APPARATUS FOR RENEWING DAMAGED SPARK PLUG PORTS

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ABSTRACT

A tool for reworking spark plug ports in soft metal cylinder heads and comprising successive sections starting with a reduced extremity tapped to fit the original thread of the spark plug port, followed by two successive reamer sections of smaller and larger diameters, respectively, a tapered lead-in section, a tapping section and a third reamer section having a diameter larger than that of the tapping section to produce a countersink at the mouth of the spark plug port. Beyond the third reamer section the tool is provided with a hexagonal or other polygonal section for engagement by a wrench or the like. A separate handle portion having an internally threaded axial bore is provided for engaging the entering end of the reaming and tapping tool after the latter has penetrated through the cylinder head, which handle portion is provided with serrations surrounding the mouth of its axial bore and is counter-bored at the mouth to receive at least a part of the reamer section of the reaming and tapping tool.

5 Claims, 3 Drawing Figures
APPARATUS FOR RENEWING DAMAGED SPARK PLUG PORTS

BACKGROUND OF THE INVENTION

Many internal combustion engines currently in use are provided with cylinder heads of relatively soft metal such as aluminum, the spark plug ports of such cylinder heads being drilled and tapped directly into the soft metal of the cylinder head. When the hard metal thread of a spark plug has burrs on it, or is cross threaded into the soft metal port, the thread of the latter is damaged, sometimes to the extent that the spark plug may be blown out of the port by the combustion pressure within the cylinder, thus shearing and completely destroying the threads of the port. In other cases the threads of the port are damaged to such an extent that leakage results causing loss of compression rendering the engine incapable of proper operation. In such cases it is necessary to rework the damaged port to permit the installation therein of a hard metal insert or sleeve which is internally threaded to receive a spark plug of the type originally installed. A tool is presently available for reaming and tapping such damaged spark plug ports, which tool comprises an entering section of reduced diameter, provided with a thread similar to that of the spark plug originally installed in the damaged port. The entering section is followed by a reaming section and a tapping section, and at the end opposite the entering section the tool is provided with a polygonal section for engagement by a wrench or the like for rotating the tool. In the case where the original thread of the spark plug port has been substantially or completely destroyed, the tool just described can not be satisfactorily employed as the original thread of the port is needed to pull the tool through the port. If an end thrust is applied to force the tool through the port the tool is caused to wobble, causing it to ream out a hole of irregular shape and somewhat larger than intended with the result that the insert, when installed, is loose and can not satisfactorily contain the combustion gases.

SUMMARY OF THE INVENTION

The present invention is intended to eliminate the difficulties described above by providing a tool consisting of a working part and a handle part, the entering end of the working part being somewhat longer than that of the prior art tool described above, and the handle part having an internally threaded bore adapted to engage the entering end of the working part after the latter has penetrated through the cylinder head. By exerting tension upon the handle portion, an axial force may be applied to the working part of the tool regardless of the condition of the original thread of the spark plug port, without causing the working part of the tool to wobble. Preferably the reaming section of the working part consists of two reamers of smaller and larger diameters, respectively, so that the reaming action requires less torque than is required in using the tool heretofore available. The reamer section of the working part is followed by a tapered lead-in section and a tapping section, which in turn is followed by a further reamer section for producing a countersink at the mouth of the spark plug hole or port, to receive the head flange of a hard metal insert. The outer end of the working part is provided with a polygonal section for engagement by a wrench or the like.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an exploded side view of a tool in accordance with the invention, the handle portion shown partly in axial section;

FIG. 2 is a sectional view through a cylinder head showing the tool of FIG. 1 in use; and

FIG. 3 is an exploded fragmentary sectional view through the spark plug port of FIG. 2 after reworking, and showing an insert about to be installed therein.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, the tool of the present invention comprises a working part 10 and a handle 11, the latter being preferably cylindrical in shape and having an axial bore 12 which is internally threaded as at 13. The diameter of the bore 12 and character of the thread 13 correspond to the diameter and thread of the spark plug port which is to be reworked. The mouth of the bore 12 is countersunk as at 14 and surrounded by a serrated rim 15.

The working part 10 of the tool is divided by flutes 16 into four equally spaced, identical wings 17 which perform the reaming and tapping operation as described, the outer edge of each wing 17 being, of course, generally arcuate in plan. The lowermost or entering end 18 of each wing 17 is provided with a thread 19 adapted to mate with the thread 13 of the handle portion 11 and, therefore, corresponding to the thread of the spark plug originally installed in the spark plug port to be reworked. Above the thread 19 each wing 17 is provided with a reamer portion comprising separate reamer sections 20 and 21 of smaller and larger diameters, respectively. Above the reamer section 21 each wing is provided with a tapered section 22 serving as a lead-in to a tapping thread 23 of increasing diameter, the upper turns of which correspond in diameter to the crest diameter of the external thread of the hard metal insert which is to be installed in the spark plug port. Above the tapping thread 23 each wing of the working part is provided with a reamer section 24 of such diameter as to form, at the mouth of the spark plug port, a countersink adapted to receive a head flange of the aforementioned insert. The head of the working part 10 preferably comprises a short cylindrical portion 25 surrounded by a hexagonal or other polygonal section 26 adapted for engagement by a wrench or other tool for turning the working part 10.

In reworking a damaged spark plug port, the entering end 18 of the working part 10 is threaded into and through the damaged spark plug port and as the extremity of the entering end protrudes into the interior of the cylinder head it is threaded into the bore 12 of the handle part 11. The serrations 15 at the mouth of the bore 12 contact the inner surface of the cylinder head and restrain the handle part 11 from turning, thus the thread 13 of the handle part serves to draw the working part 10 into the spark plug port as the working part 10 is rotated. In this way the reamer section 20 is caused to remove the damaged thread of the spark plug after which the reamer section 21 enlarges the hole to the crest diameter of the new thread to be tapped into the port. The lead-in section 22 and tapping section 23 then enter the spark plug port and the tapping is performed, after which the reamer portion 24 forms the
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countersink 27 (FIG. 3) at the mouth of the spark plug port. As noted above, the mouth of the handle part 11 is provided with a countersink 14 of a diameter to receive the reamer section 20, thus permitting the reamer section 21 to pass completely through the hole, preparing it for tapping, before the tapping operation begins. For this reason, and because the reaming operation is performed in two steps, the tool of the present invention requires the use of considerably less torque than is necessary to perform the same operation using tools heretofore available.

After the tapping section 23 has performed the initial part of the tapping operation, the working part 10 will be drawn into the work by the partially tapped thread but, if necessary, this phase of the operation may be assisted by exerting tension upon the handle portion 11 during completion of the tapping operation and reaming of the countersink 27 at the mouth of the spark plug port.

After completion of the operations performed as just described, the tool is removed from the reworked port and a hard metal insert 28 (FIG. 3), for example of the "Kelox" type, is installed in the port, the insert 28 having an internally threaded bore adapted to receive a new spark plug of the type originally installed.

Having thus described my invention, what I claim as new and wish to secure by Letters Patent is:

1. A rotary tool for reworking sparkplug holes of soft metal cylinder heads, said tool comprising an elongated working part and a separate handle part, said working part having a tool-engaging portion at one end, and a threaded handle-engaging portion at the other end, a reamer portion, for reaming a spark-plug hole to a larger size, adjacent said handle-engaging portion, and a tapping portion, for tapping the reamed-out spark-plug hole, between said reamer portion and said tool-engaging portion, and said handle part having a threaded portion for engaging said handle-engaging portion of said working part, and a countersunk portion for receiving part of said reamer portion therein when the threaded handle-engaging portion is fully threaded into the threaded portion of said handle part.

2. A tool as defined in claim 1, said reamer portion comprising a first reamer section of relatively small diameter and a second reamer section of relatively larger diameter, said first reamer section being nearest said handle-engaging portion.

3. A tool as defined in claim 1, said working part having a second reamer portion between said tapping portion and said tool-engaging portion.

4. A tool as defined in claim 1, said handle-engaging portion consisting in an externally threaded cylindrical member and said handle part having an internally threaded depression to receive said member.

5. A tool as defined in claim 4, said handle part having a serrated ridge portion adjacent the mouth of said depression.

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