NOVEL ENGINE DESIGN OF HIGHER EFFICIENCY

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Abstract

The idea of the new engine results that is possible increasing of the work efficiency of the engine. novel engine of higher efficiency development and the novel method of cylinder filling, piston stop study, dual heat path, piston cooling, combustion chamber pressure development in the constant volume phase, stress containment in the non moving piston, emissions with the direct injection installation. The creature of the solution consists in the realization the process of the combustion at the constant of the volume combustion chambers. It is realized with a piston stand during the period of combustion process. This permits on maximum pressure increasing and average indicated pressure. The enlargement of the efficiency is obtained, and finally - decrease of fuel consumption. Whereas at such itself average indicated pressure, the maximum decrease appears. This development's intention is to answer the question of alternate method of production of mechanical power from the expanding medium.

The novel engine of higher efficiency development and novel engine of higher efficiency patents address the means and methods of exchange of spent or burned gasses for the fresh charge of air or fuel–air mixture in the two stroke configuration using the circular cross section pistons like the conventional four and two stroke engines mentioned above and the practical method of stopping the piston mid cycle that will create a constant volume combustion chamber for the duration of the combustion process.

Keywords*: transport. combustion engines, constant volume combustion chamber, dual heat path, non moving piston*

1. Introduction

The engine is utilizing the two-diameter piston providing the working surface as the larger piston surface area minus the surface area of the smaller piston. The larger piston bore is opening the exhaust windows at the bottom of its stroke and the smaller piston is opening the intake windows at the same time providing the through flow through the cylinder area for efficient exhaust of the burned gases and the fresh mixture or air induction into the cylinder. The low-pressure blower is required to introduce the fresh mixture or air into the intake windows and cylinders.

No valves or valve train is used and the piston cylinder lubrication is accomplished in the same manner as the conventional 4 strokes. Higher Volumetric efficiency than the conventional 2-stroke engine is expected with the basic simplicity of the design that does not have the valves and the valve drive mechanism. The following US Patents have been issued. Patent No.: (US 6,481,393 B1), No. (US 6,895,907 B2), No. (US 6,904,878 B2), No. (US 6,955,143 B2).

2. Novel engine idea

The idea of the new engine is introduced on Figs. 1. From given of Fig. 1 results that is possible increasing of the work efficiency of the engine, co reflects the A and B area.

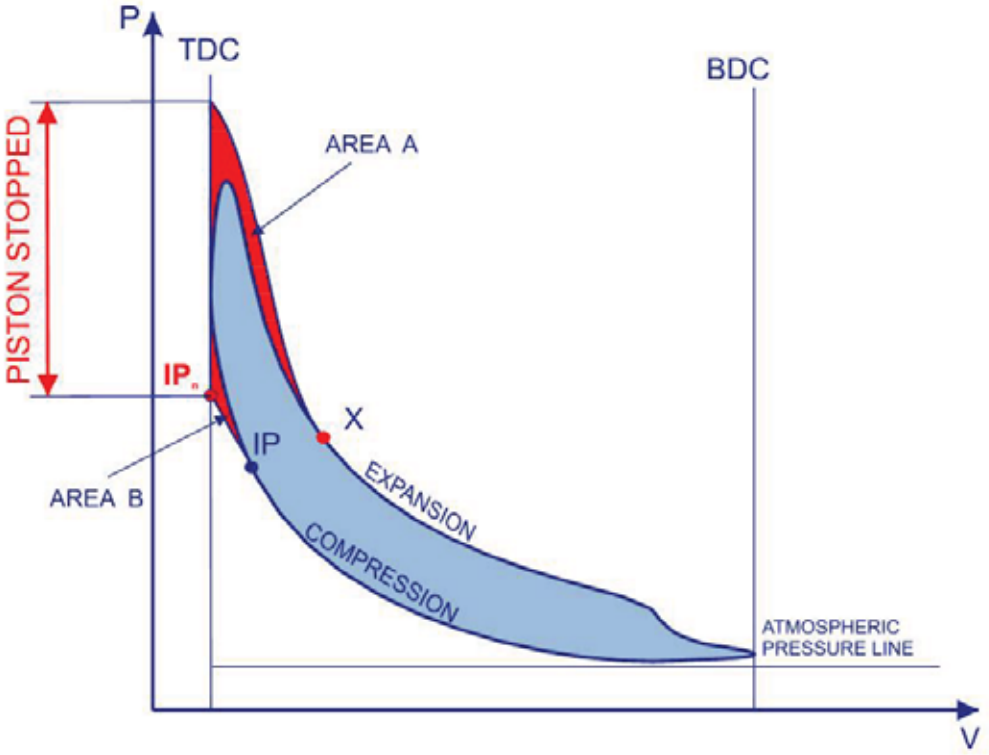


Fig. 1. Pressure changes in the piston stop cycle, novel engine design of higher efficiency

Details of the new solution present Figs. 2 - 10.

