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THE DESIGN OF A DEVICE TO DISMANTLE PISTON CYLINDER LINER IN A MARINE SHIP ENGINE

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Confession

"I admit it that this report is as a result from my own work and research only for the summary and passage that each of them I have stated the source"

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This report is about a device to dismantle piston cylinder lining in a marine ship engine. Many contributions that have been received in order to completed this report. Thank you to all that are involved, this especially my supervisor IR Talib bin Din, my family. The guidance and idea that are given by my supervisor IR Talib bin Din. He helps me to conduct my report and giving his opinion on how to design of the device. For my family, their support in my studies gives me a huge boost in increasing my confident to conduct a research and to design the product. Thanks also to my friends with their never ending suggestion and support. All the staff at MTU Services Malaysia (MSM), with their knowledge, experience and all the information about the engine. Without all of their support and contribution, this report can't be done as if today. Through all these, I want to thank you all the contributors that are not stated in this report.

ABSTRACT

This research is based on the design of a device to dismantle piston cylinder lining in a marine ship engine. Marine ship engine is a bit different with the diesel engine that is use in land. This is because, the diesel marine engine has a raw water pump. This pump is use to circulate the raw water that are being suck from the lake or the sea into the engine that are hot due to its operating temperature. For the cylinder liner, the hot temperature is cool down by the fresh water that are circulate by the fresh water pump.

The biggest advantage in designing this new tool is shortening the dismantle step. With the existing tool, we have to dismantle first the oil pan, the drive train and many more. But with the new design tool, we can shorten the entire step. We can straight to dismantle the piston cylinder liner after dismantling the cylinder head.

In this report also, I try to provide the information about the components that are related to the main objective. It helps in the research of the design.

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LIST OF SYMBOLS

SYMBOL	DEFINITION
F_f	Force exerted by friction
μ	Coefficient of friction
N	Normal force
τ	Torque
r	Particle's position factor
F	Force acting on the particle
μ_s	Screw threaded friction
μ_c	Collar friction
f	Coefficient of rolling friction
w	Weight
R	Radius
g	Gravity

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CHAPTER 1

INTRODUCTION/OVERVIEW

Every engine has its own specification and its own method to produce energy. In today's world, there are many type of engine. Some use a substance such as petrol, diesel, biodiesel and many more. This substance make the engine to produce power to make the engine itself works.

Nowadays, we can see that engineer in this world try to produce an engine that is not using the earth source that are depleting now. Through this, we can save the source for better use and in the same time makes the earth greener.

Heat are generate being engine system that are being operated. With this, every engine has it own cooling system. Some of the engine we can just use the air from the surrounding to cool down the heat, but for some engine we have to use any other way to make it cooler. Such as using the fresh water, sea water or even air that is fan generated. It is important to make the engine preserve its temperature. This is because if the engine's temperature is hotter or even cooler than its operating temperature it will not operate properly. The rising of temperature in the engine is due to the system inside the engine itself. In the engine, we have the pistons that are moving up and down in the block or crankcase, the rotating of the camshaft to guide the rocker arm and many more.

For an interval of time, every engine has to be maintained and service with the right method. This is because the performance of the engine is good and the life cycle of this engine is longer. To get this condition engine we must also follow up with full servicing schedule and replacing the wear and tear parts.

Here is the patent that suite the agenda of the report that is designing a device to dismantle piston cylinder liner in a marine ship.

Title:	**Diesel engine cylinder liner puller tool**
Document Type and Number:	United States Patent 3945104
Link to this Page:	http://www.freepatentsonline.com/3945104.html
Abstract:	A tool apparatus for removing the cylinder liner from an engine block with or without the assistance of the piston which is slidably mounted within the liner. The apparatus includes a portion which is firmly attached to the cylinder liner from the exterior of the engine block and has an impact member for removing the liner.

Table 1.1 – Patent of cylinder liner puller tool

1.1 GENERAL SPECIFICATIONS OF A DIESEL ENGINE

These are the general specifications of a diesel engine. This is important during the designing process of the tool for the marine engine. This helps to gives an exposure in the design of the tool and the specification or method that is going to use for the engine itself.

1.1.1 Subdivision of Diesel Engine

Diesel Engine is one of many type of the engine that are still been used widely nowadays. A diesel engine define as an internal combustion engine in which the liquid fuel injected into the combustion chamber is ignited by the air charge after the air has been compressed to provide the high temperature required for starting the ignition. Here are the types of a diesel engine that are already developed.

i. Whirl Chamber Diesel Engine

This diesel engine works with subdivided combustion chamber in which the fuel is injected into a combustion chamber communicating with the power cylinder through a relatively wide opening. The air flow will be properly directed during compression.

ii. Air Cell Diesel Engine

This type of diesel engine operated with a subdivided combustion chamber in which the fuel is injected directly into the cylinder main combustion chamber and can flow from there into air cell (secondary chamber) only.

iii. Diesel Engine with Direct Injection

Diesel Engine with Direct Injection is a diesel engine in which the liquid fuel is injected directly into the non-subdivided combustion chamber.

iv. Prechamber Diesel Engine

Prechamber Diesel Engine is a engine with subdivided combustion chamber in which the fuel is injected into a chamber (prechamber) communicating with the power cylinder through one or several relative small openings. No directed air flow in chamber is required.

1.1.2 Mixture Formation in Reciprocating Internal Combustion Engines

In a diesel engine there is a mixture formation in Reciprocating Internal Combustion Engine. Mixture formation is the characteristic for completion of fuel and air mixture. The importance of the mixture formation is that the ideal formation gives a best combustion in the combustion chamber. This makes the engine running with no problem.

