July 11, 1961 W. J. SCHRADER 2,991,775

VENTILATION OF INTERNAL COMBUSTION ENGINES

Filed June 22, 1960

3 Sheets-Sheet 1

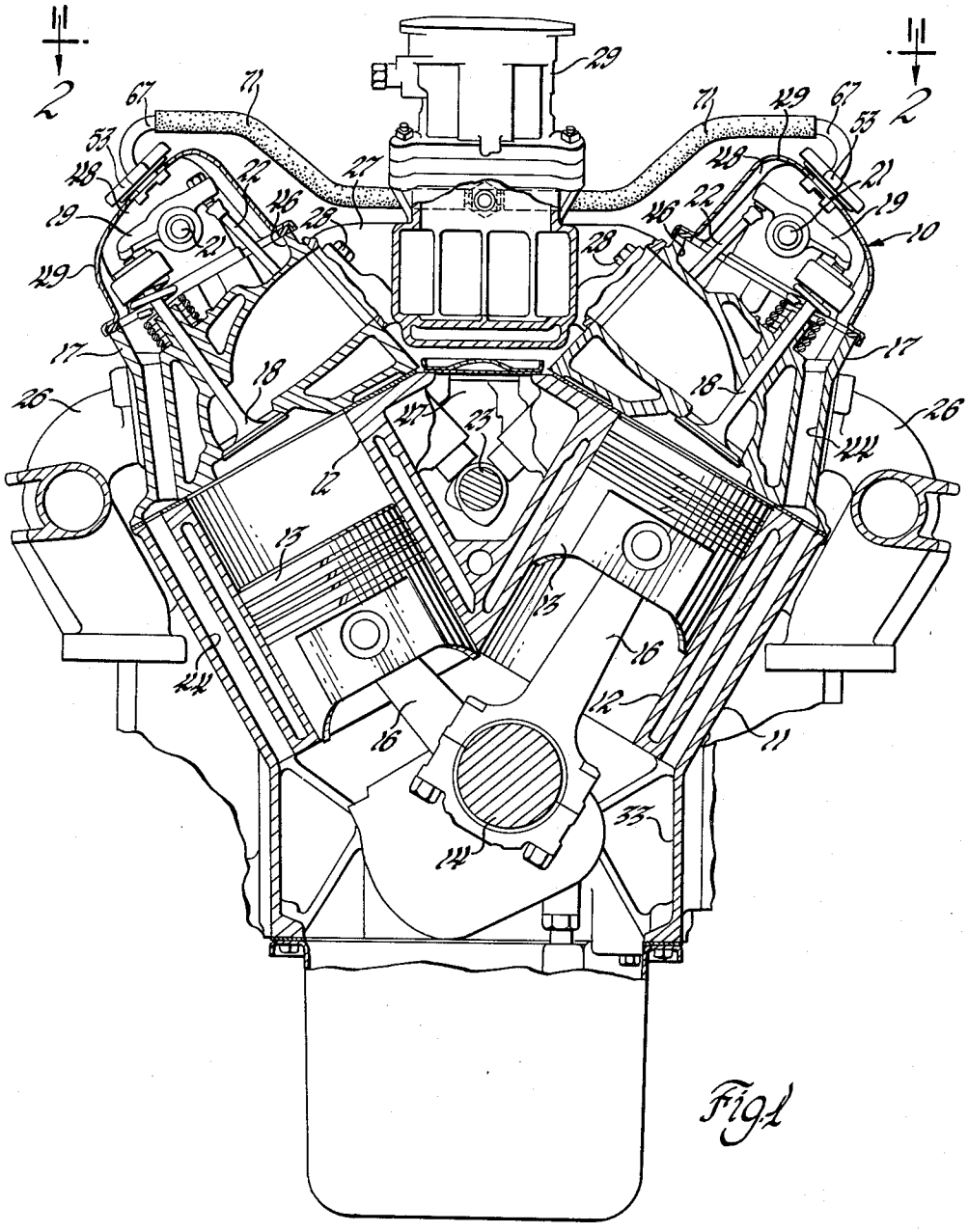

Fig. 1

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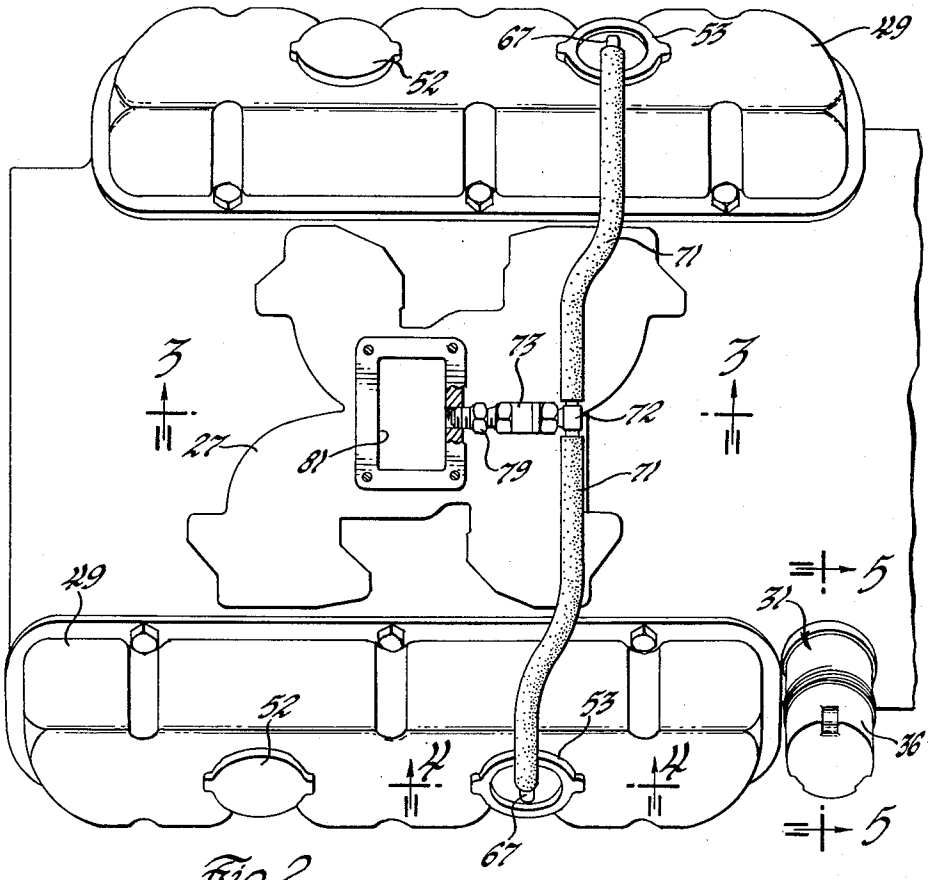