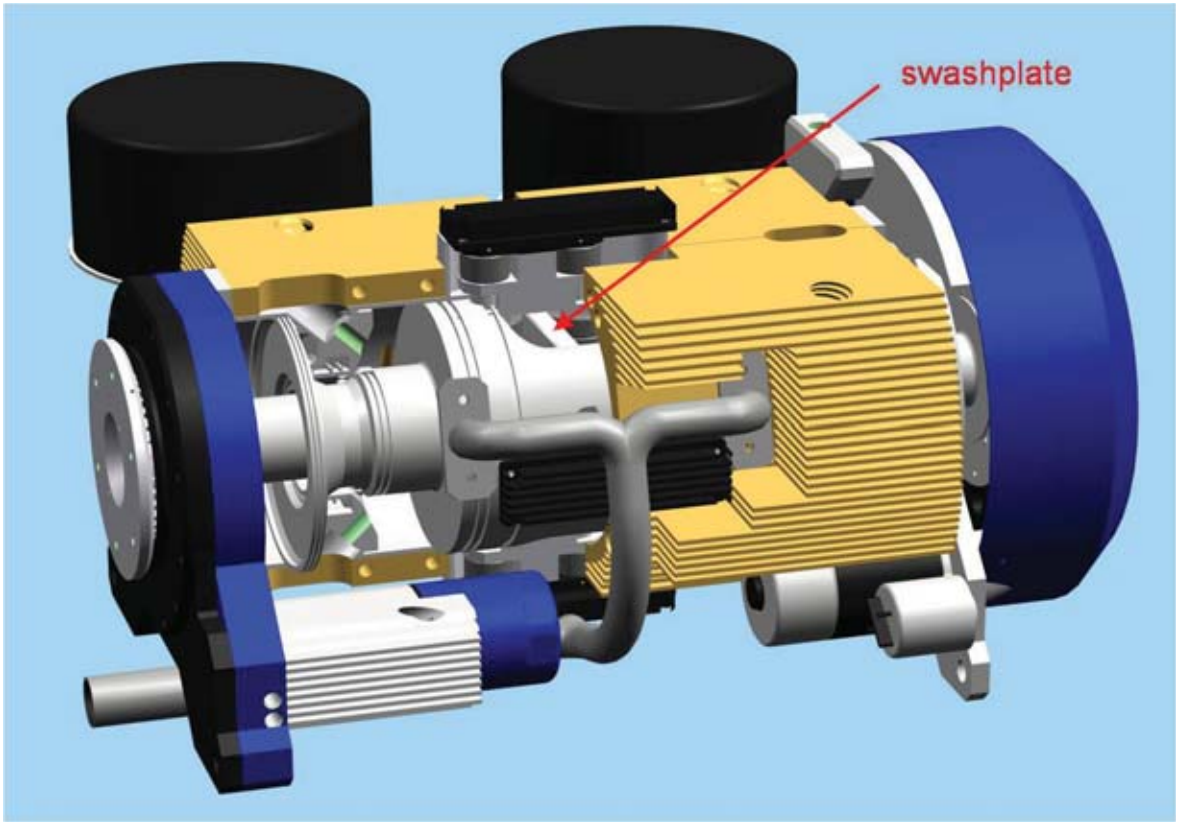


Fig. 2. Novel engine design of higher efficiency with piston stop configuration (swashplate)

In the authors view the two stroke configuration will succeed only if two of the following conditions are accomplished: effective displacement over 70 %, the effective displacement which is the displacement utilized when all the intake and exhaust widows are fully closed by the piston.

