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ROTARY PISTON ENGINE

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FIG. 1

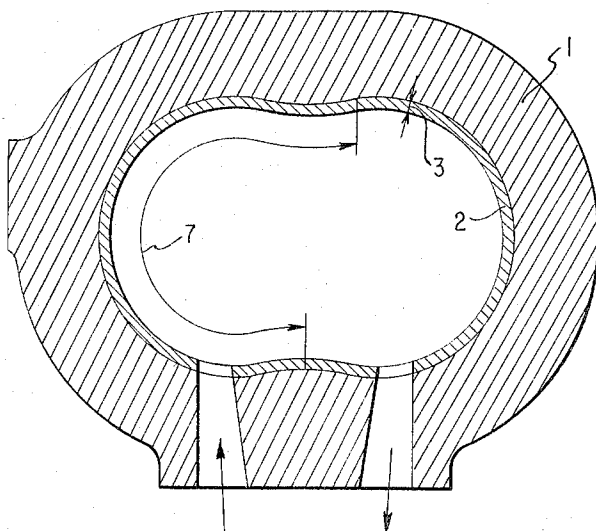
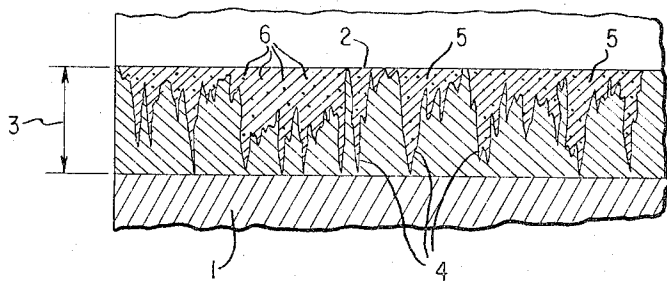


FIG. 2

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## ROTARY PISTON ENGINE

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12 Claims. (Cl. 123-8)

The present invention relates to a housing case for a rotary piston internal combustion engine, especially of trochoidal construction, which consists preferably of lightweight metal and which is provided with an inner casing surface serving as cam track or runner surface for the piston and consisting of a sprayed-on metal, for example, of a steel containing chrome.

In the actual operation of rotary piston internal combustion engines, it has been found that with an inner casing surface consisting of a sprayed-on metal as cam track or runner surface for the piston, the lubricating oil is pressed into the pores of the inner casing surface by the sealing strips or bars arranged at the piston so that these pores become filled with a mixture of air bubbles and oil. This mixture of air bubbles and oil falls back or disappears elastically yielding into the bottom of the pores when a sealing strip or bar is guided along the casing surface, and as a result thereof, a metallic contact takes place between the sealing strip and the casing surface with all the disadvantageous consequences thereof for the operation and length of life of internal combustion engine.

The present invention aims at eliminating the aforementioned disadvantages. In solution of the underlying problems the present invention essentially consists in that a filler material, for example, a synthetic resin solution, is applied onto the casing surface consisting of sprayed-on metal for closing the pores which resin solution is provided with substances having lubricating properties, for example, graphite, molybdenum disulfide or zinc sulfide.

By the application of a filler enriched with substances having lubricating properties onto the casing surface of the housing case, there is achieved a closing of the pores of the sprayed-on metal and there is prevented that the lubricating oil reaches into the pores where it no longer can fulfill its task to lubricate the movement of the sealing bars along the casing surface. The arrangement of substances with lubricating properties in the filler serves to counter the difficulties in the establishment of sufficiently good lubricating conditions which occur nonetheless at times. In those cases or places where customary lubricants no longer suffice, the substances inserted into or embedded in the filler produce excellent emergency running properties. Furthermore, the closing of the pores with a filler, when it takes place prior to grinding or honing of the casing surface, offers the advantage that any dust produced during grinding or honing cannot become deposited in the pores, out of which it may leave again in due course and may give rise to operating failures and breakdowns.