Fig. 2

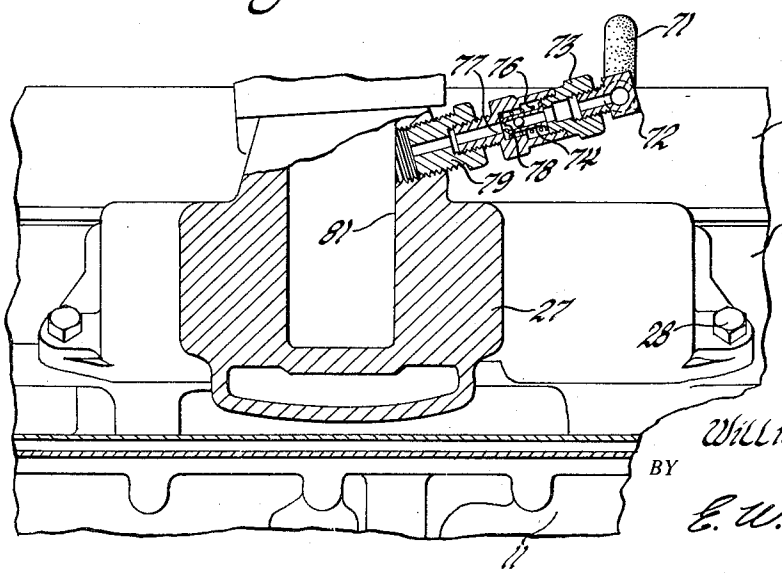

Fig. 3

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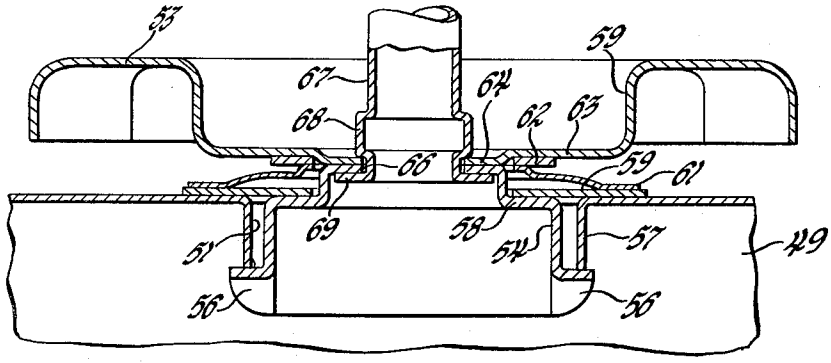

Fig. 4

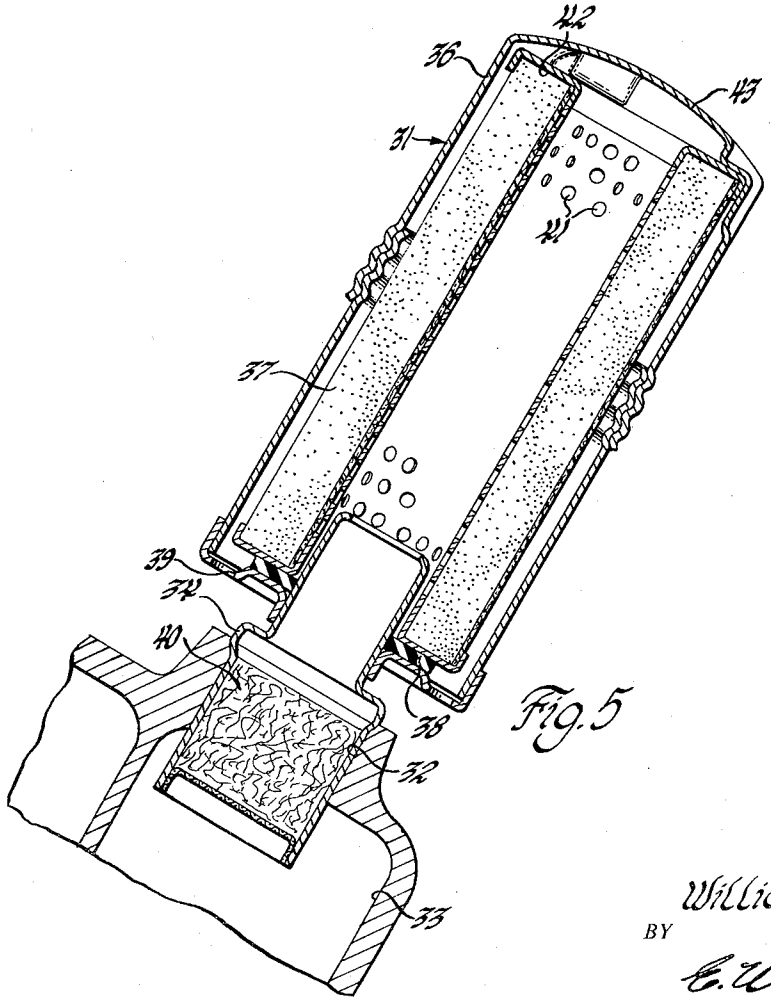

Fig. 5

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VENTILATION OF INTERNAL COMBUSTION ENGINES

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5 Claims. (Cl. 123—119)

This invention relates to crankcase ventilating systems for use in internal combustion engines especially applicable for driving trucks, busses, etc.

