PATENT SPECIFICATION

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PROVISIONAL SPECIFICATION.

Improvements in or relating to Sealing Rings for Pistons or the like.

We, D. NAPIER & SON LIMITED, a Company registered under the Laws of Great Britain, and RONALD WHITEHAIR VIGERS, British Subject, both of 211, Acton Vale, Acton, London, W. 3., do hereby declare the nature of this invention to be as follows:—

This invention relates to sealing rings and the formation of the grooves in which they lie in pistons or the like for use in internal combustion engines or air compressors, and is particularly but not exclusively applicable to internal combustion engines or compressors of the sleeve valve type in which the sleeve has imparted to it a combined oscillatory and reciprocating movement.

It is common experience, in internal combustion engines, more particularly those which run on fuel of the heavier type, and in high compression air compressors, that carbon tends to form and accumulate between a sealing ring and its groove both in the piston and, in the case of sleeve valve engines, in the plug-like cylinder head which is surrounded by the end of the sleeve, and this carbon is liable to impede the free movement of the sealing ring in its groove. The object of the present invention is to provide a construction which will tend to prevent or minimise such accumulation of carbon.

To this end, in an internal combustion engine or compressor according to the present invention in which relative movement occurs between a piston and a cylinder, a piston and a sleeve, or a sleeve and part of a cylinder, the formation of an annular groove in one of such relatively moving parts and of a sealing ring in this groove, is such that, whereas a plane face of the ring makes contact throughout its circumferential length with an adjacent plane face of the groove, parts of the opposite face of the ring are spaced from corresponding parts of the opposite face of the groove by one or more projections formed on or attached to the ring or the member in which the groove is formed.

The projections are conveniently of rectangular form and have sharp edges so that when circumferential movement of the ring takes place these edges will tend to scrape the surface in contact with which they lie and thus prevent the formation of carbon thereon.

Preferably the projections are situated on the side of the sealing ring towards the compression or combustion space so that during a compression or combustion stroke the adjacent plane faces of the ring and groove will be forced together to assist the sealing action of the ring.

The projections may either be integral with or mounted on the ring in which case the opposite sides of the groove both have plane faces, or may be integral with or mounted on the member in which the groove is formed so as to project from one side of this groove, in which case the ring may be of normal type with two plane faces uninterrupted by projections. In either case the number, dimensions and relative positions of the projections may vary.

As stated, the invention is particularly applicable to internal combustion engines or compressors of the sleeve valve type in which the sleeve has imparted to it a combined oscillating and reciprocating movement, and in such engines or compressors, as is well known, the oscillatory component of the sleeve motion tends to cause the sealing ring to work around in its groove so that when the present invention is applied to such engines or compressors the scraping action of the projections on the surface in contact with which they lie due to the circumferential movement of the ring, tends to prevent formation of carbon on such surface.

The invention may be carried into practice in various ways but the following is a description by way of example of one construction incorporating the present invention as applied to an internal combustion engine having a sleeve valve to which is imparted a combined oscillating and reciprocating motion. The engine comprises a cylinder within which is mounted a sleeve having a combined oscillating and reciprocating movement. The outer end of the cylinder is closed by a plug-like cylinder head between the outer surface of which and the inner sur-

[*Price* 1/-]

face of the cylinder is an annular space in which moves the outer end of the sleeve Reciprocating within the sleeve is a piston. Formed in the outer circumferential surface of the plug-like cylinder head are one or more sealing ring grooves in each of which is mounted a split sealing ring. The face of each sealing ring which lies remote from the piston lies throughout its circumferential length in contact with the adjacent face of the groove. The opposite face of each sealing ring, however, which lies adjacent to the piston is provided with a series of projections, which may be, for example, seven in number, which space the body part of the ring from such face of the groove, each of these projections preferably being rectangular in cross-section and one of such projections being preferably provided at each of the adjacent ends of the ring where the split occurs.

Formed in the piston are also one or more sealing ring grooves and in each of these grooves is arranged a sealing ring, the face of which remote from the cylinder head lies throughout its circumferential length in contact with the adjacent face of its groove. The face of each piston ring which lies adjacent to the cylinder head, however, is provided with a series of projections which extend into contact with the adjacent face of the groove, these projections being for example seven in number and arranged in the same manner as the projections on the rings in the cylinder head referred to above.

The projections on the rings are preferably of rectangular form and the edges of the faces of such projections which lie in contact with the groove face are preferably sharp so that as each ring tends to rotate in its groove the projections act as scrapers to remove any carbon which tends to form on the face of the groove in contact with which the projections lie.

