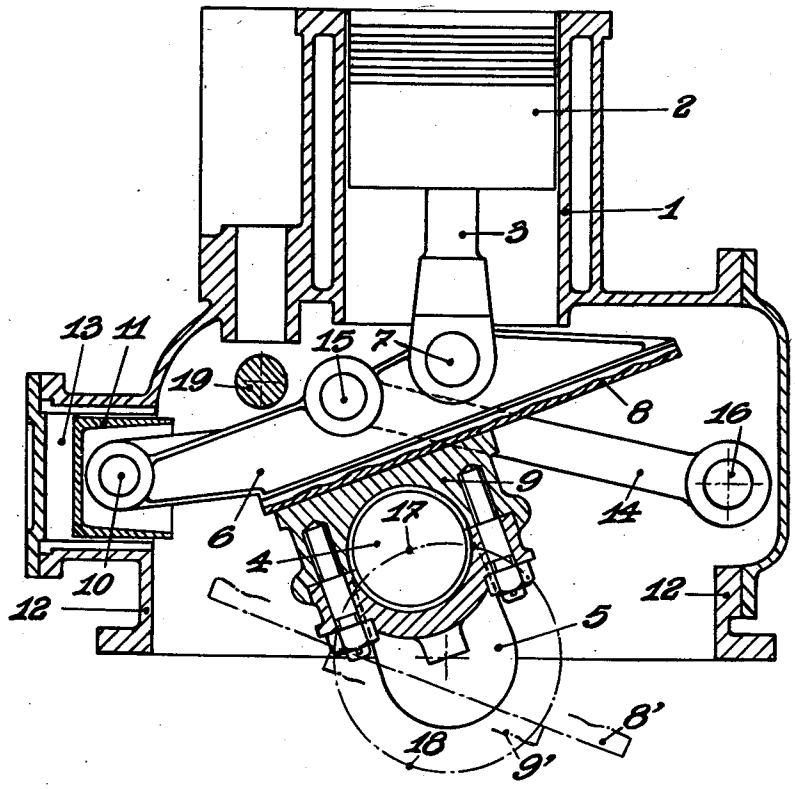
May 24, 1949. A. T. ELANTS 2,470,809

MEANS FOR OBVIATING CYLINDER WEAR IN ENGINES AND THE LIKE

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FIG. 1.



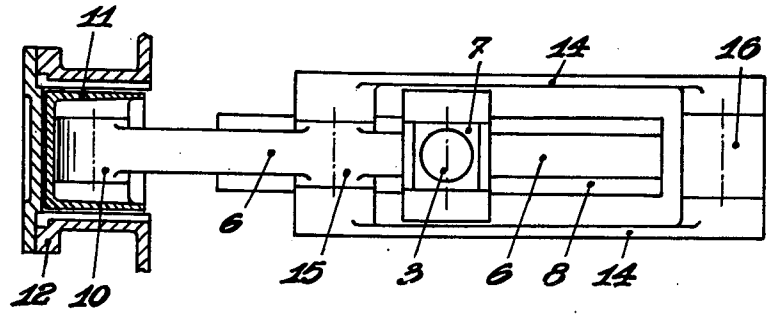


FIG. 2.

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FIG. 3.

