United States Patent [19]

Thomas

[11] **3,765,379**

[45] **Oct. 16, 1973**

[54] **ROTARY TYPE POWER PLANT**

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[22] Filed: **Oct. 18, 1971**

[21] Appl. No.: **190,010**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 868,662, Sept. 17, 1969, abandoned.

[52] **U.S. Cl.** ..... **123/8.45,** 123/119 C, 418/188, 418/267

[51] **Int. Cl.** **F02b 55/16**

[58] **Field of Search** ..... 418/144, 241, 183–188, 418/266; 123/8.05, 8.45, 119 C

[56] **References Cited**

UNITED STATES PATENTS

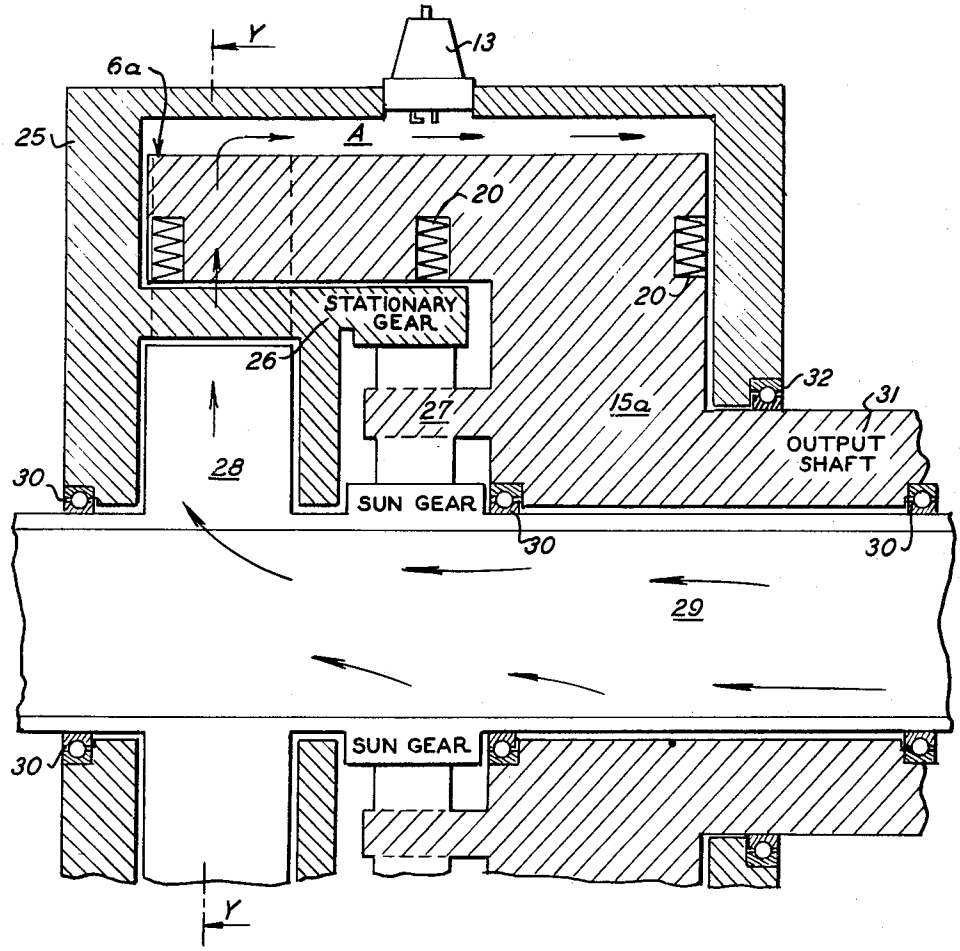
3,329,132	7/1967	DeCastelet	123/119 C X
3,441,007	4/1969	Kwaak	123/8.45
1,256,995	2/1918	George	418/185
1,349,353	8/1920	Wilber	418/185
1,113,234	10/1914	Morgan	418/184
3,250,260	5/1966	Heydrich	418/101
833,588	10/1906	Dabonville	418/266

Primary Examiner—Carlton R. Croyle
Assistant Examiner—Michael Koczo, Jr.
Attorney—Neil F. Markva et al.

[57] **ABSTRACT**

A rotary type power plant or engine having a round or cylindrical rotor member that is rotative within an outer body or housing having an internal chamber of non-round or substantially oval form. As the rotor turns, a variable spacing is formed between the rotor member and the non-round inner wall of the housing chamber. The rotor member carries movable vanes or sealing members which can be pivotal or slidable outwardly. The sealing members are constantly maintained against the non-round inner wall of the housing. Therefore, at times each of the vanes defines a larger area within the spacing between the rotor and inner wall of the housing than other vanes. An explosive force or other pressure is exerted against the surface of the vanes as each vane is extended to present the greater area to such force generated within the combustion chamber. This force acting against the vane causes the rotation of the rotor member within the housing. An inlet means is provided for introducing combustible fuel into the combustion chamber of the power plant in a direction away from the axis of rotation. That is, the combustible fuel introducing means is disposed adjacent the axis of rotation for the rotor member whereby the incoming fuel is carried by the natural centrifugal force of the rotating rotor member from the axis of rotation into the combustion chamber.

