United States Patent [19]

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[54] VANED ROTOR ENGINE AND COMPRESSOR

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[52] **U.S. Cl.**.....**123/8.29,** 123/119 R, 418/13, 418/241

[51] **Int. Cl.**.....**F02b 53/08**

[58] **Field of Search**.....123/8.29, 119 R; 418/13, 241

[56] **References Cited**

UNITED STATES PATENTS

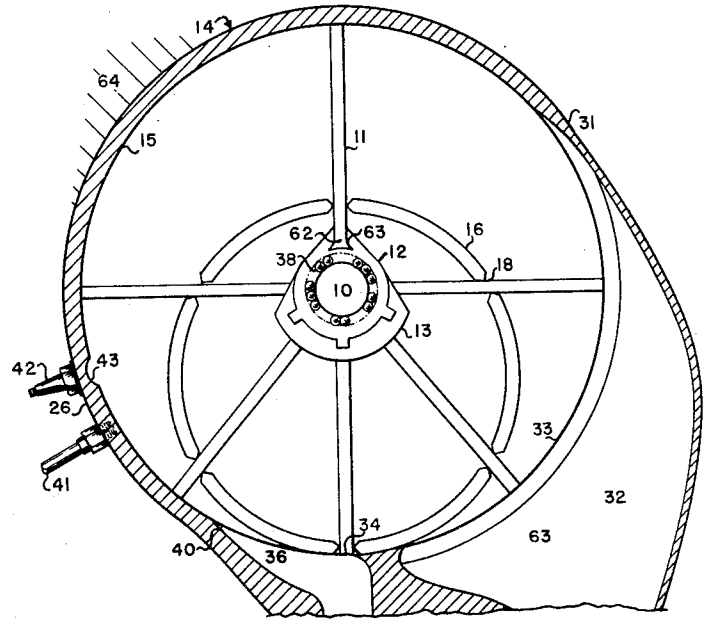
1,306,699	6/1919	Johanson	418/241
2,369,665	2/1945	Gosslau	123/119 R
1,636,799	7/1927	Bernsten	418/241
1,667,456	4/1928	Cozette	418/241
1,703,294	2/1929	Campbell	418/241
2,512,593	6/1950	Brown	418/241
3,165,093	1/1965	Etxegoien	418/241
3,181,510	5/1965	Hovey	418/241
3,356,292	12/1967	Brewer et al.	418/241

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[57] **ABSTRACT**

A rotary engine and compressor constructed in elongated configuration around a central shaft to which vanes are rotatibly secured. The vanes project through slots in a cylindrical rotor mounted off-center on bearings in a casing. The cylindrical rotor is the primary rotating member which drives through gear means the accessory shaft and the power hub. As the rotor and vanes revolve in the casing, the volume between the vanes varies from near zero at the tangent point to a maximum at 180° opposite the tangent point. Selected porting and venting of the casing cause the rotating cylinder and vanes to function as either an engine when fuel and ignition is provided or as a compressor when driven in rotation.

