Feb. 5, 1946. J. W. HOWLETT 2,394,241

PISTON

Filed March 20, 1945

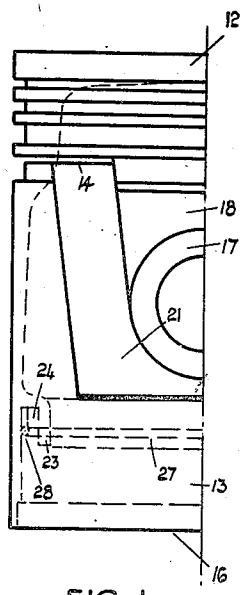


FIG. 1.

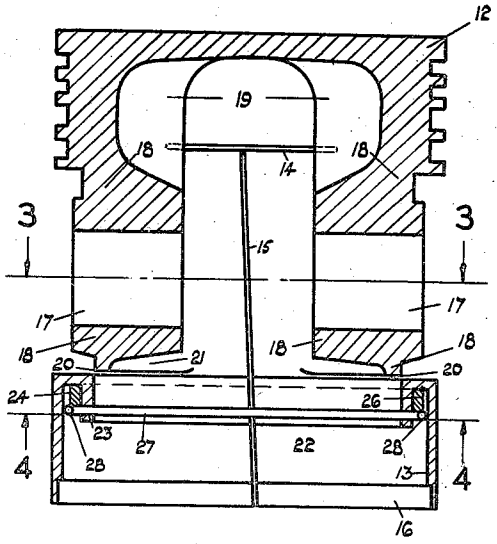


FIG. 2.

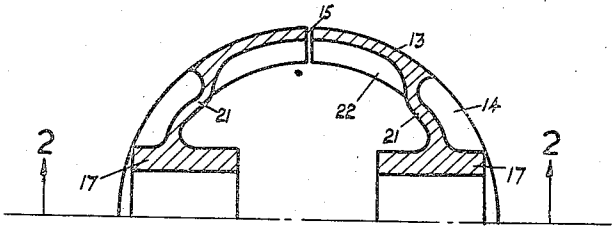


FIG. 3

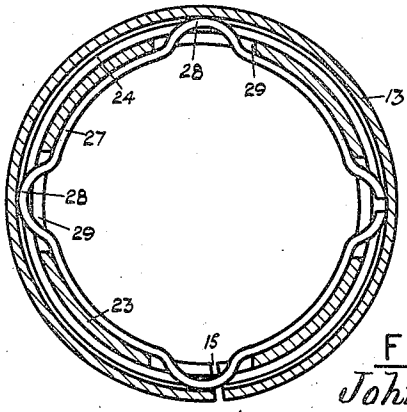


FIG. 4.

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UNITED STATES PATENT OFFICE

2,394,241

PISTON

John William Howlett, Lymington, England, assignor to Wellworthy Piston Rings Limited, Lymington, England

Application March 20, 1945, Serial No. 583,697
In Great Britain December 1, 1944

8 Claims. (Cl. 309—13)

This invention relates to a piston, for use in a cylinder bore (for example, the bore of a cylinder block, liner or valve sleeve), of the kind having a skirt formed of an alloy having a greater co-efficient of expansion than that of the material (usually cast-iron or steel) of the cylinder, the skirt being provided with at least one longitudinal slit extending fully or mainly throughout the length of the skirt.

A piston of which the skirt is formed of a light alloy having a relatively-high co-efficient of expansion has normally to be provided with a relatively-large working clearance as regards the cylinder bore in which it is intended to work, and the longitudinal slitting of the piston skirt is effected with a view to reducing the working clearance.

But it has alternatively been proposed, with a view to further reducing the working clearance which is necessary, to provide the skirt of such a piston with a sheath or sleeve of a material having a co-efficient of expansion less than that of the piston skirt, which sheath or sleeve is secured in a groove of the latter by welding or brazing to one or more inserts provided in apertures in the piston skirt, so that the exterior periphery of the sheath or sleeve is capable of making contact with the wall of the cylinder bore.

It has also been proposed to cast, within the metal of a light-alloy piston skirt, a closed ring of a material having a lower co-efficient of expansion than that of the skirt, with a view to controlling the expansion of the skirt. But this, of course, alters the casting technique—i. e., a piston of the kind first specified cannot be cast in the usual manner and then have the ring added to it. Furthermore, in production there is a tendency for clearance to occur between the light alloy of the piston and the inner periphery of the ring, as the light alloy cools during the casting operation, which naturally militates against the success of the ring in controlling the skirt expansion. The avoidance of such clearance involves very considerable production difficulties.

The main object of this invention is to provide a piston of the kind first specified with which the working clearance can be further reduced in a very simple manner, and without production difficulties being encountered.

A further object is to arrange a skirt-control ring so that the permitted expansion of the skirt, when the piston has been well run in, can be varied, as desirable, in a simple manner.

According to the invention the skirt of a piston, of the kind first specified, has a portion the external periphery of which is machined and has mounted thereon from the open end of the skirt a non-split ring which has a co-efficient of expansion less than that of the skirt, and preferably comparable to that of the cylinder, and which coacts with the said machined periphery to control the outward expansion of the skirt.

In the accompanying drawing:

Figure 1 is a half elevation of a piston provided with a skirt-control ring according to the invention;

Figure 2 is a full sectional elevation thereof taken along the line II—II of Figure 3;

Figure 3 is a half cross-section taken on the line III—III of Figure 2; and

Figure 4 is a full cross-section taken on the line IV—IV of Figure 2.

