United States Patent

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[54] VARIABLE COMPRESSION MEANS FOR A ROTARY ENGINE

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[73] Assignee: **United Aircraft Corporation,** East Hartford, Conn.

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[21] Appl. No.: **58,937**

[52] **U.S. Cl.**.....**418/159,** 123/8.05, 123/182, 418/30, 418/108

[51] **Int. Cl.**.....**F04c 15/04,** F04c 29/10

[58] **Field of Search**.....418/107, 108, 159, 24, 30, 418/31, 28, 270; 123/8.05, 8.09, 182

[56] **References Cited**

UNITED STATES PATENTS

2,991,930	7/1961	Lindner	418/159
2,473,921	6/1949	Thatcher	418/30

FOREIGN PATENTS OR APPLICATIONS

526,374	9/1940	England	123/8.09
149,229	10/1921	England	418/270
81,457	5/1956	Switzerland	418/159
767,417	5/1952	Germany	418/159

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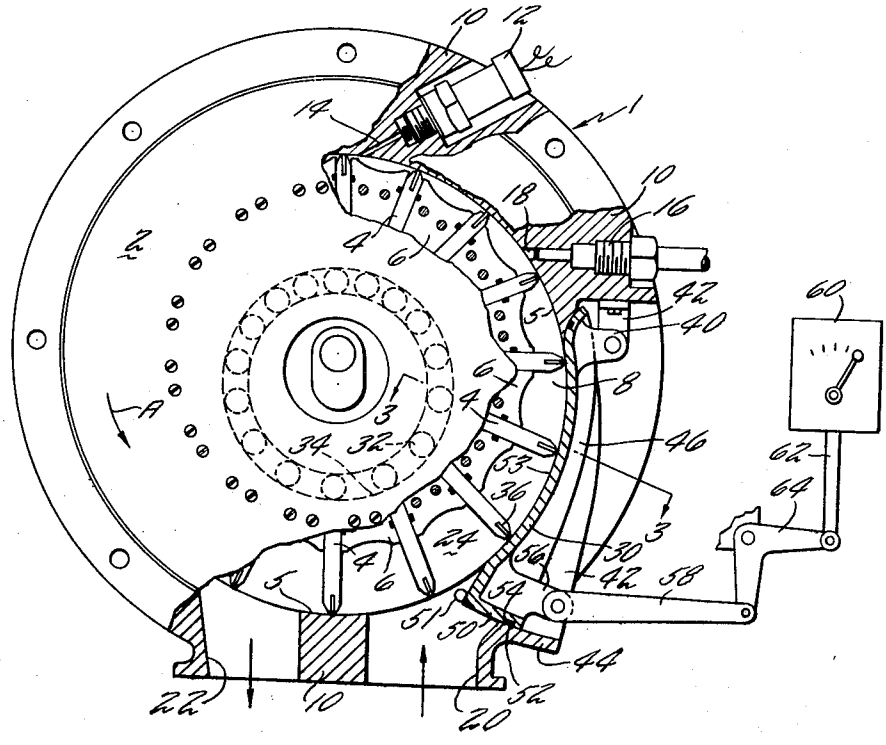
[57] **ABSTRACT**

A vaned rotary-type engine having a rotor assembly mounted for rotation within a cylindrical surface, said rotor assembly being eccentrically mounted with vanes forming chambers therebetween. The rotation of the vanes continuously varies the size of the chambers around the cylindrical surface between a maximum size at an air inlet to a minimum size at a point approximately 180° therefrom where a combustible mixture which has been formed is ignited. The size of the chamber then increases to the exhaust outlet approximately 180° therefrom. To control the compression ratio and the amount of air being compressed a section of the cylindrical surface on the compression side is made movable so that it can be hinged outwardly allowing air to bleed from the variable chambers as they advance to their smallest volume. This section is movable for predetermined positioning by a control such as a fuel control or throttle lever to provide increased compression leakage as power requirements decrease.