9 Claims, 5 Drawing Figures



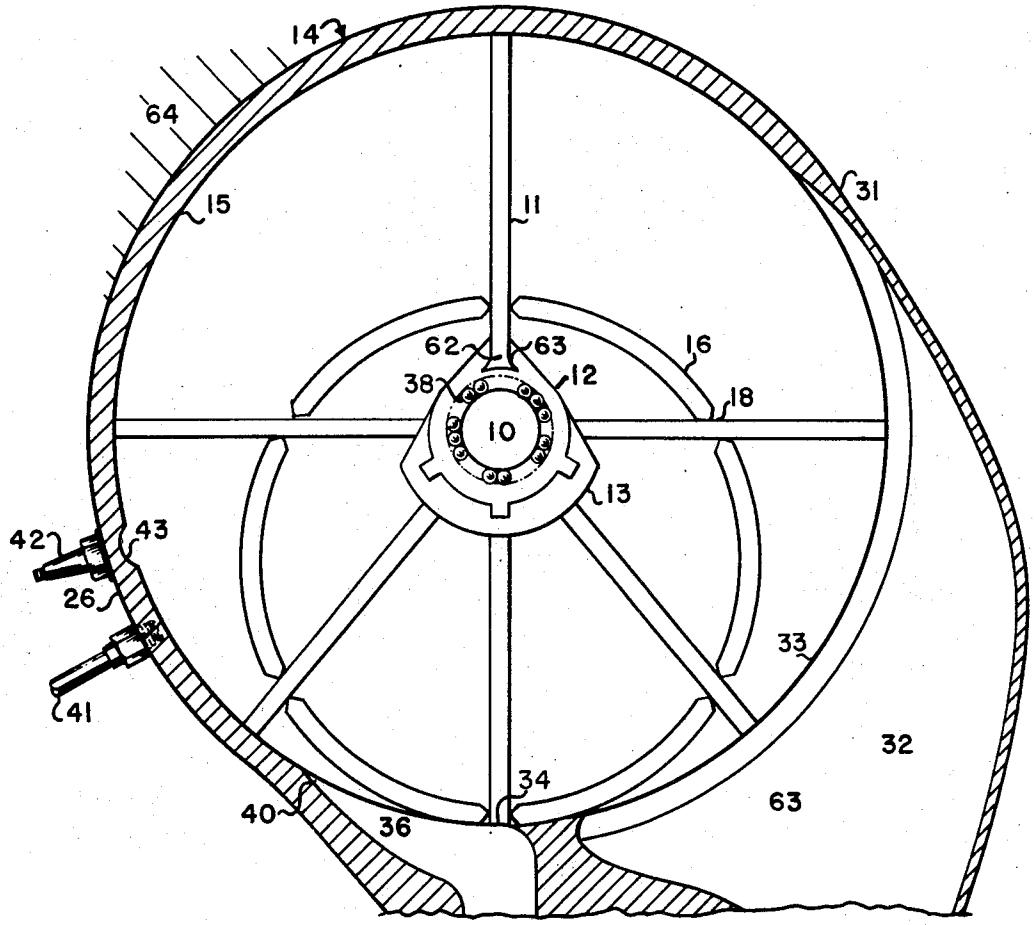


FIG. 1

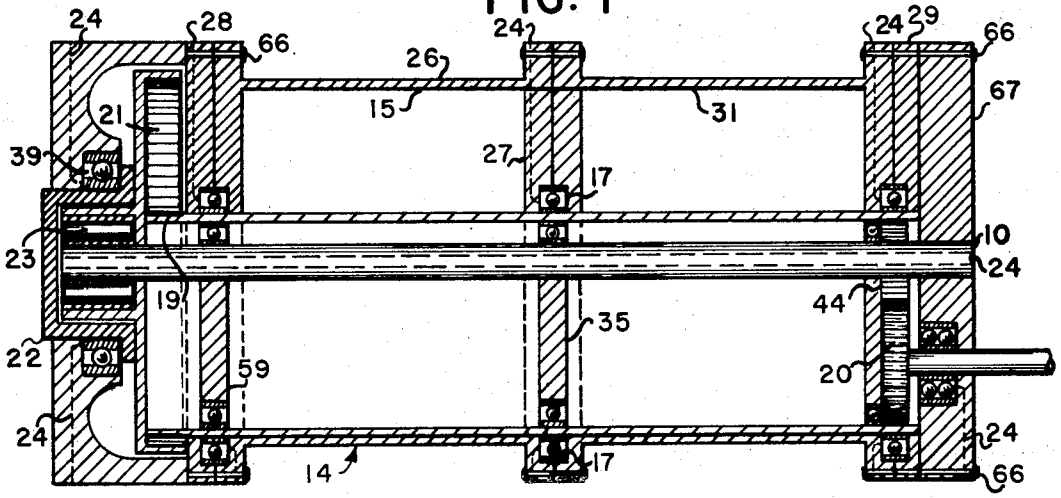