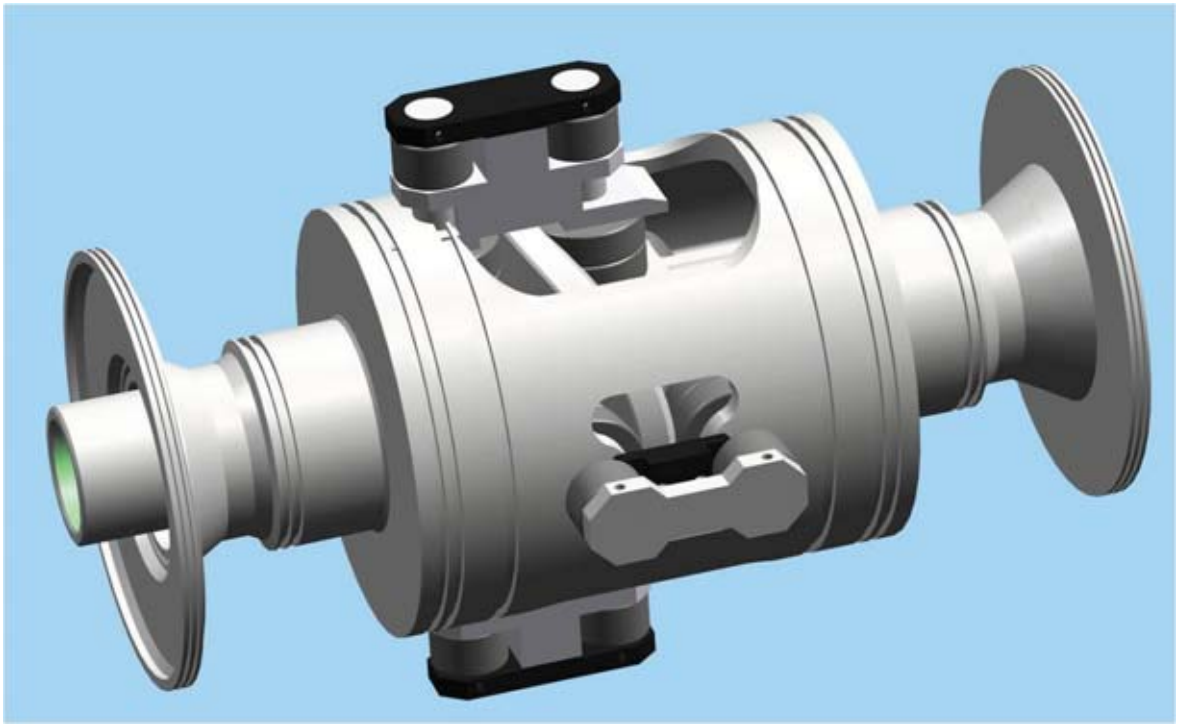


Fig. 3. Piston assembly of novel engine design of higher efficiency

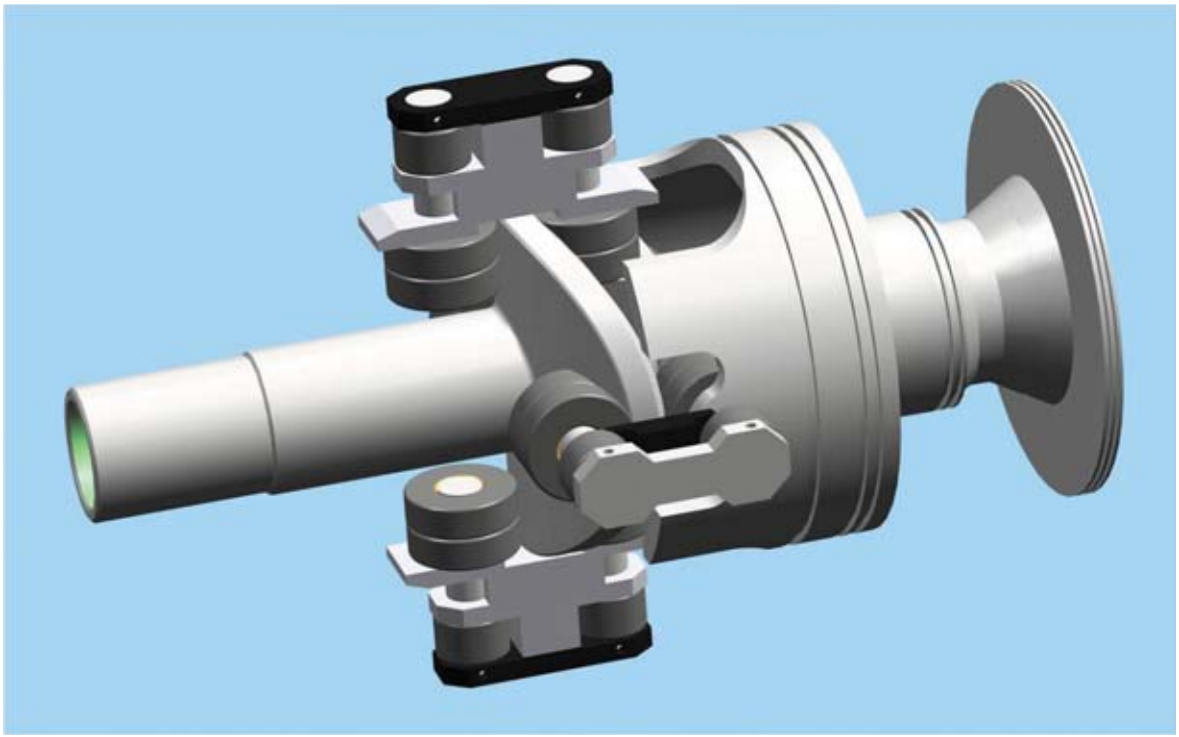


Fig. 4. Swashplate and piston of novel engine design of higher efficiency

The novel engine of higher efficiency configuration allows for the effective displacement of over 70 % of total displacement as suggested by the stroke of the piston. that above mentioned figure in the best conventional two