

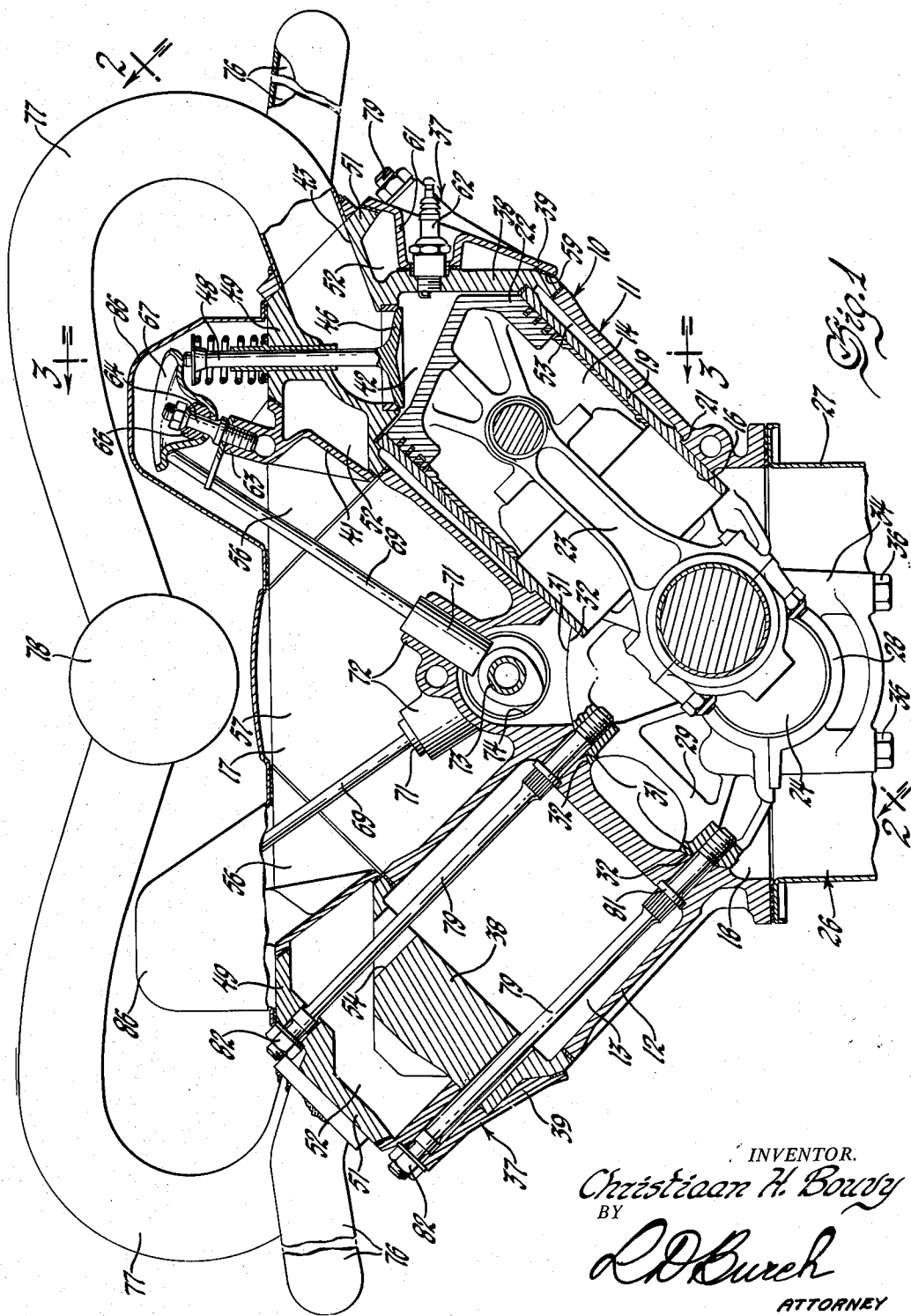
July 4, 1961

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CYLINDER HEAD CONSTRUCTION FOR INTERNAL
COMBUSTION ENGINES

2,990,819

Filed May 14, 1958

2 Sheets-Sheet 1



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1

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CYLINDER HEAD CONSTRUCTION FOR INTERNAL COMBUSTION ENGINES

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Filed May 14, 1958, Ser. No. 735,232

5 Claims. (Cl. 123—41.74)

This invention relates to construction and design features especially applicable in the manufacture of die cast aluminum or other light metal internal combustion engines for automotive and other uses.

