Aug. 14, 1951 J. W. TATTER 2,563,885

COMBUSTION CHAMBER SCAVENGE PUMP.

Filed Aug. 14, 1948 2 Sheets-Sheet 1

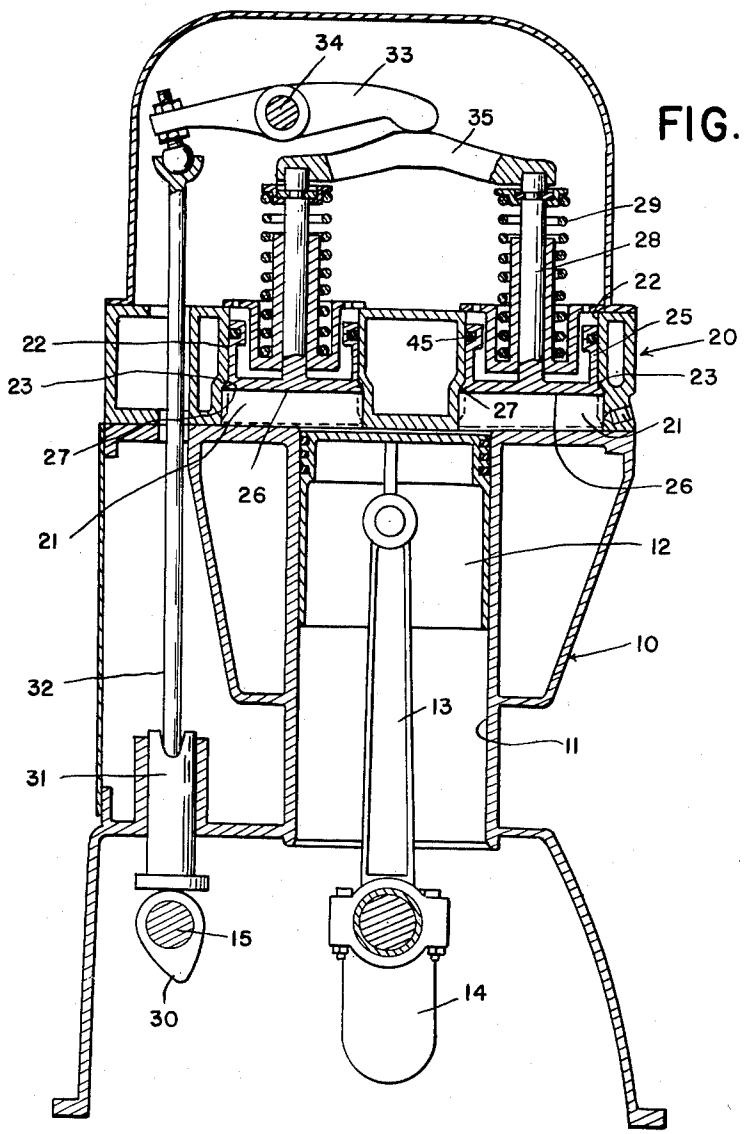


FIG.1

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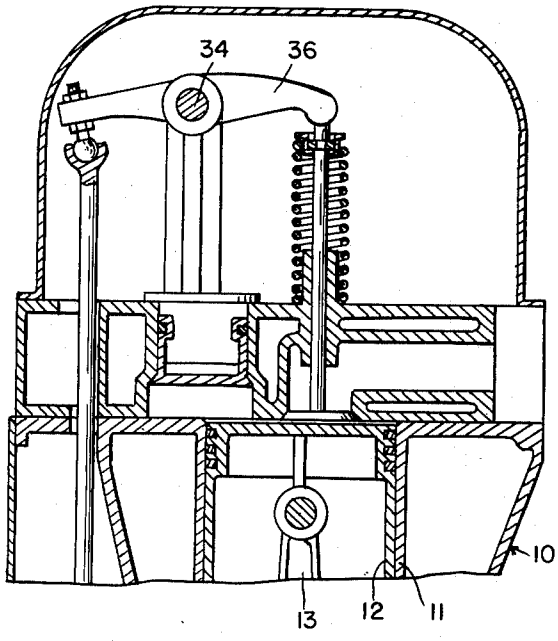


FIG.2.

FIG.3.

