

[54] **ORBITAL SEALED CHAMBER ENGINE**
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 91/211, 92/54, 123/43 R, 123/43 C

[51] Int. Cl. **F02b 59/00**

[58] Field of Search 123/43 R, 43 C, 42;
 91/176, 196, 197; 92/54; 418/49, 52, 53, 68

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[57]

ABSTRACT

An orbital sealed chamber engine comprising a two stroke single cycle engine in which the engine block and the two headed piston therein are respectively mounted and arranged to move in orbital paths in direction oppositely one another including a pressurized exhaust system utilizing functionally coordinated ports of the cylinder, the engine block and the engine block supporting frame.

5 Claims, 8 Drawing Figures

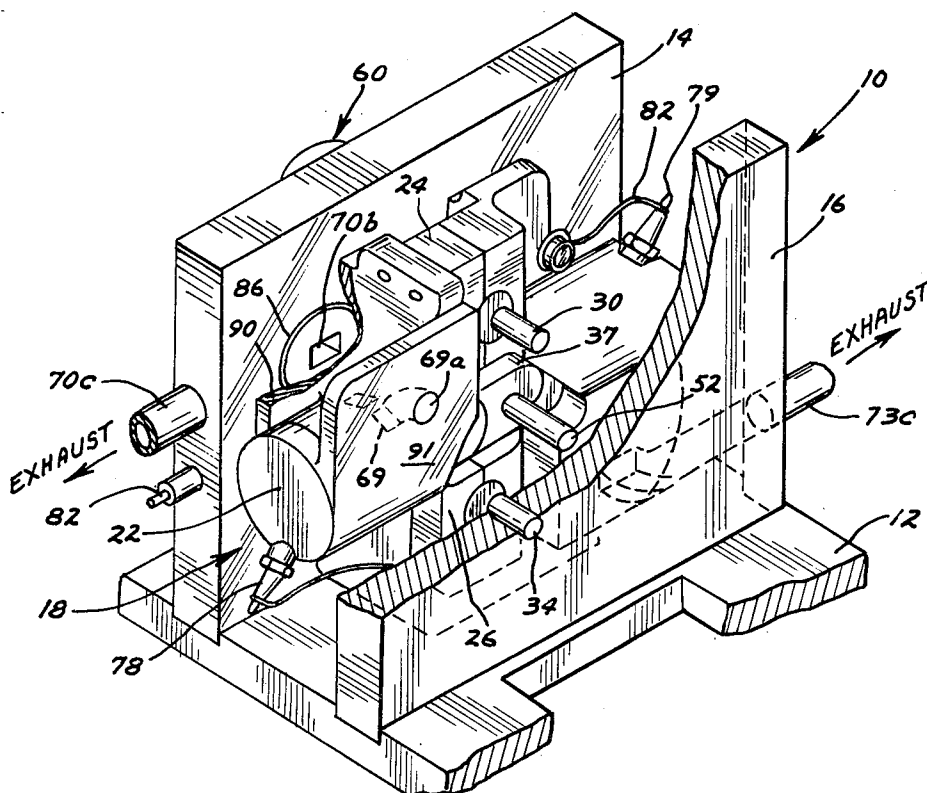


FIG. 1

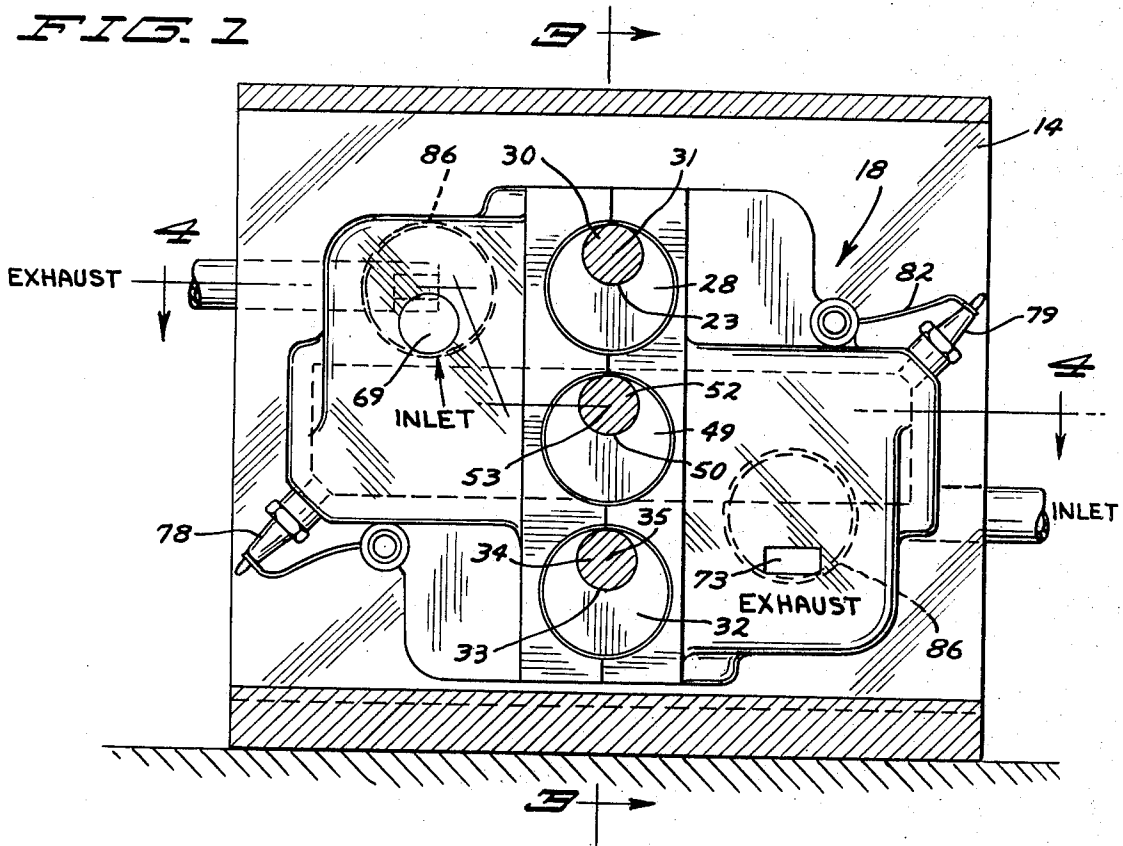
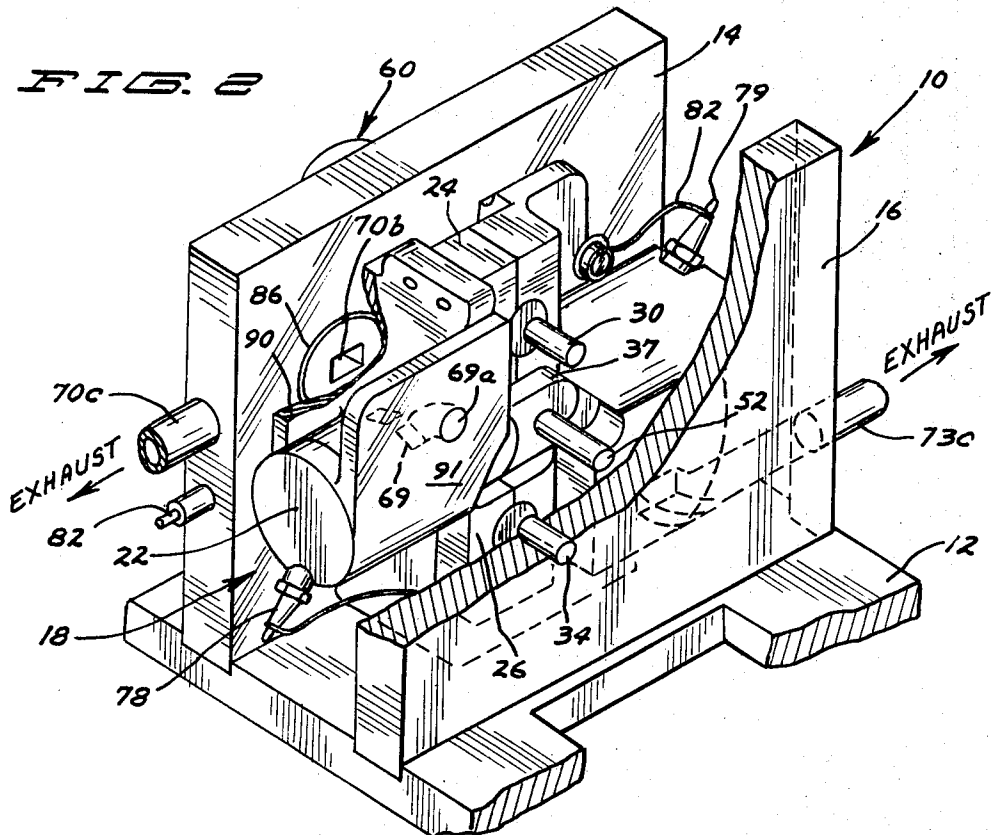


