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Radial Engine

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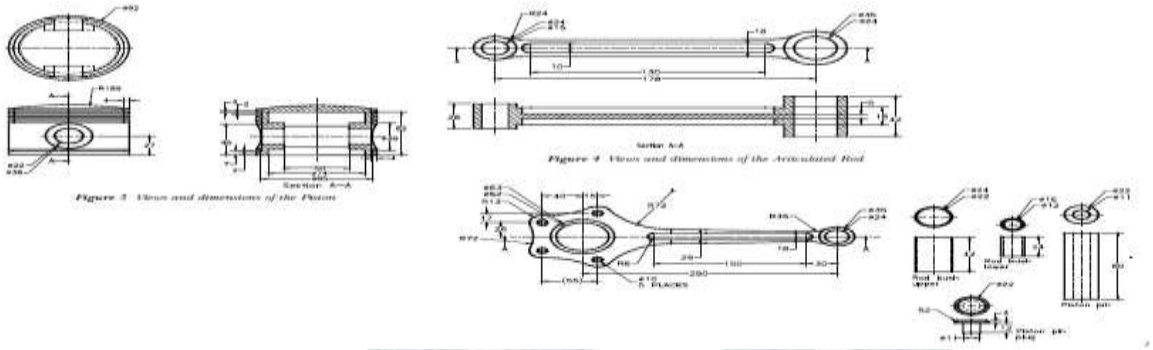
ABSTRACT :-

The main concept of our project is to design and assembly of a radial engine and also the analysis of piston & connecting rod. The radial engine is a reciprocating type internal combustion engine configuration in which the cylinder radiates outward from a central crankcase like a spoke of wheel.

The radial configuration was commonly used for aircraft engine. Designing of a radial engine is a very complicated process which involves serious of other processes that are hard to be designed. It takes a very long time of thinking of the proper dimensions, proper material (default aluminum) and even the proper shape of all different parts. It has crank case that is a little bit different than the other engines but

although that is hard to be figured out too. It also has pistons, cylinders, connecting rods, The designing is done through CATIA V5 software and the assembly is followed in assembly workbench in CATIA V5 R20.



Although nowadays used radial engine is a little engine that was not in the beginning of the aerospace transportation. Now radial engine is very helpful and mainly used because of its small weight and size. That makes it comfortable and suitable for any machine that is close of space. Despite of its small size and weight it does not make it less powerful than other engines.It was also comfortable for the World War II airplanes when the engine was in its peak. When it is war you need more space for fuel, power, weapons and bullets than any other things and then any other time. So radial engine was a great invention.

KEY TERMS :

The present invention relates to engines and particularly to radial engines. It has been developed primarily for use as an internal combustion engine in which the pistons are configured to drive the crank. However, it will be appreciated that the invention is not limited to this particular use field

INTRODUCTION

Radial engine is type of** "Internal Combustion" **engine .It is used in an aircrafts and most of the flying vehicles. It have a lot of cylinders in an add number series and all are connected in a one crankshaft in a radial position using connecting rod .

HISTORY OF RADIAL ENGINE :

*"In 1903–1904 Jacob Ellehammer used his experience constructing motorcycles to build the world's first air-cooled radial engine"**, a three-cylinder engine which he used as the basis for a more powerful five-cylinder model in 1907. This was installed in his triplane and made a number of short free-flight hops.***

FUEL TYPE :

***1.Aviation Avgas 100 LL gasoline** (because 20% more expensive)*

2.Automative ES95 Gasoline

LIQUIDLY COOLED ENGINE :

Liquid cooling systems are generally more vulnerable to battle damage. Even minor shrapnel damage can easily result in a loss of coolant and consequent engine overheating, while an air-cooled radial engine may be largely unaffected by minor damage.Radials have shorter and stiffer crankshafts, a single-bank radial engine needing only two crankshaft bearings as opposed to the seven required for a liquid-cooled, six-cylinder, inline engine of similar stiffness.

While a single-bank radial permits all cylinders to be cooled equally, the same is not true for multi-row engines where the rear cylinders can be affected by the heat coming off the front row, and air flow being masked.