13 Claims, 10 Drawing Figures



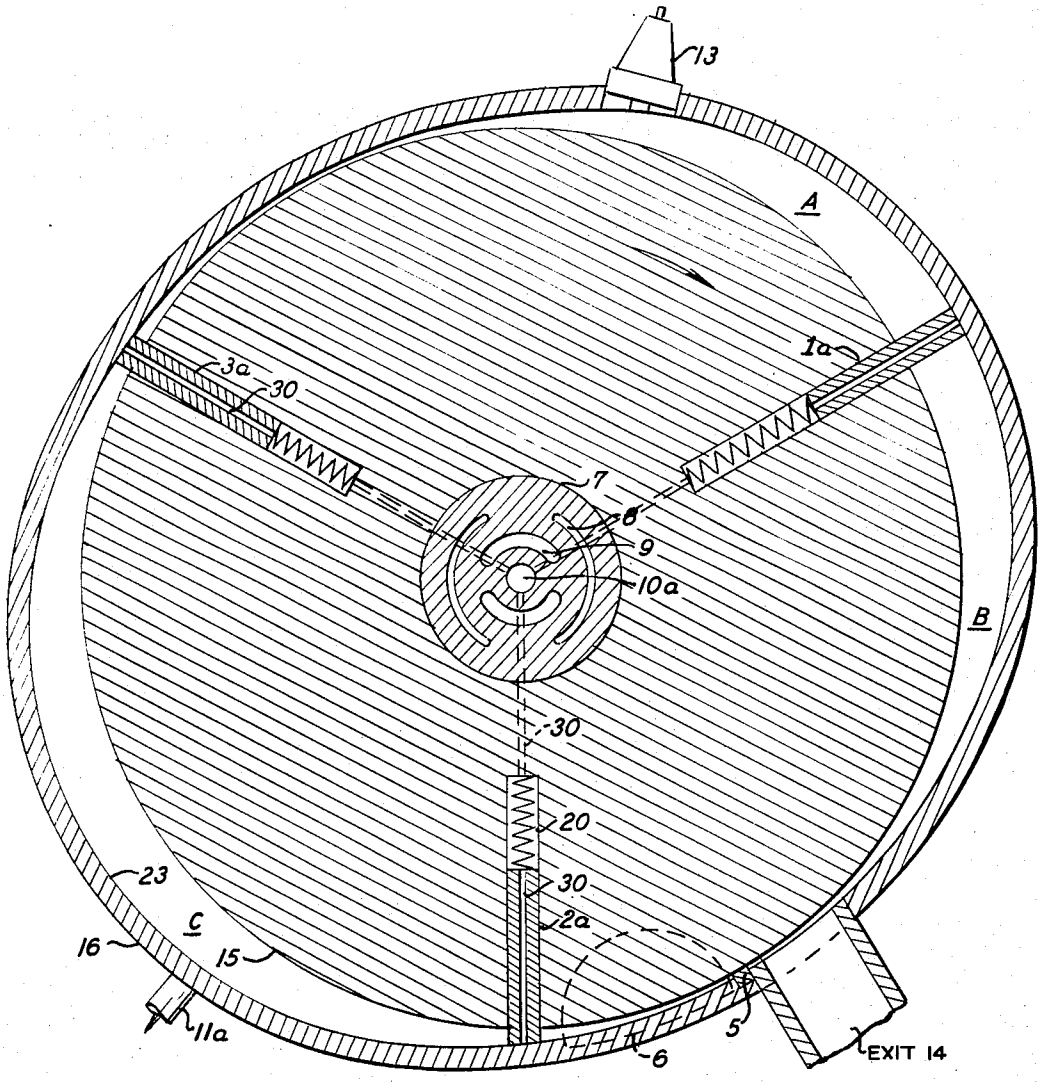

13
A
1a
3a
30
7
8
9
10a
B
30
20
30
2a
23
C
16
15
11a
5
6
EXIT 14

FIG. 1

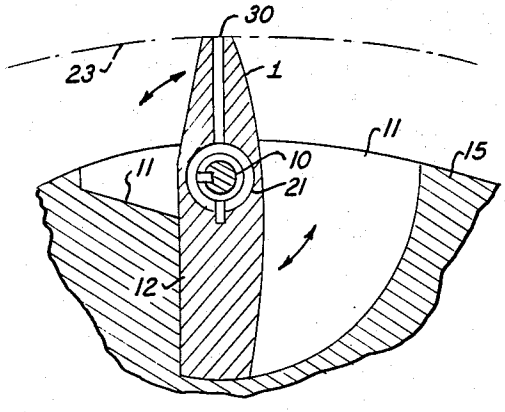

30
23
1
11
15
11
10
21
12

FIG. 3

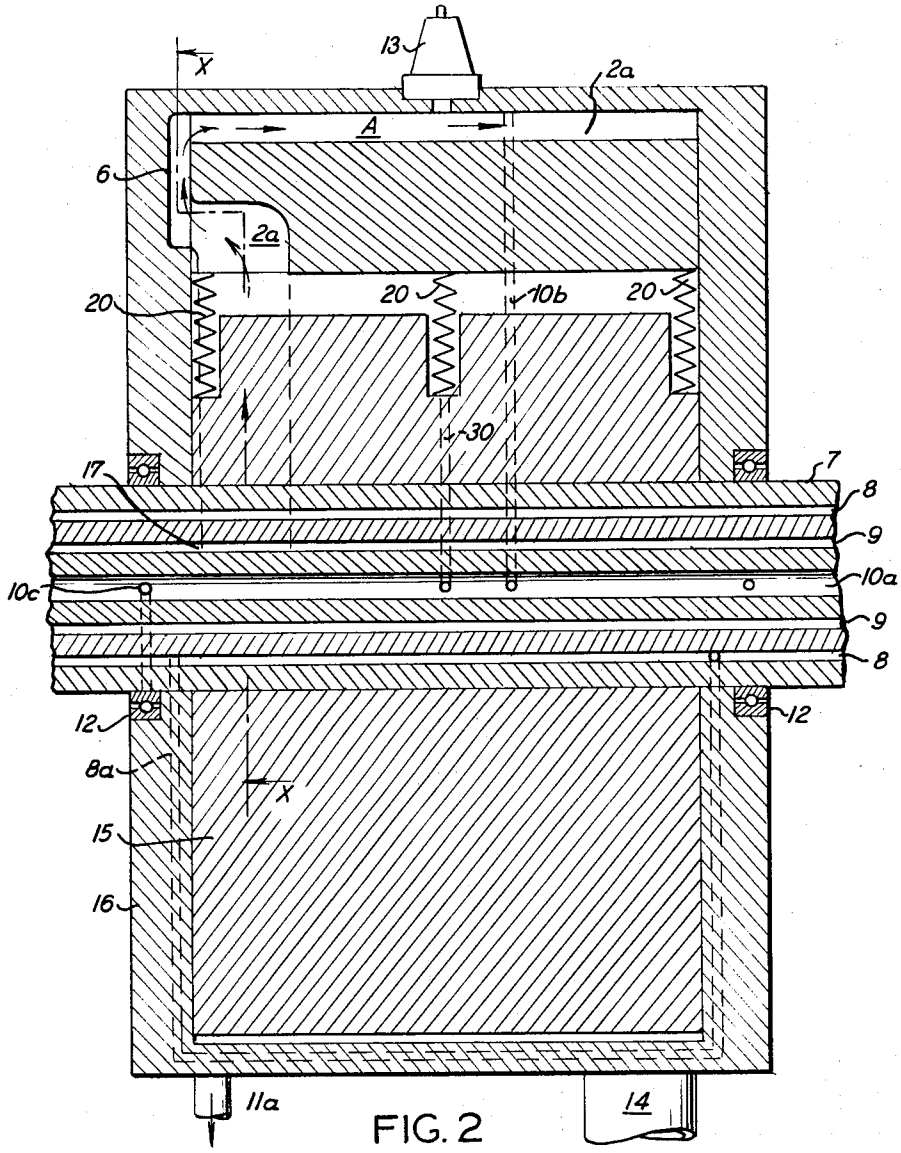

13
X
2a
A
6
2a
20
20
10b
20
30
17
7
8
9
10a
10c
9
8
12
12
8a
X
15
16
11a
14

FIG. 2

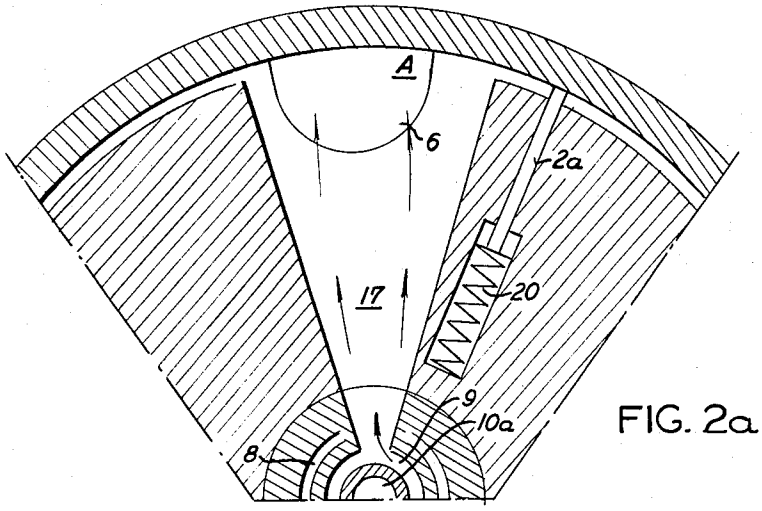

A
6
2a
17
20
9
10a
8

FIG. 2a

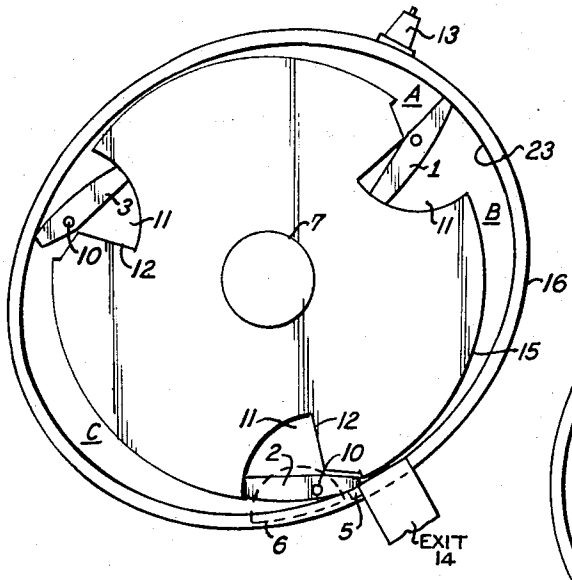


FIG. 4

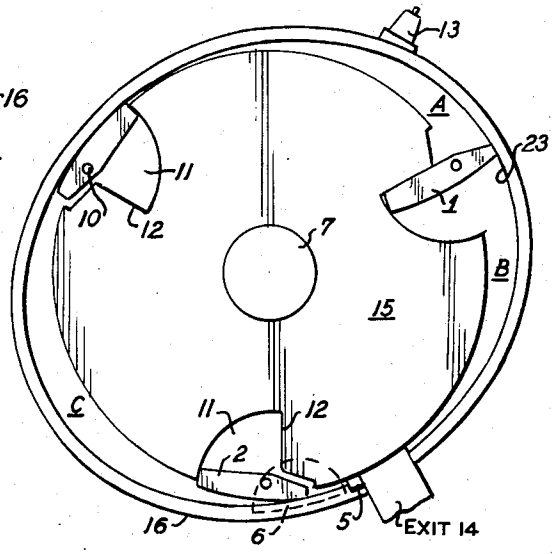


FIG. 5

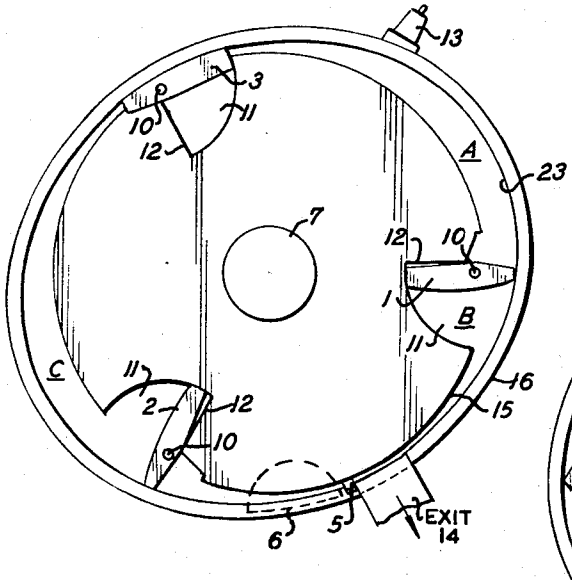


FIG. 6

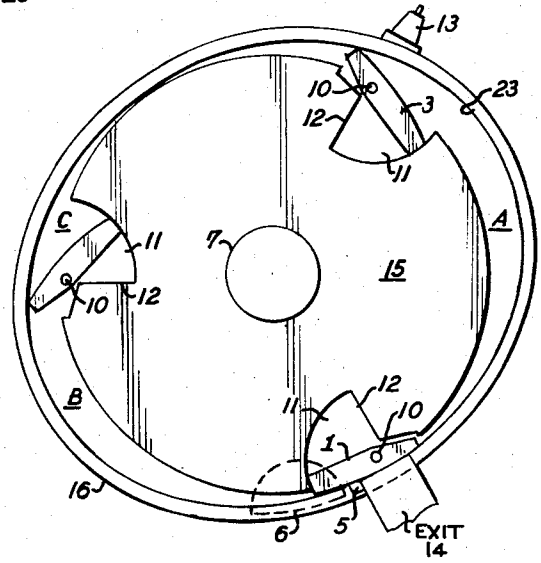


FIG. 7

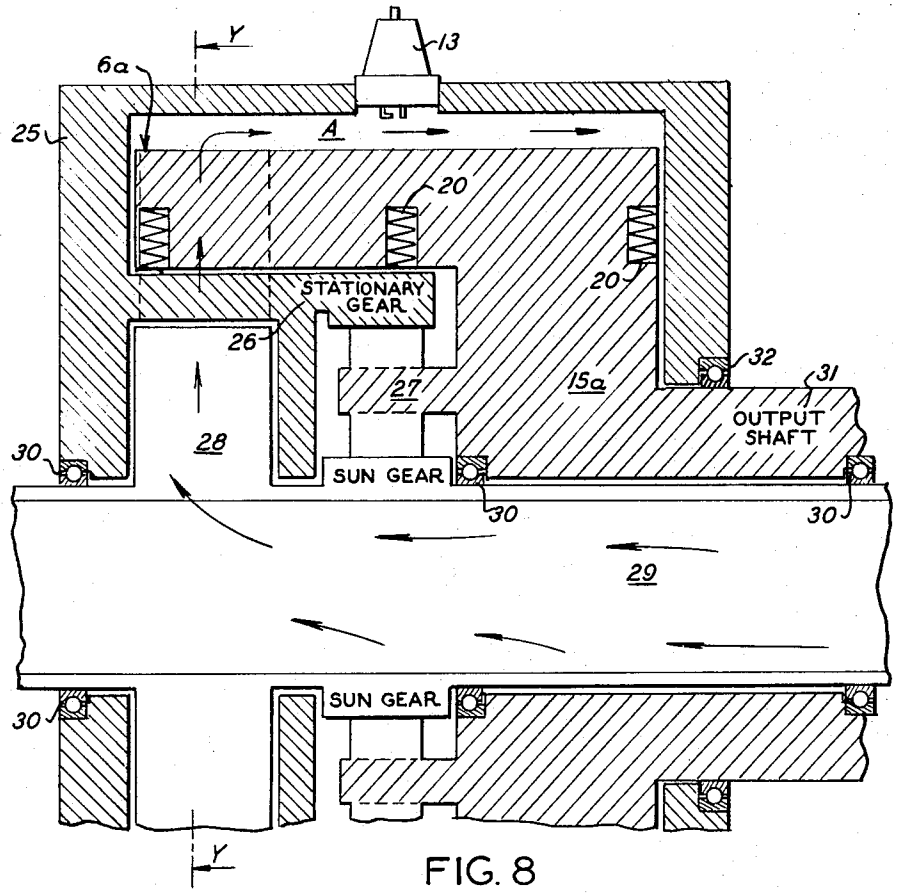

Y
13
6a
25
A
20
20
STATIONARY GEAR
26
27
15a
32
31
OUTPUT SHAFT
28
30
SUN GEAR
30
30
29
SUN GEAR
30
Y

FIG. 8

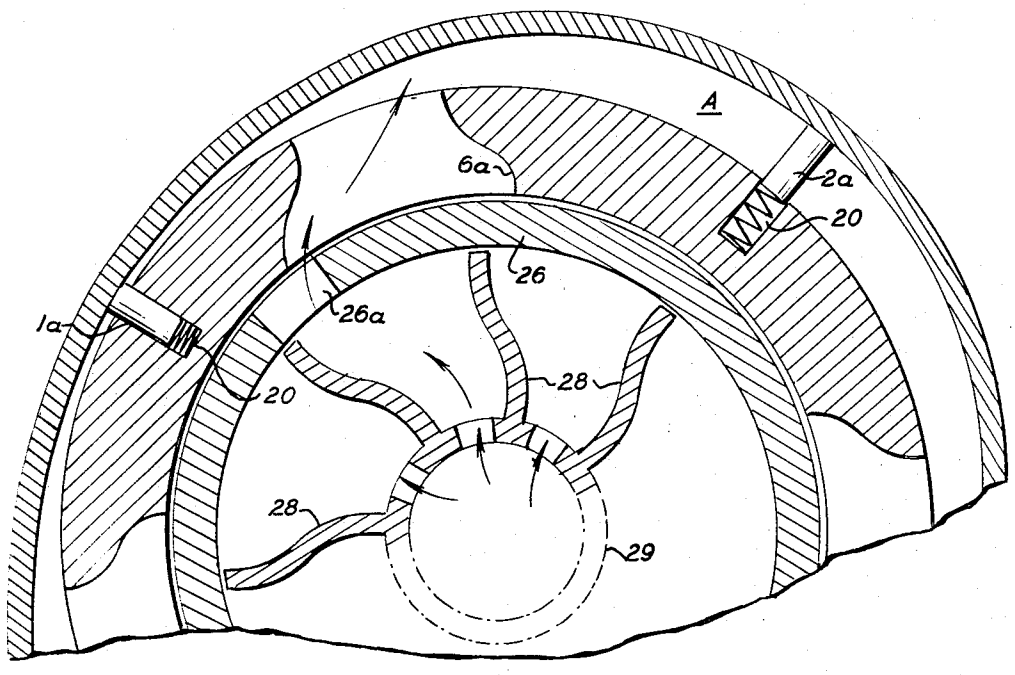

A
6a
2a
20
26
26a
1a
20
28
28
29

FIG. 9

ROTARY TYPE POWER PLANT

RELATED INVENTION

This is a continuation-in-part of copending application Ser. No. 868,662 filed Sept. 17, 1969 by the same inventor and now abandoned.

BACKGROUND OF THE INVENTION