2 Claims, 3 Drawing Figures



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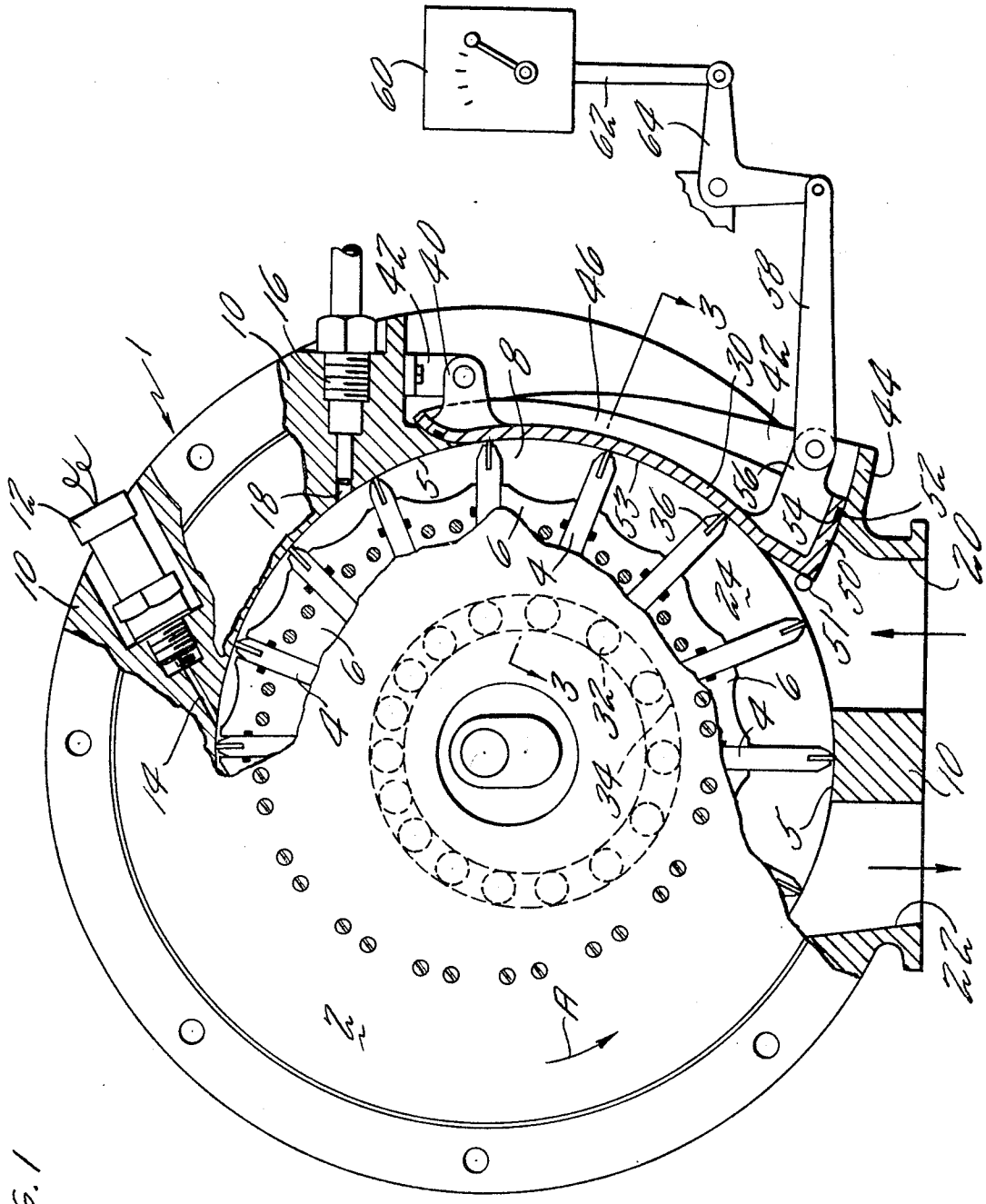

