March 9, 1943. C. E. S. KORYTKO 2,313,202

PISTON

Filed Jan. 13, 1939

Fig. 1

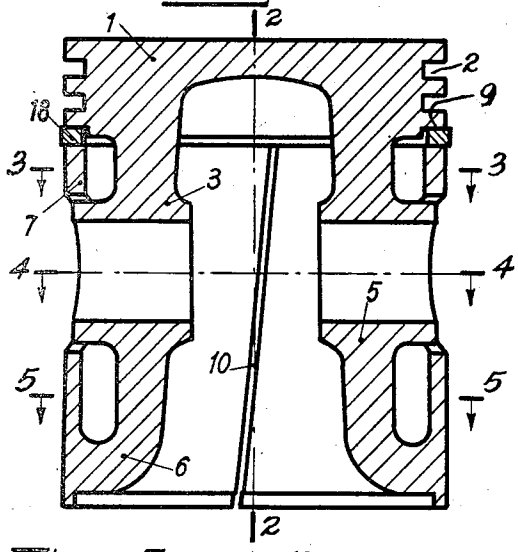


Fig. 2

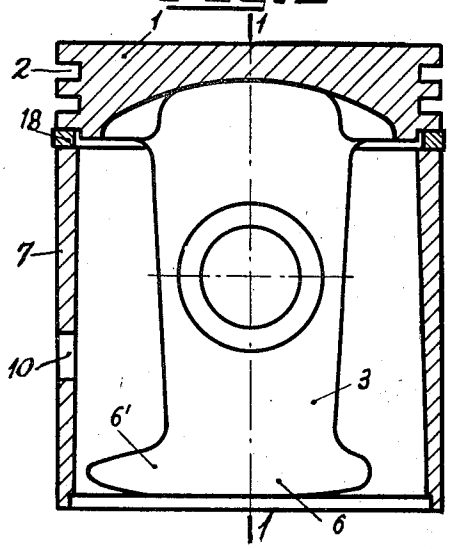


Fig. 3

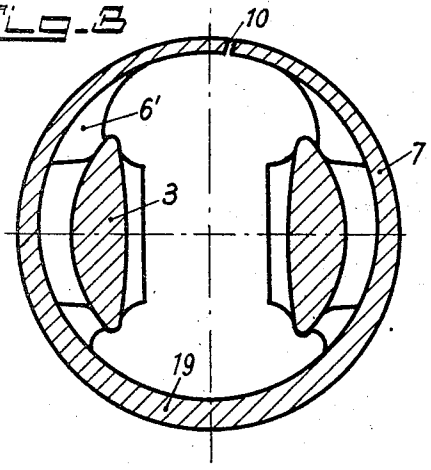


Fig. 4

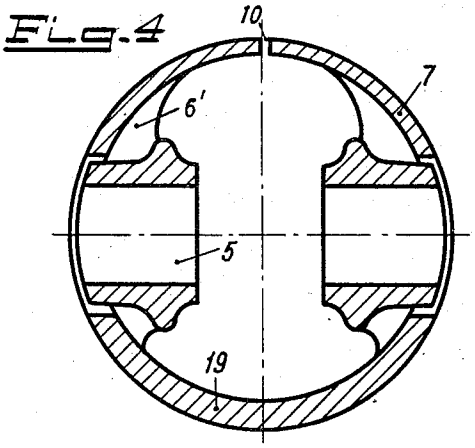
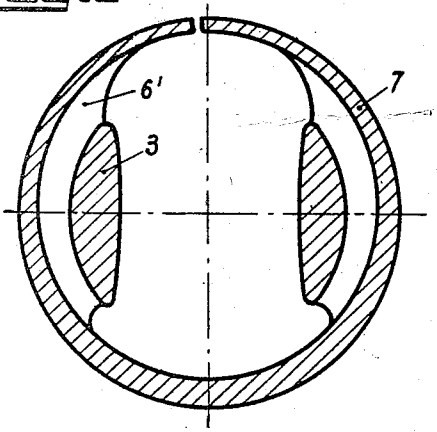


Fig. 5



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2,313,202

PISTON

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vested in the Alien Property Custodian

Application January 13, 1939, Serial No. 250,826
In France January 17, 1938

6 Claims. (Cl. 309—11)

This invention relates to pistons for engines and has for its object a piston which secures a satisfactory tight seal in an engine cylinder under all conditions of temperature in the engine operation.