According to a further feature of the present invention, the arrangement may be so made that—as related to the circumference of the casing surface—the substances with lubricating properties in the filler material are arranged only in certain sections thereof. With rotary piston internal combustion engines of trochoidal construction the substances with lubricating properties may be arranged within the filler material along those parts of the casing surfaces which enclose the suction space and the compression space of the internal combustion engine.

The filler material may consist advantageously of a commercially available phenolic resin.

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Furthermore, the housing case may be subjected with an engine operation to a brief running-in period utilizing a running-in oil, for example, a plain or non-additive type motor oil, in order to achieve in this manner that the sealing elements sliding along the inner casing surfaces of the casing adapt themselves well to the casing surface by the resulting grinding action.

Accordingly, it is an object of the present invention to provide a rotary piston internal combustion engine of the type described above which eliminates the aforementioned drawbacks encountered with the prior art constructions by simple and relatively inexpensive means.

Another object of the present invention resides in the provision of a casing for an internal combustion engine of trochoidal construction which assures adequate lubrication under all operating conditions for the sliding movements of the sealing bars arranged at the corners of the piston.

A further object of the present invention resides in the provision of a housing for an internal combustion engine of the type described above provided with a sprayed-on metallic casing surface in which the sprayed-on surface is so prepared and treated as to prevent the disappearance of the lubricating oil into the pores of the surface.

Another object of the present invention resides in the provision of a rotary piston internal combustion engine of trochoidal construction in which metal-to-metal contact between the sealing bars at the piston corners and the internal surfaces of the housing casing are prevented under all operating conditions.

Still a further object of the present invention resides in the provision of an internal combustion engine of the type described above, especially of a rotary piston internal combustion engine of trochoidal construction provided with an aluminum housing to which is applied a relatively very hard sprayed-on metal surface, which assures proper operation and relatively long length of life of the engine.

Still another object of the present invention resides in the provision of a rotary piston internal combustion engine with a sprayed-on metal casing surface in which the pores are filled with a material having lubricating properties.

A further object of the present invention resides in the provision of a sprayed-on hard metallic surface along the inner walls of the housing of a rotary piston internal combustion engine in which the pores are closed to prevent the accumulation of dust that may result during grinding and/or honing of the surfaces.

These and other objects, features and advantages of the present invention will become more obvious from the following description when taken in connection with the accompanying drawing which shows, for purposes of illustration only, one embodiment in accordance with the present invention, and wherein

FIGURE 1 is a schematic longitudinal cross sectional view, taken transversely to the axial direction, through a housing casing for a rotary piston internal combustion engine of trochoidal construction in accordance with the present invention, and

FIGURE 2 is a partial cross sectional view, on an enlarged scale, through the housing casing of FIGURE 1.

Referring now to the drawing wherein like reference numerals are used throughout the two views to designate like parts, the housing casing 1 of FIGURE 1 for a rotary piston internal combustion engine of trochoidal construction consists of light metal, such as aluminum, aluminum alloy and the like and is provided as running-surface for the piston with a two-arched internal casing surface 2 which is constituted by a layer 3 of sprayed-on metal, for example, by a sprayed-on layer of chrome-steel, of carbon steel, or the like. The casing surface 2 is very wear-

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resistant but is provided with a large number of pores by reason of the fact that the layer 3 is sprayed on. These pores are illustrated in FIGURE 2 greatly enlarged and are designated therein by reference numeral 4.

