

[54] **ROTARY STEAM ENGINE**

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[58] Field of Search **418/253-269,**
418/150

[56] **References Cited**

UNITED STATES PATENTS

835,045 11/1906 Stoker..... 418/260

FOREIGN PATENTS OR APPLICATIONS

149,659 6/1920 United Kingdom..... 418/264

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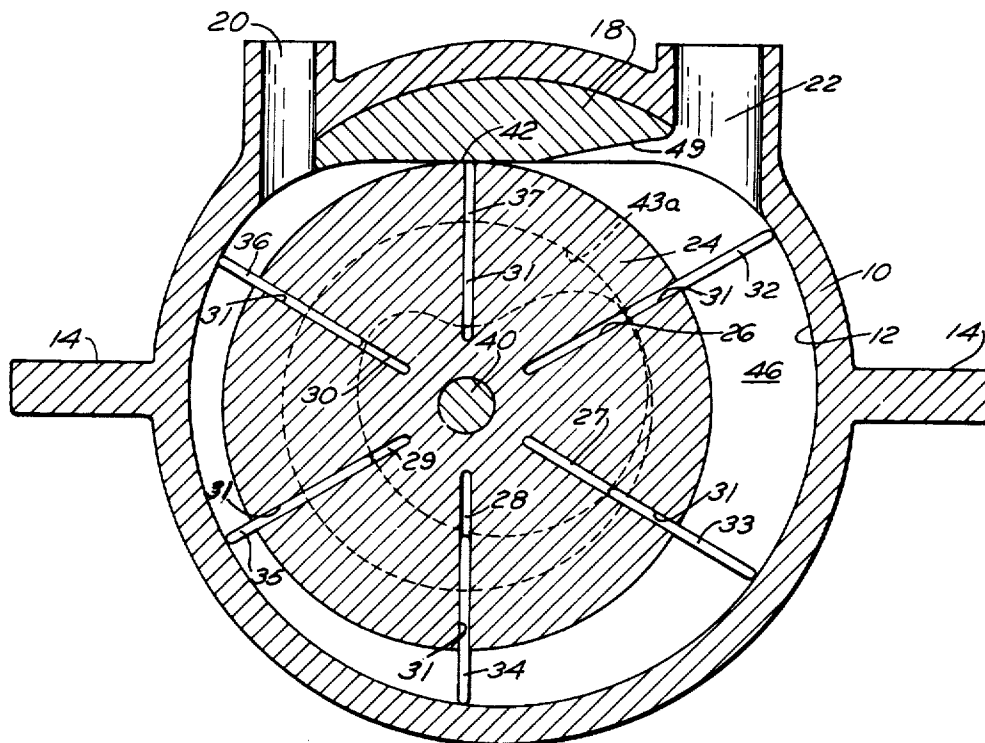
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ABSTRACT

A rotary steam engine having a cylindrical housing with an eccentrically mounted cylindrical rotor therein. The rotor is provided with reciprocal vanes that are controlled by a fixed cam surface, and the inner surface of the housing has a flat chordal plate extending thereacross through which inlet and outlet passages are provided. The arrangement is such that the chambers between the inner rotor and the housing approximate an involute in order to take full advantage of isentropic expansion.