It is known that the pistons which at present are in general use in internal combustion engines consists usually of a casting which includes a rigid head where the piston rings are mounted, and a longitudinally split skirt which is connected with said head in a manner enabling it to fit in the best possible manner in the cylinder in which the piston is mounted to operate.

Due to the thermal deformations the metal of the piston undergoes during the engine operation and the requirement that the skirt must be firmly connected with said head, difficulties are found in obtaining a proper fit of the skirt in the cooperating cylinder both when hot and when cold. The pistons at present in general use are subject to troubles such as either an unsatisfactory seal when cold or the liability of the piston seizing in the cooperating cylinder when hot.

The piston of this invention avoids such troubles in that it includes a split skirt which is entirely free in its region adjacent to the head and is connected therewith in register with the skirt edge most remote from said head, the interconnection of said head and skirt being secured by means of a body or arms which extend from said head and provide bosses in which the seats for the piston wrist pin are made.

This invention also includes further features which make the piston skirt capable of deformation in a uniform manner and of acting as a seal band or segment.

An embodiment of the present invention is illustrated by way of example on the annexed drawing and

Fig. 1 is a central longitudinal section made on line 1—1 of Fig. 2;

Fig. 2 is a central longitudinal section on line 2—2 of Fig. 1;

Fig. 3 is a transverse section on line 3—3 of Fig. 1;

Fig. 4 is a transverse section on line 4—4 of Fig. 1;

Fig. 5 is a transverse section on line 5—5 of Fig. 1.

In the construction illustrated, the piston includes a head 1 having, as usual, grooves 2 intended to receive usual piston rings, not shown.

Two arms 3 extend from the head 1 in diametrically opposed regions thereof, and provide seats 5 for the piston wrist pin, not shown.

A piston skirt 7 encircles said arms 3 and has an edge adjacent to and spaced from the piston head 1, and an opposed edge which is remote from said head. Said skirt 7 has its last named edge connected at 6 with the free ends of the bosses 3 and its outer surface extends in register with the side surface of the head 1 while the first named edge of the skirt 7 is entirely separated from the piston 1 due to the annular gap 9 provided intermediate said head and skirt. A longitudinal slot 10 which preferably is inclined as shown, extends throughout the skirt 7 as shown in Fig. 1.

Owing to the described arrangement, the skirt 7 is independent of the head 1 to the maximum possible extent and it is free to expand and contract; said skirt is thus able to provide a satisfactory alignment of the piston in the cooperating cylinder under all conditions as may occur in operation without the piston being subject to seizure in the cylinder.

Due to the fact that the head 1 is connected with bosses 3 having a comparatively large cross section, the heat accumulating in the head 1 may dissipate through said bosses 3 into the skirt 7 which is in intimate contact with the wall of the cylinder, this wall in turn being cooled by the usual cooling means provided in internal combustion engines.

Further, due to the fact that the skirt 7 and the internal parts of the piston are interconnected adjacent their end remote from the head, said skirt 7 has its coldest region adjacent to the piston head, contrary to conditions prevailing in known constructions.

The above stated conditions enable a cylindrical shape to be imparted to the outer surface of said skirt 7 instead of a conical or tapering shape, as usual. The machining is thus made more easy and the adjustment of the piston within the cooperating cylinder and also the possibility for mounting it with a somewhat forced fit are secured.

The piston is preferably made of a light metal alloy but it may be made of any preferred metal on account of the fact that the effect of heat expansion is reduced to a minimum due to the described construction of the piston.

A sealing ring 18 may be located in the gap 9 intermediate the head 1 and the skirt 7; the ring 18 obstructs the passage through the longitudinal slot 10 and it enables the full skirt 7 to act as a seal member whose pressure per square inch against the cylinder wall has a minimum value.

A number of rings usually provided in the piston may then be omitted and consequently the wear of the cylinder wall surface due to the piston rings is reduced while also the longitudinal size and weight of the piston head are lessened; the dynamic balance of the piston may thus be improved and accordingly the total longitudinal extent of the piston may be reduced without

restricting the extent of the bearing surface of the resilient split skirt.

To fully avail of the material providing the internal parts of the piston such a shape and size may be imparted to bosses 3 as to supply a resiliency proper to enable the lower region of the skirt to develop an appropriate pressure as afforded by the expansion of the piston head.

For such a purpose a shape of uniform resistance is imparted to the bosses 3; accordingly the thickness of the bosses 3 may be caused to decrease starting from the piston head 1 as shown in Fig. 1 or the width of said arms may be decreased as shown in Fig. 2.