FIG. 2

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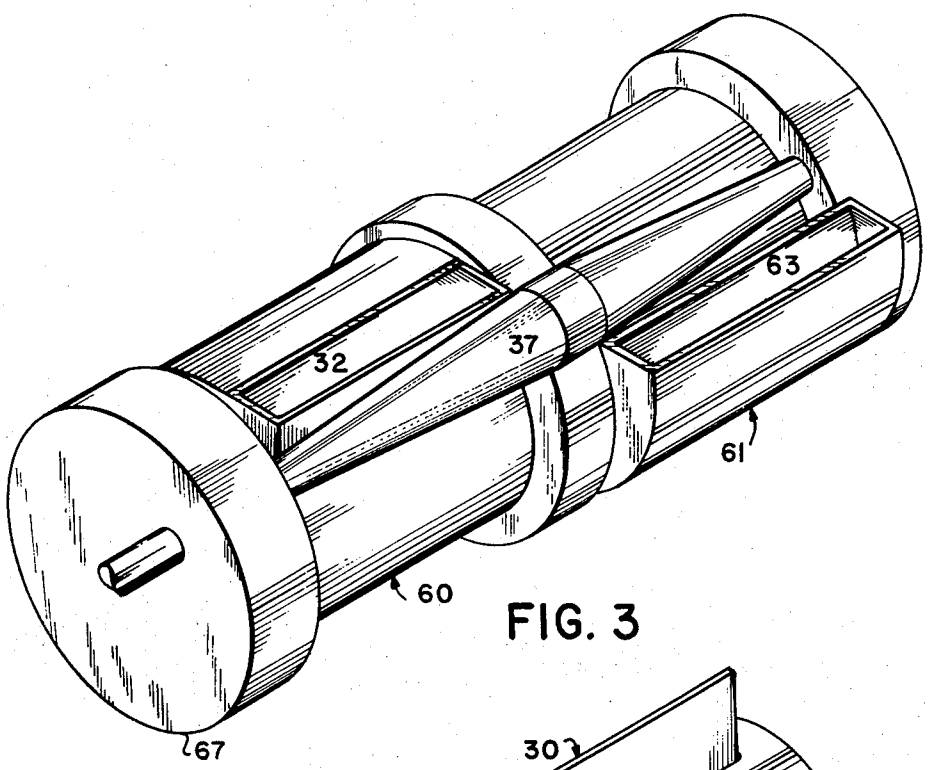


