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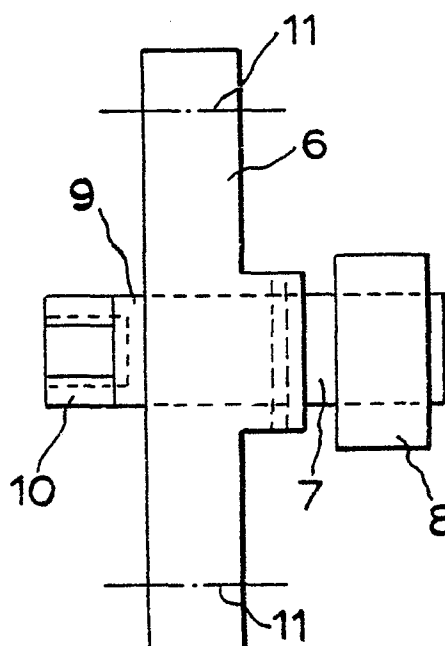
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54 Method and apparatus for securing and releasing a crankshaft pulley.

57 To exert torque on an engine crankshaft 3, for the purposes of tightening or loosening bolts which are coaxial with the crankshaft, torque is applied to the ring gear 5 which is mounted on the crankshaft and is normally engaged by a starter motor.

A tool is provided which includes a pinion 8 which can be mounted so that it engages the ring gear and which can itself be turned by a shaped end 10 on the pinion shaft. The shaft is held in a body 6 which can be securely fixed to a suitable place on an engine block 1. To lighten or loosen the bolt, the bolt itself is held stationary and the crankshaft is turned as a result of a torque being applied to the shaft of the pinion which then applies a torque to the crankshaft itself through the ring gear. Because of the relative sizes of the pinion 8 and the ring gear 5, this torque is multiplied.



METHOD AND APPARATUS FOR SECURING AND RELEASING
A CRANKSHAFT PULLEY

The present invention relates to an apparatus for exerting torque on a bolt securing a pulley to an engine crankshaft to enable the pulley to be secured to, or released from, the crankshaft.

The bolt normally used to secure a crankshaft pulley is a high torque bolt and considerable torque needs to be applied both to tighten and release the bolt. Complex and expensive torque multiplication tools are known and conventionally used for this purpose. However, because access to the bolting is usually limited it is often not possible to use such tools. The task is rendered still more difficult by the tendency for the crankshaft to rotate when a high torque is applied to the bolt securing the crankshaft pulley.

The present invention seeks to mitigate the foregoing problems.

In accordance with a first aspect of the invention, there is provided a method of applying torque to a bolt for securing a pulley to one end of a crankshaft of an engine, the method comprising fitting a spanner to the head of the bolt, and applying a torque to the crankshaft by means of a tool comprising a manually rotatable pinion meshing with a starter ring gear on a flywheel arranged at the other end of the crankshaft.

In accordance with a second aspect of the present invention, there is provided a tool for exerting torque on an engine crankshaft to permit tightening and untightening of a bolt securing a pulley to the crankshaft, the tool comprising a body adapted to be fixed relative to the engine housing, a shaft journaled in the body, a pinion fast in rotation with the shaft

and engageable with a starter ring gear on the engine crankshaft and means on the shaft for enabling the shaft to be manually rotated.

5 The invention is based upon the realisation that use may be made of the starter ring gear of the engine as part of a torque multiplication device to enable considerable torque to be applied between a bolt securing a pulley to the crankshaft so as to allow the bolt to be tightened or released. The bolt may readily be prevented from
10 rotating relative to the engine by the use of a spanner fitted to the head of the bolt and brought to rest against the engine block and the engine crankshaft may then be rotated by manually rotating the pinion engaging the starter ring gear. Apart from the torque multipli-
15 cation gear achieved by the relative diameters of the pinion and the ring gear, the task of removing and fitting the pulley is simplified by the improved access at the rear of the engine.

The tool body is intended to be secured to the engine
20 block or bell housing in the hole usually occupied by the starter motor and this hole is normally readily accessible.

It is preferable to design the tool to permit it to be used for different engines and for this reason it is
25 desirable to provide several mounting holes or arcuate mounting slots to accomodate different positioning of securing bolts. Similarly, it is preferable for the pinion to be releasably secure to the shaft so that it may be replaced by a different sized pinion to suit the
30 ring gears on different engines.

It is further preferable to provide means for preventing the shaft and the pinion from rotating relative from the housing. By locking the shaft in this manner, it is possible to prevent the crankshaft from rotation and

this to can simplify removal of the crankshaft pulley since on occasions locking the crankshaft against rotation is sufficient to enable the bolt to be removed by merely applying a torque directly to the head of the
5 bolt.

The invention shall now be further described, by way of example, with reference to the accompanying drawings, in which :

10 Figure 1 shows diagrammatically an engine having torque applied to its crankshaft;

Figure 2 shows a tool according to the invention; and

Figure 3 schematically illustrates the torque multiplication achievable by the present invention.

