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PISTON FOR INTERNAL COMBUSTION ENGINES.

APPLICATION FILED APR. 23, 1918.

1,294,833. Patented Feb. 18, 1919.

FIG. 1.

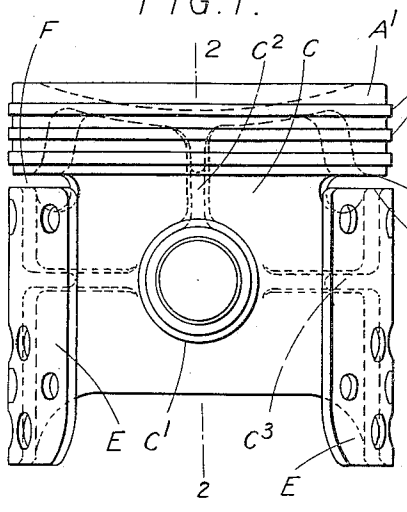


FIG. 2.

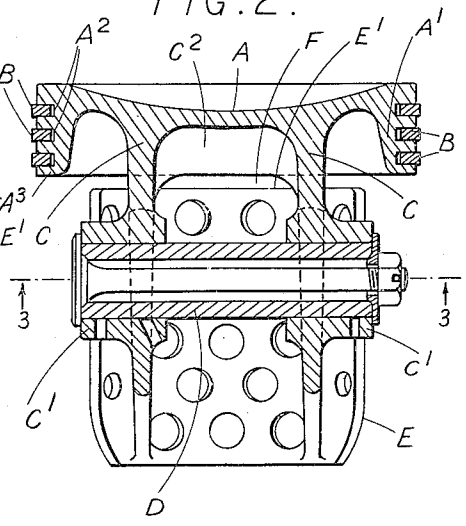
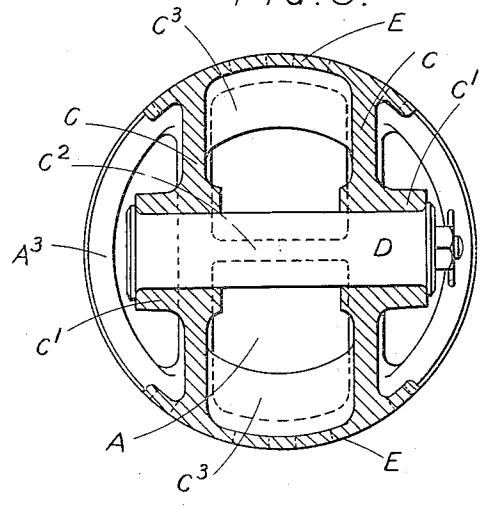


FIG. 3.



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PISTON FOR INTERNAL-COMBUSTION ENGINES.

1,294,833. Specification of Letters Patent. Patented Feb. 18, 1919.

Application filed April 23, 1918. Serial No. 230,355.

To all whom it may concern:

Be it known that I, HARRY RALPH RICARDO, a subject of the King of England, residing at London, in England, have invented certain new and useful Improvements in Pistons for Internal-Combustion Engines, of which the following is a specification.

This invention relates to pistons for internal combustion engines and has for its object to effect certain improvements in a known type of piston in which the piston head performs solely piston functions while the guiding is performed by members disposed on either side of the gudgeon pin, these guide members being extensions from the piston head flange.

In the design of piston for internal combustion engines, more especially pistons which are constructed of aluminium or aluminium alloy one of the difficulties which arises is due to the large clearance that must be allowed between the piston and the cylinder walls in order to permit of expansion. In an aluminium piston of normal design if sufficient provision is made to allow for expansion when the piston attains its highest temperature the clearance when the parts are cold is then so great that considerable noise is caused as the annular thrust of the connecting rod is reversed on passing the dead centers and consequently the piston is thrust from one side of the cylinder to the other, causing noise. By means of the present improvements this noise is reduced, as the piston is so designed that a large working clearance is not required.

According to this invention the piston comprises a flanged head of such diameter that it is a loose fit within the cylinder, with the wall of which it does not come in contact, the flange being provided with grooves in which are piston rings, and a guide portion which is a sliding fit in the cylinder and comprises two curved members or slippers between which lies the gudgeon pin. This guide portion is adapted to take the whole of the side thrust from the connecting rod and each of the curved members is separated by a continuous gap from the adjacent edge of the piston head flange. Webs carry the gudgeon pin and constitute the only connection between the curved guide members and the face of the piston head disk, with all of which parts the webs are integral. The arrangement of the webs is such that heat will be so conveyed from the piston head to the slippers as to be distributed equally over the whole surfaces of the slippers. The webs comprise two main members which may or may not be arranged parallel and are integral with and spring from the face of the piston head disk, each main portion of these webs being formed with a boss adapted to carry the gudgeon pin. The two curved guide members or slippers are oppositely disposed so as to inclose the gudgeon pin bosses, these slippers being as mentioned connected to and formed integral with the webs and through the latter connected to the piston head and gudgeon pin bosses.

