustion chamber.

Structural arrangement

Referring now to the drawings in detail and Figs. 1 and 2 thereof in particular, the structure shown therein represents a cylinder head for a four stroke cycle air cooled diesel engine. The cylinder head, generally designated 1, comprises a combustion chamber 2 separate from the cylinder 1*a* and communicating with the latter through a throat 3. A glow plug 4 extends into the combustion chamber 2. The fuel is injected into the combustion chamber 2 through an injection nozzle 5. The cylinder head has furthermore provided therein two passages 6 and 7 for the inlet and outlet of a gaseous medium, which passages are controlled by suspended valves of which only the inlet valve 8 is shown in Fig. 1. This valve 8 has a valve shaft 24, while the valve shaft 24*a* (see Fig. 2) pertains to the other valve. The reference numeral 6 designates the inlet or intake passage, while the outlet or discharge passage is designated by the numeral 7. The valve shafts 24, 24*a* are actuated by rocker arms against the thrust of springs 11, only one rocker arm 9 being shown. The rocker arms are operated by push rods 10, 10*a* actuated by a cam shaft (not shown in the drawing) which is located in the crank case of the diesel engine. The cylinder head 1 is connected to the cylinder 1*a* by means of screws 12. The cooling air is blown against the cylinder head in the direction of the arrows *a* of Fig. 1. In order effectively to carry away the heat of the cylinder head, the latter has cooling fins connected thereto. The cooling fins are composed of the fins 13 on the outside of the combustion chamber 2 and of the fins 14 on the outside of the passages 6 and 7. In addition thereto, cooling fins 15 are provided in the space between the passages 6 and 7 which fins are extending upwardly from the base body 16 of the head. These cooling fins 15 are of great importance in that they serve for the cooling of the hottest part of the cylinder head, i. e. that portion of the base body 16 which is located between the valves. The cooling air is guided toward the cylinder head by means of a sheet metal guide member 17 which is connected to a plate 18. This plate 18 is arranged above the base body 16 approximately at the height of that wall of combustion chamber 2 which is remote from the cylinder 1*a*. The plate 18 is integrally cast with and connected to the base body 16 by the cooling fins 15 as well as by the walls of the passages 6 and 7 and of the combustion chamber 2.

According to the present invention, the glow plug 4, when looking in the direction of flow of the cooling air, is arranged on the rear side of the combustion chamber 2, while the injection nozzle 5 is provided on that side of the combustion chamber 2 which is remote from the cylinder 1*a*. This arrangement is of particular advantage, because it makes it possible to extend the sheet metal guide member 17 directly and without interruptions up to

the plate 18, said guide member 17 being located on the same side of the cylinder head as the combustion chamber 2. As will be clear from the drawing, the injection nozzle 5 and the glow plug 4 are easily accessible from the outside of the cylinder head. In this connection it is most favorable when the glow plug 4 as well as the injection nozzle 5 are inserted into the combustion chamber 2 from that side of the combustion chamber 2 which is remote from the cylinder 1*a*.

The arrangement of the injection nozzle 5 and glow plug 4 according to the present invention and as shown in the drawing has another important advantage with regard to the cooling of the cylinder head. This will become particularly evident from Fig. 2 from which it will be seen that the outer configuration 19 of the wall 20 which surrounds the combustion chamber 2 and the glow plug 4 gradually becomes narrower when looking in the direction in which the cooling air flows toward the cylinder head. In other words, the outer contour of the wall 20 approaches drop-shape in conformity with the principles of aerodynamics. Inasmuch as the valves and the combustion chamber 2 are arranged in triangular form with regard to each other, and since the glow plug 4 is arranged at that side of the combustion chamber 2 which is adjacent the valves, the outer delimitation 19 of the wall 20 becomes narrower in an advantageous manner toward the space between the passages 6 and 7 in which space the cooling fins 15 are located. The access of cooling air to these cooling fins is thus favorably aided. In order still further to improve the access of cooling air to the cooling fins 15, wide passages or channels 21 for the passage of cooling air are provided at both sides of the combustion chamber 2 toward the space between the passages 6 and 7 and the combustion chamber 2. In order that the cooling air may pass by the passages 6 and 7 without any appreciable losses, the contour lines of the passages 6 and 7 adjacent the channels 21, as well as the adjacent contour line 19 of the wall 20 confining the combustion chamber 2 are shaped in conformity with the principles of aerodynamics.