In order that no lubricating oil can be pressed into the pores 4 during operation of the internal combustion engine by the sealing bars of conventional construction arranged at the piston corners, the pores 4 are closed with a filler material 5. This filler material 5, which consists for example, of a phenolic resin combined or mixed with Bakelite as binder is appropriately applied directly after the spraying operation of the layer 3 in liquid form, that is, when the casing surface 2 is still completely free of any fat or greasy substance. The filler material 5 penetrates deep into the pores 4, fills the same substantially completely and then solidifies so that no lubricating oil can disappear into the pores 4 or can be pressed into the pores 4 by the sealing bars (not shown). Nevertheless, in order to have available a corresponding emergency running characteristic during an interruption of the lubrication as may occur occasionally in engine operation, substances 6 with lubricating properties are embedded into the filler material 5. The substances 6, schematically illustrated in the drawing by dots, may consist of colloidal graphite, of molybdenum disulfide or of zinc sulfide or mixtures therein in smallest or finest particle size. Consequently, if the lubrication with the usual lubricants should not suffice temporarily or at certain places of the casing surface 2, the substances 6 in the filler 5 produce excellent emergency running characteristics so that the lack of lubrication is bridged without danger for the engine.

As exhaustive practical tests with rotary-piston internal-combustion-engines have demonstrated, it suffices if the substances 6 with the lubricating properties are admixed to the filler material 5 in the so-called "cold arc" 7 (FIG. 1) of the inner casing surface 2 which extends from the center between inlet and outlet channels in the direction of rotation of the piston up to within proximity of the spark plug; for the danger exists more likely within the "cold arc" that the lubrication with the lubricating oil is so impaired by the fuel that the internal combustion engine is relegated to the emergency running properties provided by the substances 6. Within the remaining so-called "warm arc" of the inner surfaces 2, the surface of the filler material 5, which is not enriched with the substances 6, produces an extraordinarily smooth and sliding oxidation layer in combination with the petroleum hydrocarbons which, as has been discovered, prevents the wear-appearances produced by the sealing bars at the inner casing surfaces 2.

Appropriately, the filling out of the pores 4 with the filler 5 with or without added substance 6 takes place prior to grinding or honing of the inner casing surface 2 because filler 5 prevents that, for example, grinding dust gets into the pores 4.

Since the construction of the housing casing in accordance with the present invention prevents to a certain extent that the sealing bars or strips sliding along the inner casing surface 2 adapt themselves well to the casing surface by the usual grinding action, it is advantageous to subject the casing housing in engine operation to a running-in period of short duration with the use of running-in oil, for example, plain or non-additive oil. As borne out in practice, a running-in period of about two hours suffices.

While I have shown and described one embodiment in accordance with the present invention, it is understood that the present invention is not limited thereto, but is susceptible of numerous changes and modifications as known to a person skilled in the art. The particular type of filler material and/or of the lubricating additives admixed to the filler material may be varied at will, depending on availability of the particular or equivalent materials and on the desired characteristics to be obtained.

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Furthermore, any commercially available type of material of the type mentioned above or equivalent thereof is satisfactory for purposes of the present invention. Additionally the details of construction of the rotary piston internal combustion engine may be varied at will as known by a person skilled in the art.

Thus, while I have shown and described only one embodiment in accordance with the present invention, it is understood that the same is not limited thereto but is susceptible of numerous changes and modifications as known to a person skilled in the art, and I therefore do not wish to be limited to the details shown and described herein but intend to cover all such changes and modifications as are encompassed by the scope of the appended claims.

I claim:

1. A housing casing of a rotary piston internal combustion engine, especially of trochoidal construction, comprising:

housing casing means,

a sprayed-on relatively hard metal layer on the inside of the housing casing means and serving as inner running surfaces for the rotating piston, and filler means applied to said sprayed-on layer for closing the pores thereof.

2. A housing casing according to claim 1, wherein said filler means essentially consists of a synthetic resin.

3. A housing casing according to claim 1, wherein said filler means essentially consists of phenolic resin.

4. A housing casing of a rotary piston internal combustion engine, especially of trochoidal construction, comprising:

housing casing means,

a sprayed-on relatively hard metal layer on the inside of the housing casing means and serving as inner runner surfaces for the rotating piston, and filler means applied to said sprayed-on layer for closing the pores thereof,

said filler means having admixed thereto at least over a portion of the inner runner surfaces a substance with lubricating properties.