FIG. 2



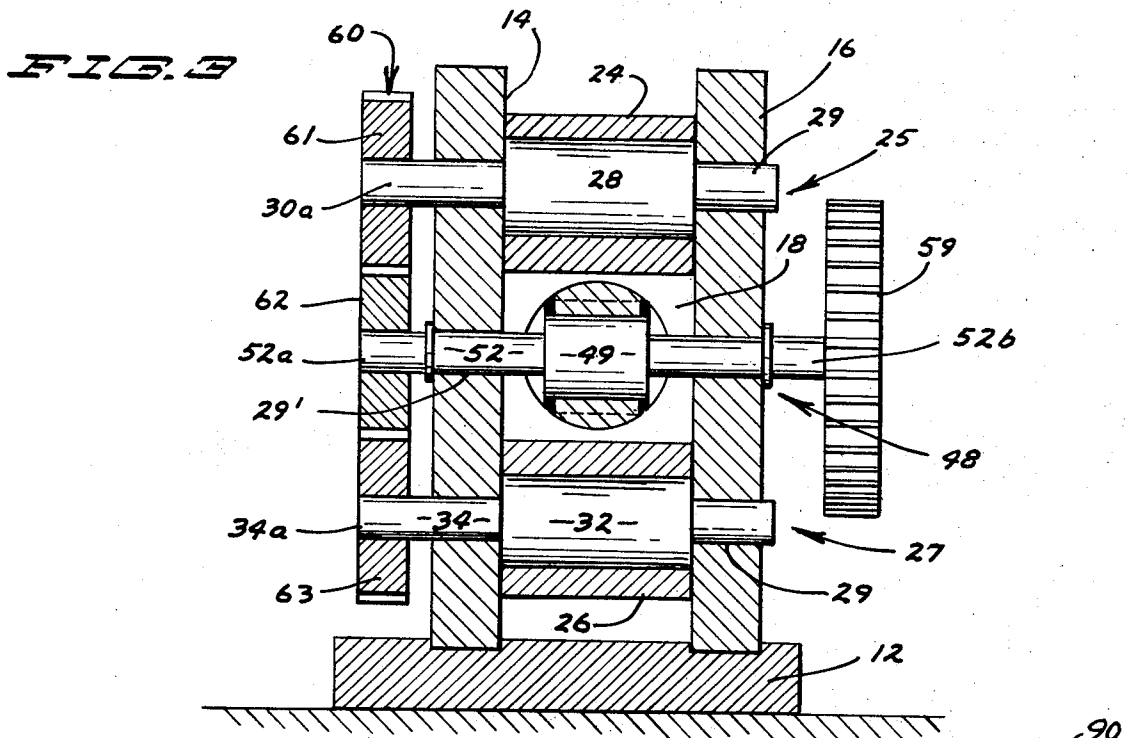
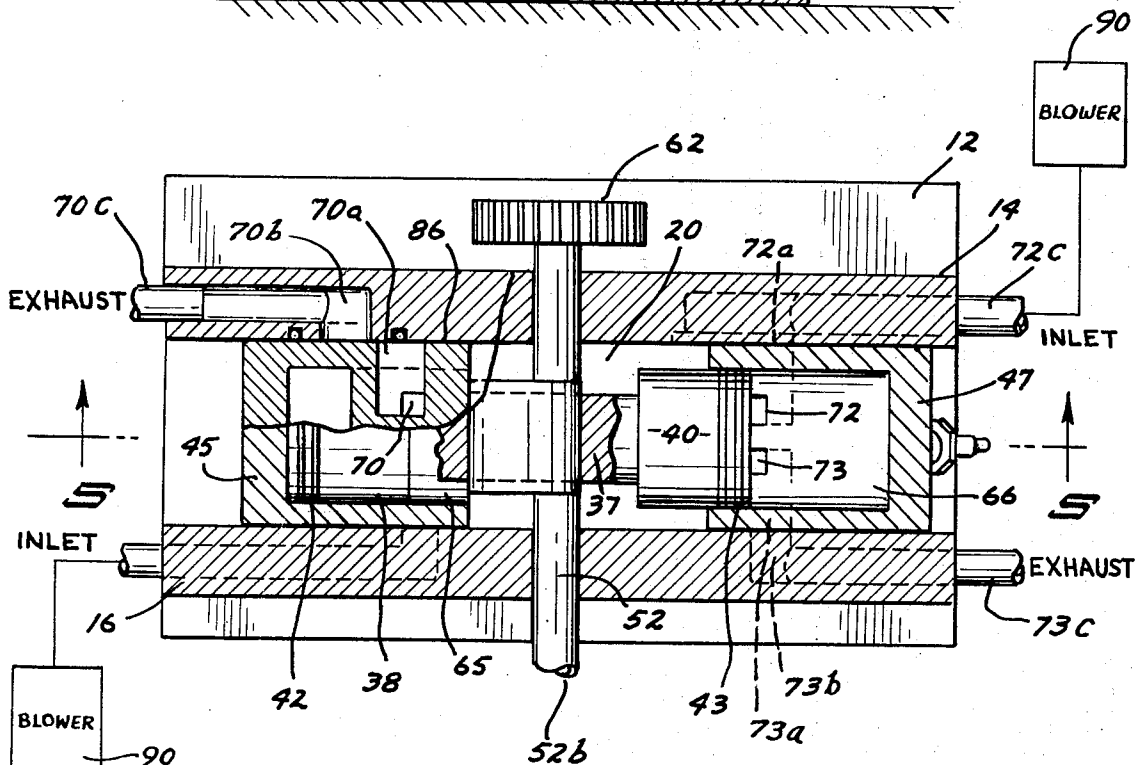