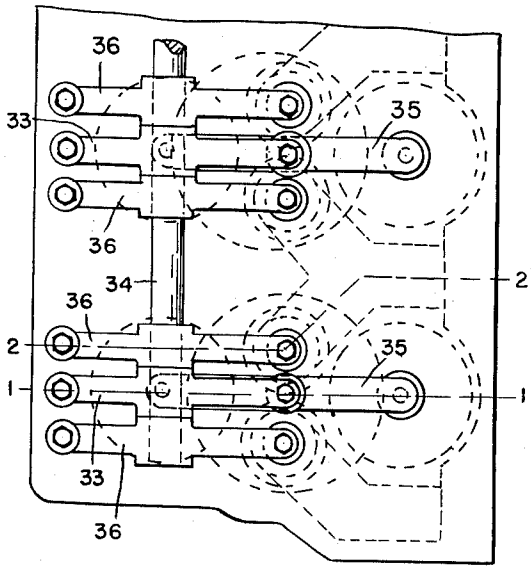
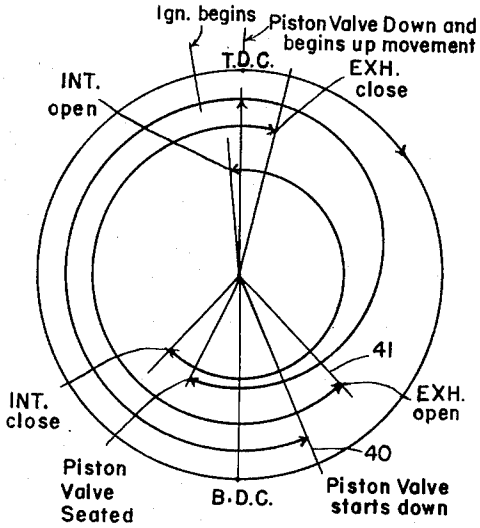


FIG.4.



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COMBUSTION CHAMBER SCAVENGE PUMP

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Application August 14, 1948, Serial No. 44,345

10 Claims. (Cl. 123—78)

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My invention relates to internal combustion engines and more particularly to means for scavenging an engine combustion chamber.

I am aware that various types of displacement devices have been used in internal combustion engines for scavenging, but all these types employed movable displacement devices constructed to be moved by such means as were readily available, but all such devices embody actuating mechanisms which are subjected to loading caused by combustion chamber pressures. Also these devices as heretofore used are not of a design which allows same to be actuated in timed relation to engine operation as they have been actuated by means of cranks and levers and consequently are more or less in motion at all times.

An object of my present invention is to overcome these difficulties by providing scavenging means operable only during the engine exhaust stroke, and which embodies a displacement piston operable in the combustion chamber when called upon to scavenge the said combustion chamber, but constructed and arranged to be seated during the engine compression and power strokes, whereby the loading of the mechanism during the time when high pressures are present in the combustion chamber is eliminated.

In my present construction, conventional engine practice is followed, and the scavenging device as embodied in my engine, does not alter the engine compression ratio or interfere with normal engine operation. I have accomplished improved results including substantially complete engine scavenging, promote an improved intake operation, reduce fuel consumption, and otherwise improve the engine performance in general.

For a more detailed understanding of my invention, reference may be had to the accompanying drawings illustrating a preferred embodiment of my invention wherein like parts are referred to by like characters throughout the several views, and in which

Fig. 1 is a vertical transverse view of a multi-cylinder internal combustion engine, showing one engine cylinder with a pair of cylindrical chambers comprising combustion chambers, and which is generally referred to as a T cylinder. This figure is taken substantially on the line 1—1 of Fig. 3.

Fig. 2 is a fragmentary vertical view taken on the line 2—2 of Fig. 3.

Fig. 3 is a fragmentary plan view of the engine with the rocker box cover removed, and

Fig. 4 is a diagrammatic crankshaft diagram showing the timing of the engine cycle of operation.

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While I have illustrated my invention in connection with an overhead valve engine, it will be quite obvious that the principles of the invention may be embodied in engines of the type other than that illustrated herein.

The engine as herein described is basically of conventional design in that it comprises a cylinder block 10 having a cylinder 11 in which a piston 12 is operable. A connecting rod 13 connects the engine piston to a crankshaft 14 supported within the engine crankcase. The cam shaft 15 is driven in any suitable manner at one-half crankshaft speed by said crankshaft. Conventional intake and exhaust valves are employed to respectively control the engine exhaust and intake ports, and suitable valve mechanisms including a rocker arm mechanism, push rods and cams carried on the cam shaft are provided. Such engine construction as heretofore described comprises conventional engine design.