As will be clear from Fig. 2, the cooling fins 15 are adjacent the combustion chamber 2 bent off into the direction of flow of the cooling air passing through the channels 21. This materially facilitates the flowing of the cooling air into the spaces between the cooling fins 15.

A modification of the cooling fins 15 is shown in Figs. 3 and 4. As will be particularly clear from Fig. 4, according to the arrangement shown therein, the ends of the cooling fins 15 adjacent the combustion chamber 2 extend in a straight manner directly up to the combustion chamber 2. In order that also with such an arrangement the cooling air may enter the spaces between the cooling fins 15, those ends of the cooling fins which are adjacent the combustion chamber 2 decrease in height toward the channels 21 as is clearly shown in Fig. 3.

For reasons connected with the casting technique, the plate 18 is provided with an aperture 23 located between the valves and the glow plug 4 and adapted to be closed by a closure plate 22. More specifically, the aperture 23 is provided for removing a necessary core from the casting mold.

In order to enable the cooling air to enter the channels 21 without any difficulties or obstructions while the easy accessibility of the glow plug 4 is maintained, the push rods 10, 10*a* are arranged on that side of the plane *b*—*b* passing through the valve shafts 24, 24*a*, which is remote from the combustion chamber 2. This arrangement of the push rods is also favorable for the necessary play between the valves and the rocker arms 9. Thus, warmed up cooling air passes around the push rods 10, 10*a* so that the push rods as well as the cylinder expand in length. Therefore, the valve play will not or at least not to any appreciable extent become greater in spite of the influence of heat upon the parts of the diesel engine.

In order to adapt the cylinder head with the arrangement according to the invention to multi-cylinder diesel engines, the passages 6 and 7 lead to that side of the cylinder head at which the push rods 10, 10*a* are located. Therefore, the arrangement of a plurality of cylinder heads may be effected so that all passages 6 and 7 lead to one side of the engine for connection with intake and exhaust pipes respectively. As will be clear from Fig. 2, the passages 6 and 7 are passed by the push rods on both sides thereof in such a manner that the push rods 10, 10*a* and the passages 6 and 7 are arranged symmetrically with regard to the plane passing through the central axis of the combustion chamber 2 and the central vertical axis of the cylinder pertaining to the cylinder head.

It is, of course, understood that the present invention is, by no means, limited to the particular constructions shown in the drawings but also comprises any modifications within the scope of the appended claims. Thus, the invention is not restricted to the described cylinder head for four stroke cycle engines but is also applicable with all its advantages to cylinder heads comprising two inlet or two outlet valves. The invention is furthermore advantageous in connection with cylinder heads having no valves as is the case with a slot-controlled two stroke cycle diesel engine.

What we claim is:

1. An air cooled cylinder head for diesel engines which comprises in combination, a combustion chamber spaced from the bottom of the cylinder head, a glow plug carried by said cylinder head and extending into said combustion chamber, said glow plug being arranged at the rear side of said chamber, when looking in the direction of flow of the cooling air toward the cylinder head, a base body forming the lower part of the cylinder head, plate means arranged above the base body at approximately the height of the upper side of that cylinder head portion which receives said glow plug, cooling fins interposed between and integral with said base body and said plate means, and sheet metal guiding means being free from interruptions and extending directly to said plate means, said sheet metal guiding means being arranged on the outside of that cylinder head wall which directly faces the oncoming cooling air.