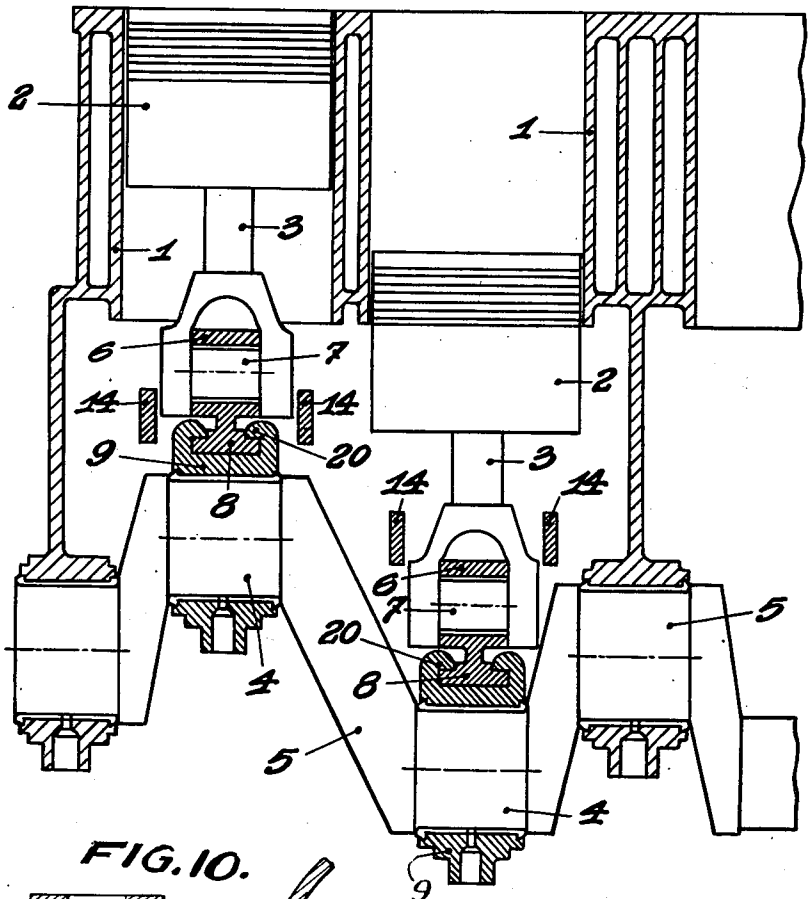
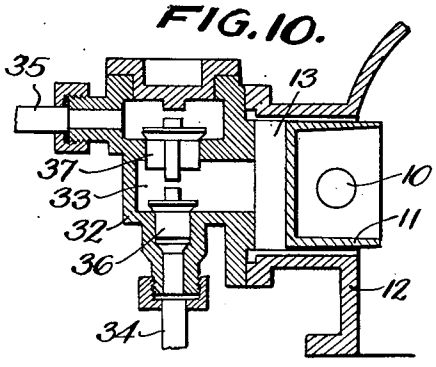


FIG. 10.



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MEANS FOR OBVIATING CYLINDER WEAR IN ENGINES AND THE LIKE

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FIG. 4.

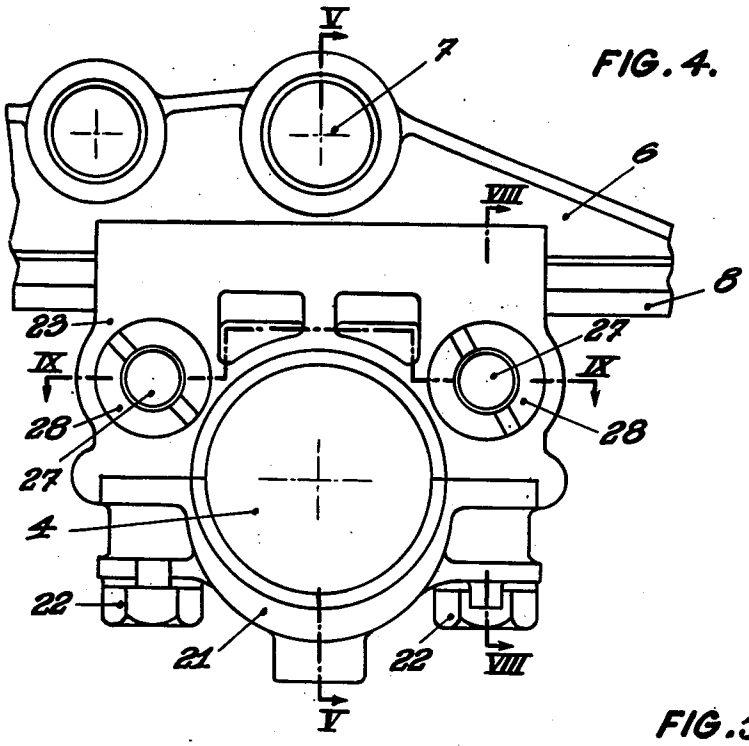


FIG. 5.