The cylinder head 20 is provided with one or more chambers which comprise combustion chambers 21 opening communication with the engine cylinder 11. The cylinder head carries a cylindrical chamber 22 of lesser diameter than the enlarged combustion chamber portion 21, and chamber portion 22 is connected with chamber portion 21 by a shoulder 23, which shoulder is preferably constructed as inclined or beveled as shown.

A piston 25 is slidably guided in the chamber portion of lesser diameter, and the enlarged head 26 of piston 25 is operable in the enlarged chamber portion 21, said head comprising an outwardly flanged portion 27 constructed for seating on the shoulder or seat 23. The piston 25 carries a stem 28 and a spring 29 seated at one end in the cup 29 secured to the cylinder head is connected at this stem 28 to yieldingly urge the flanged portion 27 on the seat 23.

A cam 30 carried on the camshaft 15 actuates a tappet 31, push rod 32 and rocker arm 33 pivotally mounted on the rocker arm shaft 34. The free end of the rocker arm 33 engages with a cross member 35 (see Fig. 1), which abuts the ends of the stems 28. As the rocker arm 33 is actuated when cam 30 lifts the push rod, the cross member is depressed, thus moving the pistons 25 toward the engine cylinder and scavenging the combustion chambers 21 of the burned products of combustion.

Preferably the mechanism described above for operating the displacement or scavenge pistons

25 is mounted between the exhaust and intake valve mechanisms (see Fig. 3) and rocker arm 33 is mounted on the common rocker arm shaft 34 on which the rocker arms 36 of the valve actuating mechanisms are mounted.

Referring more particularly to the timing diagram shown in Fig. 4, it will be observed that piston 25 commences to open at 40, closely following the opening of the exhaust valve as indicated at 41. When the piston 12 is at T. D. C., the piston 25 is down, and completely displaces the combustion chamber 21, which is just before the exhaust valve closes. The intake valve opens just before T. D. C. and during the intake stroke the piston 25 is being returned to its uppermost position and is seated just before the intake valve is closed. During the compression stroke and the following power stroke, the piston 25 remains seated, and thus all combustion chamber pressures are not loading the mechanism which actuates the piston 25. Suitable piston rings 45 are employed to seal against leakage past the piston 25, but since the shoulder 23 is preferably beveled, the piston head flange 27 is very tightly seated on the seat 23, further aiding in sealing against leakage past piston 25.

Thus the displacement piston remains seated during substantially all the engine compression and power strokes and is moved only during the exhaust and intake strokes, moving down to scavenge during the exhaust stroke and up during the intake stroke.

Although I have described but one form of my invention, it will be apparent to those skilled in the art to which my invention pertains that various modifications and changes may be made therein without departing from the spirit of my invention or from the scope of the appended claims.

I claim:

1. In an internal combustion engine, a cylinder and cylinder head engine structure having intake and exhaust ports, intake and exhaust valves for said intake and exhaust ports, a piston operable in the engine cylinder, said engine structure cooperating with the piston to provide a combustion chamber, a piston operable in said combustion chamber and movable therein to scavenge the combustion chamber substantially during engine exhaust, and means seating said piston substantially during the compression and power strokes to positively support said piston against the compression pressure tending to move the piston outwardly of the combustion chamber and to avoid leakage of compression pressures past said piston.

2. In an internal combustion engine, a cylinder and cylinder head engine structure having intake and exhaust ports, intake and exhaust valves for said intake and exhaust ports, a piston operable in the engine cylinder, said engine structure cooperating with the piston to provide a combustion chamber, a piston operable in said combustion chamber and movable therein to scavenge the combustion chamber substantially during engine exhaust, said cylinder head structure provided with a fixed seat, said piston seated on said seat substantially during the power stroke to avoid leakage of compression pressures past said piston.

3. In an internal combustion engine, a cylinder and cylinder head engine structure having intake and exhaust ports, intake and exhaust valves for said intake and exhaust ports, a piston operable in the engine cylinder, said engine structure cooperating with the piston to provide a combustion chamber, a piston operable in said combustion chamber and movable therein to scavenge the combustion chamber substantially during engine exhaust, said cylinder head structure provided with a fixed seat, said piston seated on said seat substantially during the power stroke, and means actuating said piston to move same in timed relation to engine operation, said means operable to allow the piston to remain seated substantially during the compression and power strokes, and to commence its movement towards the piston immediately subsequently to the opening of the exhaust valve for the purpose of scavenging the combustion chamber.