5. A housing casing of a rotary piston internal combustion engine, especially of trochoidal construction, comprising:

housing casing means,

a sprayed-on relatively hard metal layer on the inside of the housing casing means and serving as inner runner surfaces for the rotating piston, and filler means essentially consisting of synthetic resin applied to said sprayed-on layer for closing the pores thereof,

said filler means having admixed thereto at least over a portion of the inner runner surfaces a substance with lubricating properties and selected from the group essentially consisting of graphite, molybdenum disulfide, zinc sulfide and mixtures thereof.

6. A housing casing of a rotary piston internal combustion engine, especially of trochoidal construction, comprising:

housing casing means,

a sprayed-on relatively hard metal layer on the inside of the housing casing means and serving as inner runner surfaces for the rotating piston, and filler means applied to said sprayed-on layer for closing the pores thereof,

said filler means having admixed thereto at least over a portion of the inner runner surfaces a substance with lubricating properties,

the substance with lubricating properties being admixed in the filler means only over a predetermined section of the circumference of the inner surfaces of the casing means in relation to the direction of rotation thereof.

7. A housing casing of a rotary piston internal com-

bustion engine, especially of trochoidal construction, comprising:

- housing casing means,  
 a sprayed-on relatively hard metal layer on the inside  
 of the housing casing means and serving as inner  
 runner surfaces for the rotating pistons, 5  
 and filler means applied to said sprayed-on layer for  
 closing the pores thereof,  
 said filler means having admixed thereto at least over  
 a portion of the inner runner surfaces a substance 10  
 with lubricating properties,  
 the substance with lubricating properties being admixed  
 in the filler means only over a predetermined section  
 of the circumference of the inner surfaces of the cas- 15  
 ing means in relation to the direction of rotation  
 thereof,  
 said section essentially consisting of the suction space  
 and compression space of the internal combustion  
 engine.  
 8. A housing casing of a rotary piston internal com- 20  
 bustion engine, especially of trochoidal construction, com-  
 prising:  
 housing casing means of light metal,  
 a sprayed-on relatively hard metal layer on the inside  
 of the housing casing means and serving as inner run- 25  
 ner surfaces for the rotating piston,  
 and filler means essentially consisting of synthetic resin  
 applied to said sprayed-on layer for closing the pores  
 thereof,  
 said filler means having admixed thereto at least over 30  
 a portion of the inner runner surfaces a substance  
 with lubricating properties and selected from the  
 group essentially consisting of graphite, molybdenum  
 disulfide, zinc sulfide and mixtures thereof,  
 the substance with lubricating properties being admixed 35  
 in the filler means only over a predetermined section  
 of the circumference of the inner surfaces of the  
 casing means in relation to the direction of rotation  
 thereof,  
 said section essentially consisting of the suction space 40

and compression space of the internal combustion engine.

9. A housing casing according to claim 6, wherein said synthetic resin is phenolic resin.

10. A housing casing according to claim 9, wherein said housing casing means essentially consists of aluminum or aluminum alloy.

11. A housing casing according to claim 10, wherein said sprayed-on metal layer essentially consists of a hard metal selected from the group of chrome and carbon steels.

12. In a rotary piston internal combustion engine of trochoidal construction, which comprises a casing, a polygonal piston rotatable within said casing and having sealing strips at the corners thereof, inlet and outlet means in said casing, a sprayed-on relatively hard metal layer on the inside of the housing casing serving as inner runner surfaces for the rotating piston and filler means essentially consisting of a synthetic resin applied to said layer for closing the pores thereof, said filler means having admixed thereto over at least a portion of the runner surfaces a substance with lubricating properties,

the improvement essentially consisting of operating said engine during a short running-in period with the use of a plain running-in oil to adapt the sealing strips to said inner runner surfaces.

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