FORM 1

619906

COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952

APPLICATION FOR A STANDARD PATENT

I\We,

WELLWORTHY LIMITED

of SOUTHAMPTON ROAD
LYMINGTON
HAMPSHIRE S041 8XA
ENGLAND

hereby apply for the grant of a standard patent for an invention entitled:

PISTONS.

which is described in the accompanying complete specification

Details of basic application(s):

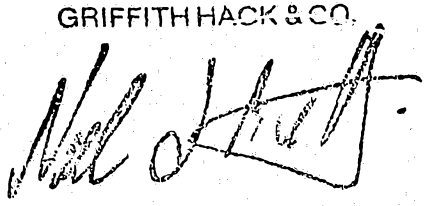
Number of basic application	Name of Convention country in which basic application was filed	Date of basic application
8824222.7	GB	15 OCT 88

My/our address for service is care of GRIFFITH HACK & CO., Patent Attorneys, 601 St. Kilda Road, Melbourne 3004, Victoria, Australia.

DATED this 12th day of October 1989

WELLWORTHY LIMITED

GRIFFITH HACK & CO.



TO: The Commissioner of Patents.

M 013030 121089

AUSTRALIA

Patents Act 1952

DECLARATION IN SUPPORT OF A CONVENTION OR NON-CONVENTION APPLICATION FOR A PATENT OR PATENT OF ADDITION

No. 42797/89

Name(s) of Applicant(s)

In support of the application/made by Wellworthy Limited

Title

for a patent for an invention entitled Pistons

Name(s) and address(es) of person(s) making declaration

I/We, R F Hadfield
Bowdon House, Ashburton Road West, Trafford Park, Manchester, M17 1RA

do solemnly and sincerely declare as follows:-

1. I am/we are the applicant(s) for the patent, or am/are authorised by the abovementioned applicant to make this declaration on its behalf.

2. The basic application(s) as defined by Section 141 of the Act was/were made in the following country or countries on the following date(s) by the following applicant(s) namely:-

Country, filing date and name of Applicant(s) for the or each basic application

in United Kingdom on 15 October 1988
by Wellworthy Limited
in ____ on ____ 19____
by ____

3. The said basic application(s) was/were the first application(s) made in a Convention country in respect of the invention the subject of the application.

Name(s) and address(es) of the or each actual inventor

4. The actual inventor(s) of the said invention is/are David Francis Fletcher-Jones of Holly Grove Cottage, Bisterne Close, Burley, Hants, BH24 4BA.

See reverse side of this form for guidance in completing this part

5. The facts upon which the applicant(s) is/are entitled to make this application are as follows:-

by virtue of an assignment dated 14 October 1988 from the said inventor to the said applicant.

DECLARED at Manchester, England this 29th day of September 19 89

for Wellworthy Limited

Robert F Hadfield

Robert Franklin Hadfield.

Authorised Signatory

This form may be completed and filed after the filing of a patent application but the form must not be signed until after it has been completely filled in as indicated by the marginal notes. The place and date of signing must be filled in. Company stamps or seals should not be used.

(12) PATENT ABRIDGMENT (11) Document No. AU-B-42797/89
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 619906

(54) Title
PISTONS

International Patent Classification(s)
(51)[4] **F02F 003/00** **F16J 001/00**

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8824222	**15.10.88**	**GB UNITED KINGDOM**

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(71) Applicant(s)
WELLWORTHY LIMITED

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(56) Prior Art Documents
GB 140651
GB 399853
DE 731634

(57) Claim

1. A piston for an internal combustion engine, the piston comprising a crown having an associated piston ring groove belt, and only the part of the crown not providing the ring groove belt is supported by gudgeon pin bosses by being connected thereto both by two generally axially extending planar webs which are orientated transversely to the gudgeon pin axis and also by two subsidiary support ribs associated with each planar web and pin boss, which support ribs are on the radially outer faces of said planar webs and extend in a generally axial direction from the crown underside and generally transversely to the planar webs.

AUSTRALIA

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PATENTS ACT 1952

Form 10

COMPLETE SPECIFICATION

(ORIGINAL)

FOR OFFICE USE

Short Title:

Int. Cl:

Application Number:
Lodged:

Complete Specification-Lodged:
Accepted:
Lapsed:
Published:

Priority:

Related Art:

TO BE COMPLETED BY APPLICANT

Name of Applicant:
WELLWORTHY LIMITED

Address of Applicant: SOUTHAMPTON ROAD
LYMINGTON
HAMPSHIRE S041 8XA
ENGLAND

Actual Inventor:

Address for Service: GRIFFITH HACK & CO.,
601 St. Kilda Road,
Melbourne, Victoria 3004,
Australia.