15 Figure 1 shows an engine block 1 mounted between two side members 2. The crankshaft axis is indicated by the chain dotted line 3. At one end of the crankshaft, a pulley 4 is mounted. This is bolted onto the crankshaft 3 by means of a bolt on the crankshaft axis. At the
20 other end of the engine block 1, a starter motor is normally mounted. The starter motor has a pinion which projects through an opening in the engine block or bell housing and which, when in operation, engages a ring gear 5 fixed to a flywheel on the crankshaft.

25 The tool which is shown in Figure 2 will now be described. The tool has a body 6, with a central bore and a shaft 7 which passes through the bore. A pinion 8 is keyed to one end of the shaft and the other end 9 of the shaft projects through the body 6 and has a shaped
30 end 10. This shaped end may have an internal square drive and/or an external shape engagable by a spanner. The body 6 has slotted location holes, indicated schema-

tically at 11, by means of which it can be secured to the engine block 1.

In use of the tool, the starter motor, which normally projects into the housing of the ring gear 5, is removed. The tool shown in Figure 2 is then fitted and the pinion 8 is introduced in place of the starter motor pinion, through an aperture in the housing and into engagement with the ring gear 5. The body 6 is then secured to the engine block 1 in a position such that the teeth of the pinion 8 remain in mesh with the teeth of the ring gear 5.

Next, a spanner 12 is applied to the head of the bolt which holds the crankshaft pulley on the crankshaft. This tool is lodged against a fixed part of the engine so as to hold the head of the bolt steady. Finally, torque is applied to the shaped end 10 of the shaft 7 to turn the shaft and the pinion 8 on the shaft, to cause the ring gear 5 to rotate. Because of the relative diameters of the pinion 8 and the ring gear 5 (as can be seen in Figure 3) a considerable multiplication of the torque applied to the shaft 7 is produced when the torque is transferred to the crankshaft 3.

Thus it can be seen that a simple and cheap tool can be provided which can allow large torques to be exerted on an engine crankshaft.

To allow the tool to be used with different engine configurations, the pinion 8 may be removable from the shaft 7 and may be interchangeable with other pinions of different sizes. the location holes 11 are slotted for the same reason, so that the body can be correctly mounted on engines having fastening points in different places.

It may also be desirable to be able to lock the pinion shaft 7 relative to the body 6, and facility for this purpose is shown at 13. This can be useful to lock the crankshaft against rotation, when access is possible to
5 the crankshaft pulley bolt. The bolt can then be turned against a stationary shaft.

CLAIMS

1. A method of applying torque to a bolt for securing a pulley to one end of a crankshaft of an engine, the method being characterised by the steps of fitting a
5 spanner (12) to the head of the bolt, and applying a torque to the crankshaft (3) by means of a tool comprising a manually rotatable pinion (8) meshing with a starter ring gear on a flywheel arranged at the other end of the crankshaft (3).
- 10 2. A tool for exerting torque on an engine crankshaft to permit tightening and untightening of a bolt securing a pulley to the crankshaft, characterised by a body (6) adapted to be fixed relative to the engine housing, a shaft (7) journaled in the body (6),
15 a pinion (8) fast in rotation with the shaft (7) and engageable with a starter ring gear on the engine crankshaft (3) and means (10) on the shaft for enabling the shaft (7) to be manually rotated.
3. The tool as claimed in Claim 2, wherein the shaft
20 (7) extends through the body (6), with the pinion (8) on one side of the body and means (10) for turning the shaft on the other side.
4. A tool as claimed in Claim 3, wherein the means for turning the shaft (7) comprise a shaped end (10)
25 engageable by a turning tool.
5. A tool as claimed in one of Claims 2 to 4, wherein the pinion (8) is removable from the shaft (7).
6. A tool as claimed in any one of Claims 2 to 5, wherein means are provided for locking the shaft (7) to
30 the body (6).

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7. A tool as claimed in any one of Claims 2 to 6, wherein the body is provided with slotted location holes (11) by means of which the body (6) can be secured to the engine.

