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[11] **3,842,937**

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[54] **CIRCULATION OF LUBRICANT OF AN INTERNAL COMBUSTION ENGINE PRIOR TO START-UP**

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[52] **U.S. Cl.** ..... **184/6.3,** 123/196 S

[51] **Int. Cl.** **F01m 1/02**

[58] **Field of Search** ..... 184/6.3, 27 R, 28; 123/196 S, 198 C, 198 D; 64/1 R; 74/10.45; 403/359, 360, 3

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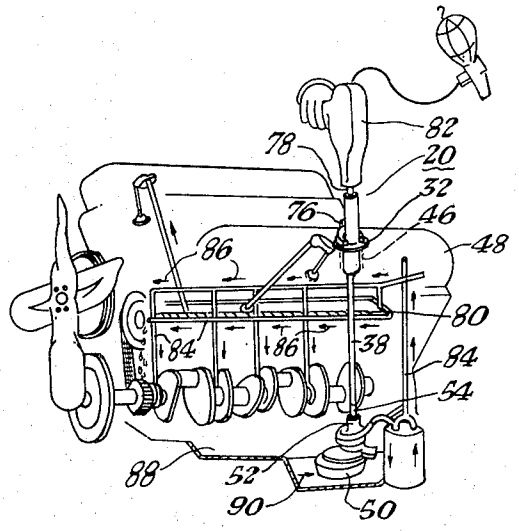
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Primary Examiner—Manuel A. Antonakas

[57] **ABSTRACT**

A lubricational tool for internal combustion engines and the like comprises a body member, a shaft rotatably extended through the body member, with the shaft terminating in a slip joint for engagement with an oil pump within the engine. The body member is shaped for extension thereof together with the shaft through an opening in a block of the engine. An arrangement is provided for rotating the shaft in engagement with the oil pump for lubricating the engine prior to start-up.

14 Claims, 4 Drawing Figures



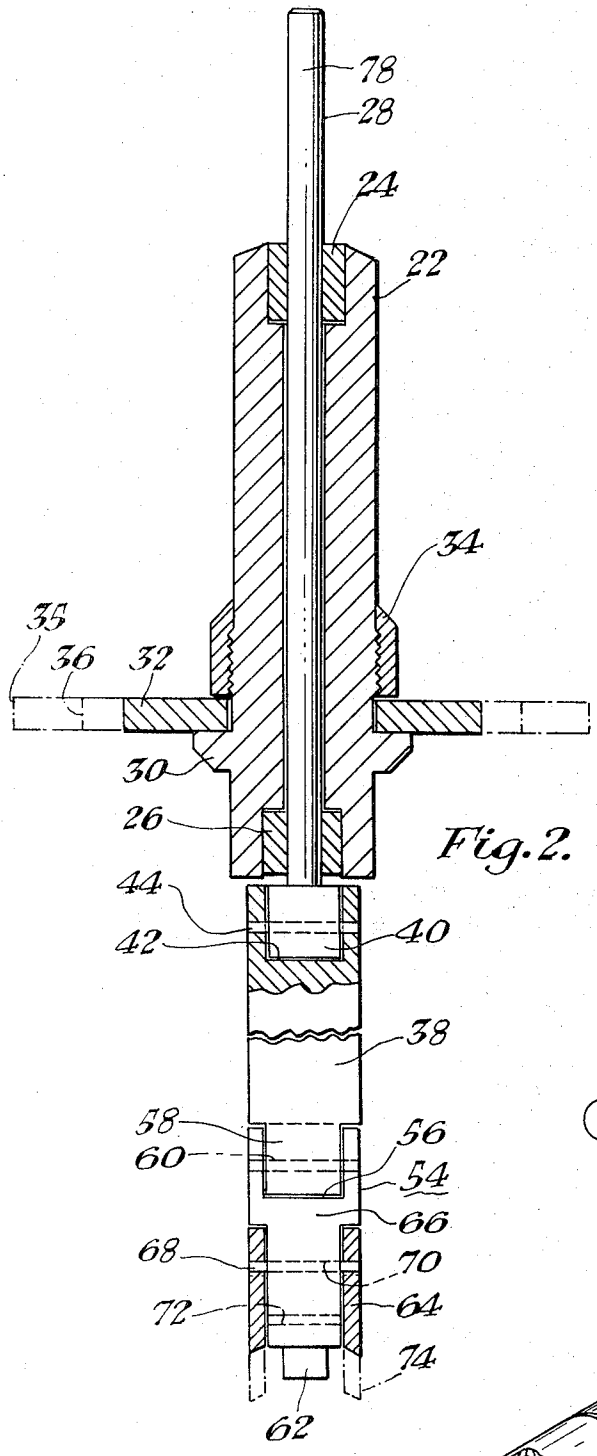


Fig. 2.