ENGINE OPERATION :

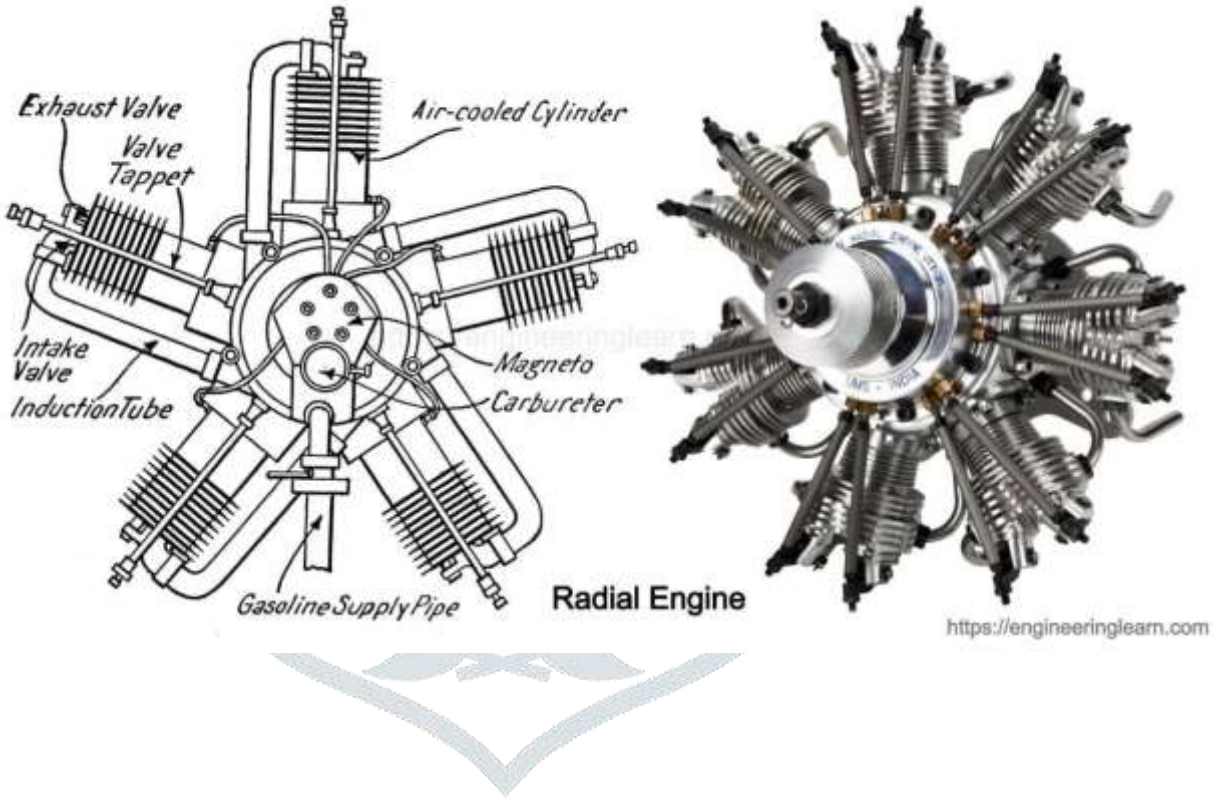
Since the axes of the cylinders are coplanar, the connecting rods cannot all be directly attached to the crankshaft unless mechanically complex forked connecting rods are used, none of which have been successful. Instead, the pistons are connected to the crankshaft a master-and-articulating-rod assembly .

One piston, the uppermost one in the animation, has a master rod with a direct attachment to the crankshaft. The remaining pistons pin their connecting rods' attachments to rings around the edge of the master rod. Extra "rows" of radial cylinders can be added in order to increase the capacity of the engine without adding to its diameter.

Four-stroke radials have an odd number of cylinders per row, so that a consistent every-other-piston firing order can be maintained, providing smooth operation. For example, on a five-cylinder engine the firing order is 1, 3, 5, 2, 4, and back to cylinder 1.

Moreover, this always leaves a one-piston gap between the piston on its combustion stroke and the piston on compression.

The active stroke directly helps compress the next cylinder to fire, making the motion more uniform. If an even number of cylinders were used, an equally timed firing cycle would not be feasible. The prototype radial Zoche aero-diesels (below) have an even number of cylinders, either four or eight; but this is not problematic, because they are two-stroke engines, with twice the number of power strokes as a four-stroke engine per crankshaft rotation.



As with most four-strokes, the crankshaft takes tworevolutions to complete the four strokes of each piston (intake, compression, combustion, exhaust). The camshaft ring is geared to spin slower and in the opposite direction to the crankshaft. Its cam lobes are placed in two rows; one for the intake valves and one for the exhaust valves. The radial engine normally uses fewer cam lobes than other types. For example, in the engine in the animated illustration, four cam lobes serve all 10 valves across the five cylinders, whereas 10 would be required for a typical inline engine with the same number of cylinders and valves.

AREA OF APPLICATION :-

Most radial engines use overhead poppet valves driven by pushrods and lifters on a cam plate which is concentric with the crankshaft, with a few smaller radials, like the Kinner B-5 and Russian Shvetsov M-11, using individual camshafts within the crankcase for each cylinder.