stroke engines stands now at about 55 %. at 50 % effective displacement the two stroke engine advantage over the conventional four stroke engine is virtually

non existent and what is remaining is only power to weight ratio and the cost of manufacturing advantage due to the non existence of the valve drive train mechanism.

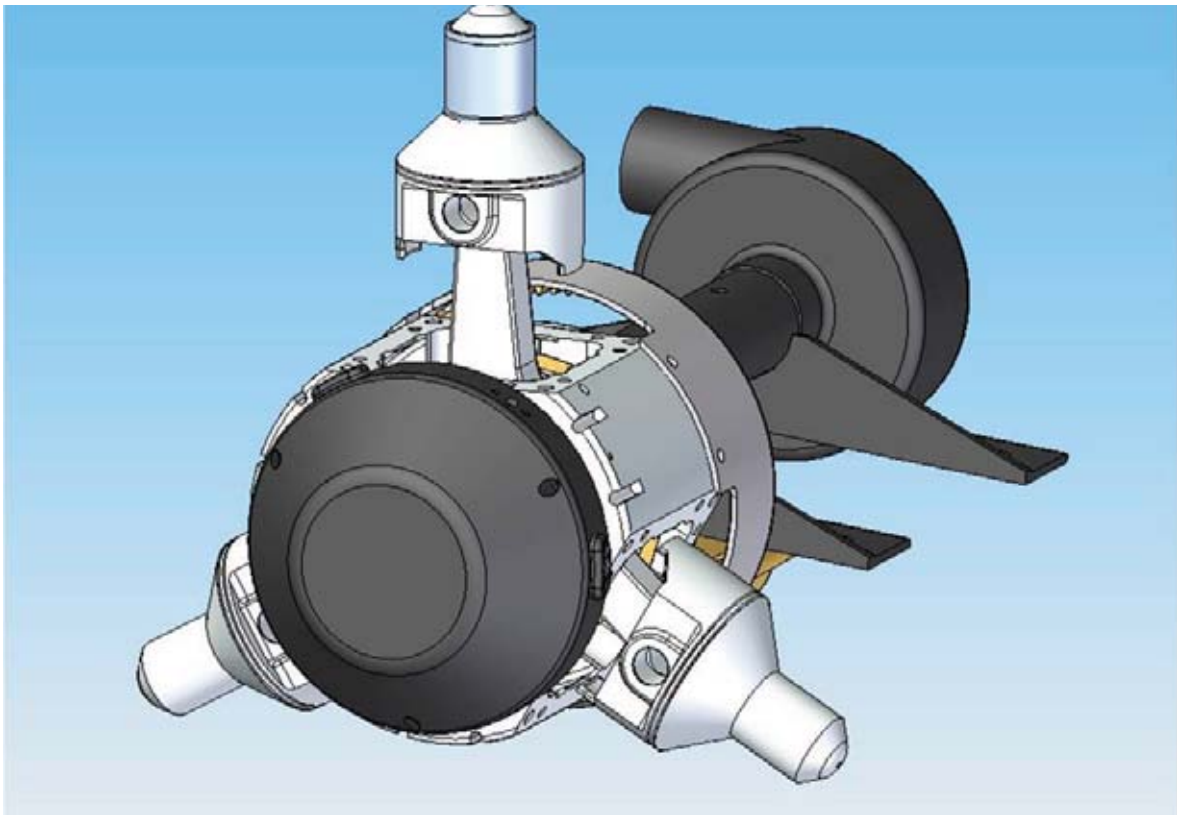


Fig. 5. Two diameter pistons, intake and exhaust lines, blower and intake configuration