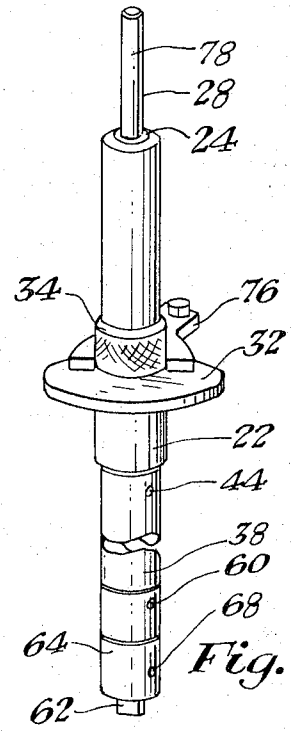


Fig. 1.

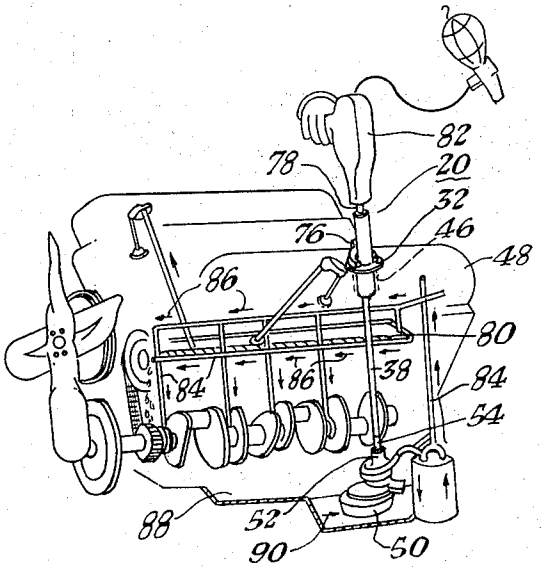


Fig. 4.

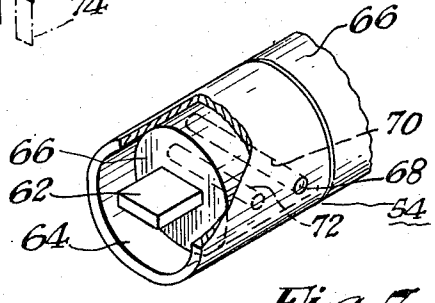


Fig. 3.

CIRCULATION OF LUBRICANT OF AN INTERNAL COMBUSTION ENGINE PRIOR TO START-UP

The present invention relates to method and means for circulating the lubricating oil of an internal combustion engine and more particularly to an arrangement of the character described for circulating oil through the lubrication system of a new or rebuilt engine, or one which has otherwise been idle for a period, prior to starting the engine.

It is widely known that the lubricating oil of an internal combustion engine, upon standing for a period, drains back into the crank case. When an engine is left idle overnight or even for a period of several days oil films of sufficient thickness remain upon the internal bearing surfaces of the engine to afford a degree of residual lubrication until such time as the engine's oil pump refills the various lubricating passages to operating oil pressure. However, depending on type or make of engine, condition of lubricant, and length of the inactive period wearing of the engine's internal components is accelerated to a greater or lesser degree.

Quite often, a false impression regarding operational lubricant pressure is given during the initial operating period of an internal combustion engine. This follows from connection of the oil pressure gauge sensor usually to the outlet of the engine's oil pump, where lubricant pressure builds up most rapidly. However, lubricant pressure builds up at a slower rate at the cam shaft and crank shaft of the engine, particularly at the crank shaft which usually is last in the lubrication circuit coupled between the internal oil pump outlet and inlet. In most engines the cam shaft, which also operates the oil pump, turns at one-half the speed of the crankshaft. Under many operating conditions lubricational efficiency is further limited.

In those internal combustion engines, then, which are operated intermitently and which may be idle for extended periods, considerable wear on bearings and other internally lubricated components can occur each time the engine is started and before adequate lubrication is established by the internal oil pump. The amount of wear will depend upon the number and extent of the periods during which the engine is not operated and upon the length of time required for residual oil films in the inactive engine to thin or dissipate below the requirements for minimal lubrication. In certain cases, an overnight stand or even an oil change may accelerate the wearing process, owing to thinning or residual oil films. Most importantly, the operator of the engine will not be aware of any deficiency in lubrication, owing to the manner of connecting the oil pressure gauge as aforesaid.