According to the invention it is proposed to construct an engine frame consisting of a number of separate die cast or other parts that may be assembled with bolts from adhesively bonded or otherwise assembled parts. Such parts are capable of being manufactured at a low cost from aluminum, magnesium, ferrous metals, etc. or from various combinations of such metals.

In the drawings:

FIGURE 1 is a cross-sectional view of an engine embracing the principles of the invention.

FIGURE 2 is a fragmentary longitudinal section view through one of the banks of cylinders and a part of the crankshaft, piston and connecting rod mechanism embraced in the structure disclosed by FIGURE 1. FIGURE 2 is taken substantially on the line 2—2 of FIGURE 1, looking in the direction of the arrows thereon.

FIGURE 3 is a fragmentary sectional view through one of the heads of the engine disclosed by FIGURE 1 and illustrating particularly the inlet and exhaust valves and the combustion chambers for the cylinders of the engine.

In the drawing, the engine 10 may comprise an engine frame 11, including an engine block 12 formed to provide rows 13 and 14 of cylinders 16. The cylinders in the rows 13 and 14 are angularly disposed with respect to one another which provides between the rows a camshaft gallery indicated at 17. The block 12 may be constructed from either aluminum or magnesium as a permanent mold casting, if this is desired. It will be noted that the walls forming the cylinder jacket in the block are tapered outwardly so that the cores may be removed from the outer ends of the cylinder jacket. A recess 18 formed in the block 12 and communicating with the inner ends of the cylinders 16, is also constructed so that it may be made by a permanent core removable outwardly from the lower part of the block 12. The cored openings in the block forming the cylinders 16 are adapted to receive cylinder liners 19 which may be fitted inwardly from the outer end of the cylinders to rest on annular shoulders indicated at 21. The cylinders are adapted to receive pistons 22 connected by connecting rods 23 to a crankshaft 24 mounted in a crankcase 26 formed by the recess 18 in the block 12 and the space within an oil pan 27 secured in any suitable manner to the flanged lower edge of the block 12. The journals of the crankshaft 24 are supported by main bearings 28 formed in the main bearing supports 29 extending transversely of the crankcase 26 and formed to provide arcuate ledges 31 which are concentric relative to the main bearings 28. The ledges 31 are adapted to engage arcuate seats 32 formed on the block 12 within the recess 18 and between and at the ends of the cylinders 16 in the rows 13 and 14. The supports 29 may be separate parts and may be made of any suitable metal. However, it may be desirable to make the bearing supports 29 of ferrous metal so as to provide the proper expansion and contraction with respect to the main journals of the crankshaft 24. If ferrous metal is employed then bushings 33 of any suitable type now being used in ferrous cast engines may be employed. The sup-

2

ports 29 may be made to receive the crankshaft 24 in the bearings 28 by providing separable bearing caps 34 secured by bolts 36 upon the crankshaft journals.

The heads 37 closing the outer ends of the cylinders 16 of the engine are elongated separately assembled parts each covering one row of cylinders of the engine. The heads consist of assembled parts 38, 39 and 41, the parts 39 and 41 being outer and inner side walls respectively of the heads 37. The parts 38 are spaced from the pistons 22 to provide combustion chambers 42 into which inlet and exhaust passages 43 and 44 respectively open through inlet and exhaust valves 46 and 47 respectively. The valves 46 and 47 for each row of cylinders are aligned, the valve stems 48 for the valves being disposed in rows with the axes thereof parallel and projecting outwardly above the heads through upper walls 49 having outer surfaces in the same plane in both heads of the engine. The outer ends of the passages 43 and 44 open through end walls 51 included in the parts 38, the walls 51 having the outer surfaces thereof disposed in planes normally intersecting the axes of the cylinders in each row of cylinders. The passages 43 and 44 open outwardly through the walls 51 on opposite sides of and beyond the walls 49.