FIG. 1

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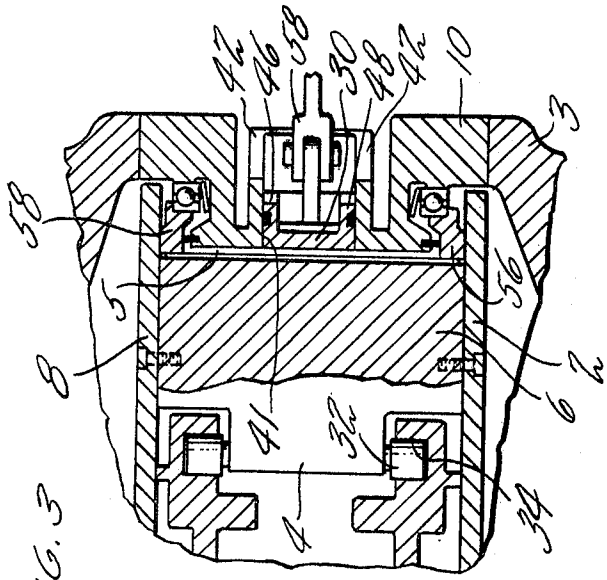
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FIG. 3

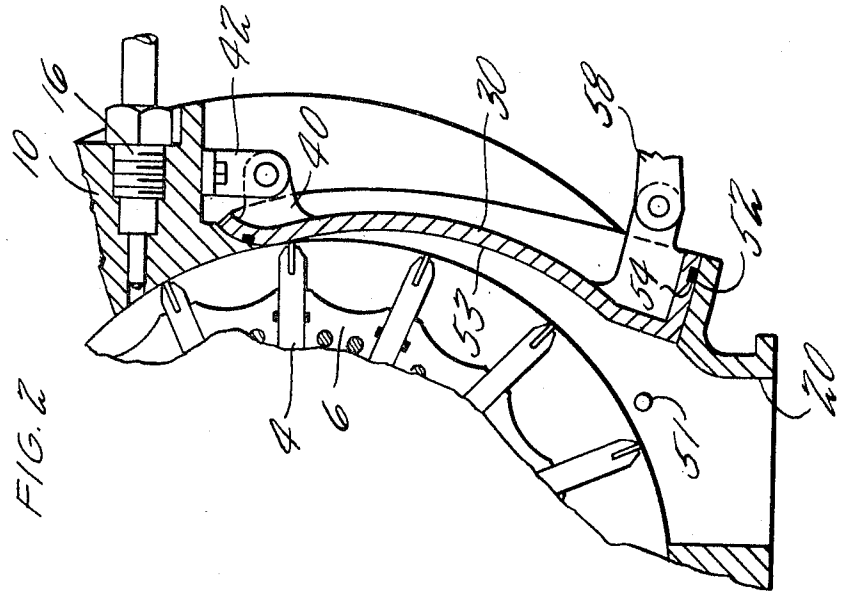
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FIG. 2

VARIABLE COMPRESSION MEANS FOR A ROTARY ENGINE

BACKGROUND OF THE INVENTION

The vaned rotary engine is of the type shown in U.S. Pat. No. 3,301,233 and U.S. Pat. No. 1,986,556. However, neither of these patents provide any mechanism for performing the function of the subject invention.

SUMMARY OF THE INVENTION

An object of this invention is to obtain a wide range of power output without incurring a very large increase in specific fuel consumption. In this instance, an attempt is made simultaneously reduce compression ratio and the amount of air being compressed while holding the expansion ratio constant. This is believed to be more efficient than throttling the inlet to the engine.

Another object of this invention is to provide a hinged bleed section in the compression side of the rotary engine housing which is connected to a throttle control. As power requirements vary, the hinged section is moved to change the compression bleed past the vaned tips. In this instance, as power requirements decrease, the hinged section is moved to increase the compression bleed.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side view partially in section of a rotary engine with an end plate off showing the location of some of the vanes and showing the hinged bleed section in its "closed" position.

FIG. 2 is a partial view taken through the hinged bleed section showing it in its full "open" position.

FIG. 3 is a view taken along the line 3—3 of FIG. 1 showing a part of the rotor between the end covers.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 shows a rotary engine 1 of the vaned type such as shown in U.S. Pat. No. 3,301,233 with an end cover 3 removed showing one side plate 2. This side plate 2 is broken away showing the inner rotor assembly within the inner cylindrical surface 5 with the vanes 4 being shown mounted for relative slidable movement between rotor spacing members 6 which are fixed between the respective side plates 2 and 8. The engine 1 is further broken away showing the housing 10 in a cross section at two places. The first place shows the location of the spark plug 12 which is connected to the interior of the engine by the passageway 14. The other broken away section shows fuel injection means 16 which injects the fuel through passageway 18. At the other end of this broken away section of the housing, the air inlet 20 is shown along with the exhaust exit 22.