FIG. 3

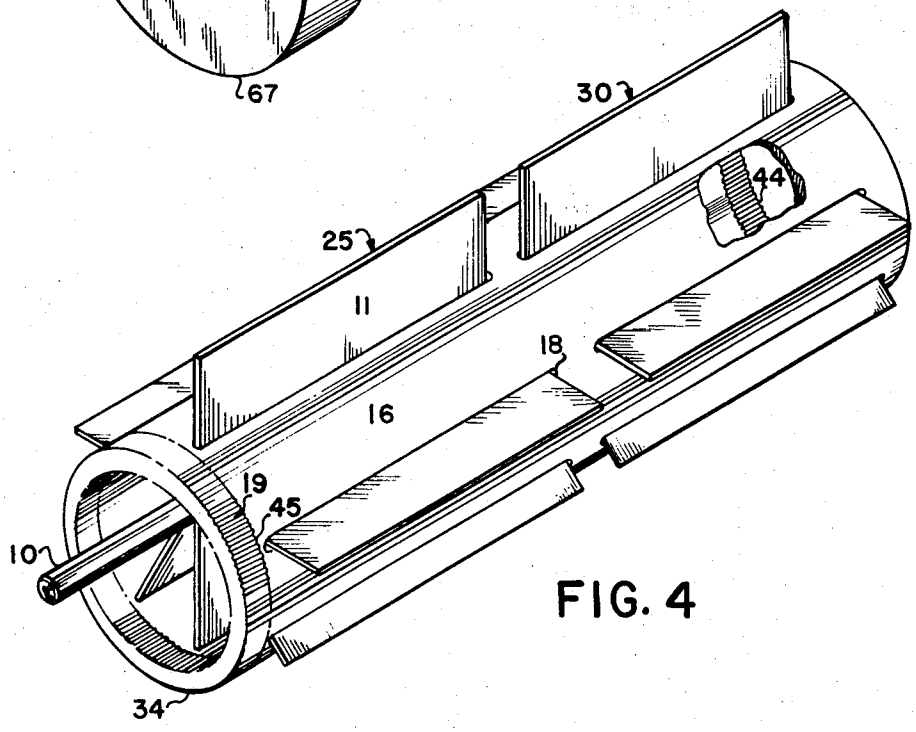


FIG. 4

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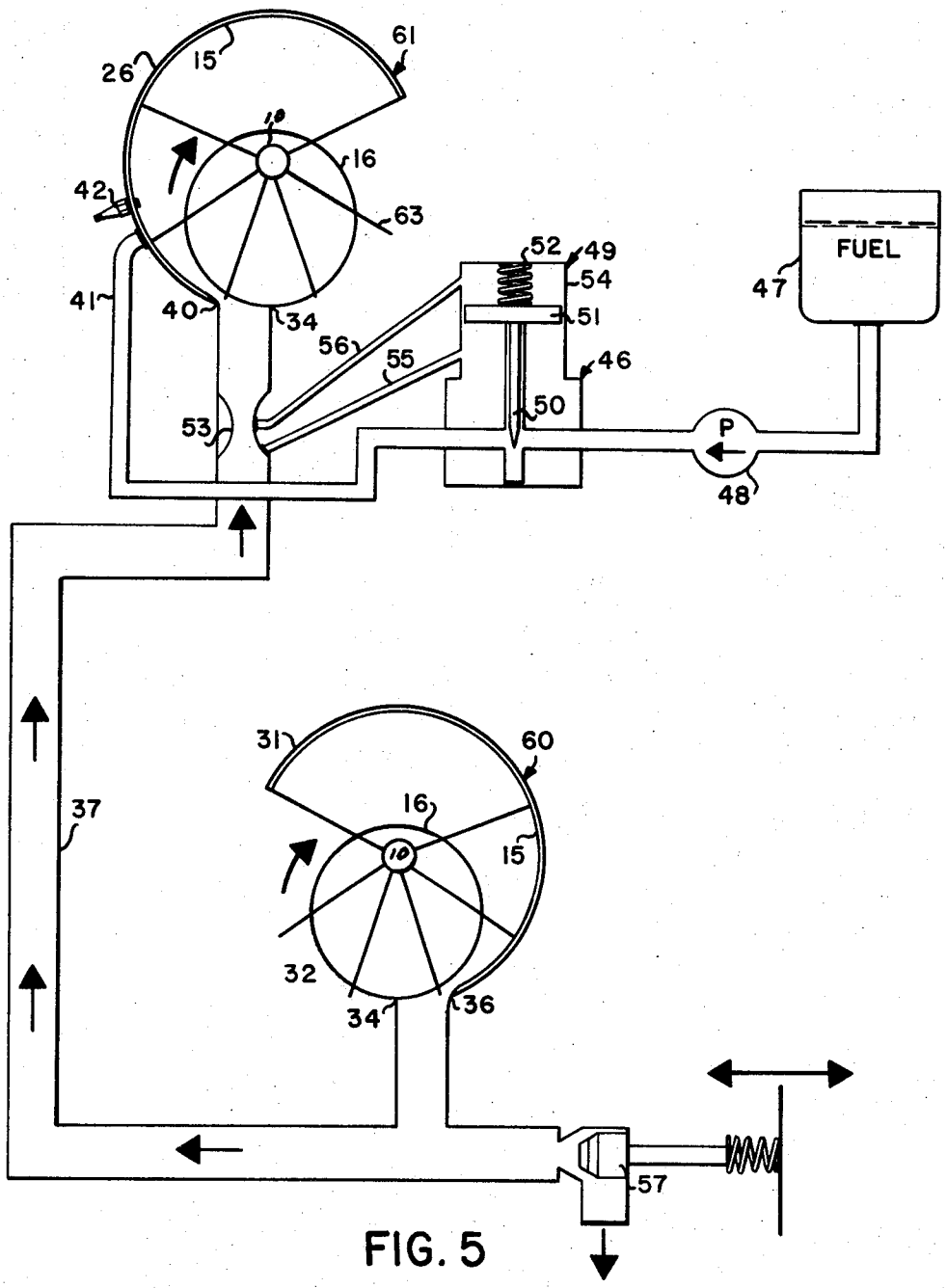