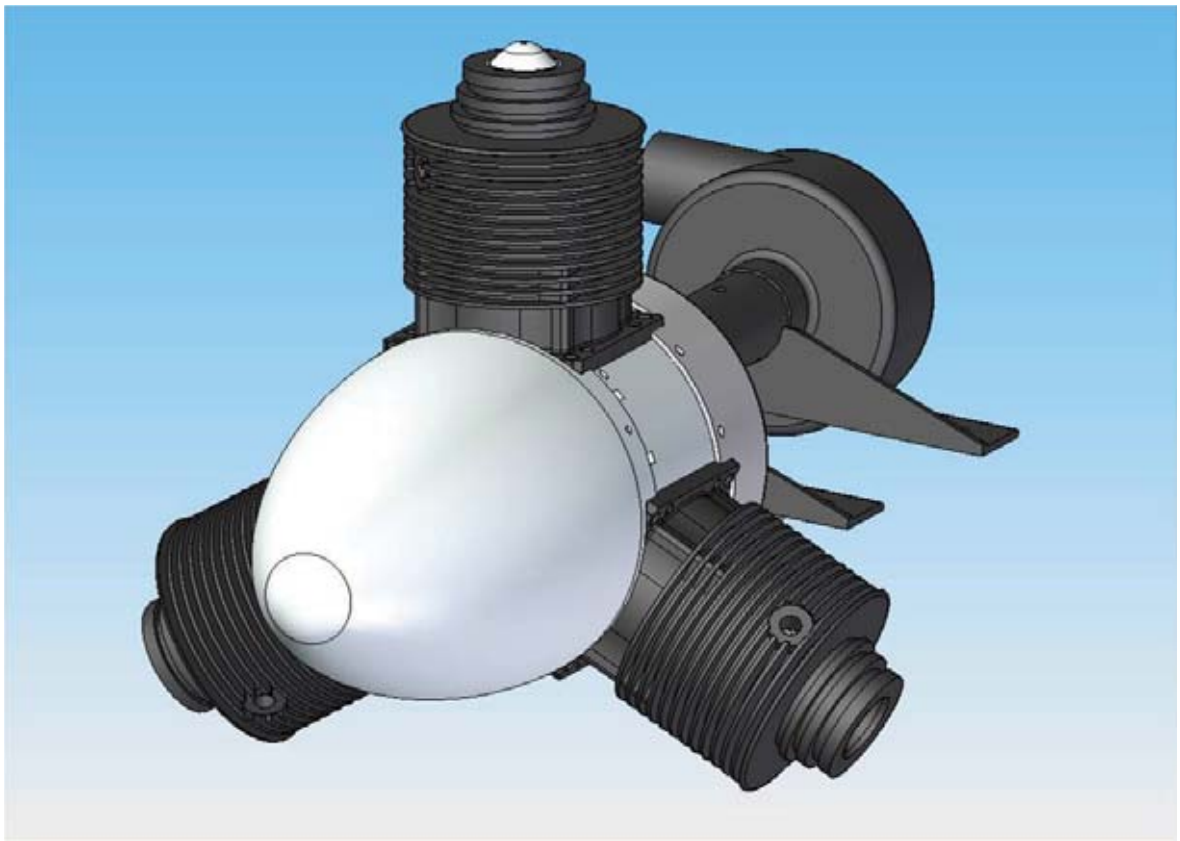


Fig. 6. Cylinder layout of novel engine design of higher efficiency

The key to the higher displacement utilization that will provide the major advantages to the two stroke operation lies in the new windows configuration, since the conventional two stroke engine positions all the windows at the bottom of the cylinder than it is impossible to replace the gasses with the small windows and regardless of the windows size the top portion of the cylinder remains difficult to reach.

Typically the gasses seeking the shortest path aerodynamically would flow from intake to the exhaust windows directly leaving the large portion of the gasses in the cylinder unchanged. In the end significant percentage of burned gasses remain in the cylinder up to 10 % leaving the remaining 90 % for displacement utilization. In the novel engine of higher efficiency configuration it is possible to have effective displacement utilization as high as 95 % or better with good exchange of gasses because the intake windows are positioned on one and of the cylinder and the exhaust windows are positioned in the other end allowing for the through flow.