The accompanying drawings illustrate by way of example one construction of piston in accordance with the present invention. In these drawings,

Figure 1 is a side elevation of the improved piston.

Fig. 2 is a sectional elevation on the line 2—2 of Fig. 1.

Fig. 3 is a transverse section on the line 3—3 of Fig. 2 looking in the direction of the arrows.

Like letters indicate like parts throughout the drawings.

The head of the piston comprises a disk portion A which is conveniently dished as shown in Fig. 2, and a flange A′, the diameter of which is such in relation to the internal diameter of the cylinder that a large clearance is provided and the piston head will not come at all in contact with the cylinder walls. In the flange A′ are grooves A^2 in which are carried piston rings B. Two main webs C spring from the piston head A across which they extend and with which they are formed integral. These webs C are parallel to each other in the construction shown in the drawings and project to a convenient distance from the head of the piston head. In each web C is formed a boss C′ adapted to carry the gudgeon pin D which may be of suitable construction and either adapted to float in the bosses C′ or be fixed therein as found desirable. On either side of the gudgeon pin bosses C′, the webs C extend laterally and unite with two curved guide or slipper members E which are integral with the webs so that the latter constitute the connection between the slipper members and the piston head A. It is desirable to provide also a small central

transverse web C^2 which springs from the face of the piston head A and lies between and connects with the parallel webs C. Small supplementary webs C^3 are also conveniently provided across the inner side of the guide slippers E and between the webs C with each of which parts these supplementary webs C^3 are integral.

As will be clearly seen in Figs. 1 and 2, the upper edge E′ of each curved guide member E is separated by an unbroken continuous gap F from the adjacent opposed edge A^3 of the piston head flange A′. Thus while the guide members E are rigidly connected to the piston head A they are not in contact with the piston head flange.

Holes are preferably made through the slippers E as shown in Figs. 1 and 2.

The two webs C serve to distribute both the pressure and the heat delivered to the crown of the piston. The whole of the thrust and such heat as thus passes through the webs C are transmitted to the guide members E and distributed equally over them owing to the manner in which the guide members are joined to the webs C. By reason of the guide members E being separated at their edges from the piston head, heat can only pass from the latter to the guide members through the webs C and then only in such a manner as to effect satisfactory and equal distribution of the heat over the guide surfaces. Moreover the total amount of heat delivered to the bearing surfaces of the guide members is reduced and these surfaces can be freely lubricated. As a result of the reduced heat flow to the crosshead portion of the piston, which is composed of the guide members E and more especially as a result of the even distribution of heat over all the guide surfaces it becomes possible to provide a less clearance for expansion. In the case of a normal construction of piston the heat is transmitted from the piston head along the trunk and consequently the heat which flows through the upper part of the trunk immediately beyond the piston rings is excessive while toward the lower or outer end of the trunk the heat is relatively slight.

Though the present invention is more especially intended to be employed in the construction of a piston formed of aluminium or aluminium alloy, it is to be understood that it is equally applicable to a piston formed of cast iron, the details of construction being modified or not as found necessary.

The shape and dimensions of the slipper members may be varied as also the other details of the construction such as the width of the gap between the slipper members and the piston head flange and the shape and disposition of the webs. Thus for example the bearing surface of one slipper member may have a greater area than the bearing surface of the other slipper member, the two slipper members then being conveniently of different widths when measured in the circumferential direction. In such a construction instead of the webs C being parallel to each other these webs may be inclined and extend between the lateral edges of one slipper member and the corresponding lateral edges of the other slipper member.

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

1. In a piston for an internal combustion engine the combination of a piston head adapted to perform solely piston functions and comprising a disk having an integral peripheral flange in which are annular grooves, piston rings in these grooves, two curved members oppositely disposed with relation to the axis of the piston and together adapted to perform solely guiding functions, each curved member being separated from the head flange by a continuous gap extending in the circumferential direction, two webs which are integral with and spring from the head disk and are connected to and integral with the guide members and constitute the only connection between the face of the piston head disk and the guide members, and gudgeon pin bosses formed in these webs in which they are so positioned as to lie between the guide members as set forth.

2. In a piston for an internal combustion engine the combination of a piston head adapted to perform solely piston functions and comprising a disk having a relatively short integral peripheral flange in which are annular grooves, piston rings in these grooves, two curved relatively long members oppositely disposed with relation to the axis of the piston and together adapted to perform solely guiding functions, each curved member being separated from the head flange by a continuous gap of small width extending in the circumferential direction, two webs which are integral with and spring from the head disk and are connected to and integral with the guide members and constitute the only connection between the face of the piston head disk and the guide members, and gudgeon pin bosses formed in these webs in which they are so positioned as to lie between the guide members as set forth.