FIG. 5

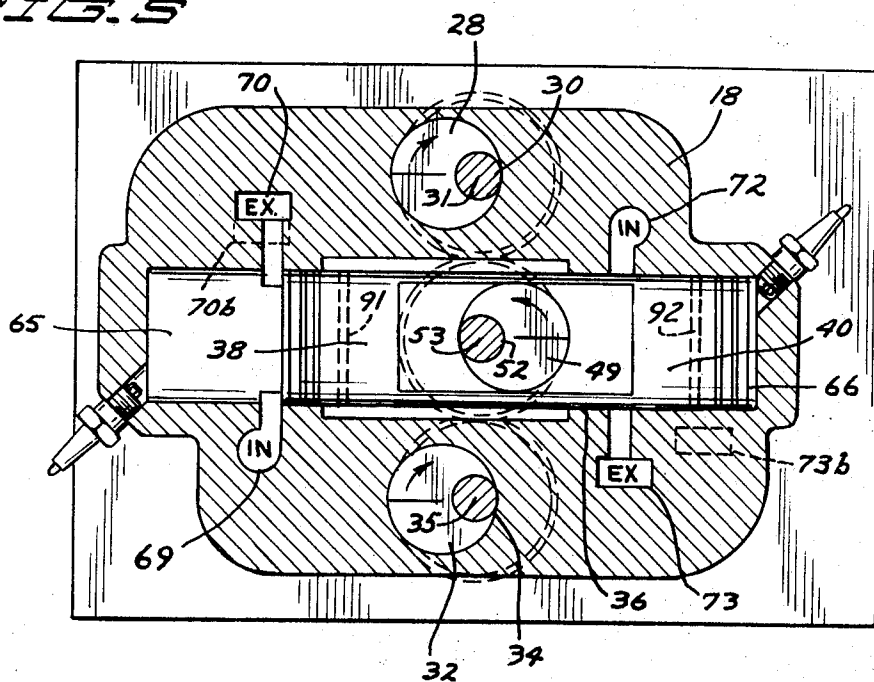


FIG. 6

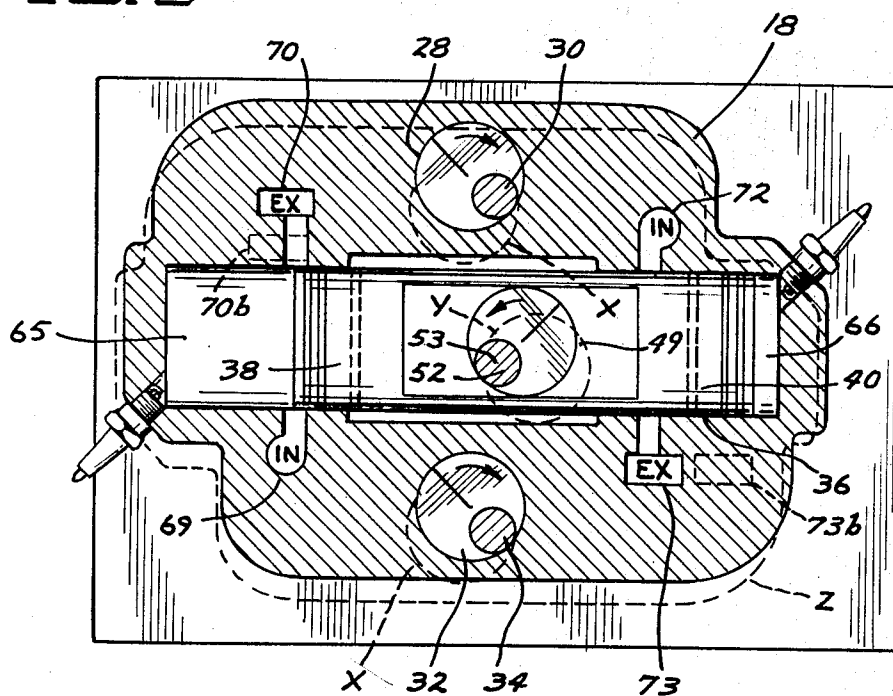


FIG. 7

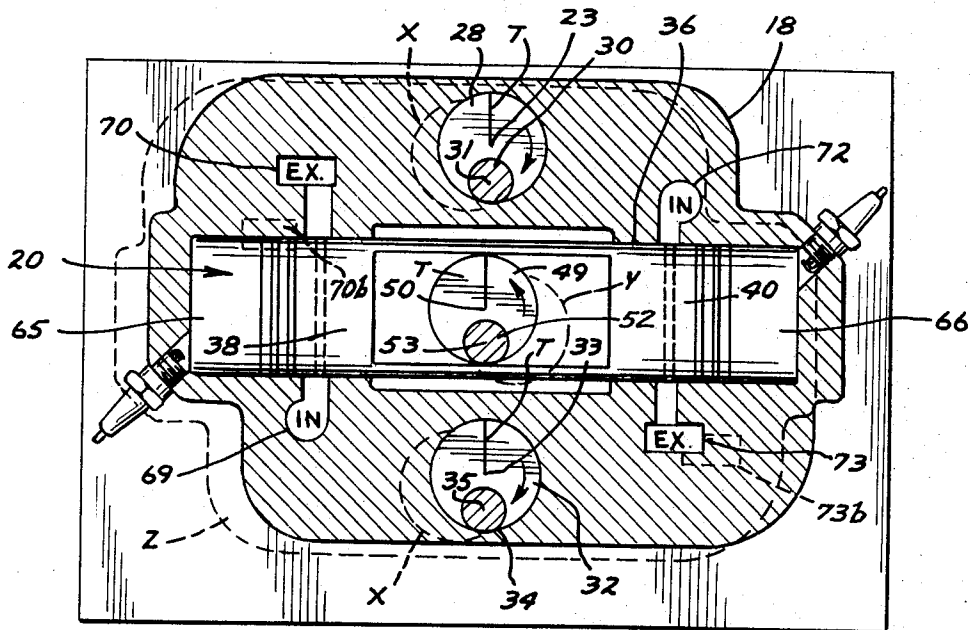
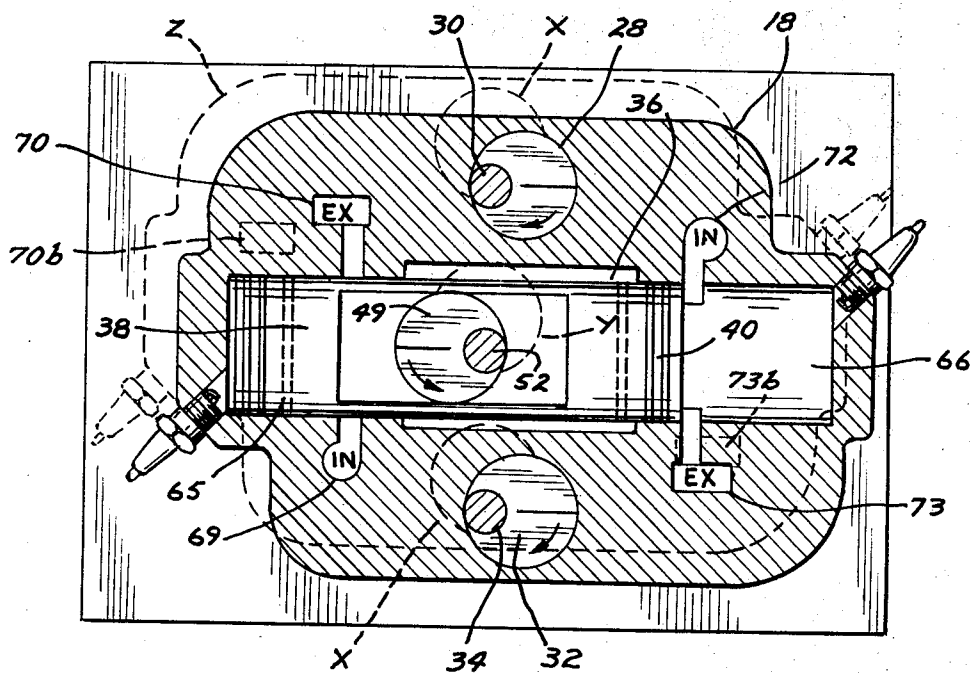