FIG. 5

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VANED ROTOR ENGINE AND COMPRESSOR

Pumps and rotary engine concepts utilizing vanes rotating in a cylinder are quite old. The inventor is the first to conceive of the mounting of a series of vanes freely rotating on a central shaft in a cylinder and driving the vanes through slots in an off-center cylindrical rotor in the compressor configuration. In the engine configuration, pressure applied to the vanes by combustion drive the cylindrical rotor. In an embodiment of the preferred concept, the rotor is mounted in suitable bearing means in the casing in which may be constructed lubricating passageways. Either internal or external gear teeth may be constructed in the rotor for starting and power take-off.

The compressor and the engine are basically mirror images of each other. The application of compressed air and fuel adjacent the tangent point with ignition will drive the vanes in rotation as the burning gases are expanded. An opposite porting would provide intake of air at the larger port and compress the volume of air as rotation occurs toward the smaller port. A method of controlling the degree of power and the rate of rotation of the engine would be to limit the degree of supercharging of the engine by venting air to the atmosphere.

For a complete description of the construction and operation of the device, reference is made to the attached several views wherein like reference characters are utilized to refer to identical or equivalent components throughout the several views and the following detailed description.

FIG. 1 is a sectional view of the device illustrating both the engine and compressor configuration.

FIG. 2 is a sectional view of the elongated dimensions of the device illustrating primarily the casing, the cylindrical rotor bearing and gear means for power take-off.

FIG. 3 is a bottom isometric view of the assembled device.

FIG. 4 is a fragmented isometric view of the central shaft and cylindrical rotor and the vanes.

FIG. 5 is a schematic illustration of the engine, fuel system, compressor and control means.

For a detailed description of the construction and operation of the device of this invention, reference is particularly made to FIG. 1. The device is constructed around a central shaft **10** to which is rotatibly, flexibly secured a series of vanes **11** which are mounted on vane retainers **12** to which are secured counter weights **13**. Encasing the vanes **11** at the extremity of their radius is a casing **14** the inner surface of which defines a cylinder **15**. Mounted off-center for rotation is a cylindrical rotor **16** which is secured in the casing by a series of main bearings **17**. Constructed in the cylindrical rotor **16** is a series of slots **18** through which vanes **11** project to a point closely adjacent cylinder wall **15**. The cylindrical rotor **16** has constructed in its inner or outer surface rotor gear teeth **19**. Operably engaging these rotor gear teeth **19** in the preferred embodiment as illustrated in FIG. **2** is accessory gear **20** driving an accessory gear shaft. In FIG. **2**, a method of power take-off is illustrated utilizing a reduction gear configuration. Power gear **21** is meshed with rotor gear teeth **19** which are integrally a part of the power hub **22**. This power hub **22** is mounted for rotation on a power hub bearing **23** which surrounds the central shaft **10**.