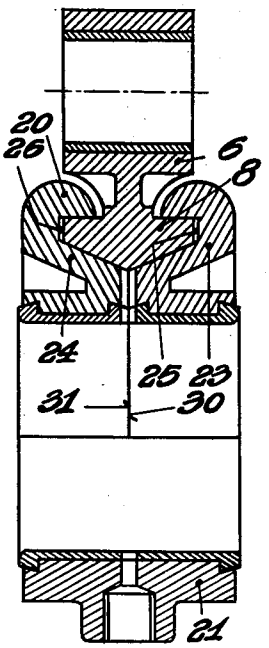
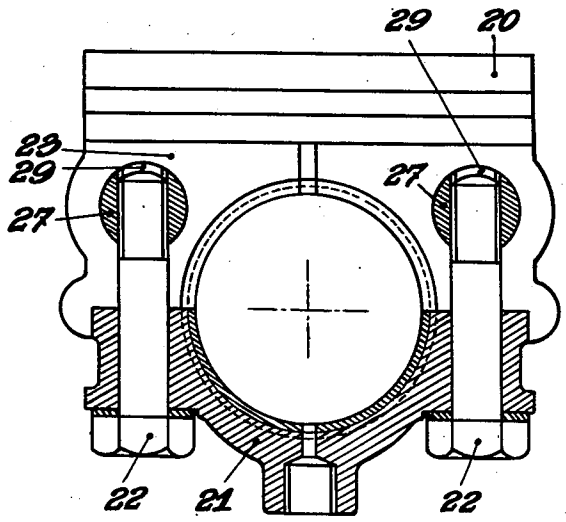


FIG. 6.



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FIG. 7.

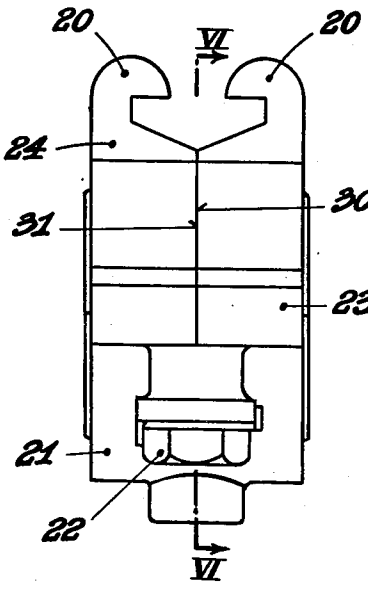


FIG. 8.

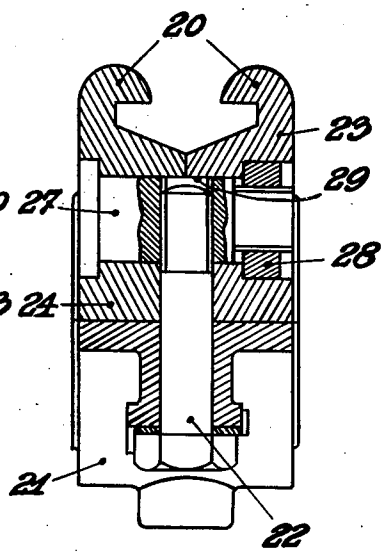
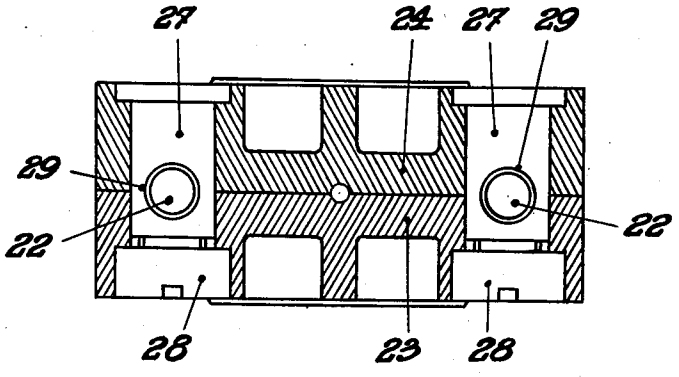


FIG. 9.