FIG. 8



ORBITAL SEALED CHAMBER ENGINE

This application is a continuation-in-part of U.S. Pat. application Ser. No. 243,987 filed Apr. 14, 1972, and which is now abandoned.

SUMMARY AND BACKGROUND OF THE INVENTION

This invention relates to a sealed chamber engine embodying a two stroke two headed piston with the engine block and said piston being respectively constructed and arranged to move through orbital paths in directions oppositely one another, said block being supported by a stationary frame.

The structure which distinguishes the engine comprising the subject matter of the invention herein from what is known in the art is the particular arrangement for the orbiting of both the engine block and the piston and the particular arrangement of pressurized exhaust through coordinated porting of the pistons, the engine block and supporting frame.

The U.S. Pat. No. 1,609,388 to Tebaldi discloses an orbiting piston and cylinder with the ducts and ports being formed in the shaft and which run from a compressed air source to exhaust to the atmosphere.

The invention herein is distinguished from Tebaldi in providing ducts and ports through the cylinder, pistons, engine block and supporting frame all functionally coordinated with the action of the pistons which structure to be present in Tebaldi would require such modification of Tebaldi as to comprise invention.

It is an object of the invention herein therefore to provide an engine structure of the type indicated in which there is a short radius of gyration for the orbiting members relative to the total volumetric displacement.

It is another object of this invention to provide a two stroke two headed piston structure having a high pressure seal accomplished by the use of conventional piston rings.

It is an object of the invention herein to provide an engine structure embodying a two stroke two headed piston which engine is capable of a high energy output resulting from a high rpm capability of orbital motion of all moving engine components.

It is a further object of this invention to provide an engine block and a two stroke two headed piston therein wherein said block and piston are constructed and arranged to move through orbital paths in directions oppositely one another and exhaust is provided through coordinated exhaust ports in said engine block and its supporting frame structure.

It is still another object of the invention to provide an engine structure embodying a pair of spaced crank shafts supporting the engine block of said engine structure and a crank shaft supporting the piston thereof wherein the inertia of the crank shaft supporting the piston with the addition of a fly wheel will equal the inertia of the other two crank shafts and their supported engine block whereby gyroscopic effect is nullified.

Generally stated the invention herein embodies an engine block and a two stroke two headed piston therein with said block and said piston being constructed and arranged to be supported by crank shafts and to be moved to orbit respectively through paths oppositely of one another and coordinated exhaust ports are provided from the cylinder through the engine

block and through the supporting frame to the atmosphere.

It is also an object of the invention herein to provide air passages through the pistons for supplementary pressurized passage of air through the exhaust passages for a more complete combustion of gases therein than could otherwise be accomplished.

These and other objects and advantages of the invention will be set forth in the following description made in connection with the accompanying drawings in which like reference characters refer to similar parts throughout the several views and in which:

FIG. 1 is a view in vertical longitudinal section;

FIG. 2 is a view in perspective with some portions thereof being broken away;

FIG. 3 is a view in vertical cross section taken on line 3—3 of FIG. 1 as indicated;

FIG. 4 is an irregular view in horizontal section taken on line 4—4 of FIG. 1 as indicated;

FIG. 5 is a schematic operational view in vertical section taken as if on line 5—5 of FIG. 4 as indicated with portions thereof in dotted line; and

FIGS. 6—8 are similar to FIG. 5 with portions thereof shown in different operating positions by reference to the dotted line.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring to the drawings, an engine structure 10 is shown comprising a preferred embodiment of the subject matter of the invention disclosed herein.