The heads 37 are formed to provide cooling cavities 52 which are adapted to communicate with cylinder cooling cavities 53 through passages 54 formed in the parts 38. The cavities 52 open inwardly and outwardly through openings in the parts 38 extending lengthwise of the heads and adapted to be closed by inner and outer side walls 39 and 41. The inner side walls 41 have laterally disposed ends 56 which are adapted to engage the end walls 57 of the block 12. The outer surfaces of the upper walls 49, the side walls 41, the laterally disposed ends 56 of the side walls 41, and the end walls 57 of the block 12 are all disposed in the same plane, this being a plane obliquely disposed to the axes of the cylinders in the rows of cylinders and substantially normally to the longitudinally disposed mid-plane of the engine extending through the axis of the crankshaft 24 and midway between the rows of cylinders 16.

The cavities 52 in the heads 37 may be formed by cores extending through the elongated openings in the parts 38. The outer cores may project inwardly through the openings in the outer sides of the parts 38, the inner extremities thereof terminating at about the middle of the inlet and exhaust passages 43 and 44. Likewise the inner core may extend inwardly through the openings on the inside of the parts 38, the inner end of the core terminating at the outer cores and at about the middle of the inlet and exhaust passages 43 and 44. The cores may be removed from the tapered openings forming the opposite sides of the cavities by movement substantially parallel to the outer surfaces of the walls 51 and 49, respectively. The inlet and exhaust passages 43 and 44 also may be formed by tapering and end abutting cores removable from opposite ends of the passages.

It is proposed to close the cavities 52 in the parts 38 by permanently securing the walls 39 and 41 to the parts 38 around the side openings therein and by the employment of a buna base thermally setting cement 59 or other suitable means. The outer side walls 39 are formed to provide recesses 61 receiving spark plugs 62 projecting into the combustion chambers 42 of the engine. The walls 39 are formed to provide openings at the inner extremities of the recesses 61 and through which spark plugs 62 project. The walls 39 may be secured to the walls 38 around the openings receiving the spark plugs by the buna base cement previously referred to or by other suitable means.

The inner side walls 41 are adapted to have projections 63 extending upwardly therefrom and for each cylinder of the engine. The projections 63 may be threaded to receive studs 64 supporting spherically shaped bearings 66

3

on which individual rocker arms 67 are mounted. The opposite ends of the rocker arms 67 engage the valve stems 48 and push rods 69 projecting from the camshaft gallery 17 and actuated by valve lifters 71 operatively supported in bosses 72 formed in the block 12. The valve lifters 71 may be actuated by a camshaft 73 rotatably mounted in camshaft bearings 74 formed in the block 12 at the lower part of the camshaft gallery 17. The camshaft 73 may be driven by the crankshaft 24 in any suitable manner.

The exhaust passages 44 for the cylinders of the engine are adapted to communicate with exhaust manifolds 76 while the inlet passages 43 are adapted to communicate with the opposite branches 77 of the inlet manifold 78.

After the side walls 39 and 41 are secured to the parts 38 to provide the heads 37 it is proposed to secure the heads to the block 12 and to the crankshaft bearing supports 29 by bolts 79. The ledges 31 of the supports 29 may be threaded to receive the inner ends of the bolts, the bolts being provided with intermediate heads 81 adapted to secure the block 12 to each of the supports. Thereafter the heads may be secured in place by projecting the bolts through openings in the heads and securing the nuts 82 upon the threaded outer ends of the bolts.

It will be apparent that the concentric arcuate surfaces forming the ledges and the seats supporting the bearing supports 29 will make it possible to properly locate the crankshaft without extensive machining and finishing operations on the supports and the block. It will also be apparent that the side walls 39 and 41 make it possible to cast the heads without great difficulty and that the heads may be assembled without parts of the heads involving inlet and exhaust passages being in different assembled parts. The inlet and exhaust passages 43 and 44 for example communicate with the combustion chamber 42 and with the space outwardly of the heads through the walls 51 which are integral parts of the walls 38 in which the combustion chambers are formed.

It is proposed to close the upper part of the engine by a single cover 86 which covers the outer ends of the valve stems, the rocker arms, the push rods and the camshaft gallery between the rows of cylinders. In fact the cover closes all of the open space in the central part of the engine and throughout the length of the engine and between the inlet and exhaust manifolds of the engine.

