May 6, 1958 E. G. MAYNARD 2,833,256

ONE CYLINDER TWO CYCLE ENGINE

Filed Jan. 31, 1957

Fig. 1.

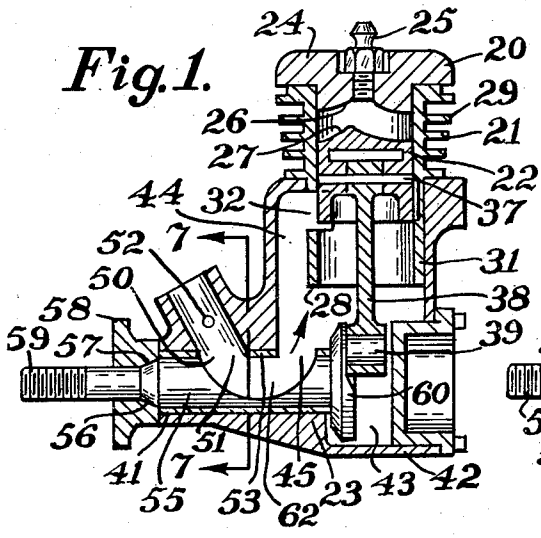


Fig. 2.

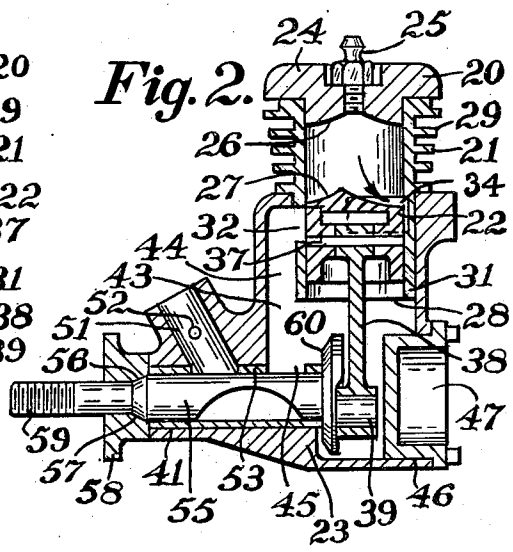


Fig. 9.

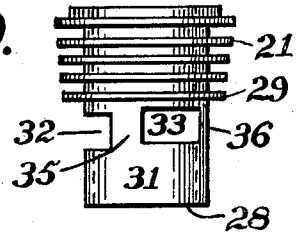


Fig. 4.

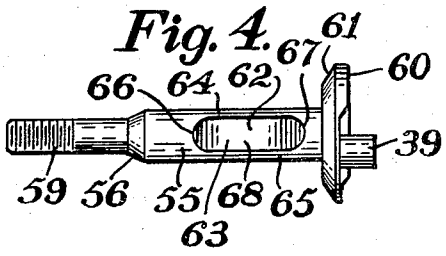


Fig. 3.

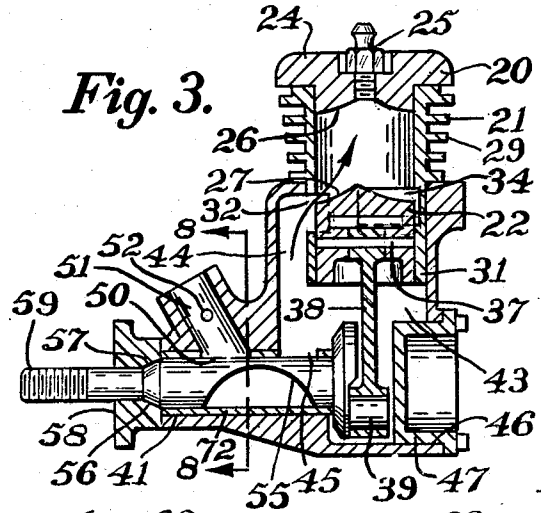


Fig. 5.

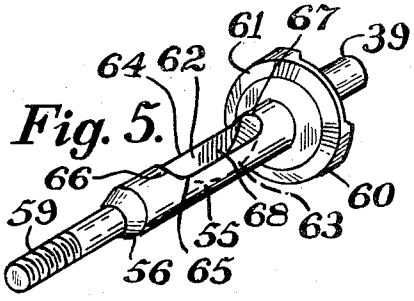


Fig. 6.