2. An air cooled cylinder head for diesel engines which comprises in combination, a combustion chamber spaced from the bottom of the cylinder head, a glow plug carried by said cylinder head and extending into said combustion chamber, said glow plug being arranged at the rear side of said chamber, when looking in the direction of flow of the cooling air toward the cylinder head, passage means arranged in said cylinder head and communicating with the bottom thereof for passing gaseous media therethrough, the outer walls of said passage means confining with the outer wall of said combustion chamber relatively wide channel means for the passage of cooling air therethrough, a base body forming the lower part of the cylinder head, plate means arranged above the base body at approximately the height of the upper side of that cylinder head portion which receives said glow plug, cooling fins interposed between and integral with said base body and said plate means, said cooling fins extending between the inwardly directed outer walls of said passage means in the direction toward said combustion chamber, the ends of said cooling fins adjacent said combustion chamber being slightly bent off into said channel means in the direction of flow of the cooling air therethrough.

3. An air cooled cylinder head for diesel engines which comprises in combination, a combustion chamber spaced from the bottom of the cylinder head, a glow plug carried by said cylinder head and extending into said combustion chamber, said glow plug being arranged at the rear side of said chamber when looking in the direction of flow of the cooling air toward the cylinder head, passage means arranged in said cylinder head and communicating with the bottom thereof for passing gaseous media therethrough, the outer walls of said passage means confining with the outer wall of said combustion chamber

relatively wide channel means for the passage of cooling air therethrough, a base body forming the lower part of the cylinder head, plate means arranged above the base body at approximately the height of the upper side of that cylinder head portion which receives said glow plug, cooling fins interposed between and integral with said base body and said plate means, said cooling fins extending between the inwardly directed outer walls of said passage means in the direction toward said combustion chamber, the ends of said cooling fins adjacent said combustion chamber decreasing in height toward said channel means.

4. In an air cooled cylinder head for diesel engines, which is provided with a combustion chamber spaced from the bottom surface of said cylinder head and arranged near the front end of said cylinder head, which front end faces the oncoming cooling air, the combination of: passage means provided in said cylinder head behind said combustion chamber and arranged for communication with the cylinder pertaining thereto for respectively conveying gaseous media to and exhausting burned gases from said cylinder, valve means for controlling said passage means, a fuel injection nozzle extending into said combustion chamber, a glow plug carried by said cylinder head behind said nozzle and extending into said combustion chamber, and channel means extending from the front end of said cylinder head and laterally of said combustion chamber toward said valve means, the wall confining said combustion chamber tapering toward the rear and being provided with cooling fins arranged to guide cooling air from the front end of said cylinder head into said channel means to cool that portion of the cylinder head which is located between said valve means.

5. An air cooled cylinder head according to claim 4, in which said valve means include push rods arranged behind said cylinder head and between said passage means.

6. An air cooled cylinder head according to claim 4, in which said valve means include push rods arranged behind said cylinder head, said push rods and said passage means being located symmetrically with regard to

the plane passing through the center of the combustion chamber and the central axis of the cylinder pertaining to said cylinder head.

7. An air cooled cylinder head according to claim 4, in which said passage means extend toward and beyond the rear end of said cylinder head.

8. An air cooled cylinder head for diesel engines provided with a combustion chamber spaced from the bottom surface of said cylinder head and communicating therewith through channel means, which comprises in combination: an injection nozzle arranged to inject fuel into said combustion chamber and located at that side of said cylinder head which faces the oncoming cooling air, first fin means connected to said last mentioned side of said cylinder head, a glow plug extending into said combustion chamber and arranged behind said injection nozzle, inlet and outlet passages arranged behind said combustion chamber for respectively admitting and exhausting gaseous media, valve means behind said combustion chamber for controlling said inlet and outlet passages, the outer wall of said combustion chamber tapering in the direction toward said valve means, said first fin means extending around the major portion of said combustion chamber, and second fin means arranged between said valve means and having their major surfaces arranged substantially perpendicular to the bottom surface of said cylinder head for guiding cooling air over the bottom section of said cylinder head between said valve means.

References Cited in the file of this patent

UNITED STATES PATENTS

2,003,311	Ricardo	June 4, 1935
2,075,911	Roth	Apr. 6, 1937
2,199,619	Daub	May 7, 1940
2,398,191	Rosen et al.	Apr. 9, 1946

FOREIGN PATENTS

229,932	Switzerland	Feb. 16, 1944
273,504	Switzerland	May 1, 1951