It is to be understood that although the invention has been described with particular reference to sealing rings for the pistons or plug-like cylinder heads of sleeve valve internal combustion engines or compressors of the kind in which the sleeve has imparted to it a combined oscillating and reciprocating motion, the invention may also be applied to pistons or plug-like cylinder heads of sleeve valve engines or compressors of the kind having rotary sleeves or to other engines in which a sealing ring tends to rotate about the axis of the member carrying it.

Dated this 15th day of February, 1932.

KILBURN & STRODE.
Agents for the Applicants.

COMPLETE SPECIFICATION.

Improvements in or relating to Sealing Rings for Pistons or the like.

We, D. NAPIER & SON LIMITED, a Company registered under the Laws of Great Britain, and RONALD WHITEHAIR VICKERS, British Subject, both of 211, Acton Vale, Acton, London, W. 3., do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to pressure sealing rings and the formation of the grooves in which they lie in pistons or the like for use in internal combustion engines or air compressors, and is particularly but not exclusively applicable to internal combustion engines or compressors of the sleeve valve type in which the sleeve has imparted to it a combined oscillatory and reciprocating movement.

It is common experience, in internal combustion engines, more particularly those which run on fuel of the heavier type, and in high compression air compressors, that carbon tends to form and accumulate between a pressure sealing ring and its groove both in the piston and, in the case of sleeve valve engines, in the plug-like cylinder head which is surrounded by the end of the sleeve, and this carbon is liable to impede the free movement of the sealing ring in its groove. The object of the present invention is to provide a construction which will tend to prevent or minimise such accumulation of carbon.

To this end in an internal combustion engine or compressor according to the present invention in which relative movement takes place between two parts, for example a piston and a cylinder, a piston and a sleeve valve, or a sleeve valve and part of a cylinder, one of such parts being provided with a groove containing a pressure sealing ring bearing on the other part, the formation of the annular groove and of the ring is such that whereas on the side of the ring remote from the compression or combustion chamber a plane face of the ring makes contact throughout

its circumferential length with an adjacent plane face of the groove, parts of the face of the ring which lies nearer to the combustion or compression chamber are spaced from corresponding parts of the adjacent face of the groove by one or more projections formed on or attached to the ring or the member in which the groove is formed which, when circumferential movement of the ring takes plate, tend to remove carbon which may tend to form on the face in contact with which they lie.

The projections are conveniently of rectangular form and have sharp edges so that when circumferential movement of the ring takes place these edges will assist the action of the projections in scraping the surface in contact with which they lie. The projections may be arranged radially or at an angle to the radius.

The projections may either be integral with or mounted on the ring, in which case the opposite sides of the groove both have plane faces, or may be integral with or mounted on the member in which the groove is formed so as to project from one side of this groove, in which case the ring may be of normal type with two plane faces uninterrupted by projections. In either case the number, dimensions and relative positions of the projections may vary.

As stated, the invention is particularly applicable to internal combustion engines or compressors of the sleeve valve type in which the sleeve has imparted to it a combined oscillating and reciprocating movement, and in such engines or compressors, as is well known, the oscillatory component of the sleeve motion tends to cause the sealing ring to work around in its groove so that when the present invention is applied to such engines or compressors the scraping action of the projections on the surface in contact with which they lie due to the circumferential movement of the ring, tends to be effected with regularity.

The invention may be carried into practice in various ways but one construction incorporating the present invention as applied to a sleeve valve engine is illustrated by way of example in the accompanying drawings, in which

Figure 1 is a side elevation partly in section through the axis of the cylinder and partly with the cylinder and sleeve valve broken away to show the piston and cylinder head in elevation, and

Figure 2 is a plan of a piston ring according to this invention.

In the construction illustrated the engine comprises a cylinder A within which is mounted a sleeve B having a combined oscillating and reciprocating movement imparted to it in known manner. The outer end of the cylinder A is closed by a plug-like cylinder head C between the outer surface of which and the inner surface of the cylinder is an annular space in which moves the outer end of the sleeve B. Reciprocating within the sleeve B is a piston D. Formed in the outer circumferential surface of the plug-like cylinder head C are one or more sealing ring grooves C^1 in each of which is mounted a split pressure sealing ring E. The face of each sealing ring which lies remote from the piston D is plane and lies throughout its circumferential length in contact with the adjacent side of the groove. The opposite face of each sealing ring, however, with lies adjacent to the piston is provided with a series of projections E^1, which may be, as shown for example in Figure 2, seven in number and serve to space the body part of the ring from such face of the groove, each of these projections being approximately rectangular in cross-section and one of such projections being provided at each of the adjacent ends of the ring where the split occurs.