That is achieved by the use of two diameter piston that will open one set of windows with larger diameter and the other set of windows with the smaller diameter of the same piston having the intake and exhaust widows positioned at the opposite ends of the cylinder. In case of the engine configured with direct fuel injection gasoline or diesel and slight overflow of fresh air the displacement utilization of 95 to 98 % can be realized in novel engine of higher efficiency configuration.

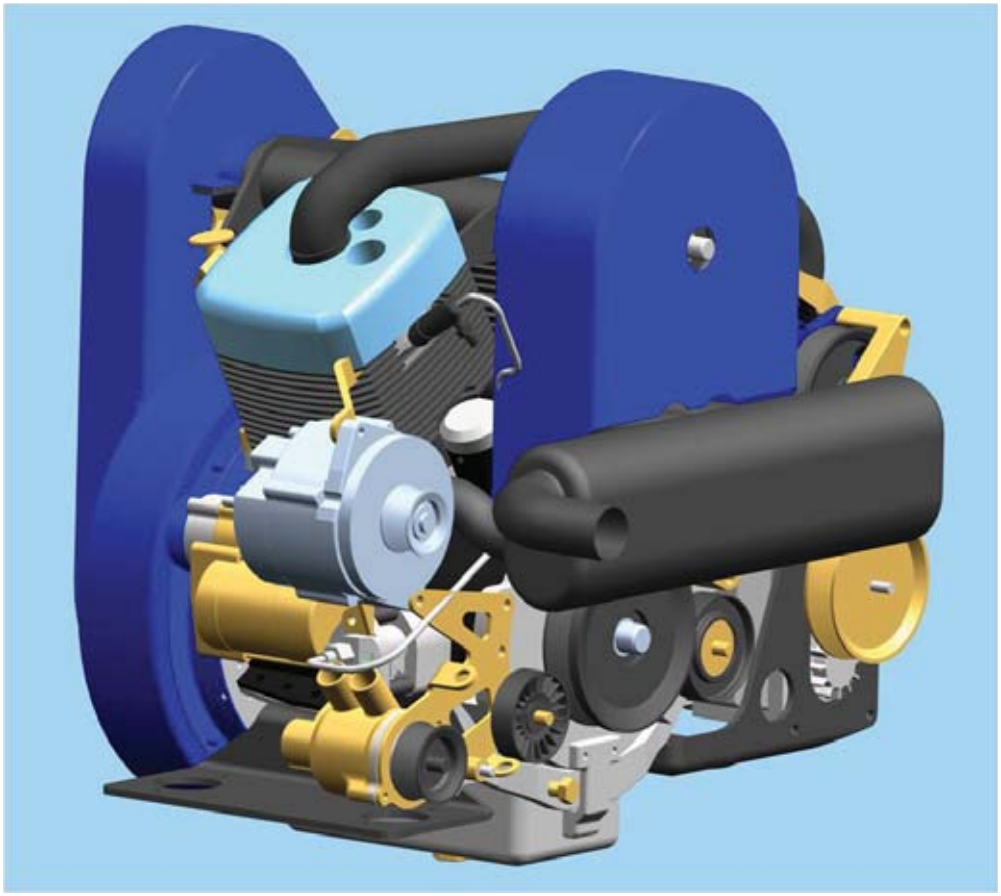
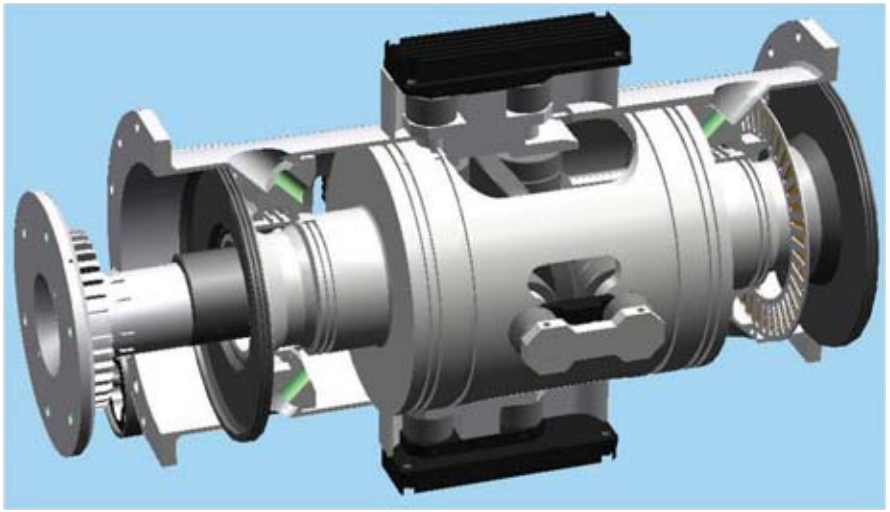