The bosses 3 connect with the lower edge of the skirt 7 at a region 6, which preferably is extended in a direction perpendicular to the generatrix lines of the cylindrical skirt and the sectional area of the arms, and of the connecting regions are calculated in such a manner as to secure a stiffness sufficient to hold the axes of the head 1 and of the skirt 7 coincident with each other.

The connecting region 6 is more extensive on one side of the piston, as shown at 6' in Fig. 2 than on the other, and the extension 6' is located on the side where the skirt 7 has its longitudinal slot 10, as shown in Figs. 3–5. The resiliency of the bottom portion of the skirt is thus uniform over the full circumference thereof.

It is useful for the wall providing the skirt 7 to have a larger thickness in the portion thereof adjacent to the piston head than at the opposed end, as shown in Figs. 1 and 2; by this provision the differences in resiliency as may depend on the interconnection of the skirt 7 with the bosses 3 are compensated for, whilst a fully cylindrical outer surface may be obtained.

A varying thickness may be imparted with advantage to said skirt also in respect of the transverse section thereof, to secure a uniform resiliency throughout said skirt.

In the embodiment shown the transverse section of the skirt has a maximum thickness in the region 19 thereof which is opposite the slot 10, and said thickness decreases as the slot edges are approached.

The above described arrangement imparts to said skirt such a uniform resiliency as to develop an even pressure on the cylinder walls and to provide for a no-play fit in the cylinder when cold as an effect of the expansion of said skirt.

Further the expansion of the skirt when hot is compensated for by its freedom to contract, any possibility of the piston becoming seized in the cooperating cylinder being removed, because the pressure the piston skirt may develop on the cylinder wall cannot go over a determined value.

What I claim as my invention and desire to secure by United States Letters Patent is:

1. In a piston comprising a rigid head and a deformable skirt spaced from said head and connected thereto, said skirt being slotted, and two struts having aligned wrist-pin bores therein extending from peripheral portions of said head, each of said struts having a cross section at one end elongated circumferentially of said skirt, and being connected at its circumferentially elongated end with said skirt on the edge thereof which is remote from said head.

2. In a piston comprising a rigid head and a deformable skirt spaced from said head and connected thereto, said skirt being slotted, and two struts having aligned wrist-pin bores therein extending from peripheral portions of said head, each of said struts being connected at its end with said skirt on the edge thereof which is remote from said head, the connecting region of said skirt and each of said struts extending along an arc of said skirt edge and being enlarged at that side of each of said struts which is adjacent to the slot of said skirt.

3. In a piston comprising a rigid head and a deformable skirt spaced from said head and connected thereto, said skirt being slotted, said skirt having an outer cylindrical surface and a thickness decreasing from the skirt edge adjacent to said head to the skirt edge remote from said head, and two struts having aligned wrist-pin bores therein extending from peripheral portions of said head, each of said struts having a cross section at one end elongated circumferentially of said skirt, and being connected at its circumferentially elongated end with said skirt on the edge thereof which is remote from said head.

4. In a piston comprising a rigid head and a deformable skirt spaced from said head and connected thereto, said skirt being slotted, said skirt having a thickness varying gradually from a maximum in the skirt portion diametrically opposite to the skirt slot to a minimum at the slot edges, and two struts having aligned wrist-pin bores therein extending from peripheral portions of said head, each of said struts having a cross section at one end elongated circumferentially of said skirt, and being connected at its circumferentially elongated end with said skirt on the edge thereof which is remote from said head.

5. In a piston comprising a rigid head and a deformable skirt spaced from said head by an intermediate continuous gap and connected thereto, said skirt being slotted, a ring located in said gap and closing the aperture of said slot in said gap, and two struts having aligned wrist-pin bores therein extending from peripheral portions of said head, each of said struts having a cross section at one end elongated circumferentially of said skirt, and being connected at its circumferentially elongated end with said skirt on the edge thereof which is remote from said head.

6. In a piston comprising a rigid head and a deformable skirt spaced from said head and connected thereto, said skirt being slotted, said skirt having an outer cylindrical surface and a thickness decreasing from its edge adjacent to said head to its edge remote from said head, said thickness also varying in different regions of the skirt transverse section from a maximum in the skirt portion diametrically opposite to the slot to a minimum at the slot edges, and two struts having aligned wrist-pin bores therein extending from peripheral portions of said head, each of said struts being connected at its end with said skirt on the edge thereof which is remote from said head, the connecting region of said skirt and each of said struts extending along an arc of said edge, and being enlarged at that side of each of said struts which is adjacent to the slot of said skirt.

CHARLES EMILE STANISLAS KORYTKO.