In new stock engines it is difficult to assess the wear occassioned by sub-standard lubrication during initial start-up of the engine. Such engines usually are run or partially "broken in" by the manufacturer such that residual oil films are present at the engine's moving components when purchased by the ultimate user. However, the engines of new automobiles, for example, may be inactive for extended periods during inventory control, transportation, display in dealers' showrooms, and the like.

Stock internal combustion engines usually are assembled with components having at least a thin oil film thereon so that extensive or critical damage is not caused during initial start-up at the factory. After purchase by the ultimate user, most stock engines are used regularly such that more or less adequate oil films are maintained upon their moving parts. However, if stock engines are left inactive for extended periods severly accelerated wear can be caused by subsequent starting under conditions of very thin oil films, until oil pressure is belatedly re-established by the engine's oil pump.

In certain engines, the oil pump prime is lost, when the crankcase is drained during routine oil changes. When new oil is subsequently added, the absence of oil in the oil pump gives a false indication of adequate oil level. The engine may then have an inadequate oil level when the pump prime is restored and the oil pump is further delayed, during repriming, in reestablishing adequate oil pressure. These and other problems discussed herein are solved by the method and means of our invention which enables operation of the engine's oil pump prior to starting the engine.

In the case of rebuilt engines and also racing engines, the engine components may not be lubricated before assembly such that the manufacturer or the user initially and inadvertently starts the engine with bone-dry components. Considerable and much more severe damage can occur during initial start-up of a completely dry engine before its internal oil pump can circulate lubricant to the engine's moving parts. In rebuilt and in racing engines, which are more likely to be disassembled and reassembled a number of times in contrast to stock engines, the engine may be restarted dry several times during its lifetime. Obviously considerable damage can occur even when an internal combustion engine is started dry only once. In our researches into this phenomenon, we have established with some degree of reliability that so called "blown" engines frequently can be traced to the extreme wearing conditions caused by dry-starting of the engine.

Insofar as we are aware, there has been no adequate solution for this last problem prior to our invention, beyond disassembling the dry engine and physically applying heavy films of oil to the component parts before initial start-up. In fact, the existence and magnitude of this and other problems described herein, and the extensive engine damage that can be caused by dry or nearly dry start-up are not generally known, if they be known at all.

Accordingly we have developed a method and means for activating the oil pump normally included in an internal combustion engine, prior to starting the engine. This eliminates the necessity of starting a new, rebuilt, reassembled, or inactive engine either bone-dry or with insufficient oil film on its bearings, crank shaft, cam shaft and other moving components. With the means and method provided by our invention the engine's internal oil pump can be operated for a longer or shorter period of time as required for circulation of adequate lubricant to all of these operating components including particularly the crank shaft of the engine. Our invention also permits the adjustment of hydraulic lifters on a new or rebuilt engines, or on engines which have otherwise been inactive for some time, without first running the engine to establish adequate oil pressure for operation of the lifters, each of which may be lubricated at four different points in the lubricant circuit of the engine. This also avoids start-up with insufficient oil films on the operating components of the engine. In short, our invention can eliminate an unsuspected source of considerable and sometimes critical engine

wear. As noted previously, a new or rebuilt or otherwise inactive engine, and in many cases engines subjected to normal oil changes, must be operated for a generally unsuspected length of time before adequate oil pressure is established.

The pump activating means afforded by our present invention can take a variety of forms. For example most stock engines, e.g. Chevrolet, Chrysler and Ford (and related brands) can have their oil pumps actuated (without starting the engine) with one of the basic forms of oil pump actuating means afforded by the present invention. Desirably, however, we have incorporated most of the necessary structural variants in such means in a universal tool also provided by the invention, to facilitate practicing the invention. Another advantage of our lubricational arrangement is the ready availability (in auto shops and in most home workshops) of a suitable rotary power source for operation of the actuating means or tool provided by the invention.

We accomplish these desirable results by providing a lubricational tool for an internal combustion engine having an internal lubricant pump, said tool comprising a body member, a shaft rotatably extended through said body member, said shaft terminating in a slip joint for engagement within said engine with said pump, said body member being shaped for extension thereof together with said shaft through an opening in a block of said engine, and means for rotating said shaft in engagement with said pump to lubricate said engine piror to start-up.

We also provide a similar lubricational tool wherein said body member is provided with a flange or collar member for closing said engine block opening.