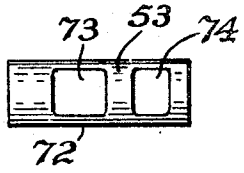


Fig. 7.

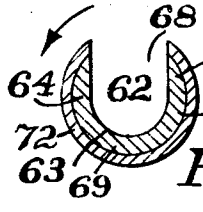
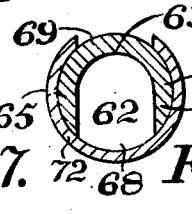


Fig. 8.



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ONE CYLINDER TWO CYCLE ENGINE

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7 Claims. (Cl. 123—73)

This invention relates to one cylinder, two cycle, internal combustion engines and particularly to miniature engines much used on model airplanes, boats and automobiles.

In the prior art such engines have sometimes been provided with hollow crankshafts, the crankshaft bore leading into the crankcase compression chamber and the shaft having an aperture in a peripheral wall for periodically connecting with a fuel intake conduit. The fuel has thus been directed into the base of the compression chamber at the level of the crank shaft axis and then has been redirected up to the combustion cylinder usually in a conduit extending along the sides of the cylinder. The hollow shaft increases the volume of the compression chamber and tends to reduce the volumetric efficiency of the engine. Such a hollow shaft valve arrangement is shown in U. S. Patent No. 2,733,694 to Brebeck of February 7, 1956.

It has also been proposed to provide a solid shaft having an impeller and a hollow sleeve valve attached to the impeller as in U. S. Patent No. 2,547,327 to King of April 3, 1951. The shaft itself does not serve as the valve means but indirectly rotates an encircling hollow sleeve having a valve aperture. The hollow sleeve increases the volume of the compression chamber, in the same manner as a hollow shaft and therefore also tends to reduce the volumetric efficiency of the engine.

The principal object of this invention is to increase the efficiency of miniature, two cycle, engines by reducing displacement at the base of the crankcase compression chamber, increasing displacement in the fuel feed conduit to the cylinder and to achieve a direct, short flow of fuel from the fuel intake conduit through the fuel feed conduit and into the cylinder.

Another object of the invention is to provide improved rotary valve means in miniature two cycle engines wherein a solid, cylindrical crank shaft serves as a rotary valve plug for connecting the fuel intake port with the fuel feed conduit of the engine.

A further object of the invention is to increase the volume of fuel feed to a miniature two cycle engine by grooving a solid crank shaft rather than perforating a hollow crank shaft thereby increasing the area of cross section of the fuel passage by the thickness of one quadrantal wall of a hollow shaft.

Still another object of the invention is to provide fuel ports, passages and conduits in a miniature two cycle engine of increased area of cross section terminating in an inlet port on the front of the cylinder nearly equal in width to one third the circumference thereof and to provide dual exhaust ports on the sides and rear of the cylinder, each nearly equal in width to one third said circumference and greater in joint total area than the area of said inlet port.

A still further object of the invention is to provide a straight, elongated, groove having an arcuate bottom intermediate of a solid crank shaft for serving as a valve port or passage, in a miniature two cycle, single cylinder engine.

Other objects and advantages of the invention will be apparent from the claims, the description of the drawing and from the drawing in which a preferred embodiment is illustrated.

Fig. 1 is a side view in section of an engine according to the invention, showing the piston and valve means during the fuel intake portion of the stroke.

Fig. 2 is a view similar to Fig. 1 showing the combustion portion of the stroke with the gases discharging through the exhaust ports and the fuel being compressed in the crankcase and fuel feed conduit.

Fig. 3 is a view similar to Fig. 1 showing the inlet port to the cylinder uncovered by the piston and the compressed fuel entering the cylinder from the fuel feed conduit.

Fig. 4 is a plan view of the preferred form of rotary valve plug means of the invention.

Fig. 5 is an isometric view of the device shown in Fig. 4.

Fig. 6 is a plan view of the preferred form of sleeve bearing for encircling the crankshaft.

Fig. 7 is a view in section on line 7—7 of Fig. 1.

Fig. 8 is a similar view in section on line 8—8 of Fig. 3, and

Fig. 9 is a side elevation of the preferred form of cylinder used in the invention.

In the drawings the two cycle, internal combustion engine **20** includes a single cylinder **21**, a piston **22** and a crankcase **23**. The cylinder **21** includes a head **24** and a glow plug **25**, the inside face **26** of the cylinder head being tapered to match the tapered baffle **27** of the piston **22**. The bottom **28** of cylinder **21** is open and suitable cooling fins **29** are provided around the cylinder.

As best shown in Fig. 9, the cylindrical wall **31** of cylinder **21** is apertured for nearly one third of its circumference to provide a fuel inlet port **32** at the front of the cylinder of relatively large area. The wall **31** also includes a pair of apertures each nearly equal in width to one third the cylinder circumference, at the sides and rear of the cylinder, to provide dual exhaust ports **33** and **34**. The total area of exhaust ports **33** and **34** is greater than the area of inlet port **32** and the exhaust ports are at a slightly higher level than the inlet port **32** to assure gas exhaustion before fuel feeding. Three narrow webs such as at **35** and **36** are thus provided in wall **31** each spaced 100° apart and reducing the frictional resistance of the wall to the piston **22**.

The piston **22** includes a wrist pin **37** for a connecting rod **38**, the rod **38** being connected to the crank pin **39**.

The crankcase **23** is provided with a crank shaft bore **41** at the front thereof and leading into the base **42** of the crankcase compression chamber **43**. A fuel feeding or supply conduit **44** extends up the front and outside of cylinder **21** and connects the fuel inlet port **32** with a fuel outlet port **45** at the bore **41**. Conduit **44** is of relatively wide area of cross section and forms the upper part of the compression chamber **43**, thereby allowing the fuel compressed by the descending stroke of piston **22** to concentrate close to inlet port **32** in conduit **44** rather than in the base **42**, as in certain engines now in use.

Preferably an opening **46**, coaxial with bore **41**, is provided in crankcase **23** and filled with a detachable filler plug **47** thereby filling additional space in the base **42** of chamber **43** to further reduce the volume thereof.

Closely spaced to the fuel outlet port **45** and preferably also in the upper quadrant of bore **41** at the front of the engine is the fuel inlet port **50**. Fuel inlet port **50** is at the terminal end of a fuel and air inlet conduit **51** formed in crankcase **23**. Conduit **51** includes a fuel sup-

ply connection **52** to a source of fuel and the air and fuel are supplied thereby to the engine all in a well known manner. Inlet port **50** and outlet port **45** of bore **41** are spaced apart by a web of material **53** and preferably inlet port **50** is of greater area than outlet port **45**.

A crankshaft **55** is rotatably mounted in bore **41** and is preferably cylindrical in outline and of solid material. Crank shaft **55** is tapered at **56**, the tapered portion **56** engaging a tapered seat **57** in a nut **58**. Shaft **55** includes threads **59** at its front terminal end for a propeller or a power connection of any desired type. A crank disc **60** is provided on shaft **55** and carries the crank pin **39**. Disc **60** is preferably bevelled at **61** at an angle of about 60° at its front edge.

The unitary, rotary valve plug means of the invention is achieved by the formation of a fuel passage, or valve port, **62** in the crank shaft **55**. As shown, the shaft **55** is solid and the passage **62** extends axially therealong in the form of a deep groove with an arcuate bottom **63** and high side walls such as at **64** and **65**. The ends **66** and **67** of passage **62** are dead ends the passage having the elongated opening **68** opposite to the integral wall **69**.

With each revolution of crank shaft **55** the passage **62** connects the fuel inlet port **50** with the fuel outlet port **45** adjacent thereto and admits fuel into the upper portion of the crankcase compression chamber **43** at fuel feed conduit **44**, as shown in Fig. 1. This is synchronized with the up stroke of piston **22** so that fuel is sucked into the entire chamber **43**. Upon explosion of the fuel in cylinder **21**, the piston **22** descends compressing the fuel in chamber **43**, and rotating passage **62** of shaft **55** to closed position, thus preventing escape of fuel. As shown in Fig. 2 the entire bore **41** is sealed off by shaft **55** to eliminate the bore and shaft from the displacement volume of the chamber. Also in Fig. 2 the exhaust ports **33** and **34** are just being uncovered by piston **22** to discharge the products of combustion. In Fig. 3 the piston **22** is in a low position where it uncovers the cylinder inlet port **32** to admit the fuel compressed in chamber **43** and conduit **44** into the cylinder.

Preferably the bore **41** is lined by a fixed bearing sleeve **72** of thin material and provided with an inlet aperture **73** corresponding to port **50** and an outlet aperture **74** corresponding to outlet port **45**. As best shown in Fig. 6 the aperture **73** is larger in area than aperture **74** and the apertures are of oblong shape with rounded corners to increase the area thereof.

It should be noted that the U-shaped groove or recess which forms passage **62** has no top wall but only bottom and side walls since the bearing, or the bore, serves to close the top opening. With a hollow shaft such as much used in the art, there is both a bottom wall and a top wall with the top wall being perforated to admit fuel into the centre of the shaft. By grooving a solid shaft, as in this invention, the thickness of one wall is eliminated and the passage increased correspondingly in area of cross section.

It is preferred that the passage, or valve port **62** have a rectangular or oblong opening **68**, with rounded corners as shown in Fig. 4. The area of the opening **68**, correspondingly reduces the area of shaft **55** in contact with the bearing **72**, thereby reducing frictional shaft resistance to rotation and improving efficiency of the engine.

I claim:

1. In a one cylinder, two cycle, internal combustion engine having a cylinder, a piston and a crankcase with a crank shaft bore the combination of a fuel inlet port in said housing connecting said crank shaft bore to a source of fuel; a fuel supply conduit in said housing, connecting said cylinder and crankcase to said bore and having a fuel outlet port at a spaced distance from said inlet port at said bore and a crank shaft rotatable in said bore and operably connected to said piston, said crank shaft forming unitary, rotary, valve plug means, including a valve port with opposite dead ends, adapted to connect said inlet and outlet ports in one angular position of said shaft and to plug said bore and disconnect said inlet and outlet ports in another angular position of said shaft during each rotation thereof.

2. A combination as specified in claim 1 wherein said crank shaft is solid except for a fuel passage intermediate of the length thereof, constituting the valve port of said rotary valve plug means.

3. A combination as specified in claim 1 wherein said inlet and outlet ports are closely spaced to, and aligned with each other, in the upper quadrant of said bore and said crank shaft includes an axially extending circumferential recess connecting said ports together when in angular registration therewith and constituting the valve port of said rotary valve plug means.

4. A combination as specified in claim 1 wherein said crank shaft is solid and cylindrical except for an axially extending, straight groove in the curved surface thereof, connecting said ports together when in registration therewith and constituting the valve port of said rotary valve plug means.

5. A combination as specified in claim 1 wherein said crank shaft is solid except for an elongated, arcuate recess intermediate of the length thereof adapted to connect said ports together once in each revolution thereof for admitting fuel to said crank case, and having a single opening of generally oblong configuration.

6. A one cylinder, two cycle, internal combustion engine comprising a combustion cylinder having inlet and exhaust ports; a piston slideable in said cylinder and having a connecting rod; a crankcase having a crank shaft bore leading into a compression chamber, a fuel feed conduit leading from said bore and chamber up the front of said cylinder to said cylinder inlet port, and a fuel intake conduit leading from a source of fuel to said crank shaft bore, proximate said fuel feed conduit, and rotary valve plug means comprising a solid, cylindrical crank shaft rotatable in said bore and operably connected to said connecting rod, said crank shaft having an arcuate, axially extending, dead-end, groove intermediate thereof adapted to connect said fuel intake conduit and said fuel feed conduit once with each revolution of said crank shaft but being adapted to sail off said bore during the remainder of each revolution thereof.

7. A combination as specified in claim 1 wherein said valve port defines a single oblong opening with rounded corners and said crank shaft bore is lined with a hollow tubular bearing having a pair of longitudinally spaced oblong apertures with rounded corners registering with, and coextensive in area with, said fuel inlet and fuel outlet ports.

References Cited in the file of this patent

UNITED STATES PATENTS

2,271,015	Jackson	Jan. 27, 1942
2,317,969	Arden	May 4, 1943
2,391,380	Barker	Dec. 25, 1945
2,410,229	Miller	Oct. 29, 1946
2,432,725	Connelly	Dec. 16, 1947

FOREIGN PATENTS

486,273	Great Britain	May 30, 1938