4. In an internal combustion engine, a cylinder and cylinder head engine structure having intake and exhaust ports, intake and exhaust valves for said intake and exhaust ports, a piston operable in the engine cylinder, said engine structure cooperating with the piston to provide a combustion chamber, a piston operable in said combustion chamber and movable therein to scavenge the combustion chamber substantially during engine exhaust, said cylinder head structure provided with a fixed seat, said piston seated on said seat substantially during the power stroke, and means actuating said piston to move same in timed relation to engine operation said means operable to allow the piston to remain seated substantially during the compression and power strokes, and to commence its movement towards the piston immediately subsequently to the opening of the exhaust valve for scavenging the combustion chamber, said means comprising engine driven cam operated motion translating elements for actuating said piston.

5. In an internal combustion engine, a cylinder, a combustion chamber communicating with the cylinder and comprising a cylindrical chamber having a beveled seat at one end remote from the cylinder, a piston guided in said cylinder and normally yieldingly seated on said seat, and means timed to engine operation for advancing said piston toward the engine cylinder away from said seat only during the engine exhaust stroke to scavenge the combustion chamber.

6. In an internal combustion engine, a cylinder, a combustion chamber communicating with the cylinder and comprising a cylindrical chamber having a beveled seat on one end remote from the cylinder, a piston guided in said cylinder and normally yieldingly seated on said seat, and means timed to engine operation for advancing said piston toward the engine cylinder away from said seat only during the engine exhaust stroke to scavenge the combustion chamber, said piston operating means comprising actuating mechanism including engine driven cam means.

7. In an internal combustion engine, a cylinder head structure having a cylindrical chamber comprising a lesser diameter portion and an enlarged diameter combustion chamber portion respectively connected by a shoulder, a piston guided in said shoulder portion of lesser diameter and having an outwardly flanged head operable in the enlarged chamber portion, spring means yieldingly seating the head on said shoulder, and means timed with engine operation to advance the piston toward the cylinder during the engine exhaust stroke, to return the piston to a seated position during the engine intake stroke and to

remain seated substantially during the engine compression and power strokes.

8. In an internal combustion engine, a cylinder head structure having a cylindrical chamber comprising a lesser diameter portion and an enlarged diameter combustion chamber portion respectively connected by a shoulder, a piston guided in said chamber portion of lesser diameter and having an outwardly flanged head operable in the enlarged chamber portion, spring means yieldingly seating the head on said shoulder, and piston actuating mechanism including an engine driven cam, mechanism operable to transmit cam lift to piston movement to scavenge the enlarged combustion chamber portion only during the engine exhaust stroke, said piston seated on said shoulder during the engine compression and power strokes.

9. In an internal combustion engine, a cylinder and cylinder head engine structure having intake and exhaust ports, intake and exhaust valves for said intake and exhaust ports, a piston operable in the engine cylinder, said engine structure cooperating with the piston to provide a combustion chamber, a piston operable in said combustion chamber and movable therein to scavenge the combustion chamber substantially during the engine exhaust, said cylinder head structure provided with a fixed seat, said piston seated on said seat substantially during the power stroke, said piston being movable in timed relation to engine operation and remaining seated substantially during the compression and power strokes, and commencing its movement towards the piston immediately subsequently to the opening of the exhaust valve, and engine driven cam operated

means for actuating said piston, exhaust and intake valve actuating mechanisms including rocker mechanisms and cam actuated push rods for actuating the rocker mechanisms, said piston actuating mechanism including rocker mechanisms, a push rod, and the cam means assembled between said exhaust and intake actuating mechanisms, and a common rocker arm shaft for all said rocker mechanisms.

10. In an internal combustion engine, a cylinder, a combustion chamber communicating with the cylinder and comprising a cylindrical chamber having a beveled seat at one end remote from the cylinder, a piston guided in said cylinder and normally yieldingly seated on said seat, and means timed to engine operation for advancing said piston toward the engine cylinder only during the engine exhaust stroke to scavenge the combustion chamber, and to return said piston to the seated position during the engine intake stroke to relatively increase the effective vacuum pressure in the combustion chamber.

JOHN W. TATTER.

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