Lubricating passageways **24** as required for proper lubrication are constructed in the central shaft **10** and casing **14**. For an illustration for the practical embodiment of this concept, reference is made to FIGS. **1**, **2** and **5**. Mounted on a single center shaft **10** in a common cylindrical rotor **16** is a series of engine vanes **25** which are isolated in an engine casing **26**. On the opposite end of the central shaft **10** and cylindrical rotor **16** are mounted compressor vanes **30** and a compressor casing **31**. An intermediate cylinder head **27** is mounted in casing **14** to operably isolate the engine casing **26** and the compressor casing **31** and to the opposite end of the engine casing **26** is secured and engine cylinder head **28**. In the comparable structure a compressor cylinder head **29** is secured to the end of the compressor casing **31**. These components are held in an integral structure by a series of casing bolts **66**.

To enable the vane rotor of this concept to function as a compressor or an engine, suitable porting means must be provided. Reference is made to FIGS. **1** and **5**. In the compressor configuration, the device must be provided with a compressor intake port **32** which is open to the atmosphere. In conjunction with this intake port **32** there must be constructed in compressor casing **31** intake slots **33**. Closely adjacent and on the opposite side of the tangent point **34** of this device in the compressor configuration must be constructed the compressor exhaust manifold **36**. This compressor exhaust manifold **36** communicates with the transfer manifold **37** which leads to an engine intake port **40**. In essence, engine intake port **40** is identical in configuration and position to compressor exhaust manifold **36**. In the vicinity of engine intake port **40** along the direction of rotation of the vanes **11** there is constructed in the engine casing **26** a fuel injector **41** adjacent to which is mounted an ignition plug **42**. Mounting for the ignition plug **42** is constructed preferably with an indentation in the inner surface of the cylinder **15** wall. This indentation comprises the ignition bypass **43** and runs the length of the engine casing **26**. This bypass **43** will permit continuous ignition independent of the ignition plug **42** once the device is in operation. The construction of the accessory gear **20** and the power gear **21** has been previously referred to in the preferred embodiment. As illustrated, accessory gear **20** is driven by internal gears **44** constructed in or secured to the cylindrical rotor **16** whereas the power gear **21** engages external rotor gear teeth **45**.

Although the structure might be utilized as a pump or engine in conjunction with other structure, for an illustration of a preferred combination, reference is made to FIG. **5**. A fueling means **46** would employ a source of fuel **47** to which is operably connected a constant pressure fuel pump **48**. The fuel flow would be metered through mixture control device **49** which might well comprise a needle valve **50** which is regulated by a piston or diaphragm **51** which is spring loaded **52**. This mixture control **49** is operably connected to a venturi **53** which is mounted in the transfer manifold **37** between the compressor exhaust manifold **36** and the engine intake port **40**. Piston diaphragm **51** is mounted in a cylinder or chamber **54** wherein the high pressure side **55** communicates with the transfer manifold **37** forward of the venturi **53** whereas the low pressure side **56** communicates with transfer manifold

37 closely adjacent the throat of the venturi 53. This arrangement of components results in an injection of fuel proportional to air flow into the engine. The combination of a combustor 61 engine and compressor 60 in the configuration illustrated would operate only at maximum power in the absence of some means of control. A suggested method of varying the power output would be a manifold pressure bleeder valve 57. Opening of this valve 57 would vent air delivered by the compressor 60 to the atmosphere.

The design of the components facilitates the assembly and interchangeability of parts. The vanes 11 are constructed with a flared shoulder 62 which is secured in the retainer slot 63 which is constructed in the vane retainer 12. These retainers 12 are identical in structure and may be interchangeably placed on the central shaft 10. Each vane 11 is secured on shaft 10 by three retainers 12 with associated counter weights 13 and retainer bearings 38.