We also provide a similar lubricational tool wherein said flange or collar is shaped for engagement with distributor hold-down means provided on said engine.

We also provide a similar lubricational tool wherein said body member is provided with mounting means, said mounting means being shaped to close s distributor housing opening in said engine block.

We also desirably provide a method for lubricating an internal combustion engine prior to starting the engine, said method comprising the steps of inserting a shaft arrangement through an opening in an engine block of said engine, detachably joining said shaft to an input shaft of an internal lubricant pump of said engine, by-passing a cam shaft of said engine with said shaft arrangement, and rotating said shaft arrangement and said oil pump for a time sufficient to supply engine lubricant to the lubricant passages thereof.

We also desirably provide a similar method including the additional step of removing a distributor assembly of said engine to provide said engine block opening.

We also desirably provide a similar method including the additional step of positioning a cover for said engine block opening on said shaft arrangement so that said opening is closed when said shaft arrangement is engaged with said pump shaft.

During the foregoing discussion, various objects, features and advantages of the invention have been set forth. These and other objects, features and advantages of the invention together with structural details thereof will be elaborated upon during the forthcoming description of certain presently preferred embodiments of the invention and presently preferred methods of practicing the same.

In the accompanying drawings we have shown certain presently preferred embodiments of the invention and have illustrated certain presently preferred methods or practicing the same, wherein:

FIG. **1** is an isometric view of one form of a lubricational tool arranged in accordance with our invention for rotating the oil pump of an internal combustion engine;

FIG. **2** is a longitudinally sectioned view of the apparatus shown in FIG. **1**;

FIG. **3** is a partial isometric view of a lower end portion of the apparatus shown in the preceding figure; and

FIG. **4** is a schematic elevational view, partially sectioned, showing our lubricational tool installed on an internal combustion engine for circulation of engine lubricant prior to start-up.

With reference now more particularly to the drawings, the means aspect of our invention is embodied in a lubricational tool **20** shown therein. The tool **20** includes a body member **22** having a sleeve bearing **24** or **26** at each end thereof as better shown in FIG. **2.** The bearings **24** can be fabricated from a suitable material such as stellite, and closely receive shaft **28** rotatably mounted therein. An outer end portion of the shaft **28** extends outwardly of the body member **22** a sufficient distance to allow attachment to a hand held power drill **80** (FIG. **4**), torque wrench, or other source of rotative power. The body member **22** can be longer or shorter proportionately than that illustrated commensurate with particular engine construction and handling techniques. Likewise the protruding portion or upper end portion (as viewed in the drawings) of the shaft **28** can be varied. Generally the shaft **28** should project sufficiently for engagement with a Jacobs chuck or the like customarily used with hand or portable power drills. The shaft **28** can be provided with a noncircular configuration to facilitate engagement with a given type of chuck, or alternatively as shown, the shaft can be provided with a circular cross section which, of course, can be varied depending upon the capacity of a specific drill or torque wrench chuck.

Adjacent the lower bearing **26** of the body member **22,** the body member is provided with a supportive flange **30** on which rests a collar **32.** The collar **32** is secured against the body member flange **30** by means of lock nut **34** which is threadedly engaged with the body member **22** for example as shown in FIG. **2.** Naturally, other fastening means can be employed such as a snap ring. Either the collar **32** or the flange **30** can be employed to close an opening for the tool **20** in the engine block **48** (FIG. **4**) as described below.

As is well known, the distributor assembly (not shown) of most internal combustion engines includes an inwardly extending shaft which makes a slip connection to the input shaft of the internal oil pump of the engine. Motive power is supplied through a suitable mechanical connection to the distributor shaft from the cam shaft of the engine for actuating both the distributor and the oil pump, when the engine is operating.

Our novel lubricational tool **20** is designed to bypass the driving connection of the engine cam shaft and to make an independent slip connection to the engine oil pump. Thus, our lubricational tool **20** in a most unexpected manner provides an arrangement for rotating the internal lubricant pump of the engine with an externally applied source of power. The oil pump then can

be actuated independently of the engine before start-up and can supply vital lubricant to the oil passages of the engine and to the crank shaft, cam shaft, lifters, and other moving parts of the engine while the latter is inoperative. Accordingly the necessity of starting a dry engine or one with inadequate residual lubricant is obviated.