These are the types of the mixture formation.

i. Engine with the External Mixture Formation (Carburation)

An External Mixture Formation means that fuel and air mixture is completed outside cylinder in intake pipe. So this means that the mixing process does not interfere with the internal of the engine

ii. Engine with Internal Mixture Formation (Fuel Injection)

For the Internal Mixture Formation, the mixing for air and fuel took place and completed in the cylinder or in a secondary chamber.

a) Diesel Engine with Direct Injection

Direct injection is where the liquid fuel is injected directly into the non-subdivided combustion chamber.

b) Prechamber Diesel Engine

Prechamber diesel engine has a subdivided combustion chamber in which the fuel is injected into a chamber (prechamber) communicating with the power cylinder through one or several relatively small openings. No directed air flow in chamber is required.

1.1.3 Cylinder Charge of Reciprocating Internal Combustion Engines

Cylinder charge for a diesel engine is the characteristic for the weight or air entering cylinder during suction stroke. For an engine, the more the air entering the mixing chamber means that the pressure is high and more power would be produce.

i. Natural Aspiration

During natural aspiration the fresh charge is drawn by the power piston directly into the power cylinder, after the combustion gases of the previous cycle have been pushed out of the power cylinder also by the power piston.

ii. Supercharging

a) Resonance Supercharging

Supercharging whereby the fresh charge is initially compressed by means of a pressure wave in intake line.

b) Independent Supercharging

The power for supercharging is taken from an independent power source.

c) Mechanical Supercharging

The power supercharging is taken from a shaft of the internal combustion engine to be supercharged.

d) Exhaust Gas Turbo charging

The power for supercharging is generated by an exhaust gas turbine driven by the exhaust gases of the internal combustion engine.

1.1.4 Operating Methods of Reciprocating Internal Combustion Engines

Operating cycle is one operating cycle comprising all the sequence in a cylinder which is periodically repeated.

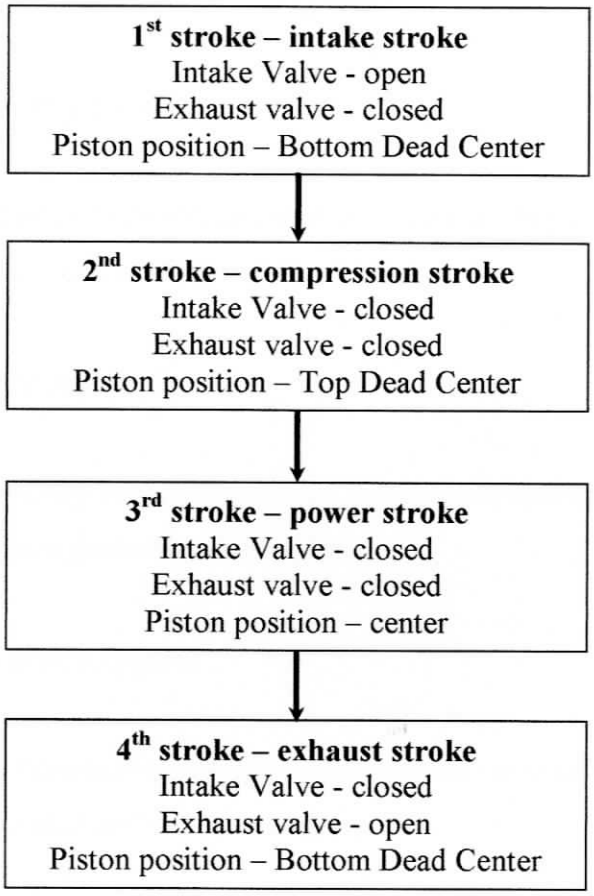
i. Two stroke Method

One cycle comprise one revolution of crankshaft, corresponding to two stroke of piston.

ii. Four stroke Method

One cycle comprises two revolutions of crankshaft, corresponding to four stroke of piston.

The four stoke of the cycle are:



Figures 1.1 – Flow of engine stroke

1.1.5 Design Configuration of Reciprocating Internal Combustion Engines

Design Configuration according to operation.

i. Single acting Engine

Single acting Engine means that the piston is charged by combustion gases from one side only.

ii. Double acting Engine

Double acting Engine means that the piston is alternately charged by combustion gases from both sides.

iii. Double piston Engine

For this Double Piston Engine, there are two pistons for one combustion chamber for an engine.

a) Opposed Piston Engine

The pistons Engine is a double piston engine that move in opposite directions.

b) U-pistons Engine

For the U-pistons engines, the pistons move in the same directions

iv. Compound Engine

The effective output is generated by a multi-stage expansion of the working medium and is taken directly from each stage.

1.1.6 Design Configuration of Reciprocating Internal Combustion Engines

Design Configuration according to position of cylinder axis.

i. Vertical Engine

Essentially vertical layout of cylinder axis (axes), with the power cylinder(s) located above crankshaft.

ii. Horizontal Engine

Essentially horizontal layout of cylinder axis (axes).

iii. Inverted Engine

Essentially vertical of layout of cylinder axis (axes), with the power cylinder(s) located lower than the respective crankshaft axis.

1.1.7 Design Configuration of Reciprocating Internal Combustion Engines

Design Configuration according to cylinder layout.

i. In-line Engine

Cylinder arranged in a place with crankshaft axis or in parallel with such axis.

ii. V-engine

Layout of cylinders in two planes located at an angle , with their line of intersection through crankshaft axis or in parallel with such axis.

iii. Opposed-cylinder Engine

Layout of cylinders in one plane with two opposed cylinder banks.

iv. Radial Engine

Layout of cylinders in one or several planes in vertical relation to crankshaft axis (single row radial, double row radial, three row radial engine etc.)