The composite device might be adapted for assembly in various manners, the preferred embodiment suggests, however, that the following procedure is acceptable. Compressor vanes 30 are first placed in the cylindrical rotor 16 then vane retainers 12 are placed on the various vanes 30 engaging the retainer slots 63 over the flared shoulders 62. For this illustration, the compressor vanes 30 are arbitrarily numbered 1 through 6 in a clockwise direction. A vane retainer 12 is secured to vane Nos. 1, 4, 2, 5, 3, 6, in the order indicated repeating the procedure until eighteen vane retainers 12 are attached to the compressor 30 vanes in the compressor 60 assembly. The central shaft 10 is then inserted through the retainer bearings 38 at the first eighteen (18) vane retainers 12. Center support buld head 35 is then placed on shaft 10. Intermediate cylinder head 27 and associated main bearing 17 are placed around cylindrical rotor 16. Engine vanes 25 are then positioned in slots 18 in engine 61 section of cylindrical rotor 16. The identical sequence specified above is then followed in engaging retainer slots 63 on the flared shoulders 62 of engine vanes 25. After the attaching of the prescribed eighteen (18) vane retainers 12 in engine 61 section the central shaft 10 is inserted through the retainer bearings 38 in the engine 61 section. Engine support bulkhead 59 is then placed on shaft 10. At this stage of assembly, cylindrical rotor 16 with central shaft 10 and engine vanes 25 and compressor vanes 30 as illustrated in FIG. 4 are assembled to receive engine casing 26 and compressor casing 31. The compressor casing 31 and compressor cylinder head 29 are secured in position. The accessory pad 67 is attached to the compressor cylinder head 29 and the various accessory assemblies secured in position. Conventional procedures are followed in securing engine cylinder head 28, power gear 21, power hub bearing 23 on shaft 10 after which thrust bearings 39 are secured adjacent power hub 22. At this stage of the assembly, the required casing bolts 66 are utilized to secure the various components in an integral structure. The foregoing is designed to illustrate in summary a method of assembly of a preferred embodiment. The method of construction and mode of assembly of a composite cylinder 15 structure is largely optional with the designer. It might well be varied by one skilled in the art.

For a description of the operation of the device, reference is made to FIGS. 1 and 5. As the compressor 60 rotates air enters the compressor 60 through the compressor intake port 32. The off-center positioning of the cylindrical rotor 16 as it drives the vanes 11 in rotation in the cylinder 15 results in a decreasing of the volume between any two particular vanes 11 as well as moving the air forward through steadily decreasing space between the cylinder 15 and the cylindrical rotor 16. The volume occupied by the air is reduced to about one-fifteenth of its former volume. As the vanes 11 approach the tangent point 34 at the bottom of the compressor 60, the air passes through the compressor exhaust manifold 36 into the transfer manifold 37 which leads through the venturi 53 to engine intake port 40 and into engine 61. Fuel injection and ignition as previously discussed occurs closely adjacent the tangent point 34 in the engine 61. The burning and expanding gases apply pressure to vanes 11 as they move through engine casing 26. Combustion occurs during approximately 200° rotation of the vanes 11 in the engine 61 at which point vane 11 will vent the burning gases to the atmosphere through the engine exhaust manifold 63. The comparison of the schematic illustrations in FIG. 5 illustrate how in operation a series of vanes 11 mounted on a single central shaft 10 driven by an integral cylindrical rotor 16 can function as a cooperating compressor 60 and engine 61. In the preferred embodiment visualized, the vanes 11 were 6 inches long and have a radius of 3 inches from shaft 10, the diameter of the cylindrical rotor was 4 inches while the diameter of the cylinder was 6 inches. Rotor 16 is mounted in casing 14 in such a manner as to be tangent with cylinder 15 wall at the bottom point as illustrated in the views. Vanes 11 are preferably constructed of titanium or other light heat resistant metals or alloys. The engine 61 could be fueled with most any hydrocarbon fuel; however, kerosene or similar jet fuel is preferable. Cooling may be accomplished by a water jacket in conjunction with a radiator or the device may be air cooled by constructing cooling fins 64 in the outer extremities of the casing of the compressor 60 and engine 61. Lubrication as stated, may be accomplished by the supplying of oil through lubricating passageways 24 in the structure. Positive pressure lubrication passing the oil through an oil radiator 65 would assist in cooling. The area of contact of the vanes 11 and the cylindrical rotor 16 in the a area of slots 18 can be splash lubricated by admitting oil internal of the cylindrical rotor 16. The utilization of a fuel such as kerosene provides some lubrication to the internal components of the device.