2 Claims, 3 Drawing Figures



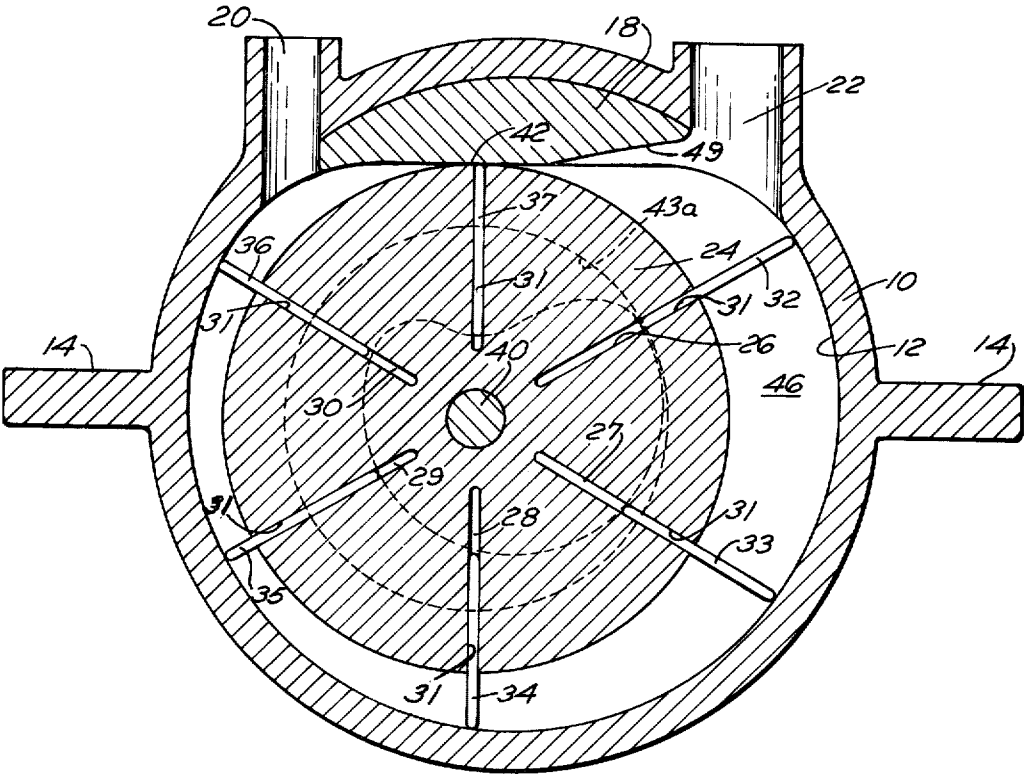


FIG. 1

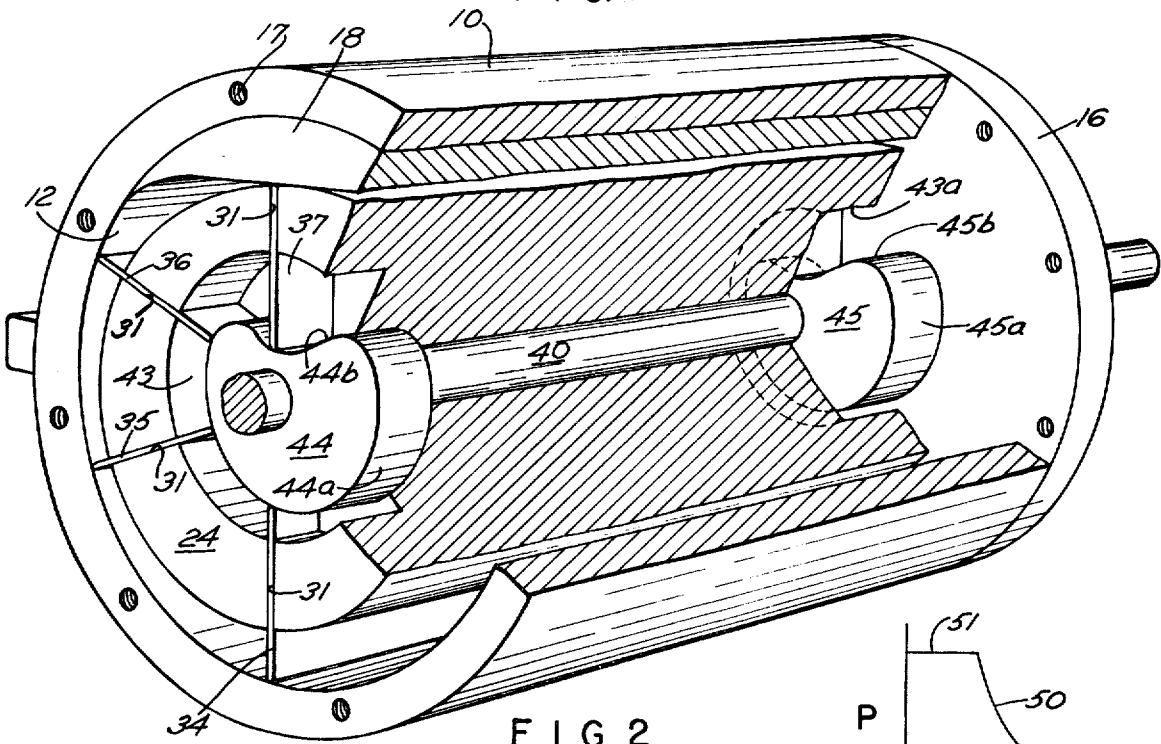


FIG. 2

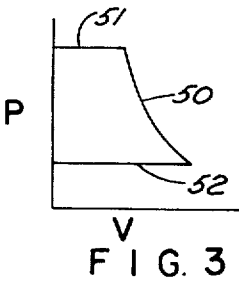


FIG. 3

ROTARY STEAM ENGINE

BACKGROUND OF THE INVENTION

It has been customary in past designs of rotary steam engines to provide a cylindrical casing and to mount a cylindrical rotor with vanes eccentrically of the axis of the housing. An arrangement such as this is exemplified by the Rich U.S. Pat. No. 2,437,653. Another approach to the configuration of rotary engines has been to utilize a cylindrical rotor and place this cylindrical rotor within an elliptical-shaped housing. An example of this type of construction is shown in the Stevenson U.S. Pat. No. 167,134 and in the Stamm U.S. Pat. No. 246,428. The difficulty with this type of configuration, however, lies in the fact that the area looked at from a cross sectional stand point between the rotor and the inner wall of the casing or housing maintains a substantially constant volume between the individual vanes as the same rotates and in fact near the end of the stroke adjacent the exhaust port results in some reduction of area or compression. In designing a steam device, it is considered very practical to follow the Rankine cycle. It is known today that this particular cycle exhibits a particular isentropic expansion curve and that in order to have efficient utilization of the steam, it is desirable that the steam expand following the ideal isentropic expansion curve to reach its constant pressure exhaust. Steam turbines closely approach working on the Rankine cycle, but heretofore there has been no simple device which would also follow this cycle with any practical configuration.

SUMMARY OF THE INVENTION

The instant invention utilizes the simple arrangement of a rotary engine configuration, and by the proper placement of the axis of the rotor within the tubular housing, the effective area of the rotating vanes increases as the rotor revolves and also the volume between the housing and the rotor and a pair of adjacent vanes exhibit an expansion