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UNITED STATES PATENT OFFICE

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MEANS FOR OBVIATING CYLINDER WEAR IN ENGINES AND THE LIKE

Adriaan Theodorus Elants, Brussels, Belgium

Application July 10, 1947, Serial No. 760,036
In Belgium February 8, 1941

Section 1, Public Law 690, August 8, 1946
Patent expires February 8, 1961

6 Claims. (Cl. 74—45)

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This invention relates to mechanism which is applicable to reciprocating engines and other machines that work with plunger pistons, and by which the lateral cylinder wear, with its disadvantageous consequences, is obviated.

It is known that in engines for automobiles and motor cycles, and also in marine engines with plunger pistons, the cylinders become badly ovalised, so that the compression can no longer be effected to its full height, and the desired power can no longer be raised. In consequence of this oval cylinder wear, the piston will be thrown to and fro in the cylinder, whereby knocking occurs. With the to and fro movement of the piston, wear also occurs in the piston-ring grooves, with the result that the piston rings in these grooves are no longer sufficiently fluidtight, and thus the compression and the explosion are partially wasted.

The lateral pressure of the piston on the cylinder wall likewise occasions the expulsion of the cylinder oil film, whereby the cylinder lubrication, particularly when starting the engine, suffers appreciably.

Moreover known motors have the disadvantage that the piston has a power-transmitting pivot in the hottest part of the piston, which is very difficult to lubricate. For this reason it would be desirable to make the bearing surface much larger, but the space necessary for this is wanting.

All these disadvantages are removed by this invention, thanks to the adoption of a mechanism of power-transmission between piston and crankshaft which ensures an accurate rectilinear motion of the piston, so that cylinder does not experience the slightest lateral pressure, while at the same time the pivot in the piston, which gives rise to many difficulties, is eliminated.

According to the invention, the power-transmission from the piston to the crankshaft is effected by means of an organ of movement which on the one hand is rotatably connected to the outer end of a piston rod, secured in the piston, and on the other hand is slidably connected with a block mounted rotatably on the crank pin, and thus is guided in a plane passing through the axis of the cylinder so that the said organ executes a composite movement consisting of a swinging movement in the sense of the piston movement and a reciprocating movement transverse to the axis of the cylinder. This guidance of the said organ may be insured by a pull-rod, of which one end is mounted rotatably about a fixed point of the motor frame, while the other extremity is rotatably connected with the movement organ. Moreover the said organ is rotatably combined

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with a guide, which is carried transversely to the axis of the cylinder.

Owing to the fact that the power reaction point no longer lies in the cylinder, but close to the axis of the crankshaft, the vibrations of the engine are greatly diminished, and the height of the motor can be appreciably reduced.

A further feature of the invention resides in an adjustable connection between the actuating member and the block rotatably mounted on the crank pin.

The invention will be further described hereunder with reference to the accompanying drawings, with a constructional example. In the drawing:

Figure 1 shows a partial cross section of a motor, on the axis of a cylinder, with the piston in its upper dead centre;

Figure 2 shows a plan view of the power-transmitting mechanism;

Figure 3 shows a partial longitudinal section of the motor, with one piston in its upper dead centre and one piston in its lower dead centre position;

Figure 4 shows the adjustable crank-pin block in side elevation;

Figure 5 is a cross section on the line V—V in Figure 4;

Figure 6 is a section on the line VI—VI in Figure 7;

Figure 7 is an end view of the block;

Figure 8 is a cross section on the line VIII—VIII in Figure 4; and

Figure 9 is a section on the broken line IX—IX in Figure 4;

Figure 10 is a sectional view showing the guide for the said organ adapted for use as a pump.