I claim:

1. An internal combustion engine comprising an engine frame having a row of cylinders therein, a head extending along said row of cylinders and closing the outer ends of said cylinders, cooling cavity means formed in said head for cooling said cylinders, said cooling cavity means being formed to open outwardly in opposite directions through oppositely disposed and elongated openings formed in said head and extending lengthwise of said row of cylinders, said cooling cavity means including inwardly tapering wall surfaces complementary to permanent type core means removable from said head through said openings, side walls for said head, means securing said side walls to said head for closing said openings and said cooling cavity means, combustion chamber means for said cylinders, inlet and exhaust passage means formed in said head and extending across said cooling cavity means and having inner ends communicating with said combustion chamber means, said cooling cavity inwardly tapering wall surfaces being extended transversely across said head and between said inlet and exhaust passage means, said inlet and exhaust passage means having outer ends opening outwardly of said head through a wall of said head between said side walls closing said openings.

2. An internal combustion engine as defined by claim 1 and in which said inlet and exhaust passage means includes inwardly tapering wall surfaces complementary

4

to permanent type core means removable from said head from said inner and outer ends of said passages.

3. An internal combustion engine comprising an engine frame having a row of cylinders therein, a head extending along said row of cylinders and closing the outer ends of said cylinders, cooling cavity means formed in said head for cooling said cylinders, said cooling cavity means being formed to open outwardly in opposite directions through oppositely disposed and elongated openings formed in said head and extending lengthwise of said row of cylinders, said cooling cavity means including inwardly tapering wall surfaces complementary to permanent type core means removable from said head through said openings, side walls for said head, means securing said side walls to said head for closing said openings and said cooling cavity means, combustion chamber means for said cylinders, inlet and exhaust passage means formed in said head and extending across said cooling cavity means and having inner ends communicating with said combustion chamber means, said cooling cavity inwardly tapering wall surfaces being extended transversely across said head and between said inlet and exhaust passage means, valves controlling said inner ends of said inlet and exhaust passage means and having valve stems, valve guides in said head and receiving said valve stems and operatively supporting said valves, said valve guides being within and said valve stems being disposed to project outwardly of said head through a wall of said head between said side walls closing said openings.

4. An internal combustion engine comprising an engine frame having a row of cylinders therein, a head extending along said row of cylinders and closing the outer ends of said cylinders, cooling cavity means formed in said head for cooling said cylinders, said cooling cavity means being formed to open outwardly through an elongated opening formed in one side of said head and extending lengthwise of said row of cylinders, said cooling cavity means including inwardly tapering wall surfaces complementary to permanent type core means removable from said head through said opening, a first side wall for said head, means securing said first side wall to said head for closing said opening and said cooling cavity means, combustion chamber means for said cylinders, inlet and exhaust passage means formed in said head and extending across said cooling cavity means and having inner ends communicating with said combustion chamber means, said cooling cavity inwardly tapering wall surfaces being extended transversely across said head and between said inlet and exhaust passage means, said inlet and exhaust passage means having outer ends opening outwardly of said head through a second side wall of said head, valves controlling said inner ends of said inlet and exhaust passage means and having valve stems, valve guides in said head and receiving said valve stems and operatively supporting said valves, said valve guides being within and said valve stems being disposed to project outwardly of said head through a third side wall of said head between said first side wall closing said opening and said second side wall of said head, and means supported by said first side wall closing said opening and operatively engaging the outer ends of said valve stems for opening and closing said valves.

5. An internal combustion engine comprising an engine frame having a row of cylinders therein, a head extending along said row of cylinders and closing the outer ends of said cylinders, cooling cavity means formed in said head for cooling said cylinders, said cooling cavity means being formed to open outwardly through an elongated opening formed in one side of said head and extending lengthwise of said row of cylinders, said cooling cavity means including inwardly tapering wall surfaces complementary to permanent type core means removable from said head through said opening, a side wall for said head, means securing said side wall to said head closing said opening and said cooling cavity means, combustion

chamber means for said cylinders, inlet and exhaust passage means formed in said head and extending across said cooling cavity means and communicating with said combustion chamber means; said cooling cavity inwardly tapering wall surfaces being extended transversely across said head and between said inlet and exhaust passages, spark plug means disposed in an inner wall of said head and projecting through said inner wall into said combustion chamber means, said spark plug means being disposed in recess means formed in said side wall closing said opening in directly opposed relation to each of said combustion chamber means.

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10

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