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(58) Field of search
**F1B**
**Selected US specifications from IPC sub-class F02B**

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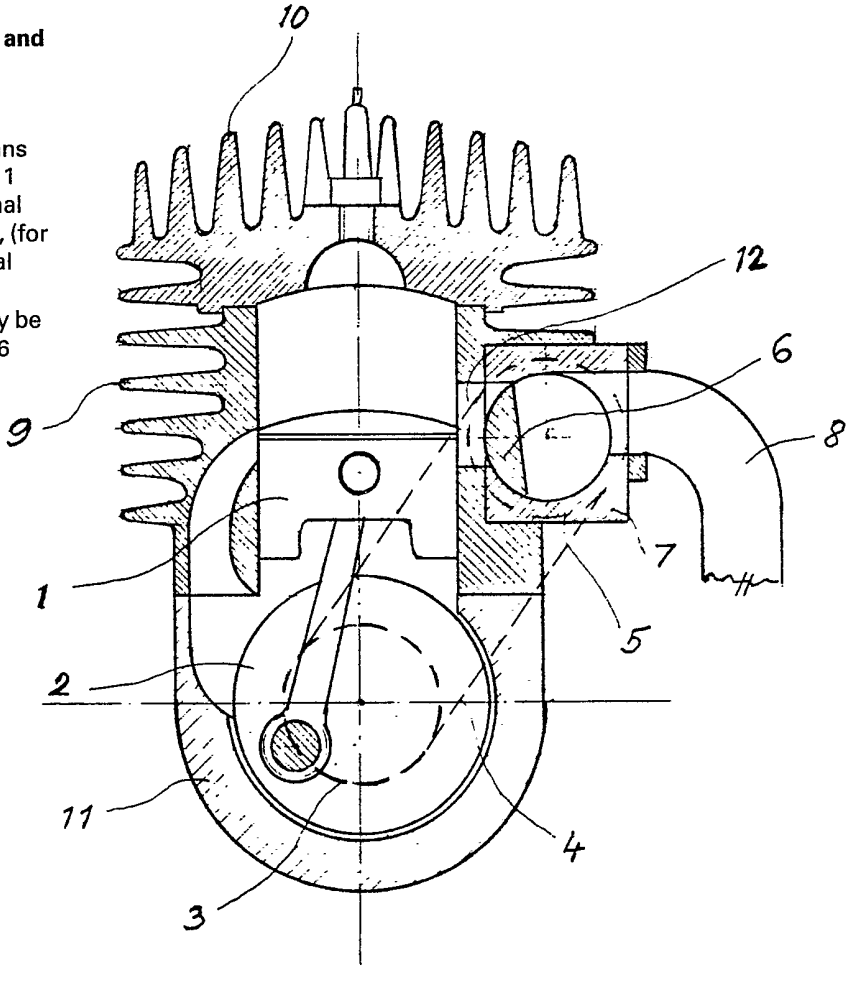
# (54) Two-stroke engine with piston and valve controlled exhaust

(57) The exhaust port closing and opening is controlled dually by means of the top edge of the engine piston 1 (for the opening) and by an additional device, for example a rotary valve 6, (for the closing), so that an asymmetrical timing of the exhaust port 12 is obtained. The additional device may be a sliding valve and the rotary valve 6 may be driven from the crankshaft through gears, a chain or a belt.