In each cylinder 1 there is a piston 2, with a piston rod 3 mounted fast therein axially. The transmission of power from the piston 2 to a crank-pin 4 of the crankshaft 5 is effected by the aid of a movement organ 6, which is rotatably connected by a pin 7 with the piston rod 3, and possesses a sliding surface 8, which is kept continuously in sliding contact with a corresponding surface on a block 9, which is so mounted in the normal manner as to be freely rotatable upon the crank pin 4. Power is thus transmitted from the piston to the crankshaft by the pressure of the member 6 upon the block 9. As indicated in Figure 3, the block 9 may be provided with two hooks 20, which engage round the side edges of the sliding surface 8, in order to hold it against the sliding surface of the block 9. Such hooks or the like may if preferred be applied to the

sliding surface 8 instead of to the block 9. In the case of a motor-cycle engine the block 9 may be mounted upon the crank-pin by means of a roller bearing.

The member 6 is furthermore rotatably connected by a pin 10 with a guide 11, which is preferably formed by a piston which is movable transversely to the axis of the cylinder 1, and which can move in an aperture 13 provided in the motor frame 12.

Finally a double connecting rod 14 is rotatably connected at one of its ends with the member 6 by a pin 15, while at its other end it is pivotally mounted by means of a pin 16 at a fixed point on the engine frame 12. From this it follows that the member 6 executes a composite motion, made up of a swinging motion about the axis of the pin 10 and a reciprocating lateral motion which is determined by the length of the connecting rod 14 and the position of the fixed point 16, and controlled by the displacement of the piston 11. The arrangement is such that the piston 2 exerts no lateral or reaction pressure upon the cylinder wall, thanks to the rectilinear displacement of the piston rod and the piston, and to the fact that the reaction is furnished by the fixed point 16.

At the lower dead centre of the piston 2, the sliding surface 8 and the crank-pin block 9 assume the positions 8' and 9' respectively as shown in dot-and-dash lines in Figure 1, in which the axis of the crank-pin 4 comes to lie at 18, whereas it lies at 17 when the piston is at its upper dead centre position. The working path of the crank thus amounts to more than 180 degrees, and conforms to the major arc between the points 17 and 18.

It is worth noting that the aperture 13 may be constructed as a cylinder fitting snugly around the piston 11, in which case the unit 11, 13 may be provided with the necessary valves to enable it to be used as a pump, for instance as an oil pump. Such an arrangement is shown in Figure 10 in which a pump unit 32 having a chamber 33 communicates with the said aperture and is connected to an inlet pipe 34 and an outlet pipe 35, respectively controlled by an inlet valve 36 and an outlet valve 37.

From the foregoing it is clear that thanks to the elimination of rubbing the cylinder wall remains cooler, which permits air cooling or oil cooling to be employed in place of water cooling. Moreover the efficiency of the engine is enhanced, and the fuel consumption thus diminished, since no loss of pressure is to be feared. It may here be observed that the working path of the crank is considerably longer for the same piston stroke. Since the motor undergoes much less wear, it has a longer life; and furthermore the taking out of the pistons for inspection is much easier. Finally it should also be mentioned that the cooling of the rubbing surfaces of the organs 6, 8 and 9 is automatically ensured by the swinging motion of the mechanism.

The invention can also be applied to existing motors with a cam shaft 19 (Figure 1), with which the mechanism according to the invention does not come into contact.

In the case of the adjustable crank-pin block of Figures 4 to 9, the lower part 21 thereof is united by bolts or studs 22 to the upper part of the block. This upper part is divided along the central plane in the longitudinal direction of the sliding surface 8 into two halves 23 and 24, which are adapted to the sliding surface 8, but leave some lateral clearance 25, 26 (Figure 5) to allow for readjustment. The two parts 23 and 24 are held together by fitting bolts 27, which are provided with adjusting nuts 28. Each bolt 27 has a transverse bore provided with an internal screw thread 29, which forms a nut for a bolt 22.

The clearance in the slidable connection arising in consequence of wear can be eliminated by moving the two parts 23 and 24 nearer together, in consequence of which the breadth of the V-shaped guide formed in these parts is reduced. For this purpose all that is necessary is to tighten up the nuts 28, after part of a packing inserted between the surfaces 30 and 31 has been taken away, or if necessary some part has been removed from these surfaces themselves.

This adjustable block may of course be employed with the greatest advantage for the slidable connection according to Figures 1 to 3. Its adoption may however be advantageous in similar slidable connections of other appliances also.