The collar **32** accordingly is sized to cover the opening in the engine block remaining after removal of the distributor housing. The size and shape of the collar **32** can be varied to meet the requirements of a particular make of engine or line of engines. For example the collar **32** as shown is sized for a series of Ford engines. Differing shapes of collars (chain outlines **34, 36**) can be employed for example for Chevrolet and Chrysler engines respectively. The illustrated sizes of the collar **36** and the overall configuration thereof are illustrative and can be varied considerably depending upon the application of the invention. It is contemplated further that the flange **30** of the body member alternatively can be configured for closing the distributor opening in other applications of the invention.

At the lower end of the shaft **28** a shaft extension **38** can be keyed and pinned or otherwise secured to the shaft **28.** For example the shaft **28** can be provided with a male socket extension **40** which is closely fitted into keying recess **42** of the shaft extension **38.** A pin **44** can be passed through suitable apertures in these components to secure the male socket member **40** to the shaft extension **38.**

The shaft extension **38** can be made longer or shorter than illustrated depending upon the distance from the distributor opening **46** in engine block **48** to the oil pump **50** (FIG. **4**), where the lower end of the lubricational tool **20** engages the oil pump shaft **52** as described below. For example, a relatively short extension is required for most Ford engines, the illustrated extension **38** of intermediate length for most Chevrolet and other GM engines, and a relatively long extension for most Chrysler engines. It is contemplated further, in given applications of the invention, that the shaft extension **38** can be omitted and the lower end of the operating shaft **28** (as viewed in the drawings) can be secured directly to connector assembly **54,** which in the illustrated embodiment is joined to the adjacent end of the shaft extension **38** through similar joint components.

The connector assembly **54** thus includes a keying recess **56** into which male keying member **58** of the shaft extension **38** is inserted where the parts are secured by transverse pin **60.** The connector assembly **54** terminates in keying member **62** which is shaped to fit into a keying recess in the adjacent end of oil pump shaft **52** (FIG. **4**) of the vast majority of internal combustion engines. The oil pump shaft recess is provided, of course, for slip attachment to the adjacent end of the conventional distributor assembly shaft (not shown). Depending on a particular oil pump shaft configuration, the keying member can be replaced with a male or female hex or other wrench configuration.

To lend greater universality to the receiver assembly **54** and hence to the lubricational tool **20,** the receiver assembly **54** is provided with an axially slidable sleeve **64.** The sleeve **64** can be pinned or otherwise secured to the adjacent necked down portion of the receiver assembly shaft **66** by means of pin **68** inserted through apertures therefor in the sleeve **64** and through a selected one **70** or **72** of transverse apertures of the receiver assembly shaft **66.** Thus, the receiver assembly sleeve **64** can be pinned or otherwise secured in an extended position such as illustrated in FIG. **3** (chain outline **74,** FIG. **2**) to facilitate engagement between the oil pump shaft and the lubricational tool **20,** for example in Chevrolet-type engines. For most other engines the receiver sleeve **64** is withdrawn to its solid outline position (FIGS. **1** and **2**). Although the keying member **62** of the receiver assembly **54** is shown generally as a relatively flat extension or blade, it will be understood that other keying or slip-junction components can be substituted depending upon a specific application of the invention, as noted above.

In the operation of the invention, referring to FIG. **4** the conventional distributor assembly (not shown) has been removed, carrying with it the conventional shaft linkage for the lubricant pump. In certain engines such as Mopar (Chrysler) types, not all of the conventional oil pump shafting is removed with the distributor assembly. The lower portion of the Mopar shafting must be fished out or the oil pan dropped. The receiver assembly **54,** and the shaft extension **38** (if used) of the lubricational tool **20** are then inserted through distributor opening **46** of engine block **48** until the slip-joining, lower end portion of the connector assembly **54** engages shaft **52** of lubricant pump **50.** In this position the connector assembly keying member or blade **62** is engaged in a complementary recess conventionally provided on the outer end of the oil pump shaft **52.** Also in this position the tool collar **32** is seated on the engine block **48** so as to close the distributor housing opening **46.** The collar **32** (or interchangeable replacement therefor depending upon the make of the engine) can be secured against the engine block by means of a conventional distributor hold down yoke **76** which is usually mounted on the engine intake manifold (FIGS. **1** and **4**). The lubricational tool **20** is now rotatably mounted on the engine block **46** and provides in its projecting shaft portions **28, 38** means for applying external rotative power directly to the internal pump **50** of the engine **48,** before the latter is started. As evident from FIG. **4** these portions of the tool **20** projecting into the engine block **48,** viz. the shaft **28,** shaft extension **38,** and connector assembly **54,** bypass the cam shaft **80** of the engine **46.**

A portable drill **82** or other suitable source of rotative power can be attached to the upper end portion **78** of the shaft **28** to rotate the oil pump **50** for a time sufficient to fill lubricant passages **84** in the engine **48** with oil. With the oil pump **50** thus operated from an external source of power (e.g. power drill **82**), oil is circulated through the lubricant passages **84** (arrows **86**) to the crank case reservoir **88** and thence to the oil pump intake (arrow **90**), in the same manner as if the engine **48** were operating.

