Aug. 21, 1951 M. S. MEAD 2,564,913

INTERNAL-COMBUSTION MOTOR

Filed May 4, 1950

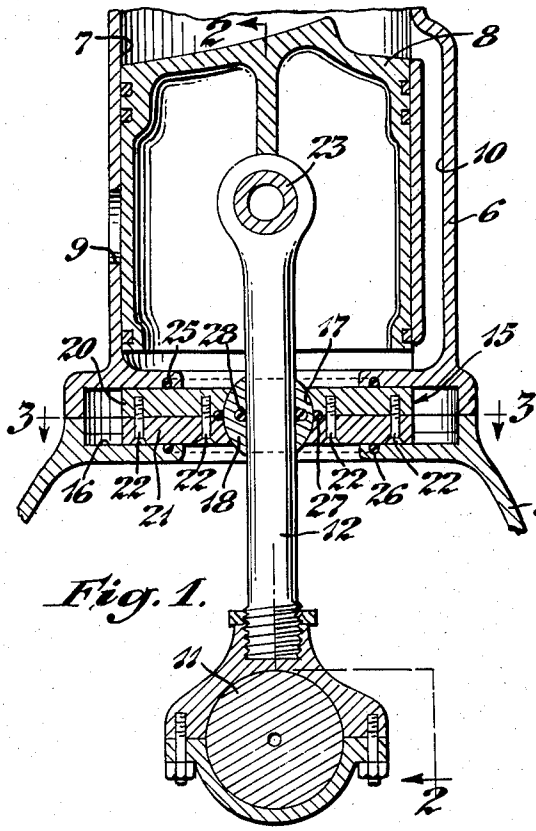

Fig. 1.

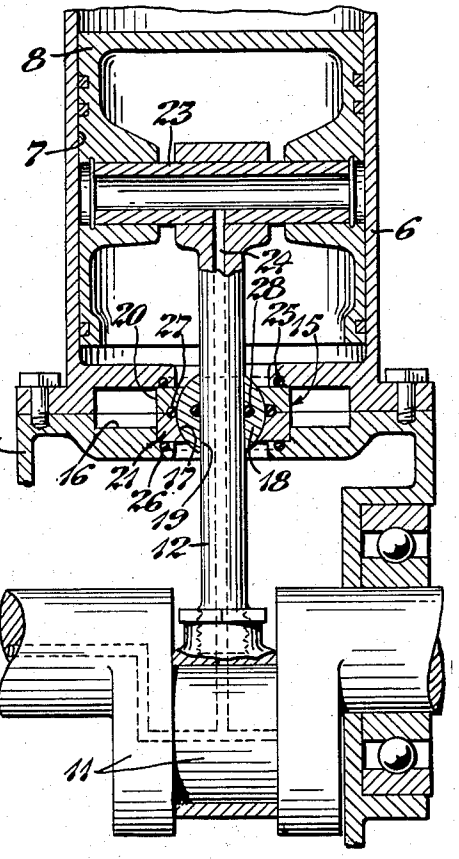

Fig. 2.

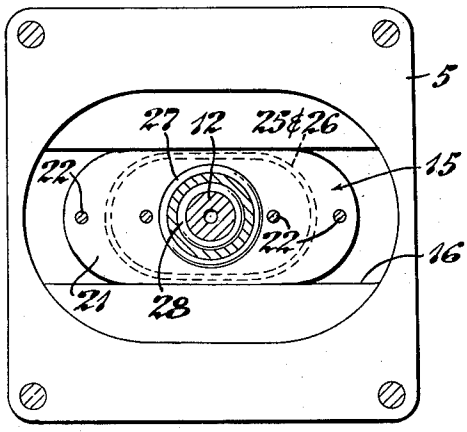

Fig. 3.

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Patented Aug. 21, 1951 2,564,913

UNITED STATES PATENT OFFICE

2,564,913

INTERNAL-COMBUSTION MOTOR

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Application May 4, 1950, Serial No. 160,061

5 Claims. (Cl. 123—74)

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This invention relates generally to internal combustion engines or motors, and particularly to motors of the two-stroke cycle type. Specifically, the invention pertains to an improved sealing means for sealing the lower open end of a cylinder of such a motor from the crank-case thereof.

It is customary in two-stroke cycle engines, wherein the fuel-air mixture enters the lower end of a cylinder upon the up-stroke of the piston and is forced upwardly by the piston into the upper end of the cylinder during the downward stroke to be later compressed during the upward stroke of the piston, to provide means for sealing the cylinder from the crank-case. This sealing means usually comprises a slide member, in the form of a plate, which is reciprocable in a horizontal guideway formed between the lower end of the cylinder and the upper end of the crank-case of the motor. The slide member has a spherical socket at its center in which a ball is universally mounted, the ball having a bore through which the connecting-rod is slidable as the piston is reciprocated in the cylinder.