What I claim is:

1. Mechanism for the transmission of power from piston to crankshaft in an engine with plunger pistons, each displaceable in a cylinder, comprising an actuating member which is rotatably connected with a piston rod mounted fast in the piston and is also slidably connected with a block rotatably mounted on a crank-pin of said crankshaft, and means for guiding the said actuating member in a plane passing through the cylinder axis so that the said actuating member executes a composite motion which consists of a swinging motion in the direction of the motion of the piston and a reciprocating motion transverse to the axis of the cylinder, in such a way as to impart a rectilinear motion to the piston and piston rod.

2. Mechanism for the transmission of power from piston to crankshaft in an engine with plunger pistons, each displaceable in a cylinder, comprising an actuating member which is rotatably connected with a piston rod mounted fast in the piston and is also slidably connected with a block rotatably mounted on a crank-pin of said crankshaft, a connecting rod rotatably connected by one of its ends to the actuating member and rotatably suspended by its other end at a fixed point of the engine, a guide member rotatably connected to the actuating member, and means for guiding the guide member transversely to the cylinder axis, so that the actuating member executes a composite motion which consists of a swinging motion around its axis of articulation to the guide member and a reciprocating motion transverse to the axis of the cylinder so as to impart a rectilinear motion to the piston and piston rod.

3. Mechanism according to claim 2, in which the guide member is formed by a piston while its guiding means are formed by a cylinder carried by the engine, the unit formed by the said guiding cylinder and the guiding piston displaceable therein being capable of being used as a pump.

4. In a mechanism for the transmission of power from piston to crankshaft of an engine with plunger pistons each displaceable in a cylinder, comprising an actuating member rotatably connected to a piston rod mounted fast in the piston, means for guiding the actuating member in a plane passing through the cylinder axis and imparting to the actuating member a composite motion which consists of a swinging motion in the direction of the motion of the piston and a

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reciprocating motion transverse to the axis of the cylinder, a block rotatably mounted on a crank-pin of the crankshaft, and sliding surfaces on said actuating member and said block, interengaging with one another in the manner of hooks.

5. In a mechanism for the transmission of power from piston to crankshaft of an engine with plunger pistons each displaceable in a cylinder, comprising an actuating member rotatably connected to a piston rod mounted fast in the piston, means for guiding the actuating member in a plane passing through the cylinder axis and imparting to the actuating member a composite motion which consists of a swinging motion in the direction of the motion of the piston and a reciprocating motion transverse to the axis of the cylinder, a block rotatably mounted on a crank-pin of the crankshaft and divided in two halves along a plane perpendicular to the axis of the crankshaft, registering holes in said halves, adjustable fitting bolts arranged in said holes for assembling said halves, a slide track of V-shaped cross section formed in said block and extending parallelly to said plane and symmetrically thereto, a sliding surface of corresponding shape on said actuating member and arranged with lateral clearance in said slide track, and means for maintaining sliding contact between said slide track and said sliding surface.

6. In a mechanism for the transmission of power from piston to crankshaft of an engine with plunger pistons each displaceable in a cylinder, comprising an actuating member rotatably connected to a piston rod mounted fast

in the piston, means for guiding the actuating member in a plane passing through the cylinder axis and imparting to the actuating member a composite motion which consists of a swinging motion in the direction of the motion of the piston and a reciprocating motion transverse to the axis of the cylinder, a block rotataby mounted on a crank-pin of the crankshaft and comprising a portion which is divided into two halves along a plane perpendicular to the axis of the crankshaft, registering holes in said halves, adjustable fitting bolts arranged in said holes for assembling said halves, a slide track of V-shaped cross section formed in said divided portion of the block and extending parallelly to said plane and symmetrically thereto, a sliding surface of corresponding shape on said actuating member and arranged with lateral clearance in said slide track, registering holes in the undivided portion of said block and in the said adjustable bolts, screw threads in the holes of the latter, bolts screwed in the latter holes for assembling the divided and undivided portions of said block, and means for maintaining sliding contact between said slide track and said sliding surface.

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