Engines to be used on trucks and busses must be made in several different displacements, with different compression ratios and with different numbers of cylinders. To do this without prohibitive expense, it is necessary to make parts in such a way that most of the parts can be used in all of the different engines. For example, a 60° V–6 or other engine can be made with different displacements by varying the diameter of the cylinders, by changing the size of the combustion chambers etc. Also, a 60° V–12 engine can be made out of substantially the same parts and in different displacements and compression ratios merely by using a 12 cylinder block instead of a six cylinder block. In such a 12 cylinder engine, four of the six cylinder heads may be used instead of two, two inlet manifolds instead of one, etc. When these engines are employed in trucks and busses they are installed in many different ways. They sometimes extend longitudinally of the vehicle, sometimes crosswise, sometimes one end is covered, sometimes the other.

It is proposed to provide an interior ventilating system which can be applied to such a family of engines without employing numerous special parts for the different engines and installations.

In the drawing:

FIGURE 1 is a cross sectional view of a 60° V–6 engine having a crankcase ventilating system embodying the invention.

FIGURE 2 is a fragmentary plan view and cross section of the engine disclosed by FIGURE 1. FIGURE 2 is taken substantially in the plane of line 2—2 on FIGURE 1, looking in the direction of the arrows.

FIGURE 3 is a fragmentary longitudinal sectional view of the engine through the inlet manifold part of the engine. FIGURE 3 is taken substantially in the plane of line 3—3 on FIGURE 2 looking in the direction of the arrows.

FIGURE 4 is a fragmentary longitudinal sectional view through a ventilating outlet from one of the rocker arm compartments of the engine disclosed by the preceding figures. FIGURE 4 is taken substantially in the plane of line 4—4 on FIGURE 2 looking in the direction of the arrows.

FIGURE 5 is a cross-sectional view of the air inlet for the ventilating system embodied in the engine disclosed by the preceding figures.

The engine 10 is a 60° V-type six cylinder engine having an engine block 11 with rows of cylinders 12 adapted to receive reciprocating pistons 13. The crankshaft 14 for the engine is rotatably mounted in the block 11 and is connected to the pistons 13 by connecting rods 16. Heads 17 are bolted or otherwise secured to the block for closing the outer ends of the cylinders 12 in the different rows of cylinders 12. The heads 17 are reversible heads so that the same head will fit either row of the cylinders 12. The heads contain inlet and exhaust valves 18 for each cylinder, these being actuated by rocker arms 19 mounted on rocker shafts 21 mounted for oscillation on the heads 17. The rocker arms are actuated by push rods 22 driven by a camshaft 23 mounted in the block 11 between the rows of cylinders 12. Exhaust manifolds

26 which fit the heads 17 on either side of the engine 10 are bolted or otherwise suitably secured to the heads for exhausting the products of combustion from the cylinders 12. An inlet manifold 27 is secured by bolts 28 to the inside walls of the heads 17 for supplying combustible charges to the cylinders 12. A carburetor 29 may be employed if desired for forming the charges supplied by the manifold 26.

A 12 cylinder engine may be made employing a 12 cylinder block and a longer crankshaft. In such an instance 12 pistons and connecting rods will be employed, four heads such as the heads 17, four exhaust manifolds such as the manifold 26 and two inlet manifolds 27 and carburetors 29. Different displacements and compression ratios may be employed in such engines by making the cylinders and combustion chambers of different sizes.