Complete Specification for the invention entitled:
PISTONS.

The following statement is a full description of this invention including the best method of performing it known to me:-

Pistons

The present invention relates to pistons for internal combustion engines.

According to the present invention a piston for an internal combustion engine comprises a crown having an associated piston ring groove belt, and only the part of the crown not providing the ring groove belt is supported by gudgeon pin bosses by being connected thereto both by two generally axially extending planar webs which are orientated transversely to the gudgeon pin axis and also by two subsidiary support ribs associated with each planar web and pin boss, which support ribs are on the radially outer faces of said planar webs and extend in a generally axial direction from the crown underside and generally transversely to the planar webs.

The two planar webs may furthermore be connected by one or more generally axially extending ribs extending therebetween and also supporting the underside of the crown at the ribs top edge. Where one rib is used it may lie in the plane which includes both the piston axis and the gudgeon pin axis. Where two ribs are used, these may be disposed about the plane which includes both the gudgeon pin axis and piston axis.

The piston crown may also include a combustion bowl in the case, for example, of a direct injection diesel engine.

The piston structure described may be utilised in a monometal piston having integral skirt portions depending from and supported, for example, by extensions of the planar

webs. Alternatively, the structure described may be part of an articulated piston construction having a separate skirt portion and articulated to the crown portion by means of a common gudgeon pin.

The piston of the present invention may be manufactured in the form of a machined steel, cast-iron or aluminium alloy casting.

In order that the present invention may be more fully understood examples will now be described by way of illustration only with reference to the accompanying drawings, of which:

Figure 1 shows a section through an articulated piston according to the present invention;

Figure 2 shows a section through the piston of Figure 1 on the line AA looking in the direction of the arrows; and

Figure 3 which shows a section in two mutally perpendicular planes through a monometal piston according to the present invention.

Referring now to Figures 1 and 2 and where the same features are denoted by common reference numerals.

A piston is denoted generally at 10 and comprises a crown portion 12 and a separate articulated skirt portion 14. The crown portion 12 comprises a combustion bowl 16, ring belt 18 having piston-ring grooves 20 and which ring belt

is in the form of an annular ring depending from the outer periphery 22 of the crown 24. Gudgeon pin bosses 26 are connected to the underside of the combustion bowl by planar webs 28 which at their upper ends 30 span and support the underside 32 of the combustion bowl. Extending substantially normally to the the plane of the webs 28 and radially outwardly of them are two subsidiary planar support ribs 34 (shown as dashed lines in Figure 1). The ribs 34 extend between the underside of the crown and the upper portion of the pin boss 26 and also, in the radial direction to the outer edge 36 of the combustion bowl underside. The crown portion 12 is a thin-walled, steel investment casting connected to the skirt portion 14, which is an aluminium alloy die casting, by a common gudgeon pin (not shown).

It should be noted that other constructions of articulated piston may employ a skirt portion made of a ferrous alloy.

Figure 3 shows a piston 40 having a combustion bowl 42 and a ring belt 44 in the form of an annular ring depending from the outer periphery 46 of the crown 48. Gudgeon pin bosses 50 are connected to the under-side 52 of the combustion bowl by planar webs 54 which span and support the underside of the combustion bowl at their upper end. The webs 54 also extend radially to support skirt bearing

lands 56 and 58 which accept piston side thrust loads. Extending between the bowl underside and the pin bosses and substantially normal to the plane of the webs 54 are ribs 60. The piston is formed as a thin-walled steel investment casting.

The webs 28, 54 and ribs 34, 60 provide rigid and light weight construction for a piston providing more uniform support of the crown and combustion bowl. The outer contact points of the webs and ribs with the crown are disposed in an even manner to provide more uniform support to the crown. Distortion of the piston crown and hence ring grooves in the ring belt during combustion is minimised. This leads to less uneven, localised loading of the pin bosses on the gudgeon pin and lower blow-by and oil consumption which improves emissions from the engine.

In some pistons an additonal rib or ribs may be included depending from the combustion bowl underside and spanning the inner faces of the planar webs 28 . Such a single rib is shown as a dashed line 70 in Figures 1 and 2, or where more than one additional ribs are used, as dashed lines 72, showing two ribs disposed symmetrically about the plane which includes both the piston axis and the gudgeon pin axis. More than two ribs may be used if necessary.