Fig. 7. 999cc V Twin novel engine design of higher efficiency and conventional crankshaft

The second part of the novel engine of higher efficiency developments and the novel engine of higher efficiency patents deals with the replacement alternative to the crankshaft and connecting rod system used exclusively throughout the engine industry excluding the Wankel engine. The issue of transforming the reciprocating linear motion into the rotary motion is resolved by the swash plate cam existing in some narrow applications in the industry at the present. The swash plate cam allows the customization of the linear to rotary movement transfer pattern to the needs

of the internal combustion engine as opposed to the conventional crankshaft where the transfer pattern is non symmetrical sinusoid with no room for optimization whatsoever.
The conventional crankshaft movement does not match the combustion and pressure change pattern in the cylinder necessitating the ignition timing advance as much as 30% or more at the high power settings allowing for the pressure rise before the TDC producing the negative horsepower and allowing the piston to lower before the combustion and pressure has risen causing the further loss of efficiency.
These problems are addressed in the novel engine of higher efficiency with swash plate cam drive mechanism fig.1 where the piston is allowed to stop for the duration of combustion eliminating the need for the timing advance this change alone is credited according to the studies of some American Universities to provide the unprecedented 25 % in efficiency gain. The piston stop and dwell is accomplished by incorporating the flat portion on the cam profile.