Said structure 10 comprises a base plate 12 having upstanding therefrom a pair of spaced plate or engine block supporting frame members 14 and 16 having disposed therebetween a cylinder block or engine block 18. Said engine block may have any suitable configuration.

Said engine block embodies an elongated cylindrical chamber 20 within a central longitudinal body portion 22 and is shown here having upwardly and downwardly extending central body structural portions 24 and 26 of reduced length and width.

Carrying said engine block by extending centrally transversely through said body portions 24 and 26 thereof are crank shafts 25 and 27 shown here in vertically aligned spaced relation. Said crank shafts respectively have crank pins 28 and 32 disposed through said body portions 24 and 26 and main journal members 30 and 34 respectively journaled in said side plates 14 and 16 in which suitable bearings 29 to receive said journaled members will be provided. Said journaled members are eccentric to their respective crank pins. Said bearings 29 comprise a suitable bearing surface.

Disposed within said chamber 20 is a piston 36 having a central portion 37 of reduced transverse dimension and having cylindrical portions 38 and 40 at the ends thereof comprising piston heads having piston rings 42 and 43 of conventional structure respectively disposed about said piston heads. Said piston is referred to as a two headed piston. Formed in the opposed or respective end portions of said chamber 20 are cylinder heads 45 and 47 respectively adapted to receive said piston heads 38 and 40 therein in sealing engagement therewith. Journaled in said central portion 37 of said piston 36 transversely thereof is a crank pin 49 of a crank shaft 48 having main journal members 52 respectively journaled in bearings 29' provided in the plate

members 14 and 16. Said journal members are eccentric to said crank pin 49.

Referring to FIG. 7, shown is said piston 36 disposed centrally longitudinally of said chamber 20 as at a starting position that said crank shafts have as a common reference starting positions at which their respective axes 31, 53 and 35 are in vertical alignment with the axes 23, 50 and 33 of their respective crank pins 28, 49 and 32.

The main journal members 30a, 52a and 34a respectively of said crank shafts 30, 52 and 34, as shown in FIG. 3, extend through the plate member 14 and are connected by a gear train 60 comprising meshing gears 61, 62 and 63 of equal pitch diameter with said gears being arranged whereby said gears 61 and 63 are disposed to rotate in a direction oppositely that of said gear 62.

The main journal portion 52b of the crank shaft 52 extends outwardly of said plate member 16 and is indicated here as being used for output and is shown carrying a fly wheel 59.

The portions of said chamber 20 formed within said cylinder heads 45 and 47 are herein characterized as expansion chambers 65 and 66. Said expansion chamber 65 is shown having an inlet port 69 and exhaust port 70 running through the engine block 18. Said expansion chamber 66 has in connection therewith an inlet port 72 and an exhaust port 73 running through the engine block 18.

The word "port" as used throughout herein embodies openings and the passages or ducts in connection therewith.

Referring to FIG. 2, spaced skirt members 90 and 91 extend upwardly of said engine block 18 and outwardly from the portion 24 thereof to the left as viewed and a like oppositely extending structure is present at the diagonally opposed underlying portion of said engine block.

Said exhaust port 70 has as a continuation thereof a port 70a which extends through the skirt member 90 and communicates with a coordinated and cooperating port 70b running through the frame member 14 which exhausts through passage 70c to the atmosphere as indicated in FIG. 4. The port 70b is positioned with respect to the orbital path of the exhaust port 70a to be coordinated with the movement of said port 70a for exhaust purposes as will be described. Encompassing said port 70b and carried by said frame member as by being partially recessed therein in a sealing ring or seal 86 to form a seal with the adjacent surface of said engine block 18.

In like manner the inlet port 72 has a port 72a extending outwardly of the engine block to the port 72b which extends outwardly of said frame member 14 and will be in communication with a supply of air under constant pressure and with a source of fuel such as will be introduced through the use of conventional timed fuel injection into the inlet ports in a known manner.

The ports 69 and 73 are respectively similar to said ports 72 and 70 with related portions thereof being similarly indicated and are shown schematically in FIGS. 5-8 and are partially shown in FIG. 2.

It will be understood that the structure herein described may operate either as an internal or an external combustion engine and may utilize either a directly combustible fuel as an internal combustion engine or

one of the various fuels which are available for use for an external combustion engine.

With respect to the embodiment herein illustrated and with a fuel such as gasoline being indicated for use, spark plugs 78 and 79 are shown in connection with the expansion chambers 65 and 66 and conductors 82 will run from said spark plugs to a conventional related equipment for a source of energy and for timing purposes. Conventional fuel injection equipment is well known in the art and not here shown.

Extending through the piston head portions 38 and 40 spaced respectively inwardly thereof are air jet ports 91 and 92 as indicated in FIGS. 5-8. Said ports as will be further described are positioned to be respectively in register at an appropriate time with the inlet and exhaust ports 69-70 and 72-73 to pass pressurized raw air through an exhaust passage, as indicated with ports 72 and 73 in FIG. 6, for further combustion of the unburned hydro-carbons present in such passage.