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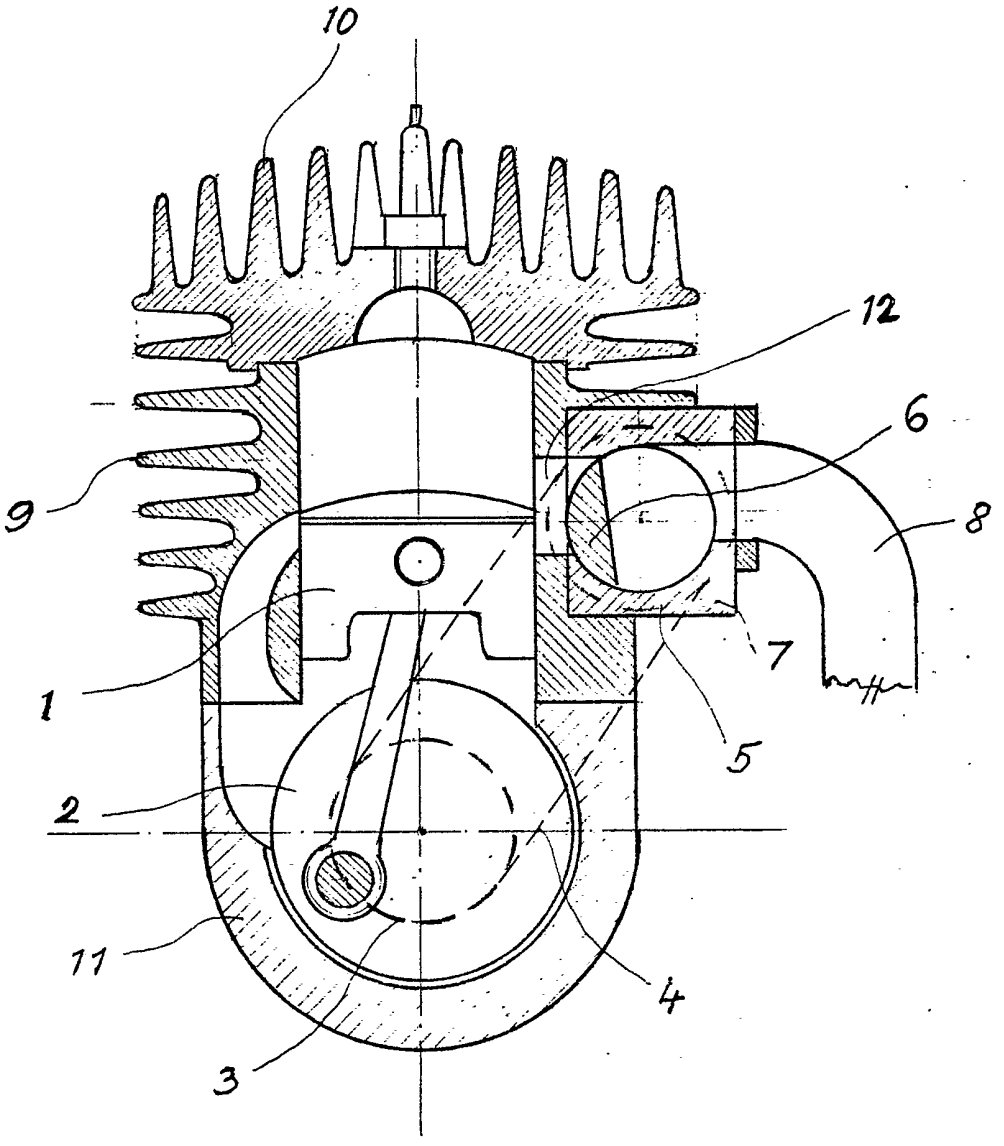
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SPECIFICATION

**Rotary Valve Controlled Exhaust Port of the Two-Stroke Internal Combustion Engine**

Technical Field:—

This invention relates to two-stroke internal combustion engines, in particular to control of opening and closing of the exhaust port.

Background Art:—

Opening and closing of the exhaust port of two-stroke internal combustion engines presently designed and manufactured is being controlled by a top edge of the engine piston. Controlling of exhaust opening and closing by the top edge of the engine piston is in this way fully symmetrical and at each engine cycle part of the fresh mixture charge is lost through the exhaust system. The exhaust port is being closed some 30° of the crankshaft movement after mixture transfer from the crankcase when the transfer ports are being closed, and this 30° late closing of exhaust port allows about 1/6 of the volume of the fresh mixture being pushed out into the exhaust system. A proper design of exhaust system and especially of expansion chambers is desirable to keep fresh mixture losses to the minimum as the exhaust system is controlling the pressures during the transfer and scavenging period in engine cylinder. But the expansion chamber design can be only appropriate in certain, very narrow range of revolutions known as a "power band" and outside these revolutions the exhaust system is inefficient causing loss of the fresh mixture in revolutions below the power band and inadequate discharge of burned gases in high revolutions above the power band. By this inefficiency some power of the engine is lost and emission of unburned gases increased.