Rotary type power plants or engines are generally known in the prior art as exemplified by U.S. Pat. Nos. 2,998,065 issued June 13, 1961 and 3,250,260 issued May 10, 1966. These prior art references generally describe a rotary type power plant having two elements wherein one of the elements is disposed within the other. One of the elements has a round surface and the other element has a non-round surface facing the round surface thereby forming a combustion chamber therebetween. One of the elements is rotatable with respect to the other. Furthermore, one of the elements carries sealing vane members which extend into the chamber forming chamber sections therebetween. The specific embodiments in these patents show a rotatable rotor member on which the sealing vanes are arranged.

There are basic disadvantages associated with the structures of the prior art as disclosed in these patents. The primary problem is associated with the breathing of the engine. It has been found that incoming combustible fuel meets with considerable difficulty due to the location with respect to the combustion chamber. That is, the fresh incoming fuel flows in a direction towards the axis of the spinning rotor. This movement of incoming combustible gas is counter to the force being generated by the spinning movement of the rotor member in the rotary type power plants of the prior art. This adversely affects the breathing of the engine. Where there are counteracting forces due to different flow conditions, the entry of the combustion fuel into the combustion chamber will not be satisfactory to give the most favorable operating conditions during the operation of the power plant. As disclosed in U.S. Pat. No. 3,250,260, the incoming combustible fuel is not introduced directly into the combustion chamber in a direction away from the axis of rotation.

A further problem associated with the prior art structures is that exhaust gases may be carried beyond the outlet port for exhausting the reaction products of combustion. The presence of the exhaust gases being carried on into the combustion chamber will adversely affect the firing of the incoming combustible gases into the combustion chamber. That is, the chemical reaction taking place at the point of ignition will be deleteriously affected by the presence of the non-exhausted reaction products of combustion. Furthermore, the exhaust gases generated by the combustion reaction will flow in a direction counteracting the incoming flow of combustible fuel into the combustion chamber.

PURPOSE OF THE INVENTION

The primary object of this invention is to provide a rotary type engine having a breathing capacity which is not available in the prior art engines of this type.

Another object of this invention is to provide a rotary type power plant wherein the combustible fuel is carried by natural centrifugal force directly into the combustion chamber.

A further object of this invention is to provide a rotary type engine wherein the inlet means and exhaust means are disposed with respect to each other to effectuate a most desirable scavenging of the exhaust gases and create the best possible breathing conditions for the engine.