In the construction shown the head 12 is formed with a number of external grooves for piston rings in an ordinary manner, and the skirt 13 is partially severed from the head by means of a slit 14, which, it will be observed, extends over one of the pressure faces of the piston. A longitudinal slit 15 in the skirt extends from the open end 16, remote from the head 12, to a point approximately mid-way of the ends of the slit 14. The gudgeon pin bosses 17 are integrally attached to the head by means of lugs 18 and webs 19, being separated from the skirt, remote from the head, by slits 20, 20. In addition, the bosses are connected to the interior surface of the skirt by relatively-flexible, integral webs 21, 21, the webs being attached internally to the pressure faces of the skirt.

In the present instance the skirt is provided interiorly, on the side of the gudgeon pin bosses remote from the head, with a belt 22 of metal which is machined from the open end of the skirt to provide an internal, axially-extending flange 23 directed towards the open end, and it is with the external periphery of this flange that the restraining or control ring 24 coacts. The latter may be fitted (though it need not be) as a slight interference fit, and if so fitted the open end of the skirt can be held contracted in any convenient manner whilst the restraining ring is being fitted.

It is preferred to provide a detachable means for axially locating the ring 24. At one end it can be axially located by the adjacent wall 26 of the skirt from which the flange 23 extends, and at its other end by means of a spring ring 27 mounted mainly within the flange 23 and having projections or bulges 28 which extend through

holes 29 provided for the purpose in the flange 23.

The fact that the control ring is detachably mounted is important for the reason that after initial wear of the piston has taken place the control ring can be removed and the periphery of the flange 23, or the internal periphery of the control ring, skimmed out to reduce the interference fit (assuming there was one) and thus allow the skirt, after the control ring has been re-assembled, to be of slightly increased diameter.

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

1. A piston, for use in a cylinder bore, having a skirt formed of an alloy having a greater coefficient of expansion than that of the material of the cylinder, the skirt being provided with at least one longitudinal slit extending mainly throughout the length of the skirt, the skirt having a portion the external periphery of which is accessible from the open end of the skirt, and a non-split ring mounted on said external periphery and serving to control the outward expansion of the skirt, said ring having a coefficient of expansion less than that of the skirt.

2. A piston cast of a light alloy and provided with at least one longitudinal slit extending mainly throughout the length of the piston skirt, the latter having internally of its outer surface a portion the external periphery of which is accessible from the open end of the skirt, and a non-split ring mounted on said external periphery with a slight interference fit, said ring having a coefficient of expansion less than that of the skirt.

3. A light-alloy piston provided with at least one longitudinal slit extending mainly throughout the length of the piston skirt, wrist pin bosses rigidly connected with the piston head, the skirt having internally of its external periphery and between said wrist pin bosses and the open end of the skirt an integral flange extending axially towards the open end of the skirt, and a non-split ring mounted on said flange, said ring having a coefficient of expansion less than that of the skirt and serving to control the outward expansion of the skirt.

4. A piston provided with at least one longitudinal slit extending mainly throughout the length of its skirt, the latter having internally, adjacent its open end, a flange extending axially towards and accessible from the open end of the skirt, a non-split ring, having a coefficient of expansion less than that of the skirt, detachably mounted on said flange to control the outward expansion of the skirt, and a detachable means providing axial location for said ring.

5. A piston provided with at least one longitudinal slit extending mainly throughout the length of its skirt, the latter having internally, adjacent its open end, a flange extending axially towards and accessible from the open end of the skirt, a non-split ring, having a coefficient of expansion less than that of the skirt, detachably mounted on said flange to control the outward expansion of the skirt, and a detachable means providing axial location for said ring, said detachable means in the form of a spring ring mounted internally of said flange and having a plurality of projections extending through slots in said flange.

6. A piston having a skirt, a head, wrist pin bosses rigidly connected wtih said head, the skirt being formed interiorly, between said wrist pin bosses and its open end, with a flange extending axially towards and accessible from the open end of the skirt, and a non-split ring, of a material having a coefficient of expansion which is less than that of the skirt, detachably fitted on said flange to control the outward expansion of the skirt.

7. A piston having a skirt, a head, wrist pin bosses rigidly connected with said head, the skirt being formed interiorly, between said wrist pin bosses and its open end, with a flange extending axially towards and accessible from the open end of the skirt, a non-split ring, of a material having a coefficient of expansion which is less than that of the skirt, detachably fitted on said flange to control the outward expansion of the skirt, and a spring ring mounted internally of said flange, said spring ring having projections extending through slots in said flange to provide axial location for said non-split ring.

8. A light-alloy piston of which the skirt is formed interiorly, near its open end, with a flange extending axially towards and accesible from the open end, of the skirt, and a non-split ferrous ring detachably fitted on said flange.

JOHN WILLIAM HOWLETT.

Certificate of Correction

Patent No. 2,394,241. February 5, 1946.

JOHN WILLIAM HOWLETT

It is hereby certified that the above numbered patent was erroneously issued to "Wellworthy Piston Rings Limited, of Lymington, England" whereas said patent should have been issued to the inventor said "Howlett" and *Wellworthy Piston Rings Limited, of Lymington, England, assignee of one-half interest therein,* as shown by the record of assignments in this office; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 21st day of May, A. D. 1946.

[SEAL]

LESLIE FRAZER,
First Assistant Commissioner of Patents.