Valving is accomplished as with a conventional two stroke single cycle engine. Preferably a conventional mechanical blower is shown schematically as indicated by the reference numeral 90 for forcing air into said expansion chamber 65 and 66. A Root's type blower is commonly used for this purpose. The inlet ports thus will be under constant pressure of air. The expansion chambers are purged of exhaust gases by raw air and sufficient raw air is retained therein to provide a higher compression than otherwise with the fuel injected for combustion. The fuel injection is timed to supply fuel to the expansion chamber with the movement of the piston head into said chamber. It will be noted that the design of the structure herein lends itself to relatively large porting. The inlet ports are under a constant higher than atmospheric pressure of air and the expansion chambers are thus provided with a higher than atmospheric pressure of air.

Sufficient of the structure has been described and illustrated for a full disclosure of the subject matter comprising the invention herein.

With reference to FIGS. 6-8 the dotted lines X, Y and Z indicate the paths defined by the orbiting components. The dotted line Z indicates the path of the engine block and the dotted circular lines X indicate various positions defining the orbital paths of the crank pins 28 and 32 while the dotted circular line Y indicates the orbital path taken by the crank pin 49. The crank shafts 25 and 27 with their crank pins 28 and 32 orbit the engine block while the crank shaft 48 and its crank pin 49 orbit the piston.

The seal rings 86 are indicated to show that they encompass the paths traveled by the adjacent or facing inlet and exhaust ports.

OPERATION

With reference to the structure described, a high pressure combustion seal having considerable use life is achieved by the use of conventional piston rings 42 and 43 on the piston heads 38 and 40.

The extent of eccentricity which determines the displacement of the crank pins 28, 49 and 32 is a matter of design.

It will be noted that the engine block is carried and orbited by the crank shafts 30 and 34 as journaled in the plate members 14 and 16. The piston 36 disposed in said chamber 20 is carried and orbited by the crank shaft 52.

The engine block and said piston are arranged and supported to be moved through orbital paths in opposite directions with said paths being parallel to one another. Thus as with a throw or eccentricity in the crank shaft of three-fourths inches, there results from said orbital movement a combined displacement of 3 inches. Hence there is a relatively short radius of gyration for orbiting members relative to total volumetric displacement.

With the fly wheel mounted onto the crank shaft 52, the design of the structure will be such that the inertia of said center crank shaft 52 with the fly wheel and with the supported piston 36 will equal the inertia of the other two crank shafts and their supported member, the engine block, whereby this balance nullifies gyroscopic effect.

There is no interruption in the continuous balanced movement of the piston and of the engine block. The vibration which is present in a reciprocating type of engine is entirely eliminated with the balanced orbital motion of the engine and piston herein described. A relatively substantial displacement is achieved of four times the extent of the eccentricity present in the crank shafts.

With reference to FIGS. 5-8, FIG. 5 shows the piston head 40 on its compression stroke fully disposed in the expansion chamber 66 which is at one extreme end of the travel of the piston. The engine block is at its extreme opposite position of its path of travel. FIG. 6 shows the piston head 40 moving out of the expansion chamber 66 on its power stroke while moving through an orbital path which extends upwardly and to the left as viewed. The engine block is moving through its orbital path upwardly and to the right. The extent of movement is indicated by the comparison of the block in its moved position to the dotted outline Z thereof showing its previous position. The extent of orbital movement of the crank pins 28, 32 and 49 about the axes of their respective journal members 30, 34 and 52 is indicated by comparison of their movement to the dotted circles X and Y.

With reference to FIG. 7 the piston 36 is shown having been moved to a position centrally of said chamber 20. The engine block 18 continues in its orbital movement upwardly and to the right having reached the apex of its upward movement. FIG. 7 is also referred to for illustration of the alignment of the crank shafts for operation. The crank throws of said shafts for purpose of illustration here are indicated by the radial lines T. The shafts will be arranged relative to one another to have their respective crank throws T in phase as shown when said crank throws are perpendicular to the axis of the bore of the chamber 20. Said axis is not shown as it is readily visualized. In operation as described, the crank pin 49 orbits in a direction oppositely that of the crank pins 28 and 32.

In FIG. 8, the piston head 38 is shown fully within the expansion chamber 65 on its compression stroke with the engine block having reached its extreme position to the right in its orbital path and a position centrally of the vertical extent of its orbital path. The piston 36 and the engine block 18 at this point have each passed through 180° of orbital movement. A full cycle will have been completed with the return of the piston and engine blocks to their respective positions as shown in FIG. 5.

As described, the engine block is provided with inlet and exhaust porting through the plate members 14 and 16. The design indicated permits the use of large ports for constant pressure of air to the inlet ports and for exhaust.

There will now be described the coordinated functional relationship of the outlet ports of the cylinder and the engine block with the outlet or exhaust ports of the engine frame member and the inlet ports in connection therewith.

The inlet ports 69 and 72 are under a constant supply of pressurized air provided by means of the blowers 90. The opening and closing of the inlet ports 69 and 72 results from the action of the pistons 38 and 40 passing thereover in moving through the cylinder.

Referring to FIG. 5, the piston 38 has completed its compression stroke and has withdrawn from the expansion chamber 65 on its power stroke but in withdrawing from said chamber, as the leading edge of said piston passes over the exhaust port 70, said exhaust port from the cylinder through the engine block comes into register with the exhaust port 70b in the engine frame, and the expansion chamber is purged of exhaust gases to the atmosphere with the help of the pressurized air stream from the inlet 69 passing therethrough.