SUMMARY OF THE INVENTION

The rotary type power plant as disclosed herein includes two elements wherein one of the elements is disposed within the other. One of the elements has a round surface and the other element has a non-round surface facing the round surface thereby forming a combustion chamber therebetween. One of the elements is rotatable with respect to the other. One of the elements carries sealing vane members which extend into the chamber forming sections therebetween. The novel combination of this invention comprises a means for introducing a combustible fuel directly into the combustion chamber of the power plant in a direction away from the axis of rotation. The combination further includes means for exhausting the reaction products of combustion out of the power plant.

In a specific embodiment of the invention, one of the elements is a rotor member and the other element is a stationary housing. The rotor member has a round outer surface and is rotatably mounted in the stationary housing which has a non-round inner surface facing the round surface of the rotor member. The combustible fuel introducing means is disposed adjacent the axis of rotation for the rotor member. This structural configuration allows the incoming fuel to be carried by the natural centrifugal force of the rotating rotor member from the axis of rotation directly into the combustion chamber.

Another feature of the invention is directed to the use of an exhausting means disposed along the non-round inner surface of the housing to allow movement of the reaction products away from the axis of rotation for the rotor member whereby effective breathing of the engine will be accomplished.

Other features of the invention are directed to specific configurations for sealing members carried by the rotor member and particular structures for the rotor member itself.

BRIEF DESCRIPTION OF DRAWINGS

Other objects of this invention will appear in the following description and appended claims, reference being made to the accompanying drawings forming a part of the specification wherein like reference characters designate corresponding parts in the several views.

FIG. 1 is a sectional view of a rotary power plant made in accordance with this invention;

FIG. 2 is a longitudinal sectional view through the structure of FIG. 1;

FIG. 2*a* is a sectional view taken along the line X—X of FIG. 2;

FIG. 3 is a fragmentary sectional view of a sealing member on another embodiment of a power plant made in accordance with this invention;

FIGS. 4 through 7 are diagrammatic views showing the operation of the power plant;

FIG. 8 is a sectional view of another embodiment of a power plant made in accordance with this invention; and

FIG. 9 is a sectional view taken along line Y—Y of FIG. 4.

DESCRIPTION OF SPECIFIC EMBODIMENTS

More specifically, the rotary type power plant shown in FIG. 1 includes a rotor member **15** having a round surface disposed within a stationary housing **16** having a non-round inner surface. The rotor member **15** is carried by shaft **7** that is mounted in suitable bearings **12.** The chambers A, B and C are located between the oval shaped inner surface **23** and the rotor member **15.** Fuel, lubricant and coolant may be fed through the hollow shaft **7** in a known manner.

A plurality of sealing members or vanes **1***a*, **2***a* and **3***a* is disposed at uniformly spaced points along the periphery of the rotor member **15.** The vanes or sealing members **1***a*, **2***a* and **3***a* are arranged to be maintained in a constant contact with the non-round interior surface **23** at all times. The members **1***a*, **2***a* and **3***a* are biased toward the inner wall **23** so that this contact will be maintained despite difference in contour between the rotor member **15** and the non-round surface **23** of the housing **16.** The sealing members **1***a*, **2***a* and **3***a* are mounted for outward or radial sliding movement with respect to the inner wall surface **23.** The members **1***a*, **2***a* and **3***a* are spring biased by springs **20** assisted by oil pressure.

The unit as shown in FIGS. **1** and **2** is illustrated without fuel induction means, lubricant or coolant accessories. However, it will be obvious that these required accessories can be attached to one end of the hollow shaft **7** that carries the rotor member **15.** Additional rotary power units can also be attached to the shaft or driven thereby to provide a power smooth compact unit.

The main shaft **7** is hollow and contains passages **8** for a coolant which can exit at **11***a*. Shaft **7** also includes a passage **9** for propellant or combustible material indexed to the port **17** located in the rotor member **15.** Port **17** is indexed in turn with a relieved portion **6** located in the end wall of the outer housing **16.** The combination of the passage **9,** port **17** and relief portion **6** constitutes means for introducing a combustible fuel directly into the combustion chamber of the power plant in a direction away from the axis of rotation for the rotor member **15.** A section of the relief portion **6** forms a part of each combustion chamber A, B and C as each is filled with incoming fuel. The arrows shown in FIG. **2** indicate the flow of combustible gases.

The passage **10***a* serves as a lubrication source for the bearings **12,** and the sealing members or vanes **1***a*, **2***a* and **3***a*. The passages **30** extend from the central passage **10***a* through the rotor member **15** and the vanes **1***a*, **2***a* and **3***a* as shown in FIG. **1.** The passages **10***b* and **10***c* extend from the main passage **10***a* to various other locations which require lubrication.

In FIG. **2,** the unburned fuel is shown to enter on one side of the housing **16** and exhausts through port **14** on the other opposite side of the housing **16.** This relationship between the inlet port **6** and the exhaust port **14** facilitates proper breathing of the engine. The breathing of unburned fuel from the center of the engine at the rotating shaft **7** and outward by the centrifugal force created by the rotation of shaft **7** acts as a sort of supercharger or blower. The action as a supercharger exists until the expended fuel is exhausted at the outer periphery of the housing **16** through the port **14** to complete a proper breathing cycle. The movement of gases within the housing **16** is generally in a longitudinal direction as shown by the arrows in chamber A.