3. In a piston for an internal combustion engine the combination of a piston head adapted to perform solely piston functions and comprising a disk having an integral peripheral flange in which are annular grooves, piston rings in these grooves, two curved members oppositely disposed with relation to the axis of the piston and together adapted to perform solely guiding functions, each curved member being sepa-

rated from the head flange by a continuous gap extending in the circumferential direction and the diameter of the guide thus formed by these two curved members being slightly greater than the diameter of the piston head, two webs which are integral with and spring from the head disk and are connected to and integral with the guide members and constitute the only connection between the face of the piston head disk and the guide members, and gudgeon pin bosses formed in these webs in which they are so positioned as to lie between the guide members as set forth.

4. In a piston for an internal combustion engine the combination of a piston head adapted to perform solely piston functions and comprising a disk having a relatively short integral peripheral flange in which are annular grooves, piston rings in these grooves, two curved relatively long members oppositely disposed with relation to the axis of the piston and together adapted to perform solely guiding functions, each curved member being separated from the head flange by a continuous gap of small width extending in the circumferential direction and the diameter of the guide thus formed by these two curved members being slightly greater than the diameter of the piston head, two webs which are integral with and spring from the head disk and are connected to and integral with the guide members and constitute the only connection between the face of the piston head disk and the guide members, and gudgeon pin bosses formed in these webs in which they are so positioned as to lie between the guide members as set forth.

5. In a piston for an internal combustion engine the combination of a piston head adapted to perform solely piston functions and comprising a disk having an integral peripheral flange in which are annular grooves, piston rings in these grooves, two curved members oppositely disposed with relation to the axis of the piston and together adapted to perform solely guiding functions, each curved member being separated from the head flange by a continuous gap extending in the circumferential direction, two webs which are integral with and spring from the head disk and are connected to and integral with the lateral portions of the guide members and constitute the only connection between the face of the head disk and the guide members, and gudgeon pin bosses formed in these webs in which they are so positioned as to lie between the guide members as set forth.

6. In a piston for an internal combustion engine the combination of a piston head adapted to perform solely piston functions and comprising a disk having a relatively short integral peripheral flange in which are annular grooves, piston rings in these grooves, two curved relatively long members oppositely disposed with relation to the axis of the piston and together adapted to perform solely guiding functions, each curved member being separated from the head flange by a continuous gap of small width extending in the circumferential direction, two webs which are integral with and spring from the head disk and are connected to and integral with the guide members and constitute the only connection between the face of the piston head and the guide members, gudgeon pin bosses formed in these webs in which they are so positioned as to lie between the guide members, and a web formed integral with the piston head disk and extending transversely across this disk between the two main webs as set forth.

7. In a position for an internal combustion engine the combination of a piston head adapted to perform solely piston functions and comprising a disk having an integral peripheral flange in which are annular grooves, piston rings in these grooves, two curved members oppositely disposed with relation to the axis of the piston and together adapted to perform solely guiding functions, each curved member being separated from the head flange by a continuous gap extending in the circumferential direction, two parallel webs which are integral with and spring from the head disk and are connected to and integral with the guide members and constitute the only connection between the face of the piston head disk and the guide members, and gudgeon pin bosses formed in these webs in which they are so positioned as to lie between the guide members as set forth.

8. In a piston for an internal combustion engine the combination of a piston head adapted to perform solely piston functions and comprising a disk having a relatively short integral peripheral flange in which are annular grooves, piston rings in these grooves, two curved relatively long members oppositely disposed with relation to the axis of the piston and together adapted to perform solely guiding functions, each curved member being separated from the head flange by a continuous gap of small width extending in the circumferential direction and the diameter of the guide thus formed by these two curved members being slightly greater than the diameter of the piston head, two webs which are integral with and spring from the head disk and are connected to and integral with the lateral portions of the guide members and constitute the only connection between the face of the head disk and the guide members, gudgeon pin bosses formed in these webs in which they are so positioned as to lie between the guide members, and a web formed integral with the piston head disk and extending transversely

across this disk between the two main webs as set forth.

9. In a piston for an internal combustion engine the combination of a piston head adapted to perform solely piston functions and comprising a disk having a relatively short integral peripheral flange in which are annular grooves, piston rings in these grooves, two curved and similar relatively long members oppositely disposed with relation to the axis of the piston and together adapted to perform solely guiding functions, each curved member being separated from the head flange by a continuous gap of small width extending in the circumferential direction and the diameter of the guide thus formed by these two curved members being slightly greater than the diameter of the piston head, two parallel webs which are integral with and spring from the head disk and are connected to and integral with the guide members and constitute the only connection between the face of the piston head disk and the guide members, gudgeon pin bosses formed in these webs in which they are so positioned as to lie between the guide members, and a web formed integral with the piston head disk and extending transversely across this disk between the two main webs as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HARRY RALPH RICARDO.

Witnesses:
A. J. HALL,
R. BAGGOTT.