Due to the oscillatory movement imparted to the connecting-rod by the combined reciprocatory motion of the piston and rotary movement of the crank-shaft, the slide member is reciprocated in a transverse path and the ball is caused to oscillate in its socket. It is apparent, therefore, that the components of the sealing means are subjected to damaging abrasive action which results in considerable wear at their contacting surfaces. This deleterious condition results in passage of the fuel from the cylinder into the crank-case and in passage of the lubricating oil from the crank-case into the cylinder to cause dilution of the oil, undesirable burning of oil, waste of fuel and oil, and loss of power and efficiency. While this deficiency of two-stroke cycle engines has long been recognized, it has been accepted as an insurmountable problem and so far as applicant is aware no satisfactory solution to the problem has been proposed prior to the present concept.

It is therefore the primary object of this invention to provide means for positively sealing the area between the cylinder and crank-case of a two-stroke cycle motor so as to prevent the passage of the oil or the combustible mixture, respectively, into the cylinder and crank-case, and thus maintain maximum efficiency of the motor.

Another object is to provide sealing means disposed between each of the moving components of the slide mechanism interposed between the

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cylinder and the crank-case for effectively sealing all the contacting surfaces thereof.

A further object is to provide sealing means of the character referred to, which comprises a series of sealing rings, each mounted in a groove of a relatively stationary part and engaging against a sliding surface of a movable component of the slide mechanism.

A still further object is to provide sealing rings for the purpose specified which are resilient and compressible against the moving part, said rings being highly resistant to oil, liquid fuel, heat, pressure, and wear, so that they normally remain effective over long periods of use and need not be replaced, except at the time of overhauling the engine.

Further objects will appear from the following description and from the drawing, which is intended for the purpose of illustration only, and in which:

Fig. 1 is a transverse, vertical sectional view through a cylinder and the associated parts of a two-stroke cycle engine or motor;

Fig. 2 is a longitudinal sectional view, taken on line 2—2 of Fig. 1; and,

Fig. 3 is a sectional plan view, taken on line 3—3 of Fig. 1.

Referring to the drawing in detail, the two-stroke cycle motor disclosed therein is, for the greater part, conventional in construction, and comprises a lower housing or crank-case 5 and a cast block 6 having walls defining a cylinder 7 in which a piston 8 is reciprocable, one wall having an inlet opening 9 through which fuel-air mixture can be introduced into the cylinder. The block 6 also has a by-pass channel 10 through which the combustible mixture is forced from the lower end to the upper end of the cylinder 7. A crank-shaft 11 is rotatable within the crank-case 5 and is operatively connected to the piston 8 through the medium of a usual connecting-rod 12 which is circular throughout the greater portion of its length.

During reciprocation of the piston 8, in response to repeated and timed explosions of the air-fuel mixture occurring in the upper end of the cylinder 7, the connecting-rod 12 oscillates with a combined axial and transverse motion. In order to provide a wall between the cylinder and the crank-case which will permit such oscillation of the connecting-rod, it is the common practice to provide a slide member 15 which is reciprocable in an elongated guideway 16 defined by walls at the lower end of the block 6 and the upper end of the crank-case 5.

At its center, the slide member 15 is provided with a spherical socket 17 in which a ball 18 is adapted to oscillate, the ball having a bore 19 through which the connecting-rod 12 extends and in which the rod is slidable axially. As shown, the slide member 15 preferably comprises a pair of plates 20 and 21 which are connected by screws 22. The piston pin 23 and the walls of the cylinder are preferably lubricated by oil forced upwardly through a passage 24 in the connecting-rod 12.

During operation of the motor, as the piston 8 moves upwardly, a charge of air-fuel mixture is drawn into the lower end of the cylinder 7 through the inlet 9, and a previous charge thereof is compressed by the piston in the upper end of the cylinder. The compressed charge is then ignited by a spark plug, not shown, the resulting explosion driving the piston downwardly to exhaust the products of combustion and to open the bypass 10 so that the new charge can be forced by the piston into the upper end of the cylinder to be subsequently exploded. During repeated reciprocations of the piston 8, the connecting-rod oscillates in a transverse plane so that the slide member 15 is reciprocated to accommodate this motion, the ball 18 thus being caused to oscillate in the socket 17. It will be apparent that due to the rapid reciprocatory and oscillatory movement of the various parts of the slide mechanism 15—19, considerable wear must occur between the various bearing surfaces. Due to this wear, the combustible vapor may pass around the slide member 15 and thus enter the crank-case to dilute the lubricating oil and cause loss of efficiency. Conversely, the oil which is splashed around the interior of the crank-case may be drawn upwardly into the cylinder 7 during the combined suction and compression stroke of the piston, and this results in the undesirable mixture of the oil with the fuel to cause excessive carbon formation.

It is the aim of the present invention to obviate this deleterious condition by providing means for sealing the several bearing surfaces of the slide mechanism 15—19. This sealing means includes a first sealing ring 25 which is disposed within a substantially elliptical groove cut in the lower surface of the upper wall of the guideway 16 and engaging the upper surface of the slide member 15. A second sealing ring 26 is disposed in a similar groove in the upper face of the lower wall of the guideway 16 and engaging the lower surface of the slide member 15.