As shown in FIG. **1,** the incoming combustible fuel is enclosed in the combustion chamber C by the vanes **2***a* and **3***a*. As the rotor member **15** revolves clockwise, the fuel is compressed between the outer surface of the rotor member **15** and the inner wall **23.** This compressed condition exists in the combustion chamber A as shown in FIG. **1.** The spark plug **13** is provided to ignite the fuel located in the combustion chamber A between vanes **1***a* and **3***a*. Upon combustion, the force of the explosion will act against the vane 1a which is extended outwardly to meet the wall surface **23.** It might not be necessary to use such a spark plug **13** in an external combustion engine. It may be possible to utilize rapid expansion gases in such a rotary type power plant. Warm refrigerant type gases such as freon or the like might be used to effect the desired results.

Another embodiment of a rotary power plant made in accordance with this invention is shown in FIGS. **3** through **7.** Each of the vanes **1, 2** and **3** has a longitudinal pivot **10** and is disposed in a recess **11** provided in the rotor member **15.** The recess **11** includes a stop wall **12** to limit the swing of the vanes **1, 2** and **3** in one direction. The pivot **10** is located to one side of the longitudinal center line of each of the vanes **1, 2** and **3** so that they are in fact pivoted off-center. The pivot **10** and the center line of the vanes **1, 2** and **3** are parallel to the axis of the rotor **15** and therefore are referred to as longitudinal pivot **10** and longitudinal center-line. The vanes or sealing members **1, 2** and **3** may be spring biased by torsional springs **21** and by gas pressure in order to maintain the constant contact with the inner wall surface **23.**

While two types of vanes or sealing members have been disclosed herein, it is apparent that other types may be employed depending upon many variables such as the coolant, the lubricant and the combustible or pressurized gases used.

The operation of the power plant of this invention is shown in FIGS. **4** through **7.** In FIG. **4,** the chamber A located between vanes **1** and **3** is preparing for the power stroke. The chamber B located between the vanes **2** and **1** is beginning exhaust since the vane **2** has passed exhaust port **14.** The chamber C located between the vanes **2** and **3** is completing the intake of combustible fuel. The combustible fuel has been drawn from the intake relief port **6.** A fixed wiping seal **5** provided on the housing **15** prevents contamination of intake gases by exhaust gases. The seal **5** extends the length of the rotor member and aids in the scavenging of exhaust gases resulting from the reaction products of combustion formed during the power stroke.

In FIG. **5,** the fuel in chamber A has been ignited. Therefore, a greater pressure has been created on the surface of the vane or sealing member **1** than on the sealing member **3.** This pressure differential results because the exposed surface of sealing member **1** in chamber A is greater than the exposed surface of the sealing member **3.** This pressure differential produces a torque on the rotor **15.** Movement of the rotor member past the seal **5** together with the pushing action of vane **1** removes the exhaust gases from the chamber B. The chamber B is continuing its exhaust and the vane or sealing member **2** is starting to expose the intake relief port **6.** The chamber C will begin compression as soon as the vane or sealing member **2** passes the relief port **6** thereby closing off the intake of the fuel supply.

In FIG. 6, the chamber A is still in the power cycle because the exposed surface of the sealing member vane 1 is greater than that of the vane 3. Chamber B is at the end of the exhaust cycle with vane 1 pushing gases out of the exhaust port 14. Vane 2 has passed the relieved intake port 6 and is starting to draw fuel into chamber B behind the vane 2. Chamber C is on compression created by the compression of fuel in the diminishing space between the surface 23 and the rotor member 15 as the rotation of the latter continues.

In FIG. 7, the chamber A has nearly completed the power stroke and is ready to exhaust as the vane 1 exposes the exhaust port 14. The chamber B is still in the intake cycle which will be complete when the vane 1 passes the port 6. Chamber C has completed the compression and is ready to enter the power stroke phase. The cycling of the power plant of this invention will then be repeated as shown in FIGS. 4 through 7.

There can be as many power inpulses in a 360° rotation as there are sealing members on the rotating circular member or rotor. Diminishing efficiency and the use of different fuels could determine the number of chambers created by the sealing members attached to the rotor. Frictional heat would be useful to create the rapid expansion of a refrigerant type of fuel such as freon and the like. The design of such a rotary power plant using expansion type refrigerant would be varied accordingly.

The embodiment as shown in FIG. 8 is directed to the use of a housing 25 having a 360° circular wall or stator projection 26. The projection 26 has a structural configuration adapted to receive a blower mechanism 28 which includes centrifugal or rotary blower vanes. The blower mechanism 28 is mounted on the hollow shaft 29 which rotates within the bearings 30. The shaft 29 constitutes a combination of an intake manifold and a blower shaft. Incoming fuel passes through the hollow shaft 29 and moves by centrifugal force through the stator projection inlet 26a and the rotor member inlet 6*a* into the chamber A. The centrifugal force is created by the rotation of the blower mechanism 28.

The rotor member 15*a* is attached to output shaft 31 and rotates within the bearings 32. The rotor member 15*a* includes an annular portion (not numbered) having the inlet 6*a* through which the incoming fuel moves. As is evident from the drawings, the annular portion or the rotor member 15*a* is disposed over the stator projection 26. As shown, gases flow from the axis of rotation of shaft 29 into the combustion chamber through the stator inlet 26*a* and each inlet opening 6*a* located between the sealing vanes in the annular portion of the rotor member 15*a*. As in the previous embodiment, there is a general movement of the gases within the power plant along the longitudinal direction of the device since the exhaust port is disposed on the side of the housing 25 opposite the combustible fuel inlet means 6*a*.