In some pistons a single subsidiary support rib may be sufficient on each planar web. Such a rib may lie in the plane which includes the piston and gudgeon pin axes.

CLAIMS

1. A piston for an internal combustion engine, the piston comprising a crown having an associated piston ring groove belt, and only the part of the crown not providing the ring groove belt is supported by gudgeon pin bosses by being connected thereto both by two generally axially extending planar webs which are orientated transversely to the gudgeon pin axis and also by two subsidiary support ribs associated with each planar web and pin boss, which support ribs are on the radially outer faces of said planar webs and extend in a generally axial direction from the crown underside and generally transversely to the planar webs.

2. A piston according to Claim 1 wherein there is one axially extending rib lying in a plane which includes both the piston axis and the gudgeon pin axis and extends between the underside of the crown and the radially inner faces of the two planar webs.

3. A piston according to Claim 1 wherein there are two generally axially extending ribs disposed about a plane which includes the piston axis and the gudgeon pin axis and which ribs extend between the underside of the crown and the radially inner faces of the two planar webs.

4. A piston according to any one preceding claim wherein the crown further includes a combustion chamber.

5. A piston according to any one preceding claim wherein the piston is of articulated construction having a separate skirt portion connected to the crown by a common gudgeon pin.

6. A piston according to any one of Claims 1 to 4 wherein integral skirt lands are also included.

7. A piston according to Claim 6 wherein the skirt lands are supported by lateral extensions of the planar webs.

8. A piston according to any one preceding claim wherein it comprises a machined steel investment casting.

9. A piston substantially as hereinbefore described with reference to the accompanying specification and Figures 1 and 2 or Figure 3 of the drawings.

DATED THIS 25TH DAY OF NOVEMBER 1991

WELLWORTHY LIMITED
By its Patent Attorneys:

GRIFFITH HACK & CO
Fellows Institute of Patent
Attorneys of Australia

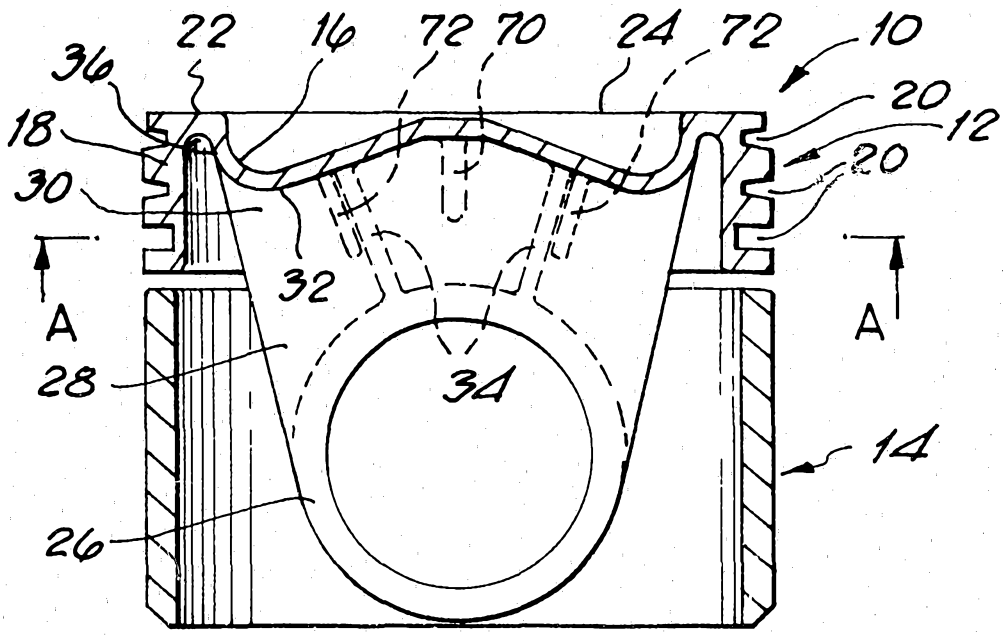
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FIG.1