Preceding the passage of the piston 38 over the exhaust port 70 is the passage of the air jet port 91 over said exhaust port providing passage between the inlet port 69 and said exhaust port at which time the exhaust port 70b of the engine frame 18 will be in register with said exhaust port 70. A small quantity of raw pressurized air is jetted into the entire exhaust passage 70-70c to introduce additional oxygen to combine with any unburned hydrocarbons and support a more complete combustion of those hydrocarbons contained in the exhaust gases purged from the chamber 65.

When said piston passed across the exhaust port 70, the ports 70 and 70b will have moved out of register with one another and the exhaust port 70 thus becomes closed. The expansion chamber 65 through the inlet port 69 then becomes charged with pressurized fuel air mixture.

As said piston 38 withdraws from the expansion chamber 65, the piston 40 enters the expansion chamber 66 on its compression stroke and coordinated therewith, the air jet port 92 comes into register with the inlet port 72 and exhaust port 73 at which time the exhaust port 73b in the engine frame is not in register with the port 73 for open passage to the atmosphere and remains a closed port. The piston 40 upon completing its compression stroke withdraws from said expansion chamber on its power stroke and upon withdrawing, the air jet passage 92 again moves into register with the inlet port 72 and the exhaust port 73 as shown in FIG. 7 and at this time the exhaust port 73 is in register with the exhaust port 73b of the engine frame and the entire exhaust passage 73-73c has pressurized raw air passing through prior to the exhaust of the gases from the combustion in the chamber 66.

The exhaust ports 73 and 73b come into register as the leading edge of the piston 40 passes over the exhaust port 70 in the same manner as described in connection with said piston 38.

The above steps are repeated with each movement of a piston from the completion of its compression stroke to its withdrawal from an expansion chamber.

The expansion chambers are effectively purged of exhaust gases with the presence of the pressurized air from the inlet ports and prior to the purging of the expansion chambers during each power stroke, air is induced through the exhaust ports to the atmosphere as described for improved combustion therein.

Thus there is a coordinated relationship of the exhaust ports in the cylinder and in the engine block with the exhaust ports running to the atmosphere in the engine supporting frame taken with the supplementary pressurized air jet ports 91 and 92. The result is a very effective exhaust system timed to the orbital relationship of the cylinder and the engine block with respect to the engine supporting frame.

The principle of after-burning of hydrocarbons as described is accomplished by jetting through an orifice in the piston and the timing of the injection of raw air.

Heat transfer from the expansion chambers is accomplished as by a conventional water jacket design not here shown. Conventional manufacturing processes and machines are used to build engines of the design herein indicated. It will be understood that the inventive concept embodied herein lends itself for use for pumps, compressors, fluid or hydraulic motors and the like.

The concept herein embodies the use of the engine structure above described in a series arrangement wherein common crank shafts will be utilized and common porting can be provided through common separating frame walls or supporting plate members.

It will of course be understood that various changes may be made in form, details arrangement and proportions of the parts without departing from the scope of the invention herein which, generally stated, consists in an apparatus capable of carrying out the objects above set forth, in the parts and combinations of parts disclosed and defined in the appended claims.

What is claimed is:

1. An orbital engine structure having in combination

a supporting frame member,
an engine block disposed in said frame member,
said engine block having a cylinder chamber therein,

a piston in said chamber,
a first means journaled in said supporting frame member supporting said engine block, said means guiding said engine block through an orbital path,

a second means journaled in said supporting frame member supporting said piston, said last mentioned means guiding said piston in an orbital path,

said first and said second mentioned means respectively guiding said engine block and said piston in orbital directions oppositely of one another and in orbital paths parallel to one another,
said cylinder chamber having an exhaust port running through said engine block,
said piston having a jet air port therethrough,
said supporting frame member having an exhaust port running from communication with said exhaust port in said engine block to the atmosphere,

said exhaust port in said supporting frame member being in register with said exhaust port of said engine block on the exhaust stroke of said piston,
said exhaust port in said supporting frame member being in register with said exhaust port of said engine block and with said jet air port in said piston on the compression stroke of said piston,
an inlet port to said cylinder chamber,
means providing pressurized air to said inlet port, and

said air jet port in said piston being in register with said inlet port when in register with said exhaust port of said cylinder chamber.

2. The structure set forth in claim 1, wherein said first mentioned means comprises a pair of crank shafts in vertical alignment, and said second mentioned means comprises a crank shaft disposed between said pair of crank shafts axially aligned therewith.

3. The structure set forth in claim 2, including a gear train driving said first and second mentioned means.

4. The structure set forth in claim 1, including a seal carried by said supporting frame member in facing sealing relationship with said engine block, and

said seal encompassing the orbital path of said exhaust port of said engine block.

5. The structure set forth in claim 1, wherein said cylinder chamber has an expansion chamber at each end thereof,

said piston has a piston head at each end thereof,
said cylinder chamber has an exhaust port running from each of said expansion chambers through said engine block,

said supporting frame member having an exhaust port corresponding to each exhaust port of said cylinder chamber, and

said piston having a jet air port extending there-through adjacent each head portion thereof.

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