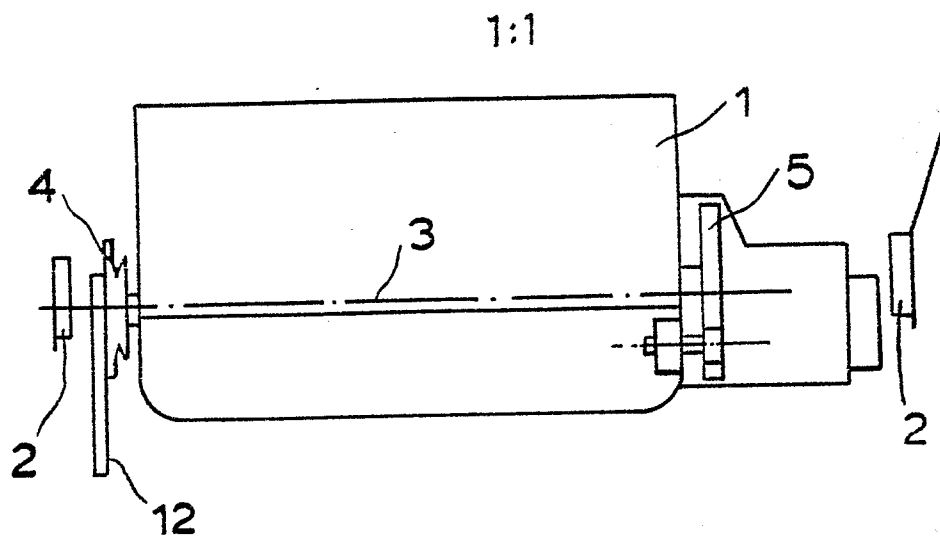


FIG. 1.

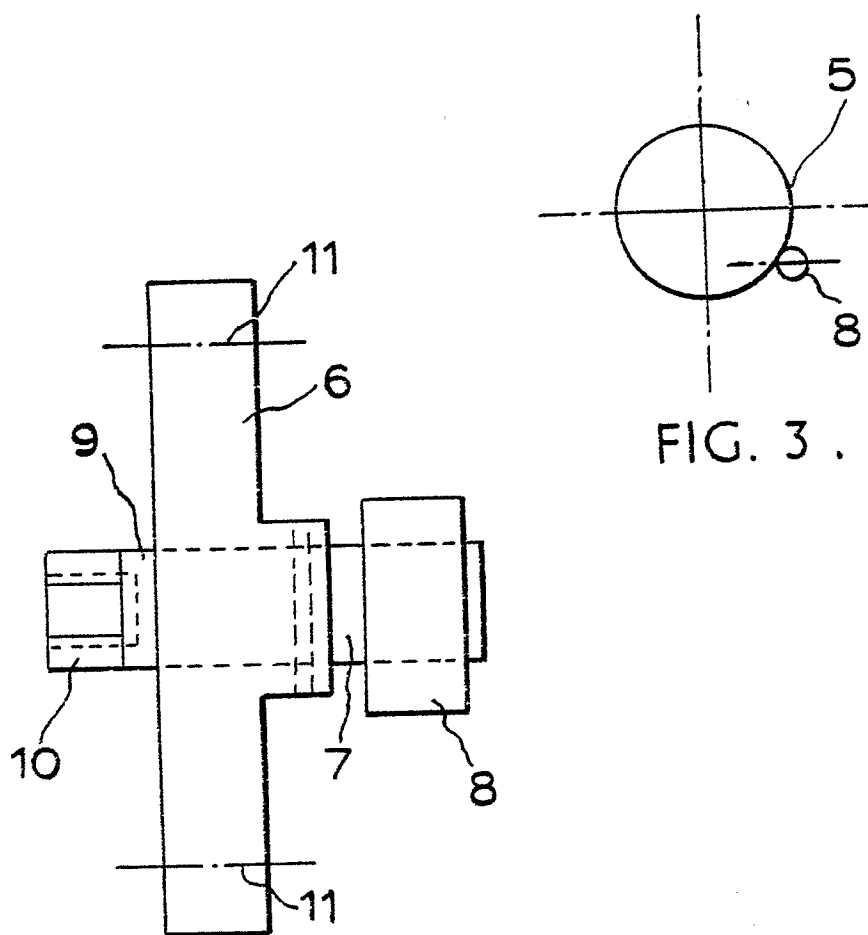


FIG. 2.

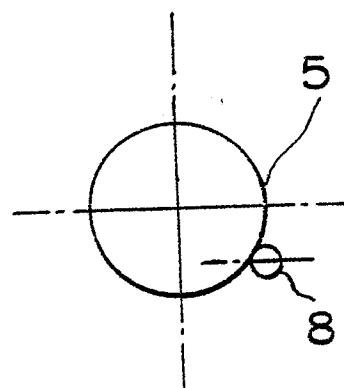


FIG. 3.



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EUROPEAN SEARCH REPORT

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Application number

EP 83 30 6155

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)
X	US-A-3 321 985 (WHEELER) * Figures 1-4 *	1-4, 7	B 25 B 27/14
A	CH-A- 314 420 (COOKSON) * Figure 1 *	1, 7	
A	US-A-2 491 727 (GOTTING)		
A	US-A-2 507 846 (ZITZERMAN)		
A	US-A-2 614 445 (RIORDAN)		
			TECHNICAL FIELDS SEARCHED (Int. Cl. 3)
			B 25 B 27/00 F 16 B 23/00
The present search report has been drawn up for all claims			
Place of search BERLIN		Date of completion of the search 12-01-1984	Examiner ZAPP E
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			