An interior ventilating system for such a family of engines and for the different uses for which such engines are employed may be made by constructing the system to include an air inlet 31 that may be inserted in a suitable opening 32 formed in the sloping upper wall of the crankcase 33 which forms a part of the engine block 11. The air inlet 31 includes a tubular outlet 34 supporting a casing 36 in which a paper or other removable and disposable or cleanable air filter 37 is supported on an end seal 38. The bottom of the casing 31 is perforated by holes 39 for the purpose of admitting air to the outside of the filter. A filter material may be placed in the tubular outlet 34, such as shredded aluminum 40, to trap and return any lubricant from the crankcase to the filter unit. The air flows through the filter 37 and through perforations 41 in the filter support 42 and into the crankcase 33 through the tubular support 34. It will be apparent that since the outer end of the filter is closed and since air will be flowing inwardly through the holes 39, that fumes from the crankcase will not normally escape to the atmosphere through the inlet 31. The air admitted to the crankcase will circulate within the crankcase and pick up gases which blow by the pistons and will pick up other substances that normally collect in the crankcase of the engine. Such substances will flow upwardly into the heads through oil return passages 44 and through push rod passages 46 that extend through the heads and the block and communicate with the camshaft gallery 47 of the engine 10. The upper ends of the passages 44 and 46 communicate with rocker arm compartments 48 formed by rocker arm covers 49 bolted or otherwise secured to the heads around the valve actuating mechanisms therein. The rocker arm covers 49 are reversible so as to fit all the heads of the family of engine and have openings 51 at either end that are adapted to fit rotatable bayonet slot closure devices 52 or 53. The closure devices 53 include centrally disposed retainers 54 having cams 56 thereon adapted to engage oppositely disposed abutments 57 formed around the edges of the openings 51. The retainers 54 have annular shoulders 58 thereon for supporting flexible annular sealing plates 59. The sealing plates extend outwardly beyond the openings 51 against leakage of fluid through the openings 51. The outer edges of the plates 59 are secured to the outer edges of annular spring disks 61 the inner edges of which slidably engage annular bearing plates 62 that are adapted to seat against the lower surfaces of operating caps 63. The inner edges of the operating caps 63 and the inner edges of the retainer 54 may be welded or otherwise secured together at 64. Openings 66 are formed centrally of the caps 59 and the retainers 54 for receiving tubular nipples 67 having annular shoulders 68 and flanged ends 69 engaging the surfaces of the caps 59 and retainers 54 around the openings 66 therein.

The closure devices 52 may be constructed the same as

the devices 53 except that the devices 52 do not have the openings 66 and the tubular nipples 67 secured therein.

The devices 52 and 53 are also reversible on the rocker arm covers 49 so that either device may be located in either of the openings 51 near the ends of the rocker arm covers 49. In the present instance the closure devices 53 are located at corresponding ends of the rocker arm covers 49 and the nipples 67 are connected by hoses 71 to the opposite end of a T connection 72. The remaining end of the T connection 72 is secured in the open outer end of a ventilation control device 73. The ventilation control device 73 has a spring pressed valve 74 therein that is adapted to move against a spring 76 to engage and close an orifice 77 to limit the flow of fluid through the valve to the amount of fluid that will flow through a centrally disposed bypass 78 in the central part of the valve 73. The opposite end of the device 73 is connected by a fitting 79 to the main distribution passage 81 of the inlet manifold 27.

When the engine 10 is running the inlet manifold will create a suction on the rocker arm compartments 48 which will be transmitted to the crankcase 33 through the push rod passages 46 and the oil return passages 44. The gases blowing by the pistons and other vaporous substances in the crankcase and the rocker arm compartments and elsewhere in the interior of the engine will be drawn into the inlet manifold 27 through the control device 73. As the inlet manifold vacuum increases the valve 74 will tend to close the orifice 77 to reduce the flow to the amount of fluid that may be carried by the bypass 78.