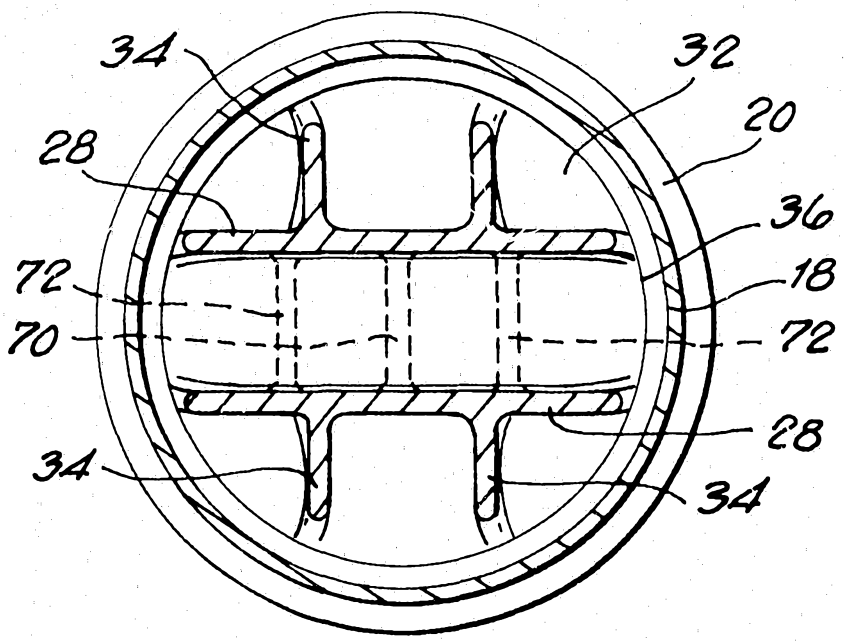
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FIG.2

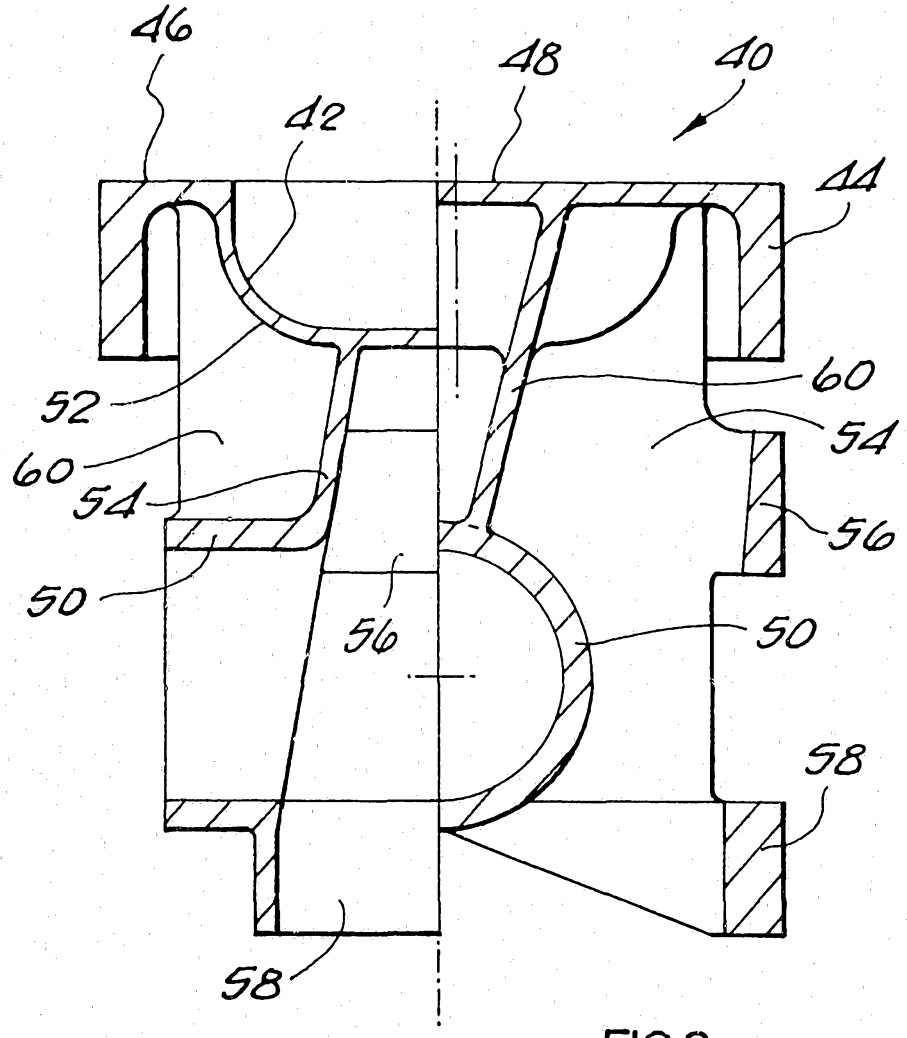

FIG.3