In the operation of this engine the rotor is moving in the direction of the arrow A and as the air passes into a chamber 24 from inlet 20, it is compressed gradually until it reaches its smallest size, shown at the top of FIG. 1 adjacent the spark plug 12, the fuel having been injected at its location prior to reaching full compression. After ignition the chambers then gradually become larger until they reach the exit opening 22 where the combustion gases are exhausted.

Between the location of the fuel injector means 16 and the inlet 20, a section of the housing, a bleed section 30, is pivotally mounted, or hinged, to move outwardly from the tips of the blades 4 for a length approximately equal to three chambers 24 along the surface 5. The blades maintain their position by the use of wheels 32 which travel in cam slot 34. The tip seals 36 are maintained in position by contact with bearing carriers 56 and 58. The construction of this tip seal support is shown and claimed in U.S. Ser. No. 887,472, filed Dec. 23, 1969.

One end of the bleed section 30 has a projection 40 adjacent the fuel injection means which is pivotally mounted to a bracket 42 fixed to the housing 10. The opening 41 in the surface 5 of the housing includes sides 42 which extend outwardly from the opening 41 along with an end member 44. These sides 42 and end member 44 seal with side members 46 and 48 and end wall 50 of the bleed section 30. A seal member 52 is shown extending around the sides 46 and 48 and end wall 50 in a groove 54. It is noted that the hinged bleed section 30 could have parallel sides forming a rectangularlike shape in the surface 5, these sides could also converge at one end forming a triangularlike opening in the surface 5. The triangularlike shape would allow changes in the bleed rate with respect to the hinge location.

The end of the bleed section 30 adjacent the inlet 20 has a boss 56 extending therefrom which is pivotally attached to an actuating link 58. This link is moved by control 60 through a rod 62 and bellcrank 64. This control can be a fuel control or a throttle lever.

FIG. 1 shows the hinged bleed section 30 fully closed as it would be for maximum power output. A stop pin 51 is provided to properly locate the inner surface of the hinged bleed section 30 within surface 5. FIG. 2 shows the hinged bleed section 30 in the fully opened position as it would be for minimum power output. In this position, the air can freely flow out of the compression volume, for the length of the hinged bleed section, as the engine rotates and since the air being displaced is approximately at ambient pressure there is essentially no power loss. For an intermediate power output, the hinged section would be positioned by control 60 to a position between that shown in FIG. 1 and FIG. 2, fully closed or fully opened. As power requirements vary, or as fuel flow is increased or decreased, the hinged bleed section 30 is closed or opened, respectively, to change the compression bleed past the vaned tips. This will effectively allow the compression ratio and the amount of air being compressed to be changed according to the power output or fuel flow requirements. By having more than one hinged section arranged to bleed in a progressive manner, the inefficiencies associated with compression leakage at intermediate throttle positions can be reduced.

I claim:

1. In a rotary internal combustion engine having a housing with a cylindrical chamber therein, said rotor means forming variable-volume operating chambers as it rotates within said cylindrical chamber of said housing, said chambers being formed by vanes which project from the rotor towards the cylindrical surface of said cylindrical chamber, an inlet located adjacent the rotor means where the variable-volume chamber is substantially at its maximum size and starting to decrease, an opening formed in the cylindrical surface of the operating chamber extends from a point adjacent the inlet to a point where the size of the chambers have been substantially decreased, a cover member located in this opening has an inner surface which conforms with the remainder of the cylindrical surface of the housing, means pivotally mounting said cover member downstream of the inlet adjacent the point where the size of the chambers have been substantially decreased, means for pivotally moving said cover member outwardly about said means pivotally mounting said cover to form a variably increasing bleed from one variable-volume operating chamber towards an adjacent rearward chamber to simultaneously control the compression ratio and the amount of air being compressed, and stop means positioned with relation to said cover member to prevent the cover member from moving too far inwardly.

2. An engine as set forth in claim 1 wherein said opening has a triangularlike shape for allowing changes in the bleed rate with respect to the means pivotally mounting said cover member.

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