I have illustrated and described the utilization of the concept of this invention in an engine 61 and a compressor 60 configuration as well as the combined structure in a dual configuration. What is desired to be claimed in all embodiments and modifications of this invention not departing from the concept as defined in the appended claims.

I claim:

1. A vaned rotary engine or compressor comprising:
   a. a central shaft means mounted substantially at the center of,
   b. a casing the inner surfaces of said casing defining,
   c. a cylinder means at a constant radius from said central shaft,

d. a cylindrical rotor rotatibly mounted off-center of said cylinder means,
e. multiple vanes flexibly secured to said central shaft, said multiple vanes projecting through,
f. uniform space slots in said cylindrical rotor,
g. vane retainers for securing said multiple vanes rotatibly on said central shaft,
h. said vanes including flared shoulders which are secured in,
i. retainer slots which are constructed in said vane retainers.

2. The invention of claim 1 in an engine configuration including:
a. fuel means, and
b. ignition means positioned to ignite fuel introduced into said engine.

3. The invention of claim 1 wherein said cylinder means comprises:
a. an engine cylinder,
a compressor cylinder,
c. engine vanes projecting through said rotor slots in said engine cylinder,
d. compressor vanes projecting through said rotor slots in said compressor cylinder,
e. manifold means inter-connecting said compressor cylinder and said engine cylinder, and
f. a manifold pressure bleeder valve intermediate said compressor cylinder and said engine cylinder, said bleeder valve adapted to vent air thereby reducing the degree of supercharge of said engine cylinder.

4. The invention of claim 1 comprising:
a. gear means constructed in or secured to said cylindrical rotor, and
b. power take-off gear means intermeshed with said rotor gear means.

5. The invention of claim 3 including an intermediate cylinder head juxtaposition said compressor cylinder and said engine cylinder.

6. The invention of claim 3 wherein said fuel means comprises:
a. a venturi including a throat positioned in said manifold means,
b. pressure responsive fuel flow control valve,
c. a high pressure sensing vent positioned forward of said venturi operably connected to said control valve,
d. a low pressure vent positioned in close proximity to said venturi throat operably connected to said control valve,
e. said control valve constructed and arranged to meter fuel responsive to variable pressure sensings.

7. The invention of claim 1 including counterweights secured to said vane retainers, said counterweights secured substantially opposite said vanes.

8. The invention of claim 1 including retainer bearings intermediate said vane retainers and said central shaft.

9. In association with an internal combustion engine the sub-combination of a fuel means comprising:
a. a compressor adapted to supercharge,
b. an engine cylinder,
c. a manifold means interconnecting said compressor and said engine cylinder,
d. a venturi including a throat positioned in said manifold means,
e. a pressure responsive fuel flow control valve,
f. a high pressure sensing vent positioned forward of said venturi throat operably connected to said control valve,
g. a low pressure vent positioned in close proximity to said venturi throat operably connected to said control valve,
h. said control valve constructed and arranged to meter fuel responsive to variable pressure sensings,
i. a manifold pressure bleeder valve positioned in said manifold means juxtaposed said supercharger and said venturi, said pressure bleeder valve adapted to vent air thereby reducing degree of supercharge of said engine cylinder.

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