This invention introduces a new approach to this problem and enables asymmetrical control of the exhaust port leading to increased efficiency of the engine, higher power output and less emission of unburned gases. Also engines with this asymmetrical exhaust control no longer require the expansion chamber and can run with a straight exhaust system pipe with a silencer. The expansion chamber is sometimes difficult to accommodate on racing motorcycles because of the ground clearance and this invention eliminates this problem also.

Disclosure of the Invention:—

A two-stroke internal combustion engine having a conventional exhaust port in the engine cylinder, the conventional exhaust port being dually controlled by the top edge of the engine piston and by a rotary valve arrangement. The opening of the said exhaust port is being controlled entirely by the top edge of the engine piston and the closing of the said exhaust port being controlled by the said rotary valve, so that an asymmetrical control of the said exhaust port is possible to obtain. The rotary valve is being driven in the rotary movement in synchronisation with the engine crankshaft by conventional means of sprockets and chain, or timing pulleys and timing belt or by a train of gears.

This invention introduces a new asymmetrical arrangement of exhaust port control eliminating the need for expansion chamber which is generally bulky and the engine can run with higher efficiency and consequently has a higher power output and lower emission of unburned gases than any known symmetrical exhaust port timing arrangement.

A specific embodiment of the invention will now be described by way of example with reference to the accompanying drawing in which:—

(1) indicates the engine piston, (2) the engine crankshaft, (3) driving timing pulley or sprocket, (4) the timing belt or chain, (5) the driven timing pulley or sprocket, (6) the rotary valve, (7) the rotary valve body, (8) the exhaust system, (9) the engine cylinder, (10) the engine cylinder head, (11) the crankcase, (12) the exhaust port.

A two-stroke internal combustion engine having a conventional exhaust port (12) in the engine cylinder (9), the conventional exhaust port (12) being dually controlled by the top edge of the engine piston (1) and by a rotary valve (6) arrangement, the arrangement being such, that opening of the exhaust port (12) is controlled entirely by the top edge of the engine piston (1) and closing of the said exhaust port (12) being controlled by the rotary valve (6), so that asymmetrical control of opening and closing of the exhaust port (12) is obtained. The rotary valve's rotational movement and the synchronisation of the rotational movement with engine crankshaft (2) is being obtained through a sprocket or timing pulley (3), a chain or timing belt (4), and a sprocket or timing pulley (5).

CLAIMS

1. A two-stroke internal combustion engine having a conventional exhaust port situated in the engine cylinder and having in addition to the said conventional exhaust port a rotary valve situated in the said exhaust port for asymmetrical control of the said exhaust port.

2. A two-stroke internal combustion engine as claimed in Claim 1 where the rotary valve in the exhaust port is controlling the connection between the engine cylinder and the exhaust system.

3. A two-stroke internal combustion engine as claimed in Claim 1 where the opening of the exhaust port is controlled by the top edge of the engine piston and the closing of the said exhaust port controlled by the rotary valve.

4. A two-stroke internal combustion engine as claimed in Claim 1 where the rotor of the said rotary valve is, in cross section, of segmental shape.

5. A two-stroke internal combustion engine as claimed in Claim 1 where the rotary valve is closing the connection between the engine cylinder and the exhaust system at approximately the same time as transfer ports are being closed by the top edge of the engine piston.

6. A two-stroke internal combustion engine having a conventional exhaust port situated in the engine cylinder and the said exhaust port being dually controlled, in opening by the top edge of the engine piston, and being closed by an additional device as for example sliding valve situated

between the engine cylinder in the exhaust port and the exhaust system, so that asymmetrical opening and closing of the exhaust port is being obtained.

7. A two-stroke internal combustion engine having the said rotary valve driven in synchronisation with the engine crankshaft by a pair of sprockets and a chain.

8. A two-stroke internal combustion engine having the said rotary valve driven in synchronisation with the engine crankshaft by a pair of timing pulleys and by a timing belt.

9. A two-stroke internal combustion engine having the said rotary valve driven in synchronisation with the engine crankshaft by a train of gears.

10. A two-stroke internal combustion engine as described elsewhere in this invention and as illustrated on the accompanying drawing.

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