A third annular sealing ring 27 is disposed in a circular groove on the spherical surface of the socket 17, in a plane extending parallel to the general place of the slide member, this ring engaging the spherical surface of the ball 18. A fourth annular sealing ring 28 is retained in a circular groove in the bore 19 of the ball 18 and engages the periphery of the connecting-rod.

The sealing rings 25, 26, 27, and 28, are resilient and compressible and may be of any desired cross-sectional shape, rings of the so-called O-ring type which are of circular cross-sectional shape having been found satisfactory for the purpose. Preferably, the rings are made from a synthetic rubber which is highly impervious to gases and liquids and resistant to relatively high temperatures, pressures and wear so that the possibility of the escape of the combustible mixture and the lubricating oil past the slide mechanism and deterioration of the sealing ring are minimized. The depth of the grooves in which the various sealing rings are retained is such that the sealing rings are compressed to a degree sufficient to insure an effective seal between the relatively movable bearing surfaces of the components. Consequently, the over-all efficiency of the motor in which the sealing rings are installed is substantially increased. Moreover, the use of the sealing means results in increased periods of use of the motor between overhauls, and thus the cost of operating the motor is substantially reduced.

As is well known to those versed in the art, it is customary in two-stroke cycle engines to mix lubricating oil with the fuel, the oil-fuel mixture being drawn into the cylinder for the purposes of combustion and lubricating the cylinder wall. It is also a recognized fact that when such an engine is reduced to an idling speed the oil of the mixture builds up within the cylinder and frequently causes stalling. This deficiency is obviated by the present improved structure since it is unnecessary to add oil to the combustible fuel, it having been pointed out that the cylinder wall is lubricated by oil forced upwardly through the passage 24.

I claim as my invention:

1. In a two-stroke cycle motor having a cylinder, a piston slidable in the cylinder, a crank-case, a crank-shaft rotatable in said crank-case, and a connecting-rod operatively connected between the crank-shaft and the piston for reciprocating the latter upon rotation of the crank-shaft, sealing means for sealing the cylinder from said crank-case, comprising: walls defining a guideway extending normal to the axis of said cylinder and disposed between the cylinder and the crank-case; a slide member reciprocable in the guideway; a ball carried by and mounted for universal movement on the slide member, said ball having a bore through which said connecting-rod extends and is slidable; and compressible sealing means disposed between the relatively movable surfaces of said guideway, said slide member, said ball, and said connecting-rod.

2. In a two-stroke cycle motor having a cylinder, a piston slidable in the cylinder, a crank-case, a crank-shaft rotatable in said crank-case, and a connecting-rod operatively connected between the crank-shaft and the piston for reciprocating the latter upon rotation of the crank-shaft, sealing means for sealing the cylinder from said crank-case, comprising: walls defining a guideway extending normal to the axis of said cylinder and disposed between the cylinder and the crank-case; a slide member reciprocable in the guideway; a ball carried by and mounted for universal movement on the slide member, said ball having a bore through which said connecting-rod extends and is slidable; and resilient, compressible sealing rings disposed between the relatively movable surfaces of said guideway, said slide member, said ball, and said connecting-rod.

3. In a two-stroke cycle motor having a cylinder, a piston slidable in the cylinder, a crank-case, a crank-shaft rotatable in said crank-case, and a connecting-rod operatively connected between the crank-shaft and the piston for reciprocating the latter upon rotation of the crank-shaft, sealing means for sealing the cylinder from said crank-case, comprising: walls defining a guideway extending normal to the axis of said cylinder and disposed between the cylinder and the crank-case; a slide member reciprocable in the guideway; a ball carried by and mounted for universal movement on the slide member, said

ball having a bore through which said connecting-rod extends and is slidable; and resilient, compressible sealing rings mounted in opposite walls of said guideway and engaging the corresponding sides of said slide member.

4. In a two-stroke cycle motor having a cylinder, a piston slidable in the cylinder, a crank-case, a crank-shaft rotatable in said crank-case, and a connecting-rod operatively connected between the crank-shaft and the piston for reciprocating the latter upon rotation of the crank-shaft, sealing means for sealing the cylinder from said crank-case, comprising: walls defining a guideway extending normal to the axis of said cylinder and disposed between the cylinder and the crank-case; a slide member reciprocable in the guideway; a ball carried by and mounted for universal movement on the slide member, said ball having a bore through which said connecting-rod extends and is slidable; a first resilient, compressible sealing ring mounted in a groove in one wall of the guideway and sealably engaging the side of the slide member disposed adjacent said cylinder; a second resilient, compressible sealing ring mounted in a groove in the opposite wall of the guideway and sealably engaging the opposite side of said slide member; a

third resilient, compressible sealing ring mounted in an annular groove in said slide member and surrounding said ball in sealing engagement therewith; and a fourth resilient, compressible sealing ring mounted in an annular groove in said ball and surrounding said connecting-rod in sealing engagement therewith.

5. Sealing means of the character defined in claim 4, in which said sealing rings are liquid, gas, heat, and pressure resistant.

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