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FLUID-COOLED TWO-STROKE CYCLE INTERNAL COMBUSTION ENGINE WITH INDIVIDUALLY MOUNTED CYLINDERS

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FIG. 2.

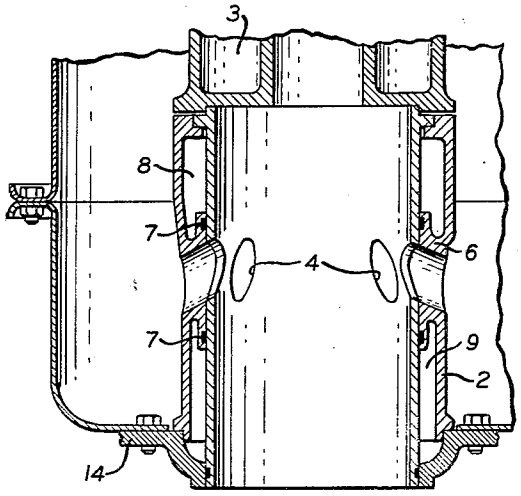
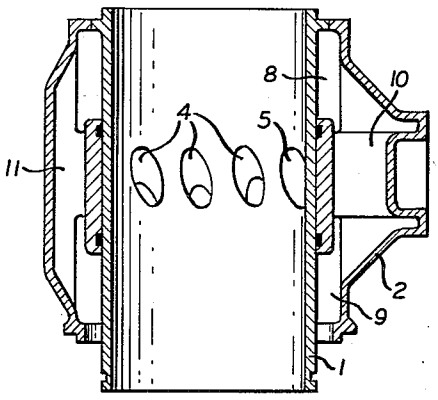


FIG. 3.



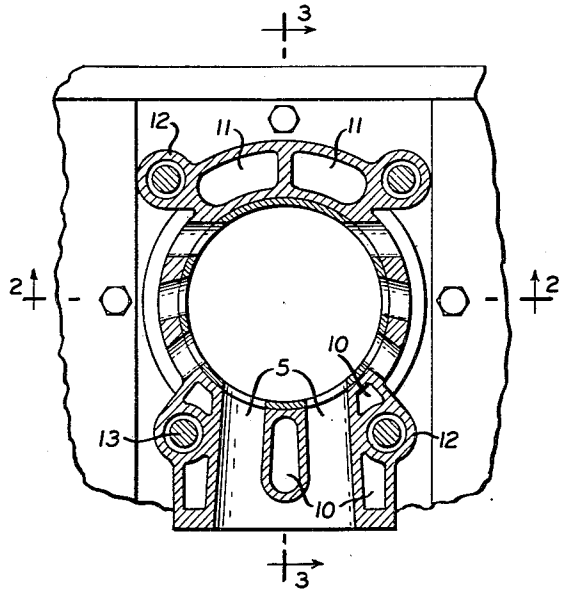


FIG. 1.

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FLUID-COOLED TWO-STROKE CYCLE INTERNAL COMBUSTION ENGINE WITH INDIVIDUALLY MOUNTED CYLINDERS

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6 Claims. (Cl. 123—41.84)

The present invention relates to a fluid-cooled two-stroke cycle interal combustion engine with individually mounted cylinders. Two-stroke engines with port control are already known, in which the cylinder sleeve is provided with seats at its outside in the region of the inlet and outlet ports, said seats being supported in the engine block by using gaskets. It is a disadvantage of this design that the cylinder sleeves have to be of a very great wall thickness, whereby the cylinder sleeve, when using a special cast iron (alloy), is very costly to manufacture. Furthermore, due to the great differences in the wall thickness, manufacture of these sleeves by means of the centrifugal casting process is very complicated.

Furthermore, the sleeves had to be provided with center drills between the ports in the region of the seats, in order to have a connection between the cooling water jackets below and above the ports.

Drilling of these bores is difficult and expensive, as said bores have to be of a small diameter because of the presence of the ports. In other known engines which were fitted with smooth cylinder sleeves similar to those used in four-stroke engines, the transfer of the scavenging air as well as of the exhaust gas took place directly in the engine housing. This method required a large and complicated casting of the engine block, with core displacements in the ducts occurring frequently which necessitated undesired subsequent machining.

It is, therefore, one object of the present invention to provide an engine in which all these deficiencies are eliminated. A cylinder sleeve, as they are known in four-stroke engines, is fitted in a cooling water jacket which is provided with seats to carry the sleeve. Preferably the seats provided in the cooling water jacket receive the exhaust ports and the gaskets for the cylinder sleeve. Furthermore, there are cooling water jackets behind those parts receiving the gaskets so that the gaskets benefit by the cooling effect.