It will be apparent that the devices 53 may be assembled in the openings at either end of the rocker arms. Under such circumstances it will be apparent that the closure devices 53 may be universally applied to the rocker arm covers 29 so that the outlet for the vaporous substances may be at either end of the rocker arm covers. The closure devices 53 also may be removed if desired for the purpose of filling the engine with oil. The closure devices 52 also may be removed for filling the engine with oil, which makes it possible to apply oil to either end of the engine and on either side of the engine. It will also be apparent that the closure devices 53 and hoses 51 and fittings 72 and control devices 73 and fittings 79 may be used in duplicate on a 12-cylinder engine with four rocker arm covers, two manifolds and two carburetors. In any event the rocker arm covers, closure devices, hoses, fittings and control devices will be universally applicable to any engine and to either of the ends of any pair of rocker arm covers.

The claims:

1. An interior ventilating system for an internal combustion engine having a row of cylinders connected to a crankcase and having a cover for said row of cylinders enclosing the valves and valve actuating mechanisms for said cylinders and having a charge forming device including an inlet manifold supplying combustible charges to said cylinders, said crankcase and said cylinders and said cover being formed to provide a crankcase compartment within said crankcase and a valve actuating mechanism compartment within said cover communicating passages in said row of cylinders and between said crankcase compartment and said valve actuating mechanism compartment and comprising, inlet means supplying air to said crankcase compartment to be circulated throughout said crankcase compartment and through said passages and throughout said valve actuating mechanism compartment, outlet means connecting said valve actuating mechanism compartment to said inlet manifold and exhausting said air and the vaporous substances within said engine to said inlet manifold, said outlet means including a rotatable cap removably engaging an outlet opening in said cover, said cap and said manifold having coupling means communicating with said valve actuating mechanism compartment and said manifold, and a flexible conduit connecting said coupling means.

2. An interior ventilating system for an internal combustion engine having a row of cylinders connected to a crankcase and having a cover for said row of cylinders enclosing the valves and valve actuating mechanisms for said cylinders and having a charge forming device including an inlet manifold supplying combustible charges to said cylinders, said crankcase and said cylinders and said cover being formed to provide a crankcase compartment within said crankcase and a valve actuating mechanism compartment within said cover and communicating passages in said row of cylinders and between said crankcase compartment and said valve actuating mechanism compartment and comprising, inlet means supplying air to said crankcase compartment to be circulated throughout said crankcase compartment and through said passages and throughout said valve actuating mechanism compartment, outlet means connecting said valve actuating mechanism compartment to said inlet manifold and exhausting said air and the vaporous substances within said engine to said inlet manifold, said outlet means including a rotatable cap removably engaging an outlet opening in said cover adjacent one end of said cover, said cap and said manifold having coupling means communicating with said valve actuating mechanism compartment and said manifold, and a flexible conduit connecting said coupling means, said cover having another opening adjacent the other end of said cover, said another opening being normally closed by another rotatable cap removably engaging said another opening, said another removable cap being a closure cap without said coupling means, said inlet means including a casing having a disposable filter therein for cleaning said air, and said caps being removable for supplying said crankcase with oil.

3. An interior ventilation system for an internal combustion engine having rows of cylinders connected to crankcase and having covers for said rows of cylinders enclosing the valves and valve actuating mechanisms for said cylinders in said rows and having charge forming device means adjacent said rows of cylinders and including inlet manifold means supplying combustible charges to said cylinders in said rows, said crankcase and said cylinders in said rows and said covers being formed to provide a crankcase compartment within said crankcase and valve actuating mechanism compartments within said covers and communicating passages in said rows of cylinders and between said crankcase compartment and said valve actuating mechanism compartments and comprising, inlet means supplying air to said crankcase compartment to be circulated throughout said crankcase compartment and through said passages and throughout said valve actuating mechanism compartments, outlet means connecting said valve actuating mechanism compartments to said inlet manifold means and exhausting said air and the vaporous substances within said engine to said inlet manifold means, said outlet means including rotatable caps removably engaging outlet openings in said covers, said caps and said manifold means having coupling means communicating with said valve actuating mechanism compartments and said manifold means, and flexible conduits connecting said coupling means of said caps to said coupling means of said manifold means.

