

SMT for cylinder Head Valve Disc lock dis-assembly

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Abstract

Due to running of engine over the years it is essential to replace the parts of IC Engine or overhaul them after a certain period of time. Intake and exhaust valves also wear out due to relative motion between Engine Head and the valve. For the overhauling of engine, the valves need to be removed from the engine assembly. The traditional method used for these replacement is manual in which the spring is compressed and then the washer and retainers are loosened from the top of the valve stem which in results the removal of valve stem. These method is harmful to the worker and requires more skills to remove the valves. As these procedure is more tedious and time confusing, it is necessary to introduce a new tool or method which can easily remove the valves from the engine. Removal and replacement of the valves in engine is most frequent procedure in all engine and engine overhauling departments. Therefore, for efficient removal of valves, the conventional method should be eliminated and a new more convenient method should be introduced. These report gives an overview of a surface mount tool for the easy removal of valves in an engine. These new tool enables the compression of four spring simultaneously and the removal of valves from each cylinder. A flat plate is used to compress the spring of four valves at a time with the help of castle nut and pins. After the compression of the springs, A tool is used to rotate the valve cap which also removes the valve stem. A rubber pad is used to avoid the relative motion between the valves. This mechanism allows the easy removal of valves in less time.

Keywords: Valves, removing mechanism, disassembly

1. Introduction

Valve typically used to control the timing and quantity of gas or vapor flow into an engine. It consists of a hole, usually round or oval, and a tapered plug, usually a disk shape on the end of a shaft also called a valve stem. The portion of the hole where the plug meets with it is referred to as the 'seat' or 'valve seat'. The shaft guides the plug portion by sliding through a valve guide. Because of the constant reciprocating motion of the valve assemblies, the valves and valve seals and valve springs are subject to wear and fatigue thereby causing a loss of compressive force and eventual fracture. These wear and tear in valves can decrease the efficiency of engine. Therefore it is compulsory or essential to change the valves after a certain period of time. These replacements can be done by removing the retainer, springs and then the valve stems. The conventional procedure of replacing these type of valves is very tedious and time consuming, hence there should be a method which can remove or replace the valves in engine more easily and can save the time required. The conventional method includes a Spring in the valve which is used for to compensate the pressure that is present in the cylinder. To remove the valve stem, it is required to compress the spring independently so by applying a force to compensate the spring action going to be the task one and to avoid the relative motion between the valve and valve cap valve is pressed against the valve seat. This is done

using the rubber pads by tightening the bolts. Then by using socket and spanner the valve's cap is loosened and removed from the valve assembly. As these conventional method is very time consuming and difficult. It also requires many equipment and skills. Hence it is required to introduce a new method or a tool which can easily remove the valve.

2. Literature Review

1. US. Pat. No. 5,241,734 issued to Brackett on Sep. 7, 1993 apparatus and method for removing and installing valve-spring retainer assemblies includes a mechanism which uses the existing hole in the head, i.e. Spark plug opening. It uses the liver for compressing the springs of the intake and outlet valves. The force is applied on the one end of the lever which push down the opposite end of the lever. The rod which is inserted in the spark plug opening act as a pivot point for the lever. The above mechanism can be also used for four valves of IC engine by making a x shaped tool. The prime function of the tool is to compress the springs to facilitate the easy removal of valves.
2. In another study, the authors have proposed a mechanism also uses the lever for compressing the springs. Unlike the previous mechanism the tool is having a threaded rod placed in nonthreaded seat. When the threaded rod is turned the rocker arm goes in upward direction which will cause the

other end of the arm to compress the spring. The pivot point for the arm used the support pin holes for mounting. The threaded rod is a safe approach because it will not slip in any condition, which was the major disadvantage in the previous attempts.

- US. Pat. No. 4,780,941 issued to Tucker on Nov. 1, 1988 quick mount hand valve spring compressor tool helps in compressing the spring of intake-outlet valve. The tool is having a support at the threaded rocker stud. The mechanism is attached to the rocker stud, and arm is rotated by hand. so, by rotating the arm spring will be pushed down. The major disadvantage of this tool is that it will only compress one spring at a time, it is hard to use for the multiple springs.

3. Need of SMT for cylinder Head Valve Disc lock dis-assembly

3.1 Problem Statement

- During stripping section, disassembly and washing of all parts takes place. Various techniques are used for disassembling the parts of engine. But the conventional method used for removing the valves of cylinder inlet & exit valve from cylinder head is tedious.
- Operator used to place the rigid rubber pads at bottom and hammer them all. Lock nut is placed in studs and pointer is inserted to open the valve lock which is supported by wooden block. By using socket & extension valve cap is removed. This process is lengthy as well as harmful to the operator.
- Hence it is necessary to designed one mechanical tool to safely remove the valve cap with minimum efforts and time. Major advantage is after placing at one position four valve caps can be removed at a time which results in increasing speed and productivity.

3.2 Objective

- The conventional method used for removing valve is time consuming, unsafe for operator as well as not even accurate. Retainer ring gets jammed into valve stem so for removing retainer the operator has to hammer it. This can cause damage to retainer ring, valve stem and to the spring.
- Therefore, with a vision to provide an alternative and easier methods for the same purpose there is a need to design equipment which will facilitate the job. So, for this reason it is necessary to design a special machine tool, which can minimize the efforts and time required to dis-assemble the

valve spring assembly without damaging other components and ensuring safety of the worker.

4. Concept and working of SMT for cylinder Head Valve Disc lock dis-assembly

The new tool designed consist of following parts:

1. Plate
2. Pin
3. Castle Nut
4. Socket
5. Handle
6. Rubber Pad

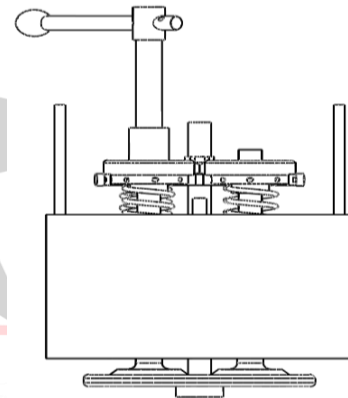


Fig.1 SMT for Valve Disc lock dis-assembly

1. The Rubber Pad is pressed against the valve from the bottom side of engine head. This will restrict the motion of the valve with respect to the valve seat.
2. Plate is inserted in the rod of the rubber pad. A castle cut from the above is screwed up to the plate.
3. The SS Pin is now inserted in holes of the retainer through the slots provided in the plate.
4. The castle nut is tightened so that the plate is pressed downwards, Compressing the all four springs.
5. This will release the pressure on the Valve cap.
6. Now the Four Sockets are rested on the valve caps.
7. The Handle is attached to one socket valve.
8. The Handle is rotated to unscrew the Valve cap from the stem valve.
9. The all four Valves are removed one by one using the handle.
10. Then Castel is loosened and Rubber pad is removed.
11. In the end all parts of the assembly are separated.

5. Conclusion

- This tool is safer than the conventional method.

- Time required for the disassembly is less.
- It is more reliable than any other method.
- Manufacturing processes are complex and time consuming.

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