It is another object of the present invention to provide an engine in which the return of the cooling water from the part below the inlet and outlet ports to the part above said ports is preferably accomplished by passages or connections which enclose and pass through the exhaust ducts, and on the other hand by means of connecting chambers which are arranged on the opposite side of the exhaust duct. According to the number of cylinders in the engine a corresponding number of cooling water elements and cylinder sleeves are mounted, i. e. each cylinder has its own cooling water jacket. Numerous embodiments in accordance with this invention are possible. With these and other objects in view which will become apparent in the following detailed description, the present invention will be clearly understood in connection with the accompanying drawings, in which:

Figure 1 is a cross sectional view of the region of the inlet and outlet ports of a unit;

Fig. 2 is a cross sectional view taken along the lines 2—2 of Fig. 1; and

Fig. 3 is a cross sectional view taken along the lines 3—3 of Fig. 1.

Referring now to the drawings, the cylinders are mounted independently from each other on the engine block, which is not depicted. Each cylinder substantially comprises a smooth cylinder sleeve 1, as they are used in four-stroke engines. Each cylinder sleeve is enclosed by a cooling water jacket 2 which is a unit in itself and which is mounted on the engine block. The upper end is covered by the cylinder head 3.

As can be clearly seen from Fig. 1 the cylinder sleeve 1 is provided with inlet ports 4 and outlet ports 5. In the region of these ports the cylinder sleeve is supported by the cooling water jacket. For this purpose the jacket 2 has a round-about seat 6 which receives the gaskets 7. Behind the gaskets the seat 6 is turned out into the direction of the ports so that the upper cooling water rooms 8 and the lower cooling water jackets 9 extend behind the gaskets, thus achieving a high cooling effect in this region, too. The inlet and outlet ports pass through said seat 6.

According to the invention the lower cooling water jackets 9 are connected with the upper cooling water jackets 8 above said ports in the region of the outlet ports and are connected with each other on the side opposite of said outlet ports. For this purpose passages 10 are provided in the region of the outlet ports 5, said passages being partly inside said exhaust duct and partly enclosing it. Directly opposite said outlet ports there are also connecting chambers 11.

By this arrangement of the connecting passages and connecting chambers it is possible to mount the cylinders very close together so that the engine is of a small overall length. Anchor bolts connect the cylinder head 3 with the engine block which is not depicted, said anchor bolts being enclosed in pipes 12. These pipes are arranged so that they do not influence the close mounting of the cylinders. The inlet ports 4 which pass through the seats 6 end in the scavenging receiver, which encloses the cylinders.

As clearly shown in Fig. 2 the individual cylinders are mounted on top of the engine block 14 and the cylinder head 3, supported by the corresponding cylinder, is retained in position by pipes 12 cast preferably integrally with said cylinder which pipes 12 receive anchoring bolts 13.

While I have disclosed one embodiment of the present invention, it is to be understood that this embodiment is given by example only and not in a limiting sense, the scope of the present invention being determined by the objects and the claims.

I claim:

1. In a port-controlled fluid-cooled two-stroke cycle internal combustion engine, an engine block and a cylinder unit comprising an outer casing and a liner defining a cooling water jacket therebetween and said cylinder unit being mounted on top of and extending with its upper portion outside of said engine block, the number of said cylinder units corresponding to the number of cylinder of said engine, and a cylinder head mounted on the upper end of each of said cylinder units, and means for fastening each of said cylinder heads to said engine block, said fastening means consisting of pipes cast integrally with the corresponding of said cylinder units and anchor bolts passing through said cylinder head and said pipes into said engine block, and a scavenging receiver enclosing said cylinder units substantially through the length thereof apart from said engine block.

2. The internal combustion engine, as set forth in claim 1, in which said liners have air inlet and outlet ports, and corresponding inlet and outlet openings in said

outer casings, a flange provided inside each of said outer casings, said flange enclosing said liners in the region of said ports, and gaskets disposed between said liners and said flanges above and below said inlet and outlet openings.

3. The internal combustion engine, as set forth in claim 1, which includes exhaust ducts connected with said outlet openings of said cylinder unit.

4. The internal combustion engine, as set forth in claim 1, which includes an additional housing enclosing each of said cylinder units and through which said exhaust ducts are passed through said scavenging receiver and are in open connection with said air inlet openings of said cylinder units.

5. The internal combustion engine, as set forth in claim 1, in which said pipes and said anchor bolts are disposed outside of said cylinder units, in order to permit mounting of said cylinder units to said engine block in very short distances.

6. The internal combustion engine, as set forth in claim 1, in which said liners comprise sleeves removably mounted in said outer casing.

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