The rotation of the rotor member 15*a* rotates the blower member 28 and the shaft 29 through the planetary gear 27, an annular stationary gear, and sun gear as shown. The planetary gear arrangement 27 is formed as part of the rotor member 15*a*.

In the embodiment as shown in FIG. 8, residual gases in combustion chamber A will not oppose the incoming gases at the incoming inlet opening 6*a* because they will be under the influence of the centrifugal force created by the rotation of the members within the housing 25.

The internal stator projection 26 may or may not support a stationary gear as shown in the drawings. The projection 26 may be located at any desired distance from the axis of rotation depending upon the design requirements. The various other hollow inlet channels have been eliminated from the FIG. 8 for purposes of clarification.

While the rotary type power plant has been shown and described in detail, it is obvious that this invention is not to be considered as being limited to the exact form disclosed, and that changes in detail and construction may be made therein within the scope of the invention, without departing from the spirit thereof.

Having thus set forth and disclosed the nature of this invention, what is claimed is:

1. In a rotary type power plant having two elements wherein one of the elements is disposed within the other, one of the elements has a round surface and the other element has a non-round surface facing the round surface thereby forming a combustion chamber therebetween, one of the elements is rotatable with respect to the other, and one of the elements carries sealing vane members which extend into the chamber forming chamber sections therebetween, the combination comprising:
   a. means for introducing a combustible fuel directly into the combustion chamber of the power plant in a direction away from the axis of rotation,
   b. means for exhausting the reaction products of combustion out of the power plant,
   c. one of the elements is a rotor means and the other element is a stationary housing, and
   d. the rotor means includes a rotor member, a blower mechanism rotatably mounted within said rotor member, and gear means to cause the blower mechanism to rotate when the rotor member rotates.

2. In a rotary type power plant as defined in claim 1 wherein
   said housing includes a stator projection for receiving the blower mechanism,
   said stator projection having an inlet opening through which gases flow from the axis of rotation into the combustion chamber.

3. In a rotary type power plant as defined in claim 1 wherein
   said housing includes a stator projection for receiving the blower mechanism,
   said rotor member includes an annular portion disposed over the stator projection,
   said stator projection has an inlet opening and said annular portion includes an inlet opening at a location between the sealing vane members through which gases flow from the axis of rotation into the combustion chamber.

4. In a rotary type power plant as defined in claim 1 wherein
   said rotor member has a round outer surface and is rotatably mounted in the stationary housing which has a non-round inner surface facing the round surface of the rotor member,
   said combustible fuel introducing means includes a hollow axle portion and a combustible fuel inlet means through which the combustible fuel is directed whereby the incoming fuel is carried by the natural certrifugal force of the rotating rotor means

from the axis of rotation directly into the combustion chamber.

5. In a rotary type power plant as defined in claim 1 wherein

the rotor member has a round outer surface and is rotatably mounted in the stationary housing which has a non-round inner surface facing the round surface of the rotor member.

said combustible fuel introducing means being disposed adjacent the axis of rotation for the rotor member whereby the incoming fuel is carried by the natural centrifugal force of the rotating rotor member from the axis of rotation into the combustion chamber.

6. In a rotary type power plant as defined in claim 1 wherein

said rotor member is rotatably mounted in said stationary housing and

the fuel introducing means includes a hollow rotor axle portion and a combustible fuel inlet means through which the combustible fuel is directed into the combustion chamber.

7. In a rotary type power plant as defined in claim 1 wherein

the rotor member has a round outer surface and is rotatably mounted in the stationary housing which has a non-round surface facing the round surface of the rotor member,

said combustible fuel introducing means includes a hollow rotor axle portion and a combustible fuel inlet means whereby the incoming fuel is carried by the natural centrifugal force of the rotating rotor member from the axis of rotation into the combustion chamber,

the sealing vane members are flaps which are pivotally mounted at the periphery of the rotor member,

the rotor member being recessed in its periphery to provide notches in which the sealing vane members are mounted,

the sealing vane members being pivotal in the notches on off-center pivots.

8. In a rotary type power plant as defined in claim 7 wherein

the sealing vane members are spring biased to urge them into an extended position and into contact with the inner non-round surface of the housing.

9. In a rotary type power plant as defined in claim 1 wherein

the rotor member has a round outer surface and is rotatably mounted in the stationary housing which is a non-round inner surface facing the round surface of the rotor member,

said combustible fuel introducing means includes a hollow rotor axle portion and a combustible fuel inlet means through which the combustible fuel is directed whereby the incoming fuel is carried by the natural centrifugal force of the rotating rotor member from the axis of rotation of the rotor member into the combustion chamber.

10. In a rotary type power plant as defined in claim 1 wherein

the rotor member has a round outer surface and is rotatably mounted in the stationary housing which has a non-round inner surface facing the round surface of the rotor member, and

the exhausting means is disposed along the non-round inner surface of the housing to allow movement of the reaction products away from the axis of rotation for the rotor member whereby effective breathing of the engine will be accomplished.

11. In a rotary type power plant as defined in claim 10 wherein

the fuel introducing means and the exhausting means are sufficiently close to each other that each chamber section is exposed to both at the same time during a portion of each revolution of the rotor member.

12. In a rotary type power plant as defined in claim 11 wherein

a wiping seal member is disposed between the fuel introducing means and the exhaust means.

13. In a rotary type power plant as defined in claim 1 wherein

said stator projection carries an annular stationary gear which engages a planetary gear arrangement disposed on the rotor member,

said planetary gear arrangement being driven through a sun gear rotatable about the axis of rotation.

* * * * *