8. Piston and cylinders of novel engine design of higher efficiency

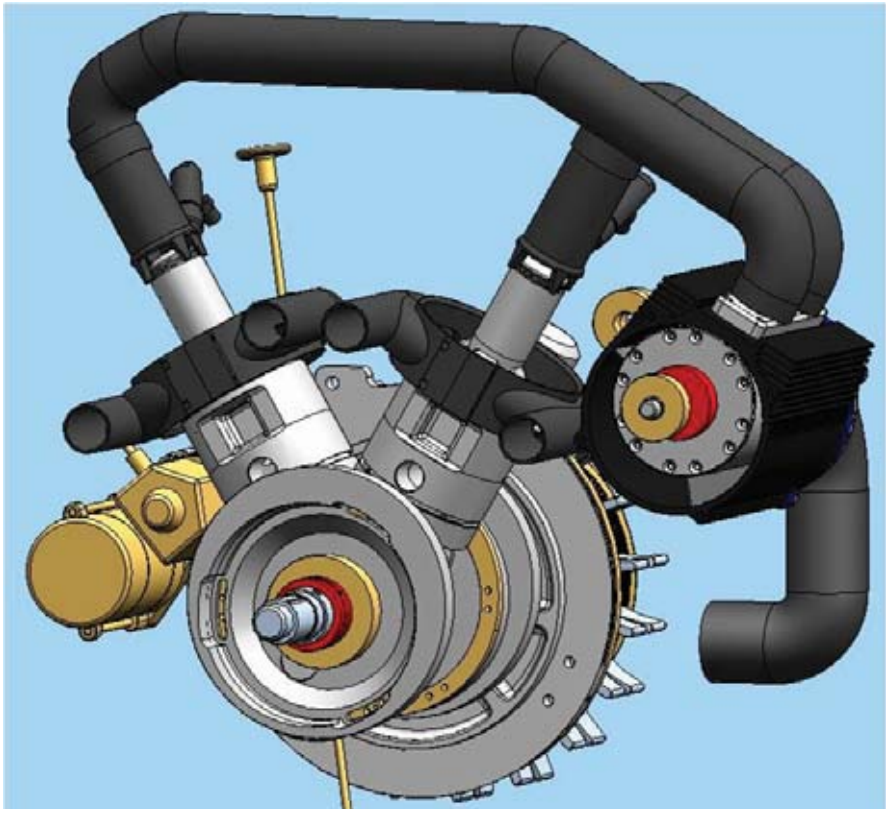


Fig. 9. Assembly with crankshaft of novel engine design of higher efficiency

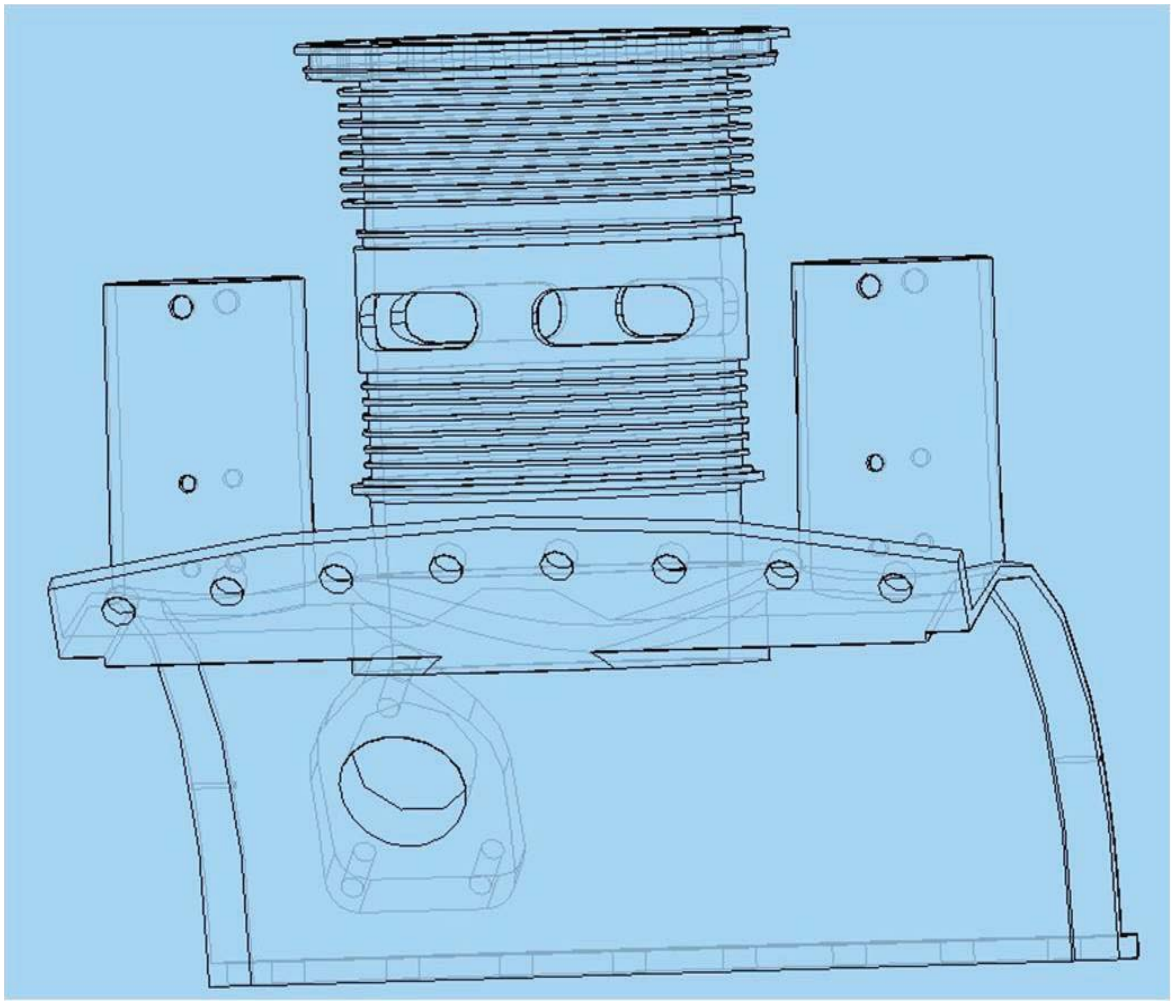


Fig. 10. V twin cylinder with exhaust windows

Fig. 11. 1200 cc 3 Cylinder novel engine design of higher efficiency radial engine

3. Conclusions

The proposed new solution allows lowering of thermal loads while in addition in increasing the overall efficiency of the engine as the result of realization of combustion process while the piston is stopped.

The key result of the novel design is also the complete elimination of inertial loads and isolation of mechanical loads while the piston is under the highest thermal loads

The effective design based solution for the suppression of thermal stresses in piston sections outside of the realm of material technology lies in the Novel engine of higher efficiency System Configuration where the whole central section of the piston is exposed to the cold air as it is forming the part of the intake device also the said intake device provides for the second heat path for conductive cooling of the piston. The Novel engine of higher efficiency Configuration virtually rewrites the rules for cooling of pistons in the internal combustion engines by creating the dual path for heat evacuation

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