A few engines use sleeve valves such as the 14-cylinder Bristol Hercules and the 18-cylinder Bristol Centaurus, which are quieter and smoother running but require much tighter manufacturing tolerances

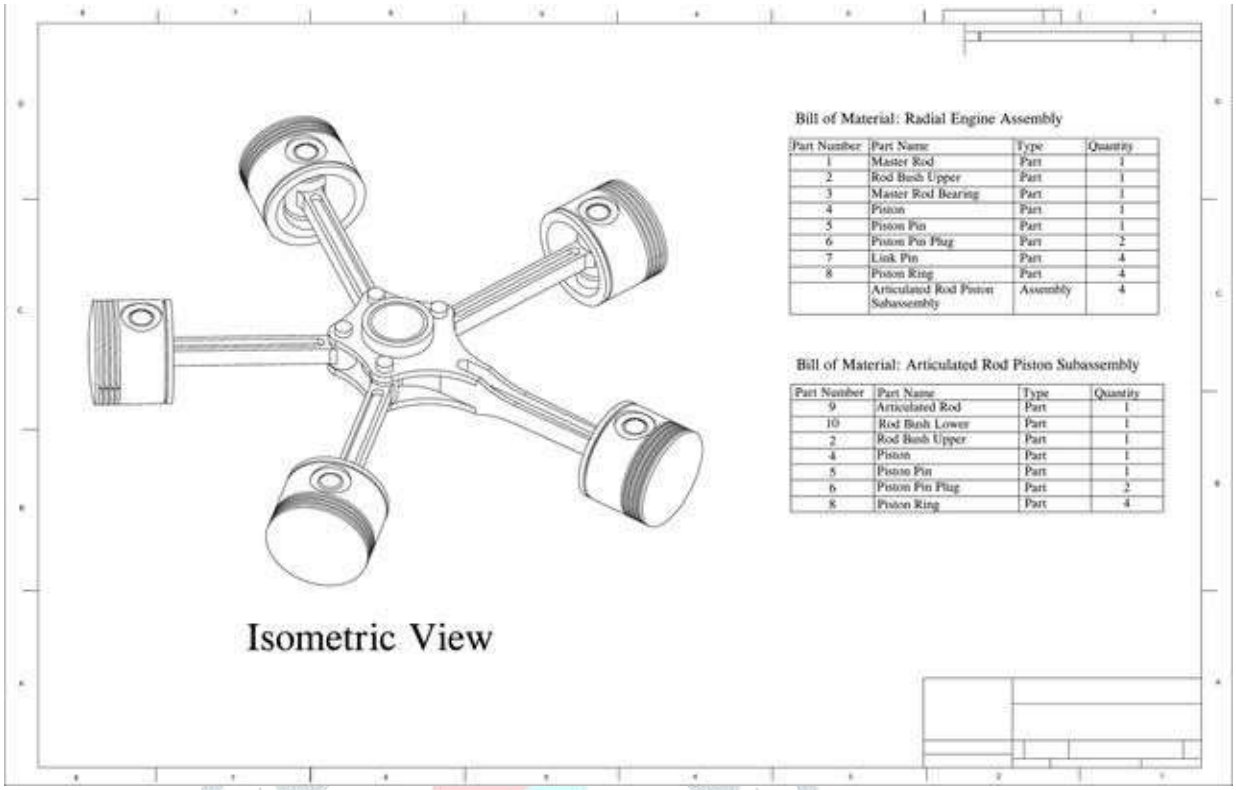
In the years leading up to World War II, as the need for armored vehicles was realized, designers were faced with the problem of how to power the vehicles, and turned to using aircraft engines, among them radial types. The radial aircraft engines provided greater power-to-weight ratios and were more reliable than conventional inline vehicle engines available at the time.

This reliance had a downside though: if the engines were mounted vertically, as in the M3 Lee and M4 Sherman, their comparatively large diameter gave the tank a higher silhouette than designs using inline engines.

METERIALS FOR RADIAL ENGINE *:-*

The main object of this project is to design the radial engine in thermal analysis by varying the temperature using different materials as Al 1060 alloy, cast carbon steel and grey cast iron on piston, connecting rod and master rod.

They're still used, but there's very little practically for a radial engine today. About the only place you'll see them in a few old school airplanes. Radial engines are still used on legacy applications. But you will not find them used on new aircraft.



CONCLUSION :-

Radial Engine is a new revolution of the Flying vehicle department & it is a key research topics for engine researcher. It was play the main role in Air-force Department and help for the engineers to get a idea for making a new innovative and more efficencyfull varius typed Engine.

ACKNOWLEDGEMENT :-

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REFERENCE :-

o get more power out of a radial engine, engineers added multiple rows of cylinders. The Pratt & Whitney Wasp Major uses four rows of seven cylinders (that's 28 total cylinders!) with a supercharger to generate up to 4,300 horsepower. It powered many of the last piston-powered large aircraft, including the B-36 Peacemaker (which used six Wasp Majors and four turbojets) and the Martin Mars.