as the rotor revolves, the expansion being arranged to closely follow the isentropic expansion curve of the Rankine cycle. In this fashion the efficiency of the rotary engine is greatly improved and is basically accomplished by eccentrically mounting the rotor within a cylindrical housing in such a way that the area between the rotor and the housing at the inlet port is small and gradually increases as the arcuate travel from the inlet port to the outlet port is experienced. The reason for attempting this type of arrangement is recognition of the fact that as the state of the art exists today, there is no power plant in existence that comes close to attaining the theoretical thermal efficiency of approximately 80%, since isothermo expansion can very seldom be realized in practice. It is, therefore, the main object of this invention to improve upon the efficiency of a steam engine and to have the work cycle approach that of an ideal prime mover.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a central sectional view showing the construction of my rotary engine;

FIG. 2 is a perspective view with certain parts omitted for clarity and also being cut away partly drawn in section showing my improved rotary engine; and

FIG. 3 is a pressure-volume diagram for a Rankine cycle.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The rotary engine is provided with a housing 10 which has an inner substantially circular wall 12 and suitable means, such as protrusions 14, extend radially outward from the wall to provide a mounting device or hanger means. The housing is provided with a pair of end plates 16 (one of which is not illustrated) which may be held to the housing by suitable bolt means engaging threaded bolt holes such as shown at 17. Within the housing and mounted substantially on a chordal extent of the cylindrical inner wall 12 is a header plate 18, and through this header plate 18 there extends an inlet port 20 in the form of an intake passage and an exhaust port or a passage 22, said passageways being laterally spaced from each other as shown in FIG. 1 of the drawings.

