INTERNAL COMBUSTION ENGINE—DESCRIPTION

FIG. 7 and 8, show an internal combustion engine embodiment of the invention. This embodiment is obviously quite similar to embodiments previously described. Exceptions being the inner cycle porting **44**; at least one of which serves as a combustion exhaust and another as a charging air inlet, being located closely approximate, both substantially diametric to the cycle pinch-point rather than immediately adjacent, as in pump and fluid motor embodiments.

A limited and more precise form of the displacement adjustment previously described in regard to pumps and fluid motors, is used primarily to regulate the effective compression ratio of the power cycle.

Another exception being the modified rotor, which is provided with coolant passages. A suitable coolant, usually oil or air, is inducted at the rotor hub **24**, via co-axial openings **25**, which connect and supply coolant to, radial bores within the rotor vanes **26**. The coolant being dynamically displaced from the rotor vanes via openings **29**, provided in the rotor containment ring **28**. The coolant being then reclaimed within, or expelled from, the adjustment and tie bolt clearance space within the housing assembly **40**, external to the containment ring **28**.

INTERNAL COMBUSTION ENGINE—OPERATION

Internal combustion operation of the embodiment is similar to two cycle conventional piston engine operation and may be more readily understood in this context.

In the embodiment of FIG. 7, the outer cycle serves to induct and lightly supercharge fresh combustion air. The charging air provided by the outer cycle discharge being ducted by a tunnel or conduit **65**, to the inner cycle port leading rotation. The charging air being then highly compressed as the inner cycle chamber or chambers containing the fresh charging air rotationally approach the inner cycle pinch-point.

At a predetermined point, determined largely by the angular location of the fuel injection or ignition device **61**, combustion is initiated. As combustion begins and progresses, rotation has relocated the combusting chamber to an angular position at which the rotor vane leading said chamber now has the greater surface area and the chamber internal pressure, enhanced by combustion, promotes continued rotation and a net positive output shaft torque.

As the combusting chamber pressure is expended promoting rotation, the first of the inner cycle ports, the exhaust port **64**, located about 160 degrees from the cycle pinch-point is accessed, and the spent combustion gases permitted to escape the cycle chamber. The inner cycle port **65**, serving as the cycle inlet, is almost immediately accessed by continued rotation. The fresh, lightly pressurized charge enters the venting chamber by means of said port, scavenging residual exhaust and recharging the chamber with fresh combustion air, and the cycle is repeated.

Combustion timing is accomplished primarily by providing multiple injectors or ignition devices **61**, having unique angular locations a few degrees apart.

It should be kept in mind that combustion, and in fact all operational events, are essentially continuous. Ignition and fuel injections can therefore also be continuous.

The pinch-point gap adjustment in combustion engine embodiments can be quite limited and is seldom fully closed in operation. The high velocity of the compressing charge flowing through the pinch-point at the same time as combustion is initiated or in progress, promotes thorough mixing of the fuel and air, and tends to substantially reduce combustion chamber pressure spiking, providing instead, a more gradual combustion pressure increase.

CONCLUSION, RAMIFICATIONS AND SCOPE OF INVENTION

While the above description contains many specificities, the reader should not construe these as limitations on the scope of the invention, but merely as exemplifications of perferred embodiments thereof. Those skilled in the art will envision many other possible variations are within its scope. For example skilled artisans will readily be able to change the dimensions and shape of the various embodiments, while at the some time maintaining critical relationships. Another obvious variation would be to use anti-friction bearings, multiple ports having the same function and serving the same work cycle to reduce pumping work and decrease working fluid intake velocities, and mounting the rotor assembly **20**, and confinement plates **42**, in the manner of the prior art. They will undoubtedly envision many applications, even functions which, for purposes of comprehension, and relative importance (necessarily subjective), are not specifically included in this application. An example being a flowmeter, or fluid volume measurement device in which the drive shaft **22**, need not extend outside the housing **40**; rotation being monitored by a inductive pickup mounted on, or in the housing assembly **40**, and simple permanent magnet, inset in a convenient location on the rotor assembly **20**. It will be obvious to those skilled in the art that the range of combinations afforded by the multiple work cycles, various working fluid port locations, and the various adjustments in considerable. The variety of mechanisms, to include mechanical, pneumatic, hydraulic, and electric, which can be employed to mount, guide, and perform the device adjustments previously defined, is obviously numerous and highly dependent on the application and service environment. They will also recognize that employing two or more of the present invention embodiments in various combinations can provide a third catagory of devices having unique functions not generally readily apparent. For example, combining an adjustable and reversible embodiment as a pump and a second non-adjustable embodiment as a fluid motor, and providing suitable fluid connections between the two results in a clutchable, brakeable, reversible rotary power transmission device capable of torque multiplication, which can be enclosed within a sealed case also serving to contain the working fluid supply. It is also obvious that, to attempt to delineate the embodiments, features, and components which are implied, although not specifically depicted by the description and drawing is not very practical, and would probably only serve to try the patience of the reader. Accordingly the reader is requested to determine the scope of the invention by the appended claims and their legal equivalents, and not by the examples which have been given.

What I claim is:

1. An improved, adjustable, rotary vane device of the type comprising: