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METHOD AND APPARATUS FOR REPLACING TIMING GEARS

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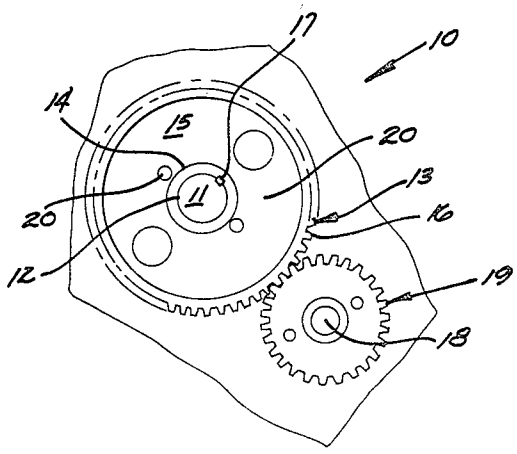


FIG. 1.

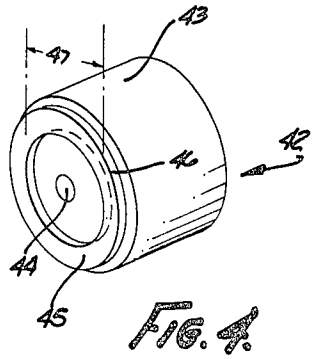


FIG. 4.

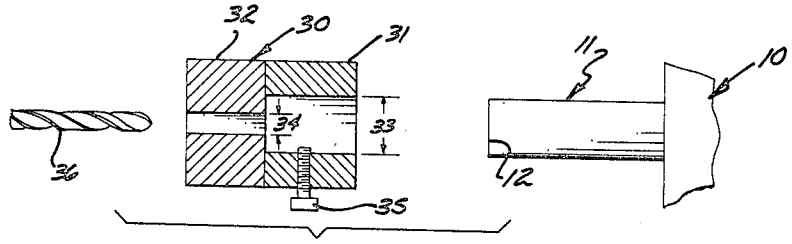


FIG. 2.

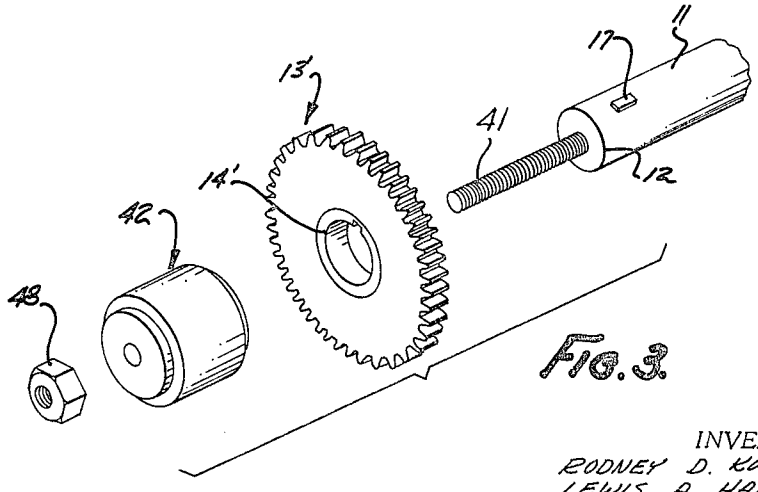


FIG. 3.

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METHOD AND APPARATUS FOR REPLACING TIMING GEARS

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ABSTRACT OF THE DISCLOSURE

After removal of the worn timing gear, a generally longitudinal recess is bored in the exposed extremity of the camshaft. This recess is tapped and an elongated threaded lug screwed thereinto. The replacement timing gear is positioned over the lug and a bearing member slid thereonto such that the timing gear lies between the shaft extremity of the bearing member. A nut is then threaded onto the exposed extremity of the lug to draw the bearing plate toward the shaft extremity and, thus, press the replacement gear onto the shaft extremity.

BACKGROUND

This invention relates to a method and apparatus for replacing timing gears on certain types of automotive engines and, more particularly, to such an apparatus and method whereby replacement may be effected without complete removal of the camshaft from the engine block.

In a number of modern types of automotive engines, rotational thrust is transmitted from the crankshaft to the camshaft via a system of two intermeshing gears located at the forward end of the engine block. One of these gears, commonly referred to in the art as the crankshaft gear, is affixed to an exposed extremity of the crankshaft and the other of these gears, commonly referred to as the timing gear, is affixed to the exposed end of the camshaft. As will be readily appreciated by those skilled in the art, the rotational displacement of the camshaft at any given moment must maintain a fixed relationship with respect to the rotational displacement of the crankshaft. This factor necessitates extremely accurate gear mesh between the two rotating components. If, for example, the timing gear should become worn so as to have some rotational "slop" with respect to the crankshaft gear, the engine will no longer function correctly and the timing gear, which is usually fabricated from softer metal than the crankshaft gear, must be replaced.

The replacement of the timing gear in engines of the types described has involved heretofore a complicated and time consuming task of removing the camshaft completely from the engine such that it may be placed in a press to force the new timing gear onto the normally exposed extremity thereof. Such removal necessitates prior removal of the radiator, grill, timing gear cover, valve cover, rocker arm assembly, the push rods, the engine side covers and all lifters. This process is necessitated by the undesirability of exerting any rearward thrust on the camshaft while it is in place in the engine. If, in fact, any such thrust is exerted on the camshaft, the bearing structure

which rotatably supports the rear extremity thereof will be ruined. For this reason, it is not possible to merely pound the new timing gear onto the exposed end of the shaft with a hammer or the like.

Once the camshaft has been removed from the engine and the new timing gear pressed in place thereon, the engine must be reassembled and properly adjusted. The replacement operation has required heretofore approximately 8 to 10 hours to complete. For example, it is customary in the auto industry to perform the replacement operation on an eight and one-half hour base price, thus, resulting in a rather expensive over-all operation. This charge, of course, is past ordinarily directly to the customer or the guaranteeing automobile manufacturer. Despite this fact, however, the particular mechanic or garage performing the service is tied up for a relatively lengthy period and, thus, cannot perform his ordinary servicing functions with regard to other types of automotive problems.

OBJECTS AND SPECIFICATION

It is an object of this invention to provide a method and/or apparatus for replacing the timing gear on engines of the type described which markedly reduces the amount of service time necessary for the procedure.

More particularly, it is an object of this invention to provide a method and/or apparatus of the type described which will reduce the mechanic's time for a reinstallation of the type described by a factor of approximately four and, thus, which will reduce markedly the expenses involved.

It is an object of this invention to provide a method and/or apparatus of the type described wherein timing gear replacement may be effected without removal of the camshaft from the engine and, yet, wherein no appreciable rearward thrust is exerted on the chamshaft which might damage its supporting bearings or otherwise impair its operative functions.

These as well as other objects of this invention will be readily understood by those skilled in the art with reference to the following specification and accompanying figures in which:

FIG. 1 is a fragmentary, front-elevational view of a typical engine block with the timing gear cover removed to expose the intermeshing timing and crankshaft gears;

FIG. 2 is a side-elevational view of the forward camshaft structure showing the drill jig and drill in exploded fashion;

FIG. 3 is an exploded perspective view indicating the manner in which the new timing gear is forced onto the exposed extremity of the camshaft; and

FIG. 4 is a perspective view of the gear-abutting bearing plate.

Briefly, this invention comprises a method of and/or apparatus for replacing a timing gear on an engine camshaft. After removal of the old timing gear, a generally longitudinal recess is bored in the exposed extremity of the camshaft and a threaded lug secured into the recess. The new timing gear is positoned over the lug and a bearing plate having a larger, nominal cross-sectional area than the shaft receiving aperture in the gear is secured to the exposed extremity of the lug and drawn toward the exposed extremity of the camshaft by means of the

threaded lug to press the timing gear onto the camshaft.

Referring now to the figures, a preferred embodiment of this invention will be described in detail. FIG. 1 illustrates an engine block **10** having a camshaft **11**. Camshaft **11** has an exposed timing gear receiving extremity **12** upon which is press fitted a timing gear **13**. Timing gear **13** comprises a conventional boss **14** having affixed thereto a planar section **15** with a circular toothed periphery **16**. The boss **14**, and, thus, the entire timing gear **13** is keyed to the timing gear receiving extremity **12** of camshaft **11** as indicated at **17**.

The crankshaft **18** has a conventional crankshaft gear **19** secured thereto in such a manner that it intermeshes with timing gear **13**. The rotational position of the crankshaft at any particular moment is transmitted to the camshaft via the intermeshing gears **13** and **19** such that the engine valves and distributor function in correct chronological sequence during operation of the engine. In actual operation, of course, the timing gear **13** and crankshaft gear **19** are covered by a suitable pan or the like and usually ride behind the radiator and grill in the automobile.

As noted previously, a tendency exists for the periphery **16** of the timing gear to wear in such a manner that some rotational "slop" exists between the crankshaft gear **19** and the timing gear **13**. This "slop," of course, permits the camshaft to get out of time with respect to the crankshaft and, thus, causes the engine to function improperly. When such "slop" has been found to exist, the timing gear must be replaced if the engine is to function properly thereafter.

Once this particular problem has been diagnosed, the grillwork, radiator and gear cover are removed from the automobile. Several satisfactory methods are well-known in the art for effecting removal of the old timing gear without necessitating the removal of the camshaft from the engine. It has been found, for example, that by drilling a pair of holes such as indicated by the reference numeral **20** in FIG. 1 on opposite sides of the shaft aperture adjacent the boss **14** and thereafter driving a pair of tapered plugs into the holes, the old timing gear may be removed with ease without fear of damaging the camshaft assembly. If, on the other hand, the particular timing gear in question has already been provided with apertures in its planar surface **15**, it is often possible to utilize a conventional wheel puller to remove the worn gear.

Once removal of the worn gear has been effected, an aperture or recess is drilled into the forward extremity of the camshaft. Preferably, the recess is oriented generally longitudinally with respect to the camshaft such that its boundaries lie concentrically with respect to the gear receiving portion **12** of the camshaft. As shown in FIG. 2, the drilling operation may be effected conveniently by placing a jig **30** having a cylindrical forward section **31** and a cylindrical butt section **32** over the exposed extremity of the camshaft **11**. The forward section **31** of jig **30** has an inside diameter **33** adapted to be slidably, but positively, accommodated by the exposed extremity of the camshaft **11**. The cylindrical butt section **32** has an inside diameter **34** which is just slightly larger than the particular drill to be utilized. The jig **30** is placed over the extremity of the crankshaft and the cap screw **35** turned to lock it in that position. The drill **36** is then inserted through the end of the jig and into the metallic camshaft until a channel or recess of sufficient depth (approximately one-half to one inch) has been formed. Thereafter, the jig **30** is removed and the aperture or recess tapped to accommodate a threaded stud.

The jig **30** is fabricated such that the drill receiving channel **34** is symmetrically positioned with respect to the camshaft receiving portion **33** and, thus, the hole so formed will be in the center of the exposed extremity of the camshaft. The jig **30** may be fabricated, conveniently, from a piece of cylindrical metal stock in any conventional manner.

Once the aperture so drilled in the forward extremity of the camshaft has been tapped, a piece of threaded stock **41** is secured thereto by screwing it thereinto (see FIG. 3). The new timing gear **13'** is inserted over the threaded stud **41** by passing the stud through the shaft receiving aperture in the boss **14'**. A bearing or pressure plate **42** is placed over the lug **41** in such a manner that the new timing gear **13'** lies between it and the exposed extremity of the camshaft and a nut threaded onto the exterior of the lug **41**. As the nut **48** is rotated to draw the pressure plate **42** toward the camshaft extremity, the timing gear **13'** is gradually forced onto the camshaft extremity. Of course, the key **17** must be positioned on the camshaft prior to forcing the gear thereonto.

The bearing or pressure plate **42** (see FIGS. 3 and 4) comprises a cylindrical bearing section **43** having an aperture **44** through the center thereof adapted to slidably receive the threaded lug **41**. The bearing plate **42** is provided with a washer-like shoulder section **45** having a depth **46** equalling the desired overhang of the camshaft extremity from the boss **14'** after complete insertion of the timing gear on the end of the camshaft. The washer-like shoulder **45** has an inside diameter **47** approximately equal to or slightly larger than the camshaft extremity to permit it to pass thereinto during the final pressing stages. At this point, of course, the shoulder pushes the timing gear onto the camshaft such that a portion of the camshaft extremity is thereafter exposed.

No over-all axial thrust is exerted on the camshaft during the installation procedure since the tension force is exerted directly between the camshaft and the gear being inserted thereof. The operation may be effected, therefore, without fear of damaging the camshaft supporting bearings or the push rod assemblies. After the installation has been completed, the threaded lug **41** is removed from the tapped hole in the camshaft extremity and the vehicle reassembled. The presence of the tapped hole or channel in camshaft extremity **12** does not interfere with proper functioning of the camshaft. This hole may be of sufficiently small dimension with respect to the camshaft diameter so as to not appreciably alter its structural characteristics.

Thus, it will be seen that this invention has provided a method and/or apparatus for installing a new timing gear in an engine which may be effected with both dispatch and efficiency, it no longer being necessary to dismantle the engine almost completely so that the new gear may be placed on the camshaft.

While a preferred embodiment of this invention has been illustrated in detail, it will be readily apparent to those skilled in the art that many other embodiments may be conceived and fabricated without departing from the spirit and scope of this specification and the accompanying drawings.

We claim:

1. A method of replacing a timing gear on an engine camshaft without removing said camshaft from the engine comprising the steps of:

removing the old timing gear;

boring a generally longitudinal recess in the exposed extremity of the camshaft;

securing a threaded lug into said recess;

positioning a new timing gear over said lug;

positioning a bearing plate over the exposed extremity of said lug, said bearing plate having a larger nominal cross section than the shaft receiving aperture in said gear; and

drawing said bearing plate toward the said exposed extremity of said camshaft by means of said threaded lug to press said timing gear onto said camshaft.

2. A method of replacing a timing gear on an engine camshaft without removing the camshaft from the engine comprising the steps of:

removing the old timing gear;

securing an elongated lug to the exposed timing gear receiving extremity of said camshaft;

positioning the replacement timing gear over said lug;

positioning a bearing member over the extremity of said lug such that said timing gear lies between said bearing member and said extremity; and

drawing said bearing member toward the said exposed extremity of said camshaft by mechanical advantage means by tensioning said lug to press said timing gear onto said camshaft.

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