Formed in the piston D are also one or more sealing ring grooves D^1 and in each of these grooves is arranged a pressure sealing ring F the face of which remote from the cylinder head lies throughout its circumferential length in contact with the adjacent side of its groove. The face of each piston ring which lies adjacent to the cylinder head, however, is provided with a series of projections F^1 which extend into contact with the adjacent side of the groove, these projections being, for example, seven in number and arranged in the same manner as the projections on the rings E in the cylinder head C referred to above.

As stated, the projections E^1 and F^1 on the rings are preferably of rectangular form and the edges of the faces of such projections which lie in contact with the sides of the groove are sharp so that as each ring tends to rotate in its groove the projections act as scrapers to remove any carbon which tends to form on the face of the groove in contact with which the projections lie.

It will be seen that pressures in the combustion space G acting on the sealing rings E and F will tend to maintain their plane faces in contact with the adjacent sides of the grooves so as to provide efficient sealing.

It is to be understood that although the invention has been described with particular reference to pressure sealing rings for the pistons or plug-like cylinder heads of sleeve valve internal combustion

engines or compressors of the kind in which the sleeve has imparted to it a combined oscillating and reciprocating motion, the invention may also be applied to pistons or plug-like cylinder heads of sleeve valve engines or compressors of the kind having rotary sleeves or to other engines in which a pressure sealing ring mounted in a groove in one of two relatively movable parts and bearing on the other part tends to rotate about the axis of the member carrying it.

This invention is not to be confused with pressure sealing rings such as have been proposed for steam engines for the purpose of ensuring that the radial force exerted by the ring on the cylinder shall not be influenced by variations in steam pressure or by leakage of steam into the space behind the ring, such rings being constituted by three arcuate spring-pressed sections having stopping pieces extending across the adjacent ends of the sections which prevent the passage of steam through the gaps and being provided on their faces remote from the pressure with radial grooves adapted to permit equalisation of steam pressure on those parts of the two sides of the ring which lie in the groove. Nor is the invention to be confused with so-called scraper rings which it has been proposed to fit below the pressure sealing rings on a piston of an internal combustion engine, such scraper rings either having radial slots in their upper and lower faces to permit the free flow of lubricant from the upper to the lower side of the ring or having scallops formed in the side of the groove remote from the pressure sealing rings and communicating with the interior of the piston to permit the escape of lubricant collected by the scraper ring.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. An internal combustion engine or compressor having two relatively movable parts one of which is provided with a groove containing a pressure sealing ring bearing on the other part, in which the formation of the groove and of the sealing ring is such that whereas on the side of the ring remote from the compression or combustion chamber a plane face of the ring makes contact throughout its circumferential length with an adjacent plane face of the groove, parts of that face of the ring which lies nearer to the combustion or compression chamber are spaced from corresponding parts of the adjacent face of the groove by one or more projections formed on or attached to the ring or the member in which the groove is formed for the purpose set forth.

2. An internal combustion engine or compressor having a pressure sealing ring constructed and arranged as claimed in Claim 1, in which the projections formed on or attached to the ring or the member in which the groove is formed are of substantially rectangular form and have sharp edges so that when circumferential movement of the ring takes place these edges will tend to scrape the surface in contact with which they lie.

3. A one-piece pressure sealing ring adapted to lie in an annular plane parallel-sided groove and having one side thereof formed with a plane face which is continuous throughout the circumferential length of the ring while the opposite side of the ring has formed or mounted thereon a plurality of projections so that when the ring is placed in a groove the plane face will make contact with one side of the groove while the projections will make contact with the other side of the groove.

4. In an internal combustion engine or compressor the combination with two relatively movable parts one of which is provided with an annular groove the side of the groove remote from the compression or combustion chamber being plane while one or more projections are formed on or attached to the other side of the groove so that when a plane parallel-sided ring is placed in the groove one plane face of the ring will make contact with one side of the groove while the other plane face of the ring will make contact with the projections.

5. An internal combustion engine having two relatively movable parts one of which is provided with a groove in which is disposed a pressure sealing ring which bears on the other part constructed and arranged substantially as described with reference to the accompanying drawings.

6. For use with an internal combustion engine or compressor, a pressure sealing ring constructed substantially as described with reference to the accompanying drawings.

Dated this 8th day of September, 1932.
KILBURN & STRODE,
Agents for the Applicants.