For universality, the drill or other source of rotative power desirably is reversible. In Chevrolet type engines the oil pump usually is rotated clockwise, while in other makes of engines the oil pump usually is rotated counterclockwise.

From the foregoing it will be seen that a novel and efficient circulation of lubricant of an internal combustion engine prior to start-up has been described herein. As described, the lubricational tool **20** is capable of operation from a variety or rotative power sources, which are readily available. The tool **20** can be easily modi-

fied for specific engine configurations. The descriptive and illustrative materials employed herein, therefore, are utilized for purposes of exemplifying the invention and not in limitation thereof. Accordingly, numerous modifications of the invention will occur to those skilled in the art without departing from the spirit and scope of the invention. Moreover, it is to be understood that certain features of the invention can be used to advantage without a corresponding use of other features thereof.

We claim:

1. In an internal combustion engine having an internal lubricant pump coupled to said engine for operation thereby, the improvement comprising a lubricational tool insertable into said engine for operating said pump to lubricate said engine prior to engine start-up, said tool including a body member, a shaft rotatably extended through said body member, said shaft terminating in a slip-joint for engagement within said engine with said pump, said body member being shaped for extension of said shaft spacedly through an opening in a block of said engine, and means for rotating said shaft in operative engagement with said pump to lubricate said engine prior to said start-up.

2. The combination according to claim **1** wherein said shaft is extended sufficiently outwardly of said body member for engagement with a portable power drill, torque wrench or the like.

3. The combination according to claim **1** wherein said body member is provided with a flange or collar member for closing said engine block opening.

4. The combination according to claim **3** wherein said collar member is removably mounted on said body member and replacement collar members of differing shapes are provided for closing correspondingly differently shaped engine block openings.

5. The combination according to claim **3** wherein said flange or collar is engagebly shaped with distributor holddown means provided on said engine.

6. The combination according to claim **1** wherein said slip-joint includes a connector-assembly adjacent an inward end of the shaft, said connector assembly including an axially projecting keying member and a sleeve member slidably mounted on the connector assembly adjacent said keying member.

7. The combination according to claim **6** wherein said sleeve is movable to a first position for engagement with an adjacent outer periphery of the shaft of said pump and to a second position withdrawn therefrom.

8. The combination according to claim **1** wherein said body member is provided with bearing means adjacent each end thereof, said shaft being rotatably mounted within said bearing means.

9. The combination according to claim **1** wherein said body member is provided with an extension thereof shaped for insertion through said engine block opening to maintain the spaced relation of said shaft in said opening.

10. In an internal combustion engine having an internal lubricant pump, the improvement comprising a lubricational tool to engage with said pump to lubricate said engine prior to start up, said tool including a body member, a shaft rotatably extended through said body member, said shaft terminating in a slip-joint for engagement within said engine with said pump, said body member being shaped for extension of said shaft spacedly through an opening in a block of said engine, and means for rotating said shaft in engagement with said pump to lubricate said engine prior to start up, said engine block opening being a distributor housing opening, said body member being provided with mounting means, said mounting means being shaped to close said distributor housing opening.

11. The combination according to claim **10** wherein said shaft includes a detachable shaft extension positioned inwardly of said body member and a connector assembly detachably joined to the inward end of said shaft extension, and means coupled to said connector assembly for slip-engaging an input shaft of said pump.

12. A method for lubricating an internal combustion engine prior to starting the engine, said method comprising the steps of inserting a shaft arrangement through an opening in an engine block of said engine, detachably joining said shaft to an input shaft of an internal lubricant pump of said engine, bypassing a cam shaft of said engine with said shaft arrangement, and rotating said shaft arrangement and said oil pump for a time sufficient to supply engine lubricant to the lubricant passages thereof.

13. The method according to claim **12** including the additional step of removing a distributor assembly of said engine to provide said engine block opening.

14. The method according to claim **12** including the additional step of positioning a cover for said engine block opening on said shaft arrangement so that said opening is closed when said shaft arrangement is engaged with said pump shaft.

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