4. An interior ventilation system for an internal combustion engine having oppositely disposed and parallel rows of cylinders connected to a crankcase and having covers for said rows of cylinders enclosing the valves and valve actuating mechanisms for said cylinders in said rows and having charge forming device means between said rows of cylinders and including inlet manifold means supplying combustible charges to said cylinders in said rows, said crankcase and said cylinders in said rows and said covers being formed to provide a crankcase compartment within said crankcase and valve actuating mechanism compartments within said covers and com-

municating passages in said rows of cylinders and between said crankcase compartment and said valve actuating mechanism compartments and comprising, inlet means supplying air to said crankcase compartment to be circulated throughout said crankcase compartment and through said passages and throughout said valve actuating mechanism compartments, outlet means connecting said valve actuating mechanism compartments to said inlet manifold means and exhausting said air and the vaporous substances within said engine to said inlet manifold means, said outlet means including rotatable caps adjacent corresponding ends of said covers and removably engaging outlet openings in said covers adjacent said ends of said covers, said caps at said ends of said covers and said manifold means having coupling means communicating with said valve actuating mechanism compartments and said manifold means, flexible conduits connecting said coupling means of said caps to said coupling means of said manifold means, said covers being identical covers and being reversible on said rows of cylinders.

5. An interior ventilation system for an internal combustion engine having oppositely disposed and parallel rows of cylinders connected to a crankcase and having covers for said rows of cylinders enclosing the valves and valves actuating mechanisms for said cylinders in said rows and having charge forming device means between said rows of cylinders and including inlet manifold means supplying combustible charges to said cylinders in said rows, said crankcase and said cylinders in said rows and said covers being formed to provide a crankcase compartment within said crankcase and valve actuating mechanism compartments within said covers and communicating passages in said rows of cylinders and between said crankcase compartment and said valve actuating mechanism compartments and comprising, inlet means supplying air to said crankcase compartment to be circulated throughout said crankcase compartment and through said passages and throughout said valve actuating mechanism compartments, outlet means connecting said valve actuating mechanism compartments to said inlet manifold means and exhausting said air and the vaporous substances within said engine to said inlet manifold means, said outlet means including rotatable caps adjacent corresponding ends of said covers and removably engaging outlet openings in said covers adjacent said ends of said covers, said caps at said ends of said covers and said manifold means having coupling means communicating with said valve actuating mechanism compartments and said manifold means, flexible conduits connecting said coupling means of said caps to said coupling means of said manifold means, said covers being identical covers and being reversible on said rows of cylinders and having other similar outlet opening means adjacent the other ends of said covers, said other outlet opening means being normally closed by other rotatable caps removably engaging said other outlet opening, said other removable caps being closure caps without said coupling means.

References Cited in the file of this patent

UNITED STATES PATENTS

2,359,485	Lowther	Oct. 3, 1944
2,829,629	Badertscher et al.	Apr. 8, 1958
2,853,986	Kolbe	Sept. 30, 1958

FOREIGN PATENTS

3,145	Australia	Aug. 7, 1926

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 2,991,775 July 11, 1961

William J. Schrader

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 2, line 30, after "crankcase" insert -- that is carried by normal air flow from the crankcase --; line 52, after "slot" insert -- type --; same column 2, line 59, after "openings 51" insert -- to close and seal the openings 51 --; column 5, line 25, for "valves" read -- valve --.

Signed and sealed this 21st day of November 1961.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents

USCOMM-DC