A rotor 24 which is substantially cylindrical and solid is provided, and this rotor has a number of vane slots 26, 27, 28, 29, 30 and 31 cut therein on a radius thereof, and within these slots are mounted a plurality of vanes 32, 33, 34, 35, 36 and 37, respectively. A central shaft 40 passes through the rotor and is rotatably mounted in end plate 16 by bearings not shown. The rotor by its shaft 40 is mounted with respect to the inner surface 12 of the housing in a fashion so that it is eccentric to the axis of the cylindrical housing and has a point of tangency to the header plate 18 as at 42 which is offset from the center of the header plate 18 which places the point of tangency closer to the intake passage than the exhaust passage. Additionally, it will be recognized that if an x and a y plane pass through the housing 10, the center axis of the shaft 40 is removed from the planes x and y into the third quadrant as viewed in FIG. 1. In this fashion the space between the outer surface of the rotor 24 and the inner surface 12 of the housing 10 has an ever-increasing space somewhat in the form of an involute.

Stationary heart-shaped cam means 44 and 45 are fixed to the end plate 16 and have a curved surface 44a and 45a and also a depressed surface 44b and 45b, respectively. The cams 44, 45 are received in cut-out recesses 43, 43a, at each end of the rotor. The vanes 32 thru 37 slidably extend into their respective slots 26 thru 31 respectively radially located in the rotor and extend into the chamber designated 46. They are urged against the inner surface 12 of the housing by the cam surfaces 44a, 44b and 45a and 45b, respectively.

In operation, and as viewed in the drawings, the rotor is intended to operate counterclockwise. As steam is admitted into the inlet passage 20, it will contact the vane 36 and the pressure thereof will cause the rotor to rotate counterclockwise whereupon the vanes 37 will pass the inlet port 20 and again steam will begin to enter between the chamber formed in the vane 37 and the following vane 32. This cycle will be repeated for all of the sectors between the respective vanes, and as the rotor rotates counterclockwise, the vanes gradually are moved outwardly so as to maintain slight contact with the inner surface 12 of the housing, and the steam will be permitted to follow an isentropic expansion in accordance with the curve 50 shown in FIG. 3 of the drawings which represents a pressure volume diagram with the line 51 being the constant pressure admission and the line 52 representing the constant pressure exhaust. In a steam cycle, the exhaust port 22 will nor-

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mally have a vacuum, being connected to a condenser, and to provide for complete scavenging, a groove 49 will be provided in the header plate 18 so there is no compression of gas by the vanes. Further, it is preferable to size the port 22 with an effective area on the same order of magnitude of the effective area of the vane as it approaches the exhaust, such as vane 32 in the drawings.

I claim:

1. A rotary steam engine comprising a substantially circular housing, an intake passage and an exhaust passage through said housing, a header plate mounted in said housing with an inner surface extending substantially on a chord of the circular housing, spaced intake and exhaust passages at opposite ends of the header

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plate, a cylindrical rotor eccentrically mounted in said housing to have a point of tangency at a point removed from the center of said header plate and closer to the intake passage than the exhaust passage, a shaft passing through the axis of said cylindrical rotor, the axis of said rotor located below a plane passing through the horizontal axis of said housing, a plurality of vanes reciprocally mounted in said rotor, stationary cam means located within the housing engaging the radially inner end of said vanes, said vanes contacting the housing or the header plate throughout.

2. A rotary steam engine as in claim 1 wherein a groove extends from the exhaust port substantially to the point of tangency.

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