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C. R. DE JOHN
SELF SEALING PISTON
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Fig. 1

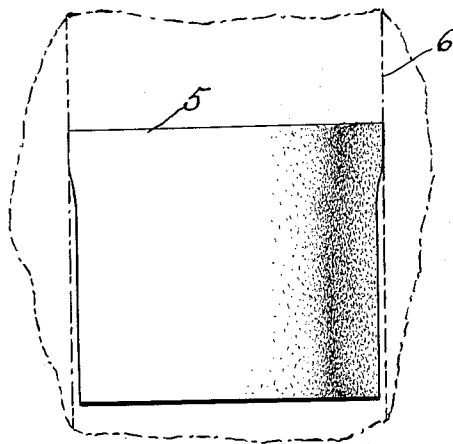


Fig. 2

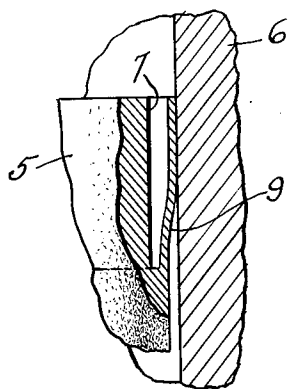
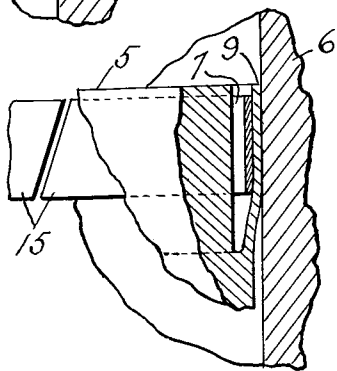
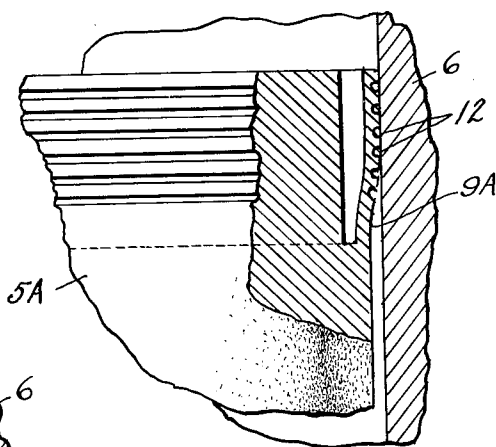


Fig. 3



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SELF SEALING PISTON

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This invention relates to self sealing or ringless pistons for operation in high speed engines or motors, and is especially valuable as applied to the very small pistons of miniature motors, as used, for example, in toy boats, airplanes and automobiles.

Piston rings are well known to be inadequate as sealing means for miniature pistons, i.e., pistons having a range of about $\frac{1}{2}$ inch to one inch diameter. They must therefore be of case hardened steel, and be individually ground and lapped to fit the respective cylinders in which they are to operate, the lapping operation involving the reciprocation of each piston in its cylinder, using an abrasive to bring it to the best fit possible. Such a procedure is obviously expensive as to material, time and labor, compared to the corresponding items of the present invention.

An object of the present invention is to greatly reduce the cost of making miniature pistons and at the same time produce pistons which have a better self-sealing quality not only when new but throughout their lives. Moreover, the improved pistons have much longer life than conventional miniature pistons, due to the construction herein shown and described.

The piston of this invention, having a much longer life, need not be case hardened, and in fact need not be made of iron or steel, but may be made of softer metal. That is due to the fact that successive wearing surfaces of the piston are resiliently pressed against the wall of the cylinder.

Another substantial advantage is that the construction is such that the gases, during both the compression and firing strokes, exert an outward pressure on the peripheral piston wall, thereby improving the sealing quality and the resulting engine efficiency.

The invention also eliminates the mentioned lapping operation which has heretofore been necessary.

The improved piston also allows smaller pistons to be made, pistons as small as $\frac{1}{8}$ inch in diameter, for which there is great need and which, heretofore, could not be made commercially.

The present invention also allows the improved pistons to be made from common trade stock in the form of small cylindrical rods, instead of the more expensive special material heretofore used and which must be hardened.

The invention contemplates a piston with a deep annular groove or cut-out in its head end, to provide outwardly or peripherally thereof what in effect is a single, wide, non-split, resilient ring spaced laterally from the body of the piston, and which is integral at one end with the piston and integral with respect to itself and which has a relatively large gas-sealing area pressing against the wall of the cylinder throughout its wearing life.

It is to be emphasized that, since the volume of air-fuel mixture in the minute cylinders is extremely small, there can be practically no leakage if the motor is to develop sufficient power to be of any use.

The invention is further distinguished by the simple procedure and tools required to make the new piston, and also by the fact that the necessary tolerance is only about three one-thousandths of an inch, as against one

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ten-thousandths for the type requiring the mentioned lapping process.

The drawings illustrate the invention, and in these:

FIGURE 1 is a side elevation of a piston within a cylinder, the latter shown in dotted lines;

FIG. 2 is a fragmentary enlarged section of FIG. 1;

FIG. 3 is a view similar to FIG. 2, showing a modified form of piston; and

FIG. 4 is a fragmentary section, also similar to FIG. 2, but showing a split expansion ring within an annular groove of the piston.

Referring to the drawings for a more detailed description, and at first to FIGS. 1 and 2, the cylindrical piston 5, within a cylinder 6, has a relatively deep annular groove 7 extending from its upper or head end downwardly or rearwardly, to form a resilient margin 9 outside of or peripheral to the groove. This margin is expanded in its upper portion to form a non-split or continuous ring of uniform diameter and substantial width, which presses against the cylinder wall, and is yieldable due to its resiliency, thereby forming a self-sealing piston.

In FIG. 3 I show a modification, which is similar to the piston described above, but differs therefrom in that the peripheral margin 9A is thicker than margin 9, and is intended for pistons of greater than one inch in diameter, and differs also in that it has a series of parallel annular grooves 12 which are provided to give greater bendability to the thicker margin.

In FIG. 4, I show a structure similar to that of FIG. 2, but, in the former, there is an expansion split ring 15 in the annular groove, for the purpose of providing extra pressure of the peripheral margin against the cylinder wall. This ring is approximately as wide or deep as that part of the mentioned margin which is otherwise in contact with the cylinder wall. The removal of the ring is thereby facilitated by providing space for a tool to be inserted in the annular groove and under the ring.

As an example of suitable piston dimensions for a $\frac{1}{8}$ H.P. motor, the piston of FIG. 2 may be $\frac{1}{32}$ " diameter in its unexpanded portion, with a length of $\frac{1}{2}$ ", the groove depth being $\frac{1}{8}$ ", the thickness of the peripheral wall .003", and the expansion of the latter .002" beyond the above stated diameter.

What is claimed is:

1. A self-sealing cylindrical piston having a relatively deep annular groove formed in its head end and of sufficient depth and adjacency to the outer surface of the piston to render resilient the margin of the piston peripheral to the groove, said margin expanded beyond the outside diameter of the remaining part of the piston and of sufficient annular width to present a substantial area of uniform diameter for pressing contact with the interior surface of a cylinder.

2. The piston specified in claim 1, in which said margin is relatively thick and has parallel annular grooves formed in its outer surface to provide an adequate degree of bendability.

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