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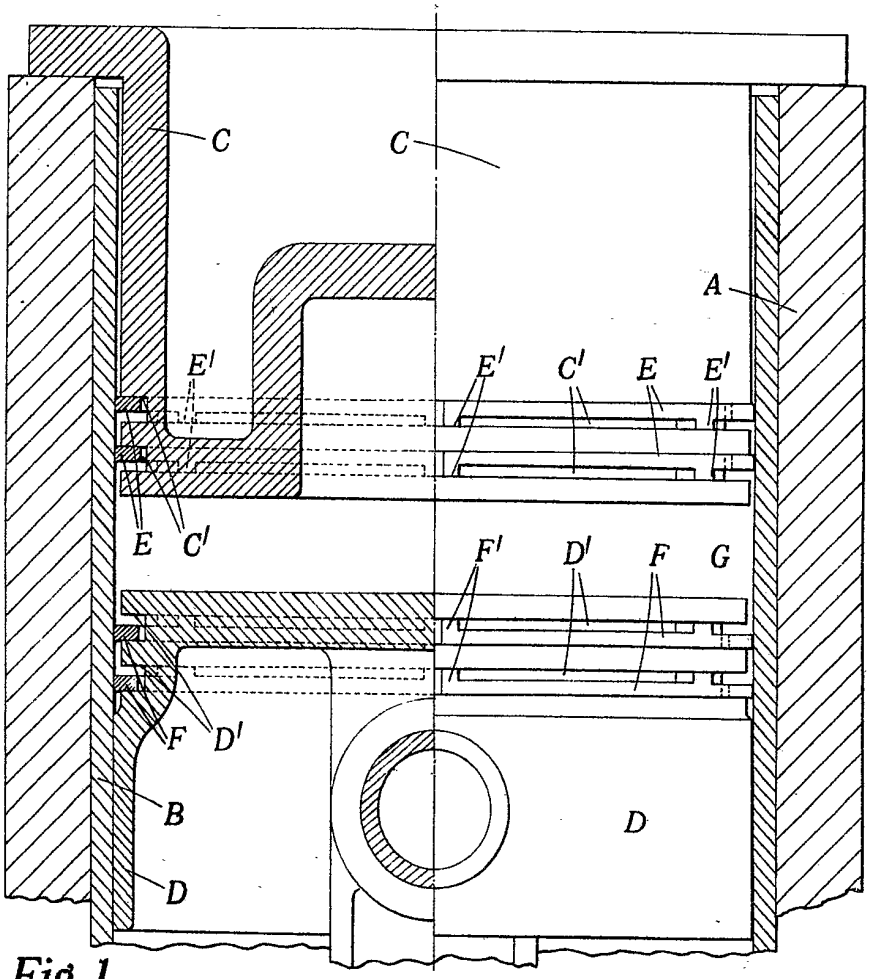

Fig. 1.

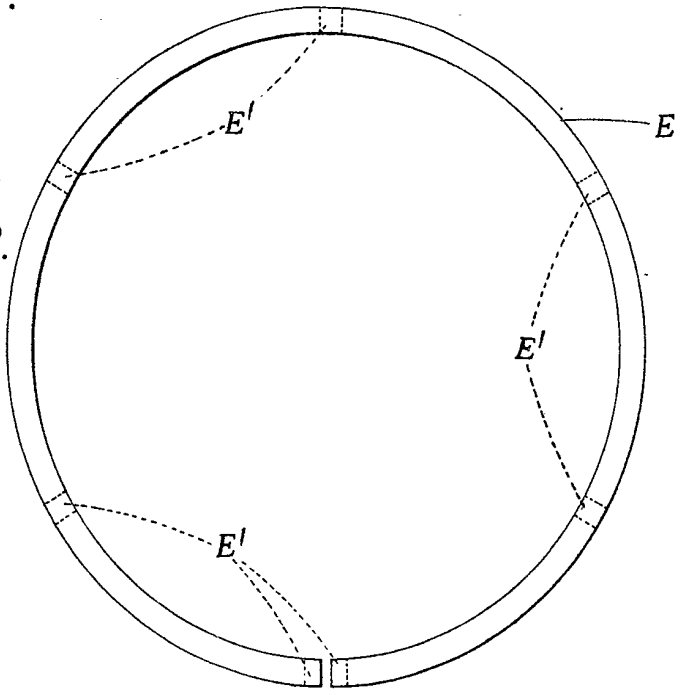

